Formal and Emergent Predictors of Coworkers' Perceptual Congruence on an Organization's Social Structure

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This article examines several factors that are hypothesized to influence the perceptual congruence among organizational members. Perceptual congruence is defined as the extent to which members agree on their perceptions of the organization's social structure. This study proposes that employees'congruence on the organization's social structure is influenced by similarities in formal structure, denwgraphic attributes, and emergent structure. The hypotheses were tested using cognitive social structure data collected at a city's public works department.

Individuals' perceptions of the world are not based solely on their private cognitions (Berger & Luckmann, 1967). Rather, individuals develop their understanding of the world based on how they perceive the orientations of others around them and how they are oriented to those others (McLeod & Chaffee, 1973; Newcomb, 1953). In his description of communicative acts, Newcomb stated that "it is an almost constant human necessity to orient oneself toward objects in the environment and also toward other persons oriented toward those same objects" (p. 395). McLeod and Chaffee (1973) state that "a person's behavior is not based simply upon his *[sic]* private cognitive structure of his world; it is also a function of his *perception* of the orientations held by others around him and of his orientation to them" (p. 470).

These arguments have led researchers to examine perceptual congruence, the extent to which two or more individuals share their perceptions about an object or an idea. Researchers have explored shared perceptions of participation (Stohl, 1993); organizational vision (Davis, 1995); organizational mission (Grant, 1995); organizational climate (Poole & McPhee, 1983); and communication rules (Eisenberg, Monge, & Farace, 1984; Hatfield & Huseman, 1982). However, there has been little research done on members' shared perceptions of the organization's overall social structure. Theorists have argued that perceptual congruence may lead to a better understanding of organizational members' ongoing interactions as well as their attitudes and behaviors (Krackhardt & Brass, 1994; Pattison, 1994). Given the potential outcomes of shared perceptions of the social structure, it is important to identify how individuals come to share similar views of their organization's social structure.

This study responds to the need to identify the antecedents of perceptual congruence on an organization's social structure. It seeks to determine how to best explain the level of congruence between two individuals' perceptions of their organization's social structure. It begins with a review of literature in the areas of perceptual congruence and social structures. It then presents a model to explain coworkers' perceptual congruence on their organization's social structure. The hypothesized model is tested using cognitive social structure data and the results are discussed.

PERCEPTUAL CONGRUENCE

There has been interest in examining how individuals' shared perceptions, or perceptual congruence, are related to their attitudes and behaviors. Researchers have identified factors that affect the level of perceptual congruence between individuals, as well as how perceptual congruence affects people's attitudes and behaviors. For example, in attempting to understand how perceptual congruence develops between individuals, Stohl(1993) found that the extent to which managers shared perceptions of participation was associated with their cultural experience. Others have examined the extent to which employees have perceptual congruence on their organization's vision (Davis, 1995) and mission (Grant, 1995). Davis

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and Grant found that those organizational members who engaged in certain activities (i.e., communicating directly with one another, collaborating with each other, citing one another in their work, and reading the same journals) were more likely to have higher levels of perceptual congruence about the vision and mission than organizational members who did not engage in those activities. Poole and McPhee (1983) offer a structurational argument to explain members' shared perceptions of organizational climate. They state that the structurational perspective "offers an intersubjective conception of climate" (p. 217).

Researchers have also explored how perceptual congruence affects individuals' attitudes and behaviors. For example, Hatfield and Huseman (1982) found that congruence about communication between supervisors and subordinates was related to increased job satisfaction. Eisenberget al. (1984) found that employees' satisfaction with their managers was influenced by the extent to which supervisors and their subordinates had perceptual congruence on communication rules. Krackhardt and Kilduff (1990) reported that friends working together who disagreed about attributions of fellow employees tended to be less satisfied with their jobs than friends who agreed about attributions of others.

This study follows in the tradition of the research on perceptual congruence described above. However, unlike earlier studies, it examines the antecedents to perceptual congruence on an organization's social structure. An organization's social structure is, like an organization's level of participation, mission, climate, or communication rules, a socially constructed concept (Giddens, 1984). Although these concepts can be based on formal organizational structures and policies, they are each interpreted differently by all members of the organization. It is important to understand how individuals come to share perceptions about their organization's social structure to determine how differently individuals and groups see their world.

The following sections describe a model developed to explain the congruence between coworkers' perceptions of their organization's social structure. First, there is an explanation of what is meant by individuals' perceptions of their organization's social structure. Subsequent sections describe and discuss the formal and emergent factors that influence employees' perceptual congruence on an organization's social structure.

AN ORGANIZATIONS SOCIAL STRUCTURE

Several scholars have argued that examining social networks offers a unique perspective to the study of social structure (Erickson, 1988; Krackhardt & Brass, 1994; Monge, 1987; Wellman & Berkowitz, 1988). Erickson argues that "natural units of analysis for attitudes are not isolated individuals but social networks" (p. 99). Structural and structurational theories imply that individuals' behaviors and attitudes shape and are, in turn, shaped by their perceptions of the social structure (Burt, 1982; Contractor & Eisenberg, 1990; Giddens, 1984). Network researchers have typically operationalized an individual's perception of social structure as a perception of his or her own communication network. However, a more complete description of an individual's perception of the social structure includes not only the perception of the individual's own interactions, but also the individual's perception of the interactions (or lack thereof) between all others in the structure. Krackhardt's (1987a) use of cognitive social structures, in which individuals report their perceptions of all interactions within a network, is one approach to understanding an individual's perceptions about the social structure. Cognitive social structures are based on individuals' cognitions of social structures rather than on the actual observed communication networks. This data collection method offers a systematic way to collect and collate the perceptions of each individual about the interactions among all individuals in the organization. Therefore, in this study, perceptual congruence between coworkers on the overall social structure is operationalized as the similarity between individuals' cognitive social structures.

As shown in Figure 1, the hypothesized model of the antecedents of perceptual congruence on an organization's social structure includes five formal and three emergent network predictors. Each of the formal structural predictors is introduced and discussed next. A discussion of the emergent predictors follows.

FORMAL PREDICTORS OF PERCEPTUAL CONGRUENCE ON AN ORGANIZATIONS SOCIAL STRUCTURE

Department

One would expect individuals within a department to interact more than individuals from different departments. Brass (1985) noted that "employees tend to develop informal relationships with others who work close to them" (p. 329). Alderfer (1987) found that individuals working in the same department tended to share similar ways of looking at the world, which facilitated their interactions with each other. Individuals who interact more with one another tend to share the same view of their world. Also, individuals who work in the same department share a similar vantage point on the overall social structure of their organization. Therefore, due to their increased interaction with one another and their colocation within the formal organizational structure, the following hypothesis is proposed:

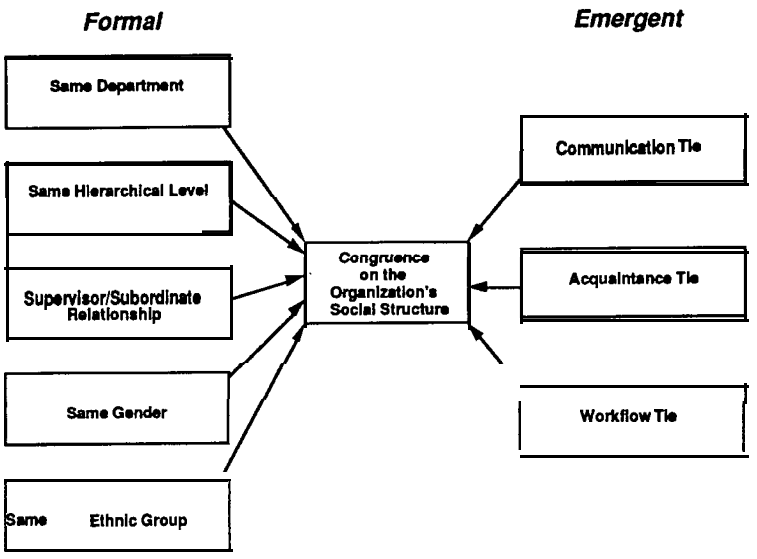

Figure 1: Hypothesized Model of Formal and Emergent Network Predictors of Coworkers' Perceptual Congruence on an Organization's Social Structure

H1: Coworkers in the same department are more likely to have greater perceptual congruence on the organization's social structure than coworkers in different departments.

Hierarchical Level

Organizational members who are on the same hierarchical level tend to perform similar roles within the organization (Katz & Kahn, 1978). The expected roles performed by individuals vary depending on their placement in the organization's formal hierarchy A classic example of hierarchical role effects was demonstrated in Lieberman's (1956) field study involving employees in a plant. Lieberman measured employees' initial attitudes about their company, their union, and their jobs. He found no systematic differences in the attitudes of the employees. After his first data collection, some employees were promoted to foremen, some employees became shop stewards, and the remaining employees experienced no change in their roles. Lieberman again examined their attitudes. He found a systematic difference in attitudes, based on the new roles performed by the employees. For example, consistent with their supervisory roles,

foremen developed more procompany attitudes, shop stewards reported more pro-union attitudes, and the attitudes of those employees whose roles did not change remained the same. Some foremen were subsequently demoted to their previous roles. Once again, Lieberman measured employees' attitudes. At this third data collection, he found that the former foremen reported attitudes identical to others in their role as regular employees and different from the attitudes they reported as foremen. "Lieberman's time series design provides an excellent demonstration of the extent to which attitudes are changed and shaped by one's position and role occupancy" (Pfeffer, 1982, p. 100).

The arguments and empirical studies reviewed above suggest that performing similar roles leads individuals to see their organization's social structure similarly. Therefore, due to their similar roles in the organization's formal structure, another hypothesis is proposed as follows:

HZ: Coworkers in the same level of the formal hierarchy are more likely to have greater perceptual congruence on the organization's social structure than coworkers in different levels of the formal hierarchy.

Supervisor-Subordinate Relationship

The interaction between supervisors and subordinates has been identified as one of the most important relations that operates in organizations (Dansereau &Markham, 1987; Eisenberg et al., 1984). Individuals who are involved in a direct-reporting relationship share a great deal of information about their organizations. For example, in day-to-day interactions involving the assignment, and the completion, and reporting of tasks, supervisors and their subordinates share with one another how other individuals, with whom they may or may not have interactions, affect their own outcomes. This type of information leads to the supervisor-subordinate pair having a similar view of the organization's social structure. Therefore, due to their direct-reporting relationship, a third hypothesis is proposed:

H3: Coworkers who are in a supervisor-subordinate relationship are more likely to have greater perceptual congruence on the organization's social structure than coworkers who are not in a supervisor-subordinate relationship.

Demographic Variables: Gender and Ethnic Group

Organizational theorists have used organizational demography (Pfeffer, 1983) and relational demography (Tsui, Egan, & O'Reilly, 1992; Tsui &

O'Reilly, 1989) to examine the influence of similar demographic characteristics on members' attitudes. Organizational demography and relational demography are based on the similarity-attraction paradigm introduced by Byrne (1971) and assume that similarity on demographic characteristics leads to attraction between individuals and that this attraction may lead to shared attitudes. Likewise, "a widely documented finding in the social identity literature is that people prefer to interact with members of their own identity group than with members of other groups (Tajfel, 1982; Abrams & Hogg, 1990)" (Ely, 1994, p. 204). Network researchers have used the concept of homophily to define the degree to which pairs of individuals are similar on certain demographic (or other) attributes (Marsden, 1988; Rogers & Kincaid, 1981). Much research has shown that emergent social relations tend to develop between people who are like one another on the dimensions of gender and ethnic group (Ibarra, 1992, 1995; Lincoln & Miller, 1979).

Gender. Researchers have shown that individuals of the same gender tend to exchange ideas more frequently with one another than with individuals of the opposite sex (Ibarra, 1992; Kanter, 1977; South, Bonjean, Markham, & Corder, 1982). Kanter reported that similar individuals tend to communicate more easily with one another and form strong interpersonal bonds. She found that male managers tended to feel uncomfortable communicating with female counterparts. Brass (1985) found that men and women working in nonsupervisory roles formed segregated networks. For example, men identified other men as members of their interaction networks 75% of the time, and women named other women 68% of the time. In a study of federal workers, South et al. (1982) found that employees received social support more often from coworkers of their own sex than from coworkers of the opposite sex. Ibarra reported that in an advertising and public relations agency, men tended to show a great degree of sex-based homophily across five types of networks, whereas women tended to show a differential pattern across the networks. Thus, individuals who are the same sex tend to interact more with one another and should, therefore, share similar views of the world (Kanter, 1977), which leads to the following hypothesis:

H4: Coworkers of the same gender are more likely to have greater perceptual congruence on the organization's social structure than coworkers of different genders.

Ethic group. Just as emergent structures of relations tend to develop between individuals of the same gender, researchers have found that same-ethnic group pairs are more likely to emerge in a social network.

Relationships that form between individuals of different ethnic groups tend to be different than those formed between individuals of the same ethnic group. For example, Thomas (1990) found that relationships between individuals of different ethnic groups tended to be weaker than relationships between individuals of the same ethnic group. He found that White mentors had difficulty identifying positively with their African American protégés.

These findings indicate that members of cross-racial pairs tend to see their worlds differently, which leads to the following hypothesis:

H5: Coworkers of the same ethnic group are more likely to have greater perceptual congruence on the organization's social structure than coworkers of different ethnic groups.

EMERGENT NETWORK PREDICTORS OF PERCEPTUAL CONGRUENCE ON AN ORGANIZATION'S SOCIAL STRUCTURE

The five predictors discussed above are based on individuals' positions within the formal structure of organizations, as well as their formal and demographic attributes. However, individuals "do not always conform to the interaction sequences dictated by their organizational roles" (Stohl, 1995, p. 25). Thus, emergent networks evolve as individuals work with, and communicate with, those others who are not formally connected to them (Monge & Eisenberg, 1987).

The term *emergent network* is used to distinguish formal, imposed networks from informal networks that occur naturally among organizational members. In early studies of organizations, scholars were aware that formal organizational charts fail to capture many of the important aspects of informal communication and the grapevine (Barnard, 1938; Follett, 1924). More recently, authors have argued that emergent structures are important to study because they add more to our understanding of organizational behavior than simply studying formal organizational structures (Bacharach & Lawler, 1980; Krackhardt & Hanson, 1993; Krikorian, Seibold, & Goode, 1997). Consequently, a study examining emergent networks is often evaluated on its ability to offer greater understanding and explanation than one that focuses only on formal structures (Tichy & Fombrun, 1979).

In terms of the present study it is therefore important to investigate how emergent networks uniquely shape coworkers' perceptual congruence on an organization's social structure. Thus, in this study, in addition to the five formal predictors discussed above, we propose three emergent

network predictors in an effort to further our understanding of the influences that shape congruence among coworkers' perceptions of their organization's social structure. The emergent predictors of perceptual congruence in our model include individuals' interaction in the emergent task-related communication, acquaintanceship, and work flow networks of an organization.

Before discussing these three networks, it is useful to distinguish them. A *tusk-related communication* network represents the individuals who talk with one another about the completion of tasks. An *acquaintance* network represents who knows one another in a network, whether they engage in communication to complete their tasks. A *work flow* network, as defined by Brass (1984), represents individuals who provide others with "inputs to their jobs" and who "distribute outputs from their work" (p. 526) to others in the network.

Task-Related Communication Tie

Coworkers who engage in conversations about work-related topics share ideas not only about those with whom they communicate, but also, directly or indirectly, about which other employees in the social structure communicate with one another. For example, one might expect to hear statements such as "when I was talking with" and "I saw A and B meeting to discuss." These examples point to the assertion that individuals who report communicating with one another about task-related issues tend to perceive the social structure of their organization similarly

Acquaintance Tie

Within organizations, there are many pairs of individuals who know one another but do not communicate about task-related issues. However, although the individuals do not talk about topics related to their tasks, they may share information about the social structure. For example, in their review of the gossip literature, March and Sevon (1984) found that through gossip, individuals communicate about rules, values, and history as well as provide information about social structure. For this reason, individuals who report knowing one another tend to see their organization's social structure in a similar fashion.

Work Flow Tie

An organization's work flow is rarely perfectly defined or stable. Instead, work flow, like communication, tends to emerge based on individuals' needs and desires to interact (Brass, 1984). Individuals whose

roles in the work flow of an organization are either to get information from, or give information to, one another would be more likely to share information about other aspects of an organization, including its social structure. Therefore, individuals who are linked together in the work flow would tend to see the organization's social structure similarly

Relationship ties between two individuals in any type of network can take only one of the following three forms: mutual, asymmetrical, or null (Wasserman & Faust, 1994). A *mutual* tie means that both individuals in the relationship report interacting with one another. However, it may happen that individuals do not see their relationship the same way and, thus, have an *asymmetrical* tie. An asymmetrical communication tie between individuals represents the case where an individual reports communicating with an alter, but the alter does not report communicating with the individual. Finally, a null relationship tie is when neither individual in a pair reports interacting with the other.

If both individuals in a pair report mutual communication, acquaintanceship, or work flow ties, they would tend to view the overall social structure similarly However, if one or both individuals in a pair report not communicating, knowing, or working together in the organization's work flow, they are less likely to share similar perceptions of the organization's social structure. These arguments lead to the following hypotheses:

H6: Coworkers who report mutual task-related communication ties are more likely to have greater perceptual congruence on the organization's social structure than coworkers who report asymmetrical or null task-related communication ties.

H7: Coworkers who report mutual acquaintance ties are more likely to have greater perceptual congruence on the organization's social structure than coworkers who report asymmetrical or null acquaintance ties.

H8: Coworkers who report mutual work flow ties are more likely to have greater perceptual congruence on the organization's social structure than coworkers who report asymmetrical or null work flow ties.

Figure 1 summarizes the hypothesized relationships between the formal and emergent predictors and coworkers' perceptual congruence on the organization's social structure. All hypothesized relationships are pairwise. That is, we posit bivariate relationships between each of the predictors and coworkers' perceptual congruence on the organization's social structure. Estimating simultaneous effects would identify the relative influence of the formal and emergent network predictors of perceptual congruence on an organization's social structure. However, due to methodological issues described later, simultaneous effects are not tested in this study

METHOD

Sample

The data reported here were collected as part of a larger interdisciplinary research project examining an organization's information and communication infrastructure. The organization under study is the Public Works Division of a military base located in the southeast United States. This organization's duties include maintenance of existing civil infrastructure and buildings, designing and overseeing construction projects, meeting the housing needs of military personnel, and assuring all activities are in compliance with environmental regulations.

At the time of the data collection, 64 individuals worked at the Public Works Division. All of these 64 individuals were civilian employees; 48 were male, and 53 were White. The average age was 47; the youngest employee was 28 and the oldest 66. The average length of time that employees of the Public Works Division had worked at the military base was 12.5 years, with tenure ranging from 3 to 42 years. The division had five hierarchical levels and four functional departments.

Data Collection

Each individual in the division participated in a series of three structured interviews with a member of the research team. The response rate was 100%. The topics of the interviews included individuals' task-related communication network, their acquaintance network, and their participation in the organization's work flow. Formal structural and demographic data were also collected during these interviews. The average duration of each of the three interviews was approximately 60 minutes. These voluntary interviews were conducted in private offices, and participants were assured that their individual responses would be kept confidential. Data were recorded by the interviewer. Additional information about the formal structure of the organization and demographics was obtained from official records and members of the Public Works Division.

Instrumentation

To collect data about the emergent communication and acquaintance networks, interviewers gave respondents a roster of all individuals in the Public Works Division and asked them to identify those individuals with whom they communicated about work-related issues during the past 2 months. The respondents were told that communication included "conversations in person, in meetings, by phone, via electronic mail, or by memoranda." Respondents were also asked to name those individuals whom they personally knew (i.e., acquaintances) from the roster of names. Thus, the data collection resulted in two unique networks: a task communication network and an acquaintance network.

Most of the work that is conducted by employees of the Public Works Division is initiated, recorded, and tracked by a government form that must be completed for each job. Therefore, to collect data about the work flow network in the organization, respondents were asked from whom they received the form (representing an input to their jobs) and to whom they gave the form (representing an output from their jobs). Respondents used the roster of individuals in the organization to aid their recall.

Finally, participants were asked for cognitive social structure data (Krackhardt, 1987a). Rather than simply aggregating the patterns of interaction reported by all others within the network, we asked each respondent about the interaction (or lack thereof) between every other pair of individuals in the network. That is, each respondent was asked to refer to the roster of individuals in the division and report, for each of the other 63 persons in the network, who that person communicated with about task-related issues. For example, Individual 1 was asked with whom, from the list of all individuals in the division, Individual 2 communicated about task-related issues. Individual 1 was then asked the same question for Individuals 3 through 64. A respondent could report a perceived link between two individuals whether the respondent knew them personally. The answers to these questions resulted in 64 separate cognitive social structures of the Public Works Division. The similarities reflected in these views of the social structure are measured as the perceptual congruence between individuals on the overall social structure of the organization.

Measures

Perceptual congruence. Perceptual congruence between individuals on the overall social structure of the organization was operationalized as the similarity between their cognitive social structures. Specifically, to calculate the perceptual congruence between one individual's perception of the overall communication network and another individual's perception of the same network, we compared responses from both individuals about each entry of the network. That is, we compared the agreement between each pair of individuals in the division about all possible pairs in the task communication network. There were 2,016 unordered pairs of individuals in the division, representing all respondents (N = 64) whose perceptions about the task communication network could be compared with all other respondents' (N − 1 = 63) perceptions of the same network, divided by 2 (to eliminate duplicates). For each of the 2,016 pairs of individuals in the division, we compared their responses about each of the 4,032 (64 *x* 63)

ordered pairs (including their responses) in the task communication network. A pair was said to be congruent on an interaction point if both individuals in the pair agreed that the individuals represented by the interaction point communicated about task-related issues.

A simple example should make this calculation more clear. If a fictitious network of interest had five members and a researcher asked all respondents to report cognitive social structures, one would expect results such as those shown in Figure 2. The top of Figure 2 represents the informal communication network as described by Person A, including A's self-report of his or her own communication and A's report of the communication that occurs between all other pairs in the network. The bottom of Figure 2 represents Person B's description of the same communication network. To calculate the perceptual congruence between Person A and Person B, we would count the number of communication ties that both A and B agree exist between every pair in the network. Both A and B agree that the following pairs of individuals communicate with one another: (a) Person A and Person C, (b) Person B and Person E, (c) Person C and Person E, and (d) Person D and Person E. Therefore, we would say that Person A and Person B's perceptual congruence on their organization's social structure equals four. We would then follow the same procedure to calculate perceptual congruence scores between all members of the network.

Returning to the data collected for this study, once the congruence scores were calculated for all pairs in the network, we then created a congruence matrix. Each entry in the congruence matrix represented the congruence score for a pair. To test each of the hypotheses, we compared the congruence matrix to a predictor matrix that was calculated from one of the following variables.

Department membership. Respondents were assigned a score for each of the four formally designated departments. Pairs of respondents were then assigned scores to signify whether they worked in the same department. Thus, predictor matrix *same department* was created, where 1 = *worked in the same department* and *0 = did not work in the same department.*

Hierarchical level. Respondents were also assigned a score for each of the five designated hierarchical ranks. Again, pairs of respondents were then assigned scores to signify whether they were both members of the same hierarchical level. Predictor matrix *samehierarchical* level was created, where: 1 = *members of the same hierarchical level* and *0 = members of different hierarchical levels.*

Supervisor-subordinate relationship. Members of each pair were assigned scores to indicate whether they were in a supervisor-subordinate relationship. If one member of the pair was the supervisor of the other member, the pair was assigned a value of 1; otherwise, the pair was assigned a value of 0 in predictor **matrix** *supervisor-subordinate relationship.*

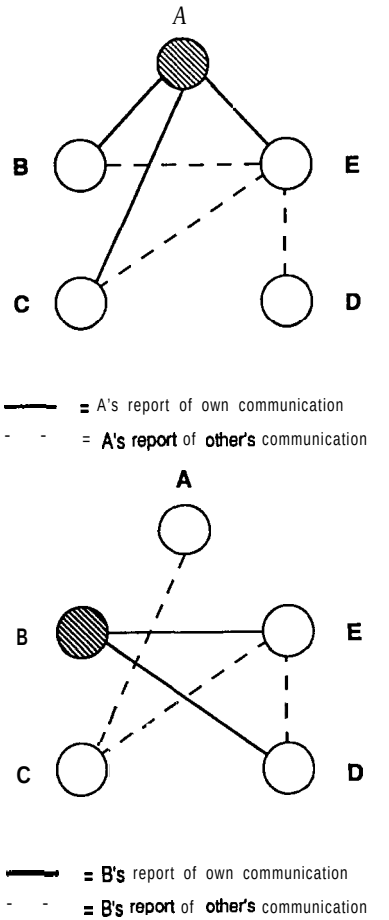

Figure 2: Representation of Person A's Cognitive Social Structure and Person B's Cognitive Social Structure

Gender. The gender of respondents was identified by a value of 1 assigned to males and 0 assigned to females. From the values assigned to individuals, pairs were then categorized based on whether the individuals were the same gender to create predictor matrix *same gender,* where 1 = *two members of the same gender* and 0 = *members not of the same gender.*

Ethnicgroup. Respondents were assigned a score of 1 if they were White and 0 if they were a minority Pairs were assigned a value of 1 if the members were both of the same ethnic group and 0 if the pair included one White and one minority member in predictor matrix *same ethnic group.*

Task communication and acquaintance networks. All respondents were asked to report their task communication and acquaintance with all other members of the organization. This information was used to create three matrices-mutual, asymmetrical, and null-for each of the two networks. A matrix for each type of relationship was created in which a pair was assigned a 1 if it met the condition, and all other pairs were assigned a 0. Each pair was assigned a 1 in only one of the three matrices created for communication *(communication mutual tie, communication asymmetrical tie,* and *communication null tie)* and acquaintance *(acquaintance mutual tie, acquaintance asymmetrical tie,* and *acquaintance null tie).*

Work flow network. The work flow network of the organization was operationalized by the respondents' use of a government form designed to initiate, record, and track activities performed by the Public Works Division. Respondents' reports of individuals from whom they get the form and to whom they give the form resulted in two matrices: get and give. As with the communication and acquaintance relationships, pairs of individuals may have a mutual, asymmetrical, or null report about their work flow relationship. Once again, a matrix for each type of relationship was created in which a pair was assigned a 1 if it met the condition, and all other pairs were assigned a 0. Each pair was assigned a 1 in only one of the following three matrices: *work flow mutual tie, work flow asymmetrical tie,* and *work flow null tie.*

ANALYSIS

Each of the eight hypotheses required testing the association of the congruence matrix with one of the predictor matrices. The analysis for each hypothesis was tested using a randomization test in a two-step process (Hubert & Schultz, 1976). The first step was to create a measure of association, or association score, for the congruence matrix and each predictor matrix described above, to index their similarity, The association score was calculated by summing the cross products of each corresponding cell in the congruence matrix and the predictor matrix. The second step was to determine the statistical probability of finding an association score as large as that observed for each predictor matrix by chance. To do this, a distribution of randomly generated association scores was created by

first permuting the rows and columns of the congruence matrix 2,000 times to create 2,000 unique, permuted congruence matrices, and second, calculating the association scores for each of the 2,000 permuted congruence matrices and the predictor matrix.

For each predictor matrix, we could identify the proportion of permuted association score values in the distribution that were greater than the observed association score. The hypothesis was supported if the association score between the congruence matrix and the predictor matrix (computed in Step 1) was greater than 95% of the 2,000 association scores between the congruence matrix and the permuted congruence matrices (computed in Step 2). These calculations were completed using the FORTRAN program Permute (Koehly, 1995).[1]

RESULTS

Table 1 identifies the results of the analysis of association between the congruence matrix and each of the predictor matrices. In general, the findings tend to support the model predicting coworkers' perceptual congruence on an organization's social structure. Table 1 identifies the following information for the relationship between the congruence matrix and each predictor matrix: (a) the name of the predictor matrix, which represents a relationship between coworkers; (b) the observed association score for the congruence matrix and the predictor matrix, which is a measure of association between the predictor matrix and the congruence matrix; (c) the mean of the 2,000 association scores for the predictor matrix and the 2,000 permuted congruence matrices; (d) the standard deviation of the 2,000 association scores for the predictor matrix and the 2,000 permuted congruence matrices; and (e) the proportion of the 2,000 association scores for the predictor matrix and the 2,000 permuted congruence matrices that are greater than the observed association score.

The values in Table 1 identify whether the observed association score for each predictor matrix is significantly greater than would be expected by chance. For example, predictor matrix *same department* represents pairs of coworkers from the same department. The observed association score calculated for same department, and the congruence matrix was 345,510. The proportion of association scores calculated for same department and each of 2,000 randomly generated congruence matrices that were greater than 345,510 was 0.00. These findings indicate that coworkers from the same department perceive the organization's social structure similarly The perceptions of coworkers from different departments are statistically less congruent than the perceptions of coworkers in the same department.

Of the five formal predictors, three were found to be significantly related to the perceptual congruence on an organization's social structure

TABLE 1
Association Between Predictor Matrices, Congruence Matrix, and Permuted Congruence Matrices

Predictor Matrix	Observed Association Score Between Predictor Matrix and Congruence Matrix	Permuted Association Scores: Mean	Permuted Association Scores: SD	Proportion of Permuted Association Scores Greater Than Observed Association Score
Formal predictors				
Same department	345,510	283,547	16,385	0.00*
Same hierarchical level	280,286	331,831	25,836	0.99
Supervisor-subordinate relationship	57,086	31,621	6,996	0.00*
Same gender	730,538	632,172	36,510	0.01*
Same ethnic group	750,370	724,605	42,910	0.27
Emergent predictors				
Communication mutual tie	528,540	345,647	27,663	0.00*
Communication asymmetrical tie	253,152	231,467	15,252	0.08
Communication null tie	288,368	492,876	33,427	1.00
Acquaintance mutual tie	978,124	843,008	27,574	0.00*
Acquaintance asymmetrical tie	31,804	116,919	16,369	1.00
Acquaintance null tie	60,132	110,243	13,217	1.00
Work flow mutual tie	8,427	10,731	1,993	0.88
Work flow asymmetrical tie	35,888	33,498	6,677	0.35
Work flow null tie	983.804	985.862	6.657	0.64

*$p < .05$.

($p < .05$). First, coworkers from the same department tended to perceive the social structure of their organization more similarly than coworkers who were from different departments ($p < .05$). This finding supports H1. Second, coworkers who were in a supervisor-subordinate relationship had greater perceptual congruence on their organization's social structure than coworkers who were not in such a reporting relationship ($p < .05$). This finding supports H3. Third, coworkers who were the same gender tended to have greater perceptual congruence on their organization's social structure than coworkers of different genders ($p < .05$). This finding supports H4.

Two of the five formal predictors of perceptual congruence were not supported empirically. H2 predicted that coworkers in the same level of the formal hierarchy would have greater perceptual congruence of the organization's social structure than coworkers in different hierarchical levels. This hypothesis was not supported by the data in this study A second formal predictor posited to have a positive effect on perceptual congruence between coworkers—ethnic group-was not found to be significant. That is, coworkers of the same ethnic group were no more likely to perceive the social structure of their organization similarly than coworkers of different ethnic groups. This finding failed to support H5. Thus, three of the formal predictors (i.e., codepartment membership, supervisor-subordinate relationship, and gender) were significantly related to coworkers' perceptual congruence on their organization's social structure. However, two of the formal predictors (i.e., same hierarchical level and ethnic group) had no effect on coworkers' shared perceptions of the organization's social structure.

The remaining three predictors in the hypothesized model of perceptual congruence were based on emergent network characteristics. The three emergent networks were task communication, acquaintanceship, and work flow. For each of the networks, it was predicted that coworkers who report a mutual tie would have greater perceptual congruence than coworkers who report either asymmetrical or null ties. Table 1 shows that two of the three hypotheses (H6 and H7) were supported. That is, in both the task communication network and the acquaintanceship network, coworkers who reported mutual ties had greater perceptual congruence of their organization's social structure than coworkers who reported asymmetrical or null communication or acquaintanceship ties. The predictor matrices for mutual communication and mutual acquaintance ties were both significant ($p < .05$, for each), whereas the predictor matrices for the asymmetrical and null ties were not significantly related to the congruence matrix.

Unlike the communication and acquaintanceship networks, the work flow network did not exhibit the predicted relationships. None of the three predictor matrices for the work flow network (i.e., mutual, asymmetrical, or null) was significantly related to the congruence matrix. Therefore, H8 was not supported.

A modified version of the model is presented in Figure 3. Included in Figure 3 are the predictors that were shown to be significantly related to a pair of coworkers' perceptual congruence on their organization's social structure. Those predictors posited to be related to perceptual congruence but which were not significant were removed from the model.

Table 2 presents the correlations among the predictor variables. These correlations were computed using the quadratic assignment procedure (Hubert & Schultz, 1976) in UCINET IV, version 1.0 (Borgatti, Everett, & Freeman, 1992). Using this permutation algorithm, a low proportion (less than 5%) suggests a strong relationship between the predictor matrices that is unlikely to have occurred by chance. In most cases, the variables are correlated. Several correlations were strong and significant. Specifically, individuals who were in the same department were likely to report mutual communication ($r = .46$); pairs of individuals who reported know-

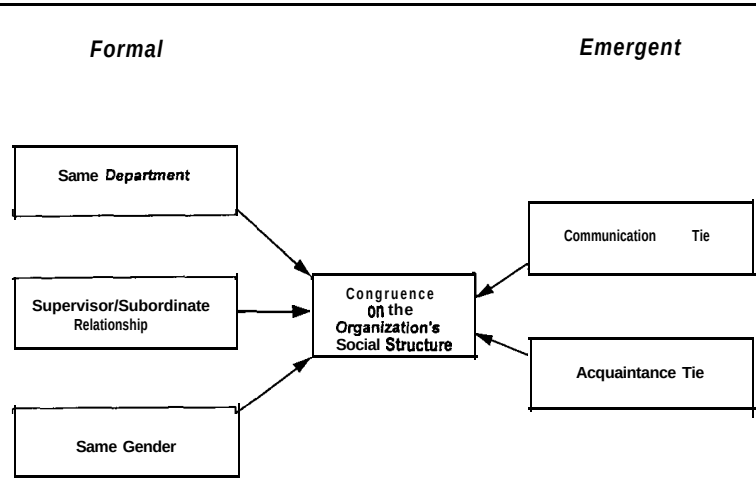

Figure 3: Revised Model of Formal and Emergent Network Predictors of Coworkers' Perceptual Congruence on an Organization's Social Structure

ing each other were likely to report communicating with one another (r = .33); pairs of supervisors and subordinates were likely to be in the same department (r = .28) and to report mutual communication ties (r = .24); and pairs who reported knowing each other were likely to be in the same department (r = .24).

DISCUSSION

This study attempted to identify predictors of coworkers' perceptual congruence on their organization's social structure. Following in the tradition of research that examined how coworkers' perceptions of organizational concepts, such as participation (Stohl, 1993), vision (Davis, 1995), mission (Grant, 1995), and climate (Poole & McPhee, 1983), came to be shared, this study shows that we could identify factors that contribute to perceptual congruence on an organization's social structure. Both formal and emergent network predictors were tested because researchers have shown that studying emergent networks increases understanding above and beyond that which can be explained by formal predictors alone (Bacharach & Lawler, 1980; Krackhardt & Hanson, 1993; Krikorian et al., 1997). Three formal variables (i.e., codepartment membership, supervisor-subordinate relationship, and gender) and two emergent network variables (i.e., task communication and acquaintanceship) were found to be predictors of coworkers' perceptual congruence on their organization's

TABLE 2
Values B een Predicto tu:

		Same Hierarchical Level	Supervisor-Subordinate Relationship	am.	Wo
				ini	Mu
				rou	
Same hierarchical level	11*				
Supervisor-subordinate relationship	.28*	–.12			
Same gender	.03	.02	.05		
Same ethnic group	–.03	–.08*	.04	.19*	
Communication mutual	.46*	.02	.24*	.07*	.05
Acquaintance mutual tie	.24*	–.01	.08*	.11*	.15
Work flow mutual tie	.04*	–.02	–.00	.02	.01

NOTE: Probabilities wer using UCINET's QAP-Correlation function (Borgatt, & 2). ng
a low proportion sugges elationship between the predictor matrices that is t to h by nc
*p < .05.

social structure. Given the results, one can argue that both formal and emergent structures contribute to coworkers' perceptual congruence on an organization's social structure.

Three variables hypothesized to be predictors of coworkers' perceptual congruence on their organization's social structure were not found to be significant. It was posited that coworkers who were at the same hierarchical level of the organization would have greater congruence on the social structure of the organization. However, this relationship did not emerge. It may be that coworkers who are at the same hierarchical level are more closely tied to individuals in their departments than to coworkers who are at their hierarchical level but from different departments. It was also posited that coworkers of the same ethnic group would view their world more similarly than coworkers of different ethnic groups. Although these results fail to support the hypothesis, they appear to be consistent with other studies examining the differential effects of same-ethnic group and mixed-ethnic group pairs. For example, research on the direct effect of subordinate race on performance evaluations has yielded contradictory results. A study by Greenhaus, Parasuraman, and Wormley (1990) and a meta-analysis by Kraiger and Ford (1985) both revealed that Black subordinates received lower performance evaluations than Whites. However, both of these studies failed to isolate the results of racial bias from the effects of true performance differences. Pulakos, White, Oppler, and Borman (1989) conducted a study in which effects were isolated, and found that the direct effect of subordinate race was minimal. Sackett and DuBois (1991) and Waldman and Avolio (1991) obtained results similar to those reported by Pulakos and colleagues. Finally, the results indicate that coworkers who report mutual ties in the work flow network are not more likely to have greater perceptual congruence on their organization's social structure than coworkers who report asymmetrical or null work flow ties. This finding suggests that although work is passed between individuals, information about the organization's social structure is not necessarily passed along the same lines.

Strengths and Limitations

This study extends previous research on perceptual congruence on key organizational and communication concepts. A strength of this study is that it builds on prior research by examining an additional key concept, the social structure of organizations. The social structure of an organization is a socially constructed concept. Knowing how individuals come to understand their world, in relation to other individuals with whom they work, offers a better understanding of the attitudes and behavior of these individuals as well as of the groups in which they are embedded.

However this study, although innovative, has at least four theoretical limitations.

First, our definition of an individual's perception of his or her organization's social structure is based on Krackhardt's (1987a) description of cognitive social structures. However, this definition is only one among many possible definitions of social structure. Rather than view their social structures as networks, individuals may use higher order linkages, such as hierarchies, departmental relationships, and work flow interactions, to represent their worlds.

Second, the five formal and three emergent predictors of perceptual congruence are by no means exhaustive. There are other formal and emergent predictors that shape coworkers' perceptual congruence on their organization's social structure. One such formal structural predictor is organizational proximity (Monge, Rothman, Eisenberg, Miller, & Kirste, 1985). That is, coworkers who are located near to one another in the organizational environment may have greater perceptual congruence on the social structure of their organization than coworkers who are not colocated in the organizational environment. An example of an emergent predictor not included in the present study is the friendship relation between coworkers (Brass, 1984; Krackhardt, 1990; Krackhardt & Kilduff, 1990; Krackhardt & Porter, 1985). Although this study investigated the acquaintance relationship between coworkers, the friendship relationship may offer additional explanatory power because it involves a deeper level of interaction between individuals. Furthermore, our operationalization of emergent network predictors of perceptual congruence included only direct ties between individuals. This study did not include emergent network predictors of perceptual congruence such as closeness, which would include both direct and indirect ties between individuals.

Third, in predicting the perceptual congruence among coworkers, this study considered the frequency but not the content of the communication among coworkers. That is, although we include the broad category of task-related communication, we have not further defined the communication by topics discussed or by importance placed on the communication by members of the communicating pair. These factors may affect the ways in which individuals perceive their organization's social structure as well as the extent to which these perceptions are shared by pairs of coworkers.

A final theoretical limitation of the present study is its reliance on formal and emergent predictors of perceptual congruence in a conventional organization. The organization under study here has a very traditional structure in which the differences between the formal structure and the emergent structures can be easily observed. However, fundamental shifts in organizational structure and management philosophy have diminished the distinction between formal and emergent networks in many

organizations. The ascendancy of new forms of organizing, such as the virtual corporation (Davidow & Malone, 1992) and the network organization (Miles & Snow, 1986), make the traditional distinction between formal and emergent predictors deployed in this study potentially irrelevant (Monge & Contractor, in press).

A methodological strength of this study is that it makes possible the reduction of an enormous amount of structural data into one congruence score. The distillation of the data into one value for each pair allows for comparison across all pairs in the network. Although other researchers have used this data-gathering technique in smaller organizations (Kilduff & Krackhardt, 1994; Krackhardt, 1987a, 1990; Krackhardt & Porter, 1985, 1986), we believe our study represents the largest sample size to date from which cognitive social structure data has been collected. However, the nature of the data collection and analysis raises four methodological concerns.

First, the magnitude of the data being requested from each respondent and the attendant response fatigue points to a potential methodological limitation in the scalability of the study reported here. The data collection was exacting and time-consuming. To assess the social structure among the 64 members in the organization, respondents typically spent approximately 1 hour identifying their perceptions of the relationships among each of the 2,016 pairs of individuals within the organization. Clearly, this approach has limitations that increase exponentially with the size of the organization under investigation. Our sample of 64 may be approaching the upper limit of sample sizes for which census data-gathering technique can be used. For larger sample sizes, it may be possible to collect data based on block sampling strategies. That is, each pair of individuals is asked to report on their perceptions of communication ties on a randomly selected subsample of the overall social structure.

A second methodological limitation of this study is that we tested separately the relationships between each of the predictors and coworkers' perceptual congruence on the organization's social structure. The study does not assess the simultaneous effects of the predictors on the congruence levels due to dependency in the data. Estimating simultaneous effects would identify the relative influence of the formal and emergent network predictors of perceptual congruence on an organization's social structure. Furthermore, it would allow one to examine the extent to which the effects of the formal predictors are mediated by the emergent network predictors. For example, it may be the case that formal structural predictors, such as departmental comembership, influence the level of task communication, which in turn, may influence perceptual congruence. Instead, the results reported here are based on bivariate analyses between the response variable, perceptual congruence, and the various

predictors. By estimating simultaneous effects, we could also incorporate interactions among the predictor variables in the model. Clearly, a multivariate analysis is more appropriate to estimate the simultaneous influence of the predictors on perceptual congruence. Unfortunately, techniques for such a study are currently lacking. The multivariate permutation tests proposed by Krackhardt (1987b) are the only methods suggested for multiple target matrices. However, Krackhardt's method is limited in its ability to assess the simultaneous influence of each predictor or take into account possible interaction effects. Rather, his approach uses permutation tests, such as those used in this article, to look at the partial correlation between two relational variables while controlling for the spurious effects of other related variables that are not directly of interest. The techniques proposed by Pattison and Wasserman (1997) may provide promising avenues to explore the effects of multiple predictors when incorporating interaction effects into the model.

A third methodological limitation of this study is that, although the emergent network variables of task communication and acquaintanceship were shown to be related to coworkers' perceptual congruence on an organization's social structure, the causal direction of the relationship is not discernible because it was collected at a single point in time. Ongoing longitudinal data collection at the Public Works Division will allow for tests of mutual causality between the emergent network variables and perceptual congruence.

A fourth methodological limitation of this study is that the ethnic origin of the respondents was observed by surveyors during face-to-face interviews rather than allowing respondents to self-report their ethnic group. An improved approach would be to ask individuals to report their ethnicity

Directions for Future Research

This study, which has proposed and refined a model predicting coworkers' perceptual congruence on an organization's social structure, sets the stage for further research examining the outcomes of employees' perceptual congruence on the organization's social structures. For example, studies can be conducted that relate perceptual congruence on an organization's social structure to organizational outcomes, such as satisfaction, commitment, perceptions of climate, participation, and agreement on organizational mission.

Furthermore, members' perceptions of the organization's social structure are not likely to remain static. One potentially fruitful area of inquiry is the influence of new communication technologies on employees' perceptual congruence on the social structure. The introduction of new

collaboration or communication technologies make some ongoing interactions less public and, hence, more difficult for others to discern. However, in other instances, work flow software may also make the organization's communication structures more visible and, hence, easier for others to predict.

Practical Implications

Understanding how coworkers share perceptions of their organization's social structure is important to managers attempting to introduce innovations into organizations. To develop appropriate implementation strategies for a new organizational policy or technology, managers need to know the extent to which employees share views of the organization's structure. This study found that coworkers from the same department viewed the social structure similarly. Therefore, implementers of innovations would find it useful to develop implementation strategies based at the departmental level. For example, if an organization were installing a new computer system, a particular implementation strategy may work well for one department but may need to be modified for another department within the organization. Furthermore, our study indicates that employees of the same gender are more likely to have similar perceptions of the organization's social structure. This finding has implications for human resource managers dealing with issues related to workforce diversity

NOTE

1. Permute is available via anonymous ftp to s.psych.uiuc.edu. The source code (Permute.f) and executable files (Permuted [DOS] and Permute [UNIX]), along with a readme file, are provided. All of these files are stored in the \pub \ Wasserman \ heald \ permute directory To download these files, follow this procedure:

ftp s.psych.uiuc.edu
USER: anonymous
PASSWORD: *enter your e-mail address*
cd \ pub \ Wasserman \ heald \ permute
binary
getfilenanze
quit

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