Being in the Right Place: A Structural Analysis of Individual Influence in an Organization

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This research examined the relationships between structural positions and influence at the individual level of analysis. The structure of the organization was conceptualized from a social network perspective. Measures of the relative positions of employees within workflow, communication, and friendship networks were strongly related to perceptions of influence by both supervisors and nonsupervisors and to promotions to the supervisory level. Measures included criticality, transaction alternatives, and centrality (access and control) in the networks and in such reference groups as the dominant coalition. A comparison of boundary-spanning and technical-core personnel indicated that contacts beyond the normal work requirements are particularly important for technical core personnel to acquire influence. Overall, the results provide support for a structural perspective on intraorganizational influence.•

With the resurgent interest in power and influence in organizations, a multitude of theories and approaches have been proposed. Common to many of these approaches is the notion that power is a multilevel concept. For example, power is often defined from a dependency framework, such that the power of A over B is equal to the extent to which B is dependent on A (Emerson, 1962). This definition is implied to be true whether A and B are considered to be two organizations, two subunits within an organization, or two individuals.

Although power is a multilevel concept, empirical research on power and influence has typically followed two distinct patterns. Research at the subunit and organizational levels of analysis has focused on the structural sources of power (Hinings et al., 1974; Salancik and Pfeffer, 1974; Boje and Whetten, 1981; Beyer, 1982). The focus of studies at the individual or interpersonal level of analysis has been on behaviors or personal traits (Strauss, 1973; Mowday, 1978; Kipnis, Schmidt, and Wilkinson, 1980; Allen and Porter, 1983). Other approaches, such as French and Raven's (1959), focus on both structural and personal sources of power. Although it is difficult to apply such concepts as referent power or charisma at the organizational or subunit levels of analysis, a structural perspective at the interpersonal level of analysis does not pose such problems. However, the structural analysis of individual power has seldom progressed beyond the concept of hierarchical authority.

The present study attempts to apply a structural perspective to the study of influence at the individual level of analysis. Kanter (1979) has argued that it is the position, not the person, that determines power. Pfeffer (1981) and Perrow (1970) have noted that power is first and foremost a structural phenomenon. McCall (1979: 189) has pointed out the importance of "being in the right place." While personal attributes and strategies may have an important effect on power acquisition, the view adopted in this study is that structure imposes the ultimate constraints on the individual.

Organizational Structure

In summarizing much of the literature on structure, James and Jones (1976: 76) concluded that structure may be defined "as

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the enduring characteristics of an organization reflected by the distribution of units and positions within an organization and their systematic relationships to each other.'' Central to this definition is the division of labor, which creates task positions and the interrelationships or interdependencies among positions. The notion that power derives directly from the division of labor has been noted by a number of researchers (Thompson, 1967; Perrow, 1970; Hickson et al., 1971; Pfeffer, 1981), and some empirical investigations of power have focused on the division of labor and interdependencies at the subunit level. However, the work that organizations divide among subunits is further divided among individuals, and some individual positions will inevitably be more powerful than others.

Organizational structure may result from informal or emergent patterns of behavior, as well as from formally prescribed positions. For example, workers may informally modify the prescribed workflow or engage in information exchanges that do not follow the formal communication channels. As these emergent interactions become recurring patterns of behavior, further structure is added to the organization. An employee's structural position within the organization is the result of the particular combination or interaction of both formal and emergent interdependencies. Thus, the organization can be conceptualized as networks of interrelated structural positions, with individual employees occupying these relational positions.

Although this network view of organizational structure differs from the traditional view that emphasizes such variables as centralization, formalization, and size, it is consistent with Weick's (1969) notion that organizations consist of patterned, repeated interactions among social actors. Several social network theorists have provided excellent reviews of the application of this approach to organizations (Weiss and Jacobson, 1955; Rogers and Rogers, 1976; Tichy and Fombrun, 1979; Roberts and O'Reilly, 1979; Tichy, 1981). Because power and influence are typically defined as involving a social relationship or some interdependence among actors, social network measures seem particularly appropriate to their investigation.

This study attempts to locate the structural positions of nonsupervisory employees within three social networks: (1) the workflow network, (2) communication network, and (3) the friendship network. These networks correspond roughly to three of the four basic flows noted by Tichy, Tushman, and Fombrun (1979: 508): (1) exchange of goods, (2) the exchange of information and ideas, and (3) affect or liking. From a power perspective, they are the bases of interdependencies among workers. While characteristics of these networks can be described and used to compare organizations (Tichy and Fombrun, 1979), the focus of the current study is on differences in individual positions within the three networks. The network measures themselves, though they are assigned to individuals, are relational, rather than being attributes of analytically isolated persons or positions.

Influence

Building on the dependency framework (Emerson, 1962), the strategic contingencies and resource dependency frameworks (Hickson et al., 1971; Salancik and Pfeffer, 1977) posit that power (the inverse of dependence) derives from control of

relevant resources. Control by one actor implies that others in the social relationship have few alternative sources for acquiring the resource, such that the actor controls or mediates others' access to the resource. A relevant resource is one that is in demand or in which others have a high motivational investment (Emerson, 1962). Thus, employees who are able to control relevant resources, and thereby increase others' dependence on them, are able to bring about the outcomes they desire (Salancik and Pfeffer, 1977). In addition to increasing others' dependence on him or her, an actor seeking power must also decrease his or her dependence on others. In other words, he or she must have access to relevant resources that is independent, not controlled or mediated by others.

The complexity of the relationship between power and dependence increases when one considers the multitude or variety of resources that may be considered relevant in a complex organization. Thus, actor A may control a particular resource that is relevant to actor B, but actor B may control another, different resource that is relevant to actor A. In such a case, focusing on only one resource would lead to an inaccurate description of the social relationship. Thus, in order to acquire power, two conditions are necessary: an actor must both decrease his dependence on others and increase others' dependence on him.

Centrality

In literature on power, actors or units occupying central positions in a network are viewed as potentially powerful because of their greater access to and possible control over relevant resources. This relationship has been demonstrated at the subunit level in workflow networks (Hinings et al., 1974) and at the organizational level in joint programs, referrals, and formal and informal communication (Boje and Whetten, 1981). At the individual level of analysis, Fombrun (1983) found that centrality in the communications network was related to attributed influence, but the effect was relatively minor when compared to formal position, rank, and status.

In the social network literature, the notion of centrality dates back to the small-group laboratory studies of the 1950s (Bavelas, 1950; Leavitt, 1951; Guetzkow and Simon, 1955; Shaw, 1964; Davis, 1969). In general, these studies concluded that persons in central positions tended to emerge as leaders of the groups. Since that time, a multitude of variants on the measurement of centrality has emerged. Recently, Freeman (1979) has attempted to clarify the conceptualizations of centrality as they relate to the particular measures. In reviewing the literature, Freeman (1979) noted three related measures of centrality: (1) degree, or number of contacts, (2) betweenness, and (3) closeness, or proximity. The degree measure of centrality refers to the number of other points to which a given point is directly connected; it is a measure of activity.

Betweenness refers to the extent to which a point falls between pairs of other points on the shortest path connecting them. The measure of betweenness is the extent to which a position has potential control over others. Thus, if two persons A and C are connected only through person B, B would fall between A and C and would have control of any resources that flow between A and C. Although this betweenness centrality

measure has been infrequently applied (e.g., Freeman, 1979; Hage and Harary, 1981), Freeman suggested that it is particularly appropriate for measuring the control of information.

The third measure, closeness, is generally calculated by summing the length of the shortest paths from one point to all other points. Variations of this closeness measure are the most frequently used measures of centrality in small-group research, and it is similar to the measure used by Boje and Whetten (1981) and others (e.g., Lincoln and Miller, 1979; Blau and Alba, 1982). According to Freeman (1979), this closeness measure can be conceptualized as independence (the extent to which an actor can avoid the control of others) or efficiency (extent to which an actor can reach all other actors in the shortest number of steps). Thus, it measures independent access to others. A central actor can reach other actors through a minimum number of intermediary positions and is therefore dependent on fewer intermediary positions than the peripheral actor.

These latter two measures of centrality roughly correspond to the two conditions for acquiring power. Decreasing one's dependence on others corresponds to increasing independent access (the closeness measure), while increasing others' dependence increases control (the betweenness measure). Both centrality measures will be investigated in this study and will be referred to as access and control. The distinction between the two centrality measures is exemplified when one considers a group of individuals who each have direct links to all others in the group. All individuals would receive the highest possible access score (because of direct links to all others), but all would also receive the lowest possible control score (because no individual mediates any of these connections).

Units of Reference

Little attention has been given in the literature to what is the appropriate unit of reference in calculating centrality scores. In the early laboratory studies, there was only one reference unit to consider: the small group created in the laboratory. At the subunit or organizational levels of analysis the small number of other units restricts various combinations or subsets. However, at the individual level of analysis it is possible to consider centrality within a person's immediate workgroup, within departments or divisions, or within the entire organization. In terms of acquiring power, is it important to control the communication flow within one's immediate workgroup or within one's department? Is access to everyone in the organization necessary? Or, is centrality within a particular group of individuals sufficient?

The question of the appropriateness of the unit of reference is amplified when one considers the possibility of different structural locations being differentially important, contingent on characteristics of these positions. For example, employees located in the technical core may acquire influence by being central to the entire organization, whereas boundary-spanning personnel may be influential by virtue of controlling information within their workgroup. This research therefore explored various units of reference.

Workflow Network

Within a workflow network, the basis for interdependencies among workers is established by the recurring exchange of inputs and outputs as the work flows through the organization. From a power perspective, the relevant resource is the performance of one's task, which continues the flow of work.

Criticality. When a task position is critical to the continued flow of work, the position holder may be potentially powerful. If the removal of a task position, and its direct workflow links, breaks the workflow chain, the position could be described as highly critical. The organization and the other interdependent positions in the workflow are dependent on the critical position holder. However, if other workflow positions can easily replace or substitute for the focal position, such that the same inputs can be acquired and the same outputs distributed, then the focal position would not be considered critical. From a power-dependency perspective, the organization has alternate sources in the latter case, and its dependency on the focal position is minimized. Perhaps the classic case of critical task positions was illustrated in Crozier's (1964) study of the dependence of French tobacco-processing plants on their maintenance engineers. Hinings et al. (1974) referred to this criticality dimension as nonsubstitutability and found that it related positively to influence in their study of subunits. Pfeffer (1981) and Mechanic (1962) also suggest that being irreplaceable can be a source of power.

The effects of occupying a critical task position are amplified when one considers the effects of uncertainty on routinization and substitutability. Uncertainty in the technology may make it difficult for the organization to routinize or standardize the task, which, in turn, would make it difficult for the organization to hire and train a large number of workers to perform the task (Brass, 1981). Likewise, an employee who develops special skills in coping with relevant uncertainties also decreases his or her substitutability, thereby increasing the criticality of the task. This argument is consistent with Hickson et al.'s (1971) proposition that routinization indirectly affects power by both reducing uncertainty and increasing substitutability.

Transaction alternatives. Just as the organization may be dependent on a critical task position, that focal position may be dependent on other workflow positions. That is, an actor in the focal position may have few alternative sources for the acquisition of needed inputs or distribution of outputs. An actor in a focal position that has many alternative positions available for these input-output transactions would minimize his or her dependence and thereby increase his or her potential power. Thus an actor in a workflow position with many transaction alternatives would have more potential influence than one in a position with few transaction alternatives.

Criticality and transaction alternatives are dyadic measures, since they are based on the specific dyadic exchanges. They consider only the links immediately adjacent to the focal position in the workflow. This research also assessed the more general access and control measures of network centrality in the workflow. The power of network centrality derives from one's position in relation to multiple resource flows, rather

than from particular dyadic resource exchanges (Astley and Sachdeva, 1984), and access to those multiple resource flows, or positions that control such flows, will be more likely to generate dependencies and influence.

Distance from boundary. A major premise in both the strategic contingencies approach (Hickson et al., 1971) and resource dependence model (Salancik and Pfeffer, 1977) is the potential power associated with one's ability to cope with uncertainties. According to Thompson (1967), occupants of certain positions in the organization's workflow will encounter more uncertainty than those in other positions and thereby will have more opportunity to cope with uncertainty and thus establish a base of power.

According to Thompson, organizations attempt to remove uncertainty as the work flows from the environment, through boundary-spanning positions, toward the organization's technical core. One might therefore hypothesize that the further removed a focal position is from the organization's environmental boundaries, the less relative uncertainty an occupant of that position would encounter and the less likely that occupant would be to establish influence based on coping with uncertainty. Indeed, the literature on boundary spanning suggests that persons in those positions act as gatekeepers and that they are more influential than persons who do not have direct links to the environment (Pettigrew, 1972; Hickson, et al., 1981).

Occupying a position close to the organization's external boundaries may be incompatible, however, with occupying a position central to the workflow of the organization. Assuming that an individual employee can effectively maintain only a limited number of workflow connections, external connections would logically detract from the possibility of internal centrality. While this boundary-spanning position may be central to the immediate workgroup, or even an entire boundary-spanning department, it is unlikely that it will be central to the entire organization. Therefore, this study distinguished between workgroup, department, and organization-wide centrality (access and control). It is hypothesized that organizational centrality in the workflow will be positively related to distance removed from the organization's boundary.

If distance from the organizational boundary is related to organizational centrality, the result may be a decrease in the relationships between either variable and influence. However, these hypotheses concerning centrality and distance from the boundary are not competing or contradictory. Rather, they are two different structural sources of potential influence. A position on the boundary may be potentially influential because its occupant effectively copes with environmental uncertainties, whereas a position central to the organization's workflow may be potentially influential because its occupant has access to many other persons, instrumentalities, or information. In particular, a central position in the organization may be the ''right place'' for potentially controlling information. Thus, while the sources of influence may differ, both locations in the organizational structure may be potentially powerful. In order to investigate these possibilities, additional, separate analyses were performed for boundary-spanning and technical core positions.

Communication Network

In the communication network, the interdependencies among people are based on the exchange of information. The notion that one's position in a communication network determines one's relative influence dates back to small-group communication experiments (Leavitt, 1951; Mulder, 1959; Shaw, 1964). Laboratory findings indicated that the person in the central position in the network (access measure) was perceived by others to be more influential, more independent, and was more likely to be selected as the leader of the group (Leavitt, 1951; Trow, 1957; Shaw, 1964; Cartwright and Zander, 1968). Shaw (1964) defined independence to include freedom from all restrictions on action, a definition similar to that used to define power. He concluded that persons in peripheral positions had low independence while persons in central positions had relatively great independence. The power literature also suggests that the control of relevant information can be a source of potential influence (Mechanic, 1962; Pettigrew, 1972; McCall, 1979; Pfeffer, 1981). Those persons who are centrally located in the communication network are hypothesized to have potential access to and control of relevant information and thus have potential power. As is the case with workflow centrality, centrality in the communication network can be assessed within different network units. For example, an employee may be central to the communication flow within his or her own workgroup, but may not be central within the departmental flow or when the communication flow for the entire organization is considered. Although it is likely that three such measures of communication-flow centrality would be interrelated, these measures were assessed so that their relationships to influence could be compared.

Friendship Network

An informal, emergent structure can be assessed when one considers employees linked together on the basis of social liking, or friendship. Often success in an organization is attributed to being part of or well integrated into such a social network. For example, Strauss (1973) suggested relying on friendships as a power tactic. He noted that employees often operate on the principle of ''reward your friends, punish your enemies'' and are involved in a network of exchange of favors (Strauss, 1973: 358). Friendships also can provide access to information and people and be the basis for forming coalitions and alliances. Thus, Mechanic (1962) noted that ''attractiveness'' can lead to access to persons and be a source of power for lower participants.

As suggested by the examples noted, the relevant resource in such a network — friendship or social liking — may not be directly related to power. Rather, the friendship connections may be instrumental in obtaining other relevant resources such as information or rewards. For example, Kotter (1982) found that effective general managers build extensive interpersonal networks in order to implement agendas more easily. Interviews and observations indicated that often these interpersonal interactions involved social, nonwork-related issues.

To the extent that developing friendships results in access to or control of relevant information, overlaps between the

friendship and communication network and the relationships to power are expected. However, being highly interconnected in a friendship network may also provide a person with control or access to other resources, such as access to people for possible coalition formation. Thus, persons in central positions in friendship networks are expected to be more influential than those in peripheral positions. As with the centrality measures in the other networks, centrality (access and control) in friendship networks was assessed at the workgroup, department, and organizational level.

Dominant Coalition

It is likely that being included in the informal communication and friendship networks of supervisors and top-level executives will be more instrumental in a person's acquiring influence than being central in nonsupervisory networks. Of particular interest in this research was the dominant coalition, a small group of individuals, typically occupying the highest positions, who have the most influence or decision-making authority. Access to this particular group may provide a person with valuable information, resources, and support. Likewise, controlling communication to and from the dominant coalition puts one in a mediating position that may greatly increase others' dependence. Thus, it is hypothesized that centrality in the dominant coalition will be extremely important in acquiring influence.

Contacts beyond the Workflow

In considering the above networks, the distinction between formal and informal position is easily blurred. Certainly the friendship network can be described as informal, whereas the workflow is at least in part formally prescribed. An employee's formal workflow position assumes even greater importance when one considers the effects of proximity and required workflow interactions. That is, employees tend to develop informal relationships with others who are located close to them. This research attempted to separate such interactions from those that go beyond the proximal workgroup and required workflow interactions.

Increasing one's contacts beyond those normally required should increase one's access and control of resources, which seems particularly important for workers in routine, standardized jobs such as those in the technical core of the organization. Required interactions in these jobs may not provide the access and control that critical or high-uncertainty positions do. On the other hand, because of the critical nature of boundary positions, occupants of those positions may not need to build networks beyond those contacts required by the job (Astley and Sachdeva, 1984).

Department Membership

Organizational subunits have most often been the unit of analysis in empirical research on intra- or interorganizational power. Perrow (1970: 59) noted, "Tasks are divided up between a few major departments of subunits, and all of these subunits are not likely to be equally powerful." Because power is, at least in part, an attributed property, it is not unreasonable to expect that an employee might be attributed a certain degree of influence simply on the basis of his or her mem-

bership in a powerful department. Thus, being in the right place may include membership in a particular department.

Assessing Influence

One of the problems that has contributed to a scarcity of empirical research in the area of power is the ability to measure it. Because power is in part an attributed property, several studies have asked participants for their perceptions of who has power (Perrow, 1970; Hinings et al., 1974; Salancik and Pfeffer, 1974; Boje and Whetten, 1981). Such reputational measures assume that those asked are knowledgeable about power, that they are willing to divulge what they know, and that the process of asking does not create the phenomenon (Pfeffer, 1981). Although such measures have been criticized (Kadushin, 1968), they have shown high agreement across informants and have correlated with other indicators of power (Salancik and Pfeffer, 1974; Pfeffer, 1981). The current study used two independent, reputational sources (supervisors' ratings and nonsupervisors' listings) and a third measure, promotion to supervisory positions.

Kanter (1979) has argued that acquiring influence is a necessary condition for upward mobility. Because the sample was nonsupervisory and the focus was on individuals rather than groups, promotion to a managerial level position provided an indirect but relevant indicator of acquired influence. This indicator was included as a nonreputational measure of influence, even though promotions are sometimes constrained by turnover and available positions, as well as by an organization's ability to promote from within.

METHOD

Participants. The research was conducted as part of a larger study at a newspaper publishing company. One hundred forty (87.5 percent response rate) full-time, nonsupervisory employees completed a questionnaire administered by the researcher. The immediate supervisors of these employees completed a different questionnaire. In addition, the publisher of the company insisted that employees not be asked to fill out questionnaires that he and other top-level managers were not willing to complete. Thus, 90 percent of the second-, third-, and fourth-level managers, including the publisher, completed the same questionnaire that the nonsupervisory employees completed. In all cases, participation was voluntary and respondents were assured that their responses would be kept confidential and used for research purposes only.

Measures

Networks. On the nonsupervisory questionnaire, respondents were asked to list the names of persons (1a) who provided them with inputs to their jobs and (1b) to whom they distributed the outputs from their work; (2) with whom they talked frequently about work-related topics; and (3) whom they considered close friends. These listings provided the primary basis for the three networks: (1) workflow network, (2) communication network, and (3) friendship network.

These listings were evaluated in terms of whether a person reciprocally listed the person who had listed him or her. When considering these reciprocations, only those employees who

filled out questionnaires were counted. In the case of the communication and friendship networks, this included the top-level managers who completed the nonsupervisory questionnaire. The reciprocation rate was used to verify or improve the validity of the employees' network listings.

In the workflow network, 84 percent of the employee listings were reciprocated by other employees. In some cases the source of an input or destination of an output was a group of people. For example, people in the advertising department frequently listed ''billing'' as a destination for outputs. Likewise, the billing personnel listed ''advertising'' as a source of inputs. In such cases the groups were considered the same as an individual, and the link was counted as reciprocated if a majority of each group listed it.

The workflow network was also assessed via direct observation and interviews conducted by the researcher prior to the questionnaire administration. This independently derived workflow network was compared with the network generated by the employee listings. All discrepancies between the two workflow networks were resolved through interviews following the questionnaire administration.

In the communication network, 76 percent of the listings were reciprocated. A small sample of employees was interviewed following the questionnaire administration about discrepancies in employee listings. In almost all cases, the interviewee indicated that he or she talked frequently with a number of persons and that he or she had simply forgotten to list a particular person. An assessment of the friendship network listings indicated an 87 percent reciprocation rate. Based on the high degree of reciprocation and the sample of interviews, all employee listings were considered in constructing the communication and friendship networks.

Centrality. Several different measures of access and control were calculated for the sample of 140 nonsupervisory employees. The different measures reflect the different networks and the different groups of employees used as references for the particular centrality measures. These included access and control within the entire organization, within the department in which the focal person was a member, and within the workgroup in which the focal person was a member. Departments corresponded to the organization's formal designations, and a workgroup included all employees with the same immediate supervisor. Centrality indices based on these three reference groups were calculated for the workflow network, the communication network, and the friendship network. Thus each employee's position was measured by nine access and nine control measures.

In addition, a small group of top-level personnel referred to as the dominant coalition was used as a reference group for calculating access and control measures. This was done for both the communication and friendship networks. Designation of the dominant coalition follows later in this section.

Following Blau and Alba (1982), the access measure of centrality was operationalized as the minimum distance between a focal person and all other persons in the reference group. The distance was measured by counting the number of links be-

tween the focal person and each other person. The sum of the distances to all other persons in the reference group formed the access measure. This sum was then divided by n-1, where n equals the number of persons in the reference group. The access measure reflects both direct relationships to others and indirect relationships mediated by those direct contacts. Thus, a person with a high access index has easy, efficient access to others. Such a person can be considered as central or well integrated into the particular reference group (Freeman, 1979).

Following Lincoln and Miller (1979), the access centrality means were transformed by the formula 1-[(d-1)/$d$max], where d equals the path distance and $d$max equals the largest observed value of d. This transformation does not change the magnitude of the relationship between access and other variables but reverses the sign, such that higher scores reflect greater access.

The control measure of centrality was calculated using the formula developed by Freeman (1979).[1] This formula assumes that the potential for control of any resource passing between any two points (or persons, in this case) is the probability that the focal person falls on a randomly selected geodesic (shortest path) connecting those two other persons. To determine the overall control centrality, the probability of falling on the shortest path between any two pairs of persons is summed over all unordered pairs of persons. This value is then divided by $(n^2 - 3n + 2)/2$, the maximum value when n equals the number of persons in the network. The measure reflects the relative extent to which a focal person falls on the shortest path, or mediates the relationship, between any two other persons.

In calculating the control centrality scores in the workflow network, direct connections with persons outside the organization were included. Without these connections, all organizational boundary spanners would receive scores of zero, because their positions represent the first or last link in any workflow chain. Thus, they could not mediate or control any workflow interdependencies between two other members of the organization.

Contacts beyond the workflow. Separate measures of contacts with others were calculated for the communication network and friendship network. This was done by counting the number of direct relationships between a focal person and persons who were not members of the focal person's immediate workgroup nor persons with whom the focal person was required to interact in performing normal work functions. This measure reflects the extent to which an employee develops relationships with persons whom that employee would not normally come into contact with during the required performance of the job.

Criticality. An index of criticality in the workflow was formed by counting the number of alternative routes through which the work could flow, once the focal person was removed from the workflow network. For example, consider two persons A and C who are linked in the workflow by person B. How many B′ or B1, B2, etc., routes are available to link A and C if B is removed? The greater the number of routes, the lower the criticality of the focal position. This measure reflects the extent

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$$C'(p_k) = \frac{2C(p_k)}{n^2-3n+2}$$

$$C(p_k) = \sum_{i}^{n} \sum_{j}^{n} b_{ij}(p_k)$$

$$b_{ij}(p_k) = \frac{1}{g_{ij}} \times g_{ij}(p_k) = \frac{g_{ij}(p_k)}{g_{ij}}$$

where p = any point

g_{ij} = the number of geodesics linking p_i and p_j that contain p_k

n = number of points

b_{ij} = the probability that point p_k falls on a randomly selected geodesic linking points p_i and p_j

$C(p_k)$ = overall betweenness (control) of point p_k

$C'(p_k)$ = relative betweenness (control) of point p_k'

to which the focal person controlled the workflow or the extent to which the organization was dependent on that particular person for the continued flow of work through the organization. These scores were transformed using the 1-[(*c*–1)/cmax] formula so that a high score reflected high criticality.

Transaction alternatives. An index of transaction alternatives was formed by calculating the number of workflow positions available to the focal person for the acquisition of the same inputs or distribution of the same outputs. Separate measures for inputs and outputs were calculated. These numbers were then divided by the total number of input or output links in order to obtain an average score for each focal person. This measure reflects the extent to which a focal person was not dependent on particular other persons (has many alternatives) in the necessary interdependencies involved in performing his or her task. Because separate input and output measures produced similar correlations with influence, they were averaged to form one measure of transaction alternatives.

Although employees were not asked to list specific inputs and outputs, knowledge of these specifics was required in order to calculate the criticality and transaction-alternatives measures. This specific information was obtained in interviews prior to the administration of the questionnaire, and in observation of the workflow transactions. In some cases, clarification of the specific inputs and outputs was also necessary in order to resolve discrepancies between the observed and reported workflow networks.

Department membership. Respondents were assigned a score for each of the five formally designated departments (1 = member of that department; 0 = not a member of that department). The five departments were the editorial, advertising, circulation, and production departments and the business office. This variable was dummy coded (*n*-1 dummy variables) in the regression analyses.

Distance from organizational boundary. This variable was measured by counting the number of workflow links on the shortest path between an employee and a person outside the organization who was a source of inputs or destination of outputs. Thus, an employee with a direct workflow link to a person not employed by the organization received a score of one. Employees who followed in the workflow received scores of two, three, four, etc., depending on the number of intermediate workflow links between themselves and persons outside the organization. Higher scores reflect workflow positions that are internal to the organization.

Influence. Two independent reputational measures of influence were obtained. Nonsupervisors were asked: "List the names of persons whom you consider to be influential at the newspaper. That is, list persons who seem to have pull, weight, or clout in this company. List as many or as few as you think necessary." The mean number of nominations received by each member of the nonsupervisory sample was 1.37, with a standard deviation of 1.85.

Some caution must be used in interpreting these nonsupervisory listings. Because these persons were also asked to list persons with whom they worked, talked, and were friends,

those named individuals would be more salient in the respondent's memory, and subsequent cognitive processing would make the individuals on one list more available for listing on another list. In an attempt to minimize this possibility, the workflow listings were obtained in a different section of the questionnaire, and the influence listing preceded the communication and friendship listings. An examination of the actual names listed indicated several repeated names on the communication and friendship listings. People very often said they talked with their close friends. Fewer repeated names were found in examining the workflow and communication listings. Rather, people tended to talk to those in the immediate workgroup whether or not those people were sources or destinations for inputs or outputs. This was a result of many workgroups being organized on a functional basis, with pooled interdependencies among members. Many workers received inputs from and distributed outputs to other workgroups.

The number of repeated names found on the influence listings was surprisingly few. As indicated by the low mean for the nonsupervisory sample, most employees listed higher level personnel as influential — persons who were not involved in the actual workflow and whom they did not talk with frequently. These persons were seldom listed as close friends.

In addition, the immediate supervisor of each employee was asked to rate that employee on a scale from one (''very little amount of influence'') to seven (''very great amount of influence''). The same instructions as noted above were used, with modifications appropriate to rating rather than listing the names. The mean score was 2.80, with a standard deviation of 1.49. The correlation between number of nominations received from nonsupervisors' and supervisors' ratings of influence was .70 ($p \leq .01$), indicating a significant degree of agreement between supervisors and nonsupervisors.

These immediate, first-level supervisors were not asked to list workflow, communication, or friendship interactions, to avoid the possibility of method-variance contamination in their influence ratings. The names of all the immediate subordinates were listed on the rating form so that there would be no bias in the recollection of names.

A nonreputational measure of influence was obtained by contacting the company to learn which of the persons in the original nonsupervisory sample had been promoted to the supervisory level during the three years following the original data collection. Each employee received a score on promotion (1 = promoted; 0 = not promoted). A total of ten persons in the original sample had been promoted. Despite the skewedness of this distribution, which limits the size of the correlation, promotions were significantly related to supervisors' ratings of influence ($r = .34$; $p \leq .01$) and nonsupervisory listings ($r = .43$; $p \leq .01$).

Dominant coalition. The dominant coalition in the organization was identified by considering the communication and friendship listings of the ten persons in the organization who received the most listings as influential on the nonsupervisory questionnaire. Of these ten individuals, four were selected as

being the dominant coalition, based on their interaction patterns. The listings of these four indicated reciprocated communication listings by all four and reciprocated friendship listings by three of the four. The friendship listings of one individual were reciprocated by two of the other three persons. One of these individuals received an overwhelming number of nonsupervisory listings as influential, and the other three were ranked in the top five in the nonsupervisory influence listings. Thus, these four persons were used as a reference group for calculating the centrality measures (access and control) in relation to the dominant coalition.

RESULTS

Preliminary analyses of the correlations between corresponding measures in the communication and friendship networks indicated substantial overlap (correlations ranged from .60 to .97). Treating these network measures separately produced very similar correlations with influence, with the communication measures showing slightly stronger relationships. A series of partial correlations with the measures of influence as the dependent variables were performed. These results indicated that the friendship network measures did not explain significant amounts of variance in the influence measures when the corresponding communication network measures were controlled for. However, some of the partial correlations between the communication measures and the influence measures were significant when controlling for the corresponding friendship measure. Thus, only the communication network measures are reported in the following analyses.

Table 1 presents the means, standard deviations, and intercorrelations for the network measures. Certain patterns are evident. Employees in critical task positions tended to be located close to the organization's boundaries and were not central to the workflow (access or control) when the entire organization was considered. However, they did tend to have contacts beyond the workflow and workgroup and access to communication flows within their departments. The median correlation between an access measure of centrality and its corresponding control measures was .32, indicating that the separate calculation and analyses of these two measures was warranted.

Control of communication flows within the entire organization was strongly related to control within one's departmental communication flow and control of communication to and from the dominant coalition. All three of these control measures were positively related to contacts beyond the proximal workgroup and workflow. Access to communication flows within the department was positively related to access in the workgroup and the entire organization. Positions that were central in terms of access to the entire organization's workflow tended to be located in the technical core, and persons in these positions had less access to communications within their workgroup and department. This may reflect centralized communication structures within these internal workgroups and departments or the possibility that workflow interdependencies exist across workgroup and department boundaries rather than within these group boundaries.

Table 1

Intercorrelations for Network Measures

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Workflow																				
1. Criticality	.81	.23																		
2. Transaction alternatives	3.85	2.46	04																	
Workgroup																				
3. Access	.90	.07	30	–06																
4. Control	.35	.08	13	–20	08															
Department																				
5. Access	.76	.16	05	18	13	–08														
6. Control	.04	.07	27	02	54	28	49													
Organization																				
7. Access	.65	.12	–44	03	–29	09	27	18												
8. Control	.01	.02	–33	–16	14	15	16	15	27											
9. Distance from boundary	1.91	1.14	–52	11	–38	–16	–31	–35	38	10										
Communication																				
Workgroup																				
10. Access	.87	.12	23	–12	20	–04	–28	–17	–41	06	–16									
11. Control	.07	.06	06	11	05	09	–18	02	–07	03	16	26								
Department																				
12. Access	.77	.11	43	02	37	–17	21	20	–31	08	–54	57	05							
13. Control	.05	.03	12	18	22	08	–12	08	08	01	07	23	24	32						
Organization																				
14. Access	.63	.07	12	–02	08	04	–06	09	–01	29	–17	44	17	63	38					
15. Control	.007	.04	10	07	18	09	–17	08	06	06	09	19	26	26	78	54				
Dominant coalition																				
16. Access	.71	.11	17	19	20	07	08	26	–02	–04	03	–11	13	12	34	12	36			
17. Control	.03	.07	18	07	26	11	–15	18	05	04	04	16	25	22	68	40	85	39		
Contacts beyond workflow	2.14	2.09	38	06	24	03	–12	13	–29	–14	–22	21	10	37	41	50	58	25	47	

$p \leq .05$ for all $r \geq .17$; $p \leq .01$ for all $r \geq .22$

Relationships between Structural Measures and Influence Measures

Table 2 presents the zero-order correlations between each of the structural measures and the influence measures. In parentheses are the standardized regression coefficients (Beta's) when all independent variables are entered simultaneously into the regression equation. Because there was a large number of variables, the adjusted R^2 is reported in Table 2. This is an R^2 statistic adjusted for the number of independent variables in the equation and the number of cases. It represents a more conservative estimate of the percentage of variance explained. Overall, the results in Table 2 provide strong support for the predicted relationship between structural position and influence at the individual level of analysis.

Criticality, transaction alternatives, and access to the communication network of the dominant coalition show significant positive relationships with the perceptual measures of influence. However, when promotions are considered, control of communication flows in one's workgroup, department, and the entire organization are the dominant variables. Being in a position to control communications within the department is particularly important to being promoted. This may indicate that persons promoted from nonsupervisory to supervisory-level positions are promoted within their departments, rather than being promoted to positions in other departments. This

Table 2

Relationships between Structural Measures and Measures of Influence

Structural measures	Supervisors' ratings of influence		Nonsupervisors' listings		Promotion	
Workflow	*r*	Beta	*r*	Beta	*r*	Beta
Criticality	52••	(.480)••	36••	(.257)••	21••	(.172)
Transaction alternatives	31••	(.265)••	27••	(.245)••	03	(–.138)
Workgroup						
Access	23••	(.075)	39••	(.238)•	22••	(–.028)
Control	11	(.066)	08	(–.088)	15	(.049)
Department						
Access	14	(.184)	06	(.022)	–10	(–.171)
Control	24••	(–.094)	33••	(.075)	13	(.112)
Organization						
Access	–08	(.258)••	–07	(.057)	01	(.038)
Control	–19•	(.079)	–04	(–.032)	05	(.222)•
Distance from organizational boundary	–16	(.101)	–17•	(–.194)	–03	(–.124)
Communication						
Workgroup						
Access	17•	(.151)	18•	(.070)	20•	(–.047)
Control	06	(–.073)	13	(–.060)	25••	(.165)•
Department						
Access	35••	(.331)•	35••	(.116)	28••	(.092)
Control	33••	(.013)	46••	(.235)	62••	(.875)••
Organization						
Access	12	(–.150)	25••	(.115)	17•	(.010)
Control	22••	(.077)	35••	(–.060)	33••	(–.457)••
Dominant coalition						
Access	46••	(.261)••	39••	(.196)•	28•	(.038)
Control	26••	(–.025)	41••	(.165)	36••	(.027)
Contacts beyond workflow	24••	(–.011)	21••	(–.236)•	10	(–.084)
Department membership*	46••		26		18	
Adjusted R^2	56••		40••		51••	

•$p \leq .05$; ••$p \leq .01$;
*Represents a multiple correlation.

may also explain why the workflow positions as a whole did not relate strongly to promotions. Typically, promotions within the organization would be made from a pool of candidates who perform similar job functions and are located in similar workflow positions.

Centrality in relation to the dominant coalition showed significant positive zero-order correlations with all three influence measures. However, the standardized regression coefficients for the control measures of centrality and influence were not significant. This may be due to the strong interrelationships between control measures for the dominant coalition and department and organizational control.

Comparison of Boundary Spanning and Technical Core

Although distance from the organization's boundary did not relate strongly to influence, a comparison was made of relationships with influence for boundary-spanning employees (those with direct workflow contacts outside the organization) and technical core personnel (those whose direct workflow connections were entirely inside the organization). Table 3

presents the results of these comparisons. As predicted, contacts beyond the proximal workgroup and workflow were significantly related to influence for the technical core personnel, but not for the boundary spanners. In addition, control of communication flows within the entire organization was more strongly related to influence for persons in the technical core than for boundary spanners. The relationships with influence and the other independent variables, however, indicate few consistent differences between the two groups.

Table 3

Comparison of Relationships with Influence for Boundary Spanning and Technical Core Positions

Structural Measures	Boundary Spanning (n=76) Supervisors' ratings	Nonsupervisors' listings	Promotion	Technical Core (n=64) Supervisors' ratings	Nonsupervisors' listings	Promotion
Workflow						
Criticality	48••	24•	18	48••	37••	24•
Transaction alternatives	42••	38••	19	26•	20•	–19
Workgroup						
Access	22••	33••	28•	08	36••	11
Control	–03	–07	00	25•	25•	39••
Department						
Access	18	04	–08	00	01	–18
Control	22•	34••	22•	16	25•	–04
Organization						
Access	08	13	17	04	–03	–10
Control	14	16	14	–43••	–18	–02
Communication						
Workgroup						
Access	35••	15	26•	–05	14	14
Control	–06	03	30••	28•	34••	22
Department						
Access	59••	31••	41••	–04	26•	15
Control	31••	44••	68••	40••	55••	59••
Organization						
Access	13	12	18	07	34••	17
Control	10	20•	28•	40••	59••	43••
Dominant coalition						
Access	61••	46••	37••	35••	35••	20
Control	17	29••	29••	38••	61••	48••
Contacts beyond workflow	01	–10	02	42••	56••	19

•$p \leq .05$; ••$p \leq .01$.

In addition to the above analyses, a series of hierarchical regression analyses were performed to check for interaction effects among the network variables. Of particular interest were the interactions between corresponding access and control measures of centrality, but no significant interaction effects were found.

DISCUSSION

Overall, the results of this study provide strong support for viewing individual influence from a structural perspective. In connection with studies at the organizational and group levels of analysis (Hinings et al., 1974; Salancik and Pfeffer, 1974; Boje and Whetten, 1981; Beyer, 1982), it supports the view of power as a multilevel concept. In this regard, the analyses go

far beyond the previous individual-level network studies of small groups in the laboratory. Measures such as contacts beyond the proximal workgroup and workflow interactions, and access and control of communication in relation to the dominant coalition provide information that was not available from laboratory studies.

Although the results of this study are consistent with many of the theories and findings on intraorganizational power at the subunit level of analysis, some discrepancies remain to be explained. For example, the strategic contingencies approach (Hickson et al., 1971; Hinings et al., 1974) found support for the proposition that coping with uncertainty, centrality, and nonsubstitutability were all necessary but not sufficient conditions for acquiring power. However, the results of this study indicated no interaction effects. Criticality, which is similar to Hickson et al.'s (1971) variable of nonsubstitutability, was strongly related to influence even when controlling for all other independent variables. This finding may be an indication of the organization's inability to routinize and thereby decrease the criticality of highly uncertain tasks. Thus, substitutability and low uncertainty may be inextricably linked in many organizations.

This explanation is supported when particular boundary-spanning personnel are considered. Although criticality is significantly related to being close to the organization's boundary, classified advertising employees provided an exception. These employees had direct links with persons external to the organization, but the job of taking classified ads was highly routinized, and the organization employed several persons in that position. Thus, although these positions were on the external boundary, they involved very little uncertainty, individual workers were not highly critical, and they were rated as having very little influence.

Although criticality was positively related to access to communication flows within the department, it was negatively related to workflow centrality measures for the entire organization. This suggests the possibility that occupants of critical workflow positions do not need to be in central positions in order to acquire influence. When controlling for other variables, in particular, criticality, access to organizational workflows was significantly related to influence. These findings suggest that there are multiple bases of structural influence within an organization.

In addition, the failure to find interaction effects for corresponding measures of access and control suggests multiple resource flows within an organization. For example, Boje and Whetten (1981) identified several different resource flows in their study of centrality and power at the organizational level of analysis. While the current study attempted to separate workflow, communication, and friendship flows, several subsets of these are possible. Further research might attempt to separate communications involving technical workflow problems from communications involving personnel decisions, administrative matters, or purely social, nonwork-related interaction.

The failure of the friendship network measures to significantly relate to influence when controlling for the communication network measures suggests several alternative explanations.

Friendships may provide the bases for exchange of information, or vice versa. In either case, the significant relationships between the communication measures and influence, when controlling for the friendship measures, indicate that communication, rather than friendship, is the important factor in acquiring influence. That is, an employee may not need to be a close friend of many others as long as that employee communicates with many others.

Alternatively, the overlap between the two networks may be due to response bias or the inseparable nature of work-related and purely social interaction. Other methods of constructing these social networks could answer these questions. Unobtrusive observation of an ethnographic nature, such as recording interactions around the coffee machine or in the cafeteria, might provide independent measures for these networks. Kadushin (1968), in a review of various methodologies, described the use of a "snowball sample." Using this method, the researcher could identify powerful persons in the organization via questionnaires or interviews and could then record the content and frequency of the interactions of these influential persons. The network snowballs as the researcher follows these interactions and expands the network.

Such techniques might provide better understanding of the processes involved in interaction and influence. Because this study was cross sectional, it is impossible to determine whether increased interaction leads to influence, or influence leads to increased interaction, or both. For example, it is possible that employees would be more likely to exchange valuable information with those whom they perceive to be influential. Thus, power and interaction may build on themselves. Powerful persons may not need to instigate communication; they may be sought out by many others. Thus, observing which party instigates the interaction may provide additional insights.

Exceptions

Due to the large number of network measures included in this study, it was difficult to find employees who were rated as influential but did not score high on at least some of the measures. However, there were some notable exceptions of employees who scored high on the measures but were not considered influential. One case involved employees who had been with the organization for a long period of time. They had developed many connections, and one of them occupied a critical position. Because the sample was nonsupervisory, these persons may have been rated low on influence because they had not been promoted, despite their having been with the company a long time.

Another exception was an employee in a liaison sort of position. Although the employee had many communication and workflow contacts within and across departments, the task was primarily one of assisting others in carrying out routine coordination and supplying inputs. Perhaps because of the nature of the task, the employee was not perceived as influential, despite being in a position of access and control of work and communication flows. However, this person was promoted.

These exceptions may provide some insights into factors that affect the perceptions or attributions of influence. Because influence is at least in part a perceptual phenomenon based on attribution, the reputational measures of influence are relevant. More information on this process might be obtained by specifically analyzing the content of the interaction. In this research, the specific content of the interaction was known only in regard to the workflow. An assumption was made that communication provides access and control of valuable information; however, the possibility exists that highly visible contacts with, for example, top executives may lead to the perception of influence, regardless of the content of those contacts. Although the self-report questionnaire item asked about work-related communication, the specific content of the communication interaction was not known.

Social Networks

The results presented here provide further support for the conceptualization of organizational structure from a relational, network perspective. These measures provide a method of assessing structure at the individual level of analysis that does not require the aggregation of individuals or the assumption of homogeneity among individuals. In addition, the results support the conceptual distinction among the access and control measures of centrality as suggested by Freeman (1979). These two measures did not overlap to the degree expected, and, as they related to influence appear to tap different dimensions of centrality. Further research might explore the effects of task uncertainty and task structure on these measures. For example, high-uncertainty tasks may require organic communication flows that will in turn provide employees with high access but low control.

Further longitudinal research exploring the changes in interaction patterns over time is also needed. Despite the collection of the promotion data over a three-year-time period following the network measures, the strong correlations suggest the possibility of fairly stable patterns or the notion that influence and interaction build on themselves. Although this remains speculative, the strong correlations warrant further investigation. Finally, this research did not measure personal characteristics or behavioral strategies. While the position is taken that structure will provide the constraints on such personal factors, further research that combines both structure and personal characteristics is needed to assess the importance of each.

Finally, it is interesting that the strongest predictors of promotions were the least easily perceived measures of centrality — the control, or betweenness measures. Access to the dominant coalition, access to input/output nodes, or being on a critical path in the workflow are concepts that are easily understood by employees and can be readily seen as perceived indicators of influence. The concept of betweenness is far more difficult to envision or observe. Yet it proved to be the best predictor of the ultimate winners in the organization, those who received promotions. Exploring why this was true may prove to be an interesting area for further research.

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