Journal of Applied Communication Research
27 (1999), 285–309

Individual and Structural Influences on Information Technology Helping Relationships

Ronald E. Rice, Lori Collins-Jarvis and Sharon Zydney-Walker

ABSTRACT *Getting help in understanding how to use and interpret a new information system is a crucial organizational and individual resource. Indeed, both informal and formal sources of information technology help are expensive and necessary, but largely unidentified, unmanaged, and underresearched. This study proposes that two types of factors influence the formation of information technology helping relationships: individual and structural. Based on a survey of employees in an organization implementing a new workstation-based customer database system, the study compares influences on being sought as an informal source of IT help, and on types of help (individual or positional) that one seeks. One individual factor (some forms of computer expertise) and most structural factors (especially measures of employees' perceived socialization, task interdependence, and communication networks) exerted weak but significant influences on employees' IT helping relationships.*

Information technologies (IT) have become an essential means for employees to perform a wide variety of tasks in an increasing number of organizations. Yet professional information and assistance in the use of IT continues to lag far behind user demands. For example, a recent study of six public sector organizations revealed that the average information systems professional struggled to provide individual assistance to over 100 personal computer users, while still ensuring system-wide services for the organization as a whole (Wallace, 1996). The limited ability of information systems professionals to provide formal help means that employees must turn to informal networks to help them with their everyday needs for IT information and assistance (Bannon, 1986). Yet identifying and accessing, or being allowed access to, those IT help sources, are not straightforward. As

Ronald E. Rice is a professor at the School of Communication, Information and Library Studies, Rutgers University (rrice@scils.rutgers.edu). Lori Collins-Jarvis is a senior project manager, Lieberman Research Worldwide, Los Angeles (lcollins-jarvis@lrw-la.com). Sharon Zydney-Walker is a senior business analyst, EDS, Bedminster, NJ, sharonzydney@att.com. We would like to thank the exceptional collegiality and help of Jennifer Lehr and Sara Schneider on the larger related research project. We also thank the organizational respondents, and our primary contacts, Frank Chechile, Donna Adams, Mike Wallace, and Grace McGowan. Direct correspondence to the first author at the School of Communication, Information and Library Studies, Rutgers University, 4 Huntington St., New Brunswick, NJ 08901-1071 (or e-mail rrice@scils.rutgers.edu).

who occupy a similar place in an organizational structure, and are thus unlikely to seek help outside of that structure. Thus, if IS professionals seek to extend their reach by promoting informal help networks, they need accurate information about what factors influence these networks. The following section outlines hypotheses predicting individual and social structural influences on IT helping networks.

Individual and Structural Influences

Individual Influences on Information Technology Help Relationships

Information Technology Expertise. Research on technological innovation suggests that early adopters of information technology tend to maintain a greater level of IT expertise, and that their expertise helps them influence others' attitudes toward the technology (Bannon, 1986; Papa, 1990; Rogers, 1986). People with greater expertise are likely to consider new systems easier to use and requiring less training than novice users, thus also needing less help. Some studies suggest that users with greater expertise also influence others' choice of IT help. Studies by Lang, Auld and Lang (1982), Lee (1986), and Eveland, Blanchard, Brown and Mattocks (1995) found that employees who were sought out as IT helpers maintained greater levels of computer education, and used a greater number of computer applications than did the users whom they helped. It seems likely that employees should turn to organizational members with greater relevant IT expertise to help them with IT problems.

H1a: Employees with greater information technology expertise are more likely to be sought as IT helpers, while people with less expertise are more likely to seek IT help.

Expected Ease of Use. Individual perceptions and expectations influence the outcomes of IT implementation (Lucas, 1981). In particular, perceptions of ease of use of IT are valid and significant predictors of use and positive evaluations of new systems (Davis, Bagozzi, & Warshaw, 1989; Rice, Grant, Schmitz, & Torobin, 1990). Employees who expect that new ITs will be more difficult to use may be more likely to seek out help as a way to reduce their anxieties. Conversely, people who have pre-implementation expectations of ease of use should be less likely to need extra technical help, but more willing to provide such help.

H1b: Employees who have greater expectations of system ease of use should be less likely to seek out helping relationships but more likely to be sought out.

Gender. It seems likely that gender differences will influence the development of IT helping relationships, as they do other helping relationships (Ibarra, 1992, 1993). Unfortunately, little research considers this issue. Both men and women prefer to seek help from members of the same gender group since they may share similar perspectives, similar communication styles, or belong to the same communication networks (Ibarra, 1992, 1993; Ragins & Cotton, 1991). However, heterogeneous gender relationships are more likely when organizations have a greater proportion of male employees, especially at higher levels of authority. Also, Ibarra notes that women are more likely to go to men for instrumental support (though not specifically mentioned, this would seem to include computer help), but to

other women for emotional support. Though these results imply either contradictory or fairly contingent results, we propose that in the analyzed organization where men do not represent the majority, employees will be more likely to seek same-gender helping partners.

H1c: IT helping relationships are more likely to involve people of the same gender.

Females tend to be socialized to exhibit more cooperative behaviors than males, and to be less concerned with presenting themselves as independent and autonomous (Gardner, Peluchette, & Clinebell, 1994; Tannen, 1994). As a result, women may be more likely to seek informal IT help than men. Eveland, Blanchard, Brown and Mattocks' (1995) study found no gender differences between high help providers and non-providers, but did not analyze whether women were more likely than men to become involved in information system helping relationships (either as seekers or providers). One survey of employees in 12 different organizations found that women were more likely than men to seek help from other users regarding problems using MS-DOS (Bowman, Grupe, Lund, & Moore, 1993). Another multi-organizational survey found that women were more likely than men to become involved in mentoring relationships maintained via electronic mail (Chitogopekar & Mabry, 1996).

H1d: Females are more likely to seek IT help than are males.

Structural Influences on Information Technology Help Relationships

By structure, we mean formal or informal relationships in which individuals are more or less embedded, that represent constraints and/or resources, including information, norms and job requirements. As Contractor, Seibold and Heller (1996, p. 458) argue, such "structures have no reality independent of the interactions they constitute and in which they are constituted."

Structural factors should matter if we assume that the attributes and use patterns of IT help relationships are (at least somewhat) socially constructed within a particular organizational and interactional context, which shapes the way that employees understand these technologies (Contractor et al., 1996; DeSanctis & Poole, 1991; Fulk, 1993). Two studies (Fulk, 1993; Rice & Aydin, 1991) tested the influence of this aspect of organizational context, finding that structural factors (e.g., organizational unit proximity and relational proximity) exerted a greater influence than individual factors (e.g., computer expertise) on employees' attitudes toward, and use of, information technologies. However, while Rice et al. (1990) found that both structural influences (such as relational proximity and critical mass) and individual factors (such as task analyzability and expectations about the system) were significant predictors of email adoption, indicators of social construction were not, controlling for the other variables.

Thus it seems logical to propose that employees' relationships with others who provide or receive IT help develop within a particular organizational structure. This structure constrains the degree to which employees perceive themselves as IT helpers, or others as likely sources of informal IT help.

Organizational Unit Proximity. Overall organizational proximity is determined by the system of hierarchically and functionally-differentiated positions in an organizational structure, as well as the social relations that connect those

positions (Rice, 1993). Organizational unit proximity refers to employees who occupy positions within the same functional department, and who report to the same overall supervisor (Rice & Aydin, 1991). In both Lang, Auld and Lang's (1981) study of two university departments, and Lee's (1986) study of twelve private and public sector organizations, users cited departmental colleagues as their primary source of computing advice. Eveland, Blanchard, Brown and Mattock's (1995) study also confirmed the importance organizational unit proximity when it found that 74% of helper/helpee dyads involved users within the same functional department or workgroup. There are at least two reasons why IT helping relationships should develop within functional workgroups. First, workgroup members tend to be peers, and employees rely on peers for job-related information because they are less likely to lose face by admitting ignorance to an individual of equal status (Chitogopekar & Mabry, 1996; Kramer, 1996; Morrison, 1993). This should be particularly true for technical information, which represents an important source of power in most technologically-advanced organizations (Pettigrew, 1972).

The second reason that help relationships should develop among workgroup members is because such people belong to the same functional sub-culture, and thus, are likely to share similar perceptions (Contractor, Eisenberg, & Monge, 1994). For example, Stevenson and Gilly's study (1991) of problem-solving networks found that medical employees were more likely to seek assistance within their own functional sub-culture (of doctors, nurses or administrators) than outside of their division. Employees seeking assistance with an IT problem should similarly look for help in their own division.

H2a: People who are proximate in the same organizational unit (belong to the same workgroup) are more likely to engage in IT helping relationships.

Spatial Proximity. Spatial proximity refers to the degree that individuals' work locations are physically close to one another in an organization. Research suggests that spatial proximity influences informal relationships, since the frequency of informal conversations decreases dramatically between employees who are located on different floors, or in different buildings (Kraut, Fish, Root, & Chalfonte, 1990). Physical proximity, also appears to influence IT helping relationships, since employees in two studies (Bowman, Grupe, Lund, & Moore, 1993; Lang, Auld, & Lang, 1982) cite nearness or availability as one of the most important reasons for choosing a particular source of IT help. Similarly, only nine percent of helper/helpee dyads in Eveland et al.'s (1995) study involved employees located in different buildings. It makes sense that employees should seek IT help from individuals who are spatially proximate, since they are more readily available to solicit advice face-to-face.

H2b: People who are spatially proximate (located at the same organizational site) are more likely to engage in IT helping relations than those that are located at different sites.

Relational Proximity. Relational proximity is defined as the degree that individuals are directly or indirectly linked through interaction. While organizational proximity accounts for similarity based on interactions that are mandated by the organizational structure, relational proximity includes individually-initiated inter-

actions. This informal network of relations thus may overlap, subsume, or avoid connections created by organizational proximity (Rice, 1993).

Studies of helping relationships reveal that employees tend to seek help from organizational members who are relationally proximate whether they are located in the same organizational unit (Kramer, 1996; Stevenson & Gilly, 1993), or in different units (Chitgopekar & Mabry, 1996). One study also suggests that IT help-seeking relationships extend beyond work group structures (Carroll & Perin, 1994). Employees may seek help from members that they interact with frequently because they have developed a trusting relationship which allows them to expose their information needs, or share innovative information (Albrecht & Hall, 1981a; 1981b). Another reason that employees may seek IT help from relationally proximate others is because they share similar perceptions of the technologies, and how they can be integrated into their jobs. For example, studies find a positive relationship between relational proximity and similarity of attitudes and behavior toward a particular information technology (Burkhardt, 1994; Contractor et al., 1996; Fulk, 1993; Papa, 1990; Rice, 1993; Rice & Aydin, 1991; Rice et al., 1990; Schmitz & Fulk, 1991), mediated by factors such as others' influence, situational uncertainty, group cohesion, structurational processes, and timing (Contractor et al., 1996; Fulk, 1993; Rice & Aydin, 1991).

H2c: People who are relationally proximate (communicate frequently about work-related matters) are more likely to engage in IT helping relations.

We may also consider the influence of an individual's position in the entire communication network on seeking help and being sought for help. The more *central* one is in a work communication network, the more familiar one should be with all others' tasks, knowledge, and problems, and therefore more likely to either seek, or be sought for, IT help. For example, Contractor et al. (1996) show that the effect of perceptions by members of one's network, on one's own perceptions (of the group's processes), should be weighted by the rated influence (one manifestation of centrality) of each network member. We use two forms of the extent to which one is centrally located in a network (Freeman, 1979): degrees and betweenness. Out-degree centrality represents something like "sociability", and the extent to which the person has access to others in the network. In-degree centrality represents something like the "attractiveness" or "status," and extent to which others have access to the person. A more rigorous measure is *betweenness* centrality. This represents the individual's control of the flow of information between and about the other network members (Freeman, 1979). This concept is more specific than in- or out-degrees, as it takes into account the patterns of communication relations among all group members.

H2d: People who are more central are more likely to seek specific persons for IT help rather than formal positions.

H2e: People who are more central are more likely to be sought as IT help providers.

Task Interdependency. One aspect of organizational structure is the extent to which one's job is interdependent with other jobs. Hackman (1983; Hackman & Oldham, 1980) argues that working closely with others is one of the crucial and fundamental dimensions of job characteristics. Jobs that are interdependent involve two processes relevant to our discussion. First, people who have interdependent jobs are more likely to interact with other people in general, as task dependencies require transactions and requests across jobs. That is, interdependence is a structure that would facilitate knowledge of, and access to, those who might have useful task information. Second, interdependent jobs necessarily involve some similar task information, technical processes, and both covert and overt knowledge. For example, Eveland, Blanchard, Brown and Mattocks (1995) found that IT helper/helpee dyads shared at least five similar information work tasks in common. Thus, people who need to share or obtain information on how to solve problems, or find new ways of accomplishing tasks, would also be considered to have higher levels of task interdependency (Johnson & Rice, 1987). An organization's norms for sharing information about one's job and problems are one source of this aspect of task interdependence. For example, Dewhirst (1970–71) showed how restrictive information-sharing norms suppressed subordinates' willingness to ask superiors job-related questions, reducing expressions of task interdependence.

H2f: People who have jobs with higher task interdependency are more likely to be sought as IT help providers.

Organizational Socialization. Clearly, one form of structure is organizational socialization. Socialization is an on-going learning process whereby "an individual comes to appreciate the values, abilities, expected behaviors, and social knowledge essential for assuming an organizational role and for participating as an organizational member" (Chao, O'Leary-Kelly, Wolf, Klein, & Gardner, 1994, p. 730, citing Louis, 1980, pp. 229–230).

Group activity requires successful socialization, coordination and collaboration (McGrath, 1990), especially through informal, spontaneous communication (Kraut, Fish, Root, & Chalfonte, 1990). It also requires the development of "mutual expectations" about the nature or that work and collaboration (Gabarro, 1990). Positive mutual expectations increase one's confidence and trust in, and attraction and liking for, co-workers. "Mutual knowledge", or shared understandings of contexts, jargon, and assumptions, is also a crucial factor in successful organizational collaboration (Krauss & Fussell, 1990). Achieving such mutual knowledge is more difficult when participants either have little or no prior mutual knowledge, share different sets of mutual knowledge, are members of different work units, or are undergoing large-scale change. Formal role relations can limit the domains of mutual expectations and knowledge, and, further, emphasize asymmetrical status relations, leading to decreased self-disclosure and trust. Thus socialization and informal interaction are crucial to developing the mutual expectations necessary for effective and successful collaboration.

Chao et al. (1994) developed and tested measures of six dimensions of organizational socialization—performance proficiency, politics, language, people, organizational goals/values, and history—derived from Feldman (1981), Fisher (1986) and Schein (1968, 1971). We focus on three of those dimensions.

Relationship or people socialization refers to the development of satisfying and successful work relationships with other members, including learning relationships. Employees who are more highly socialized into, or knowledgeable of, their individual roles, relationships, and/or the organizational culture are more likely to be sought out for help with career development and mentoring (Ibarra, 1992,

1993). Those more relationally socialized should feel more comfortable and knowledgeable about seeking help, and should be better known as sources of help.

Task performance socialization is defined as the ability to perform the tasks and skills involved in their job. Those interested in greater performance should be more likely to seek out IT help. It would seem that better performing employees would be sought out to provide help in using information technology. For example, employees who are more socialized into their job tasks may be better equipped to help other users understand how new information technologies can be successfully integrated into their own jobs. It may be the case that those socialized into greater focus on task performance may be less inclined to divert their efforts into informal helping relations, however.

Political socialization includes the ability to get information about work relationships and power structures from knowledgeable others. Being more aware of these structures should make it easier to know whom specifically to ask for IT help, unless the pervading culture suppressed information sharing (see Dewhirst, 1971). Employees who are more highly socialized about organizational politics may be perceived as better able to advise others into how to use IT in a way that fits within those relationships, or within that political culture.

We also include a common surrogate for socialization, the length of time working for a particular organization. All things equal, socialization levels should be higher for those with greater *organizational tenure*. Thus people with greater organizational tenure should know better who to turn to for IT help, and should be better known by others as sources of IT help. On the other hand, those with greater tenure may need less IT help, and thus be less likely to seek others.

H2g: People who are more socialized into relationships with others, their job performance, and organizational politics are more likely to seek, and be sought as, IT help providers.

Influences and Levels of Analysis

The hypotheses propose individual or structural influences on helping relationships at either individual or dyadic levels of analysis. Hypotheses analyzed at the individual level test the impact of (mostly individual) influences on: (1) extent of an individual's seeking help (through either positional or personal source), and (2) being sought as a source of IT help. Hypotheses analyzed at the dyadic level test for influences on the involvement of a pair of employees in a dyadic helping relationship. Table One summarizes the hypotheses by influence and level.

Method

Site

This study is part of a longitudinal evaluation of the implementation of an integrated information system at a multi-site customer service organization (referred to as CSO). The study was undertaken with the goal of looking at several dimensions of organizational adaptation to new technology. The study involved two sites in neighboring states, about a three hour drive away from each other. The majority of employees were situated at Location X, which provided service to the external customers and some internal technical support, while most technical staff and system developers worked at Location Y.

TABLE 1
Hypotheses by Influence Factors and Levels of Analysis

Influence Factors	Levels of Analysis: Individual	Levels of Analysis: Dyadic
Individual	*H1a.* Computer expertise greater for IT help sources, less for IT help seekers *H1b.* Ease of IT use: greater for sources, less for seekers *H1d.* Females seek IT help more than males	*H1c.* Gender homophily in help relationships
Structural	*H2d.* Central people seek people as providers *H2e.* Central people more sought as providers *H2f.* Greater task interdependency of IT help sources *H2g.* Greater organizational socialization of IT help sources & seekers	*H2a.* Organizational unit proximity *H2b.* Spatial proximity *H2c.* Relational proximity

In 1994, CSO provided telephone-based servicing of corporate telephone cards from over 6,000 companies and received 10,000 facsimiles per week requesting changes, requests, deletions, re-structurings, additions, etc. In an attempt to remove this massive paper-management task, to provide greater functionality and response, and to develop more sophisticated technology capabilities directly to the customers, the organization decided to implement an integrated information system. This system replaced the traditional mainframe application and the paper-based fax delivery system. The primary component is a Windows-based workstation service support system, built around a customer service database managed by a client-server network instead of the former direct connection to a mainframe.

Sample

Measures were collected from two organizational surveys. A baseline survey was conducted at time one, before the implementation of the new information systems. The total number of completed surveys from the baseline survey (T1, Spring 1995) was 141 in site X (97% of those eligible to participate) and 39 in site Y (95%). The total number of completed surveys from the follow-up survey approximately a half-year after initial implementation of the two systems (T2, Fall 1995) was 86 in site X (68%) and 26 in site Y (84%). Respondents had worked at CSO for an average of nearly 6 years (s.d. = 54 months).

Independent Measures: Individual

Computer expertise was measured in two ways. The first was four separate items indicating *duration of computer usage* (see Rice et al., 1990): the number of years of experience using a home computer (measured at T1), and, measured at both T1 and T2, the percentage of the average work day spent using general office automation systems (such as a personal computer, word processing, spreadsheets), the percentage of time spent using the prior mainframe system, and the percentage of the average work day spent using the new workstation service support system. *Breadth of computer expertise* was measured by the total number of five kinds of computer expertise respondents reporting having at T1 (using reports or informa-

tion produced by a computer, entering data by using a keyboard, doing word processing on a terminal or computer, using other applications [databases, spreadsheets, etc.], or programming [Basic, DBase procedures, complex macros, etc.]). General expectations at T1 of *ease of use* of the new system was measured by four items used by Johnson and Rice (1987) and Rice and Aydin (1991): easy to learn to use, easy to use for difficult tasks, little training needed, and little time needed to become competent (1 = strongly disagree to 7 = strongly agree).

Gender was coded as 1 for female and 2 for male. A symmetric *Gender homophily matrix* was computed by placing a "1" in the cells *i, j* and *j, i* for each pair of people *i* and *j* with the same sex, and a "0" if they were of different sex.

Independent Measures: Structural

Unit proximity was measured as a 180 × 180 symmetric matrix, derived from the organizational chart. It had a "1" in the *i, j* and *j, i* cells, when person *i* and person *j* reported to the same person on the organizational chart, and "0" if not. *Spatial proximity* was measured through a 180 × 180 symmetric matrix, derived from the employee roster. It had a "1" in the *i, j* and *j, i* cells, when person *i* and person *j* worked at the same location (site X or site Y), and "0" if not. *Relational proximity* was measured as a 180 × 180 asymmetric matrix. It was derived from the T1 survey which asked respondents to indicate the frequency with which they communicated (from 0 (never) to 1 (several times a month) to 5 (several times a day)) about work-related matters with all other listed employees. The value was entered in cell *i, j* of the relational matrix for respondent i's reported communication with person j. There was some intercorrelation among the matrices (unit with relational = .43; spatial with relational = .31; spatial with gender = .10; and relational with gender = .08, all $p < .005$).

Communication network centrality was measured in two primary ways: degrees, and betweenness. *Average out-degrees* is simply the total number of others that one names, divided by the total number of all others. *Average in-degrees* is the total number of others who name the respondent, divided by the total number of all others. *Betweenness centrality* measures the extent to which each person lies on the communication paths of all other pairs in the network. This procedure requires a binary symmetric matrix. Therefore, if respondent i's frequency of communication with named person *j* was either every day or several times a day (i.e., a value of "4" or "5"), it was recoded as "1", and "0" otherwise. This asymmetric binary matrix was then converted into a symmetric binary matrix by the union procedure (if either cell *i, j* or *j, i* had a 1), which was then entered into the centrality routine of UCINETIV. Individual out-degree, in-degree, and betweenness values were then added back into the dataset.

Task interdependency was measured through a standard measure of job characteristics (Hackman, 1983; Hackman & Oldham, 1980): Extent to which one's job involves working closely with others (from 1 = very little to 7 = very much). The review noted that the concept of interdependence can also include the extent of, or need for, sharing information and solving problems. Thus task interdependency was also measured through two factors critical to performing tasks at CSO, as identified by employee focus group interviews: the degree of satisfaction (from 1 = very dissatisfied to 7 = very satisfied) with (1) sharing new ways of doing your job, and (2) with sharing solutions to job-related problems. Note that these

measure generalized structural constraints or requirements associated with task interdependency, not specific interdependencies between pairs of individuals, which would be more precise operationalizations.

Organizational socialization was measured using three of the most relevant dimensions from Chao et al.'s (1994) study. Each of the three highest-loading items were chosen for three dimensions (from 1 = strongly disagree, to 7 = strongly agree). Performance efficiency socialization measured efficiency in job performance, task mastery, and successful use of appropriate skills and abilities (alpha = .69). Measures of organizational politics included knowledge of how things "really are" inside the organization, influential people, and motives behind others' actions (alpha = .56). The people socialization measure (including considering coworkers as friends, being part of the gang, and included in informal networks) will be reported, but was unreliable (alpha = .36). Organizational *tenure* was measured by the total number of months the respondent had been working for the organization. Tenure was uncorrelated with any of the socialization measures, while political socialization was correlated .18 with people socialization and .28 with task performance socialization, both $p < .01$).

Dependent Measures

Individual involvement in help relationships was measured in two basic ways: whether a respondent seeks help, or whether a respondent is sought for help.

Help Seekers. Two questions on the T2 survey asked respondents to print the name of: "Who you are most likely to go to if you need information or assistance . . . about the workstation service support system?" and ". . . about personal computers?" If there was no specific *person* who respondents usually went to, they were asked to indicate the *position* they might go to, like "a member of your team, a member of another team, your direct supervisor, another team leader, a trainer, a developer, a member of the implementation team, etc." Forty-seven respondents named no person, 45 one, and 27 two; 35 respondents named no position, 43 one and 41 two. Only four people did not seek either a person or a position, and only six people chose a total of one (of either), while 109 chose a total of two. Because these two variables are not highly correlated ($r = -.23$, $p < .005$), we also created a summary variable, indicating the extent to which one goes to a formal position (43 named one or two positions but no people), a mix (41 named one position and one person), or a person (31 named one or two people but no positions).

Help Sources. This was measured as being named specifically by a respondent as someone they would most likely to go to for information or assistance about the system or personal computers. The total number of times one was named, and whether one was named or not, were correlated at .99, so we used the second, more general measure.

Help Matrix. This asymmetric matrix was constructed by entering a "1" in each *i, j* cell of the network matrix, where *j* was the id of the person named by the respondent *i* as a source of help. However, because all the predictor matrices are, by definition, symmetric, and therefore would be necessarily less associated with

an asymmetric dependent variable, representing a form of measurement error, a symmetric version of this matrix was also created (if i, j or $j, i = 1$, both were set to 1) to indicate a shared relationship between seeker and helper.

Analyses

Analyses of Individual Influences. Pearson bivariate correlations were used for analyses of the associations between the influences and the measures of number of people, or the number of positions, sought for help. However, Spearman bivariate correlations were used for analyses of the influences and the level of positional-personal seeking, or being sought for help, because they assume only an ordinal level of measurement, which is appropriate for these two dependent variables (a three-level and a dichotomous rank, respectively).

Statistically significant influence variables were then tested in a stepwise regression for each of the dependent variables, leading to final regressions that included only significant predictors. Linear regressions were used for the three "seeking" variables, while logit regression was used for the "sought" dependent variable, because of its dichotomous nature. An alternative approach would be to construct multi-items of measures that are highly correlated (as identified through factor analysis and reliability assessment). But, due to the small number of variables, our interest in identifying specific influences (such as between types of computer expertise), and the ability of regression analysis to identify unique variance explained by just the remaining significant variables from the bivariate correlations, we chose to use the individual items.

Analyses of Structural Influences. Most network analyses reported here used the UCINETIV suite of programs (Borgatti, Everett, & Freeman, 1992). Individual-level structural influences were tested through correlations of the measures of task interdependency, socialization, and network centrality. For the dyadic structural analyses, the two primary approaches were matrix correlation and matrix multiple regression. Because the rows and columns of network matrices are not necessarily independent, thus possibly biasing parametric significant tests, the significance level of a matrix correlation is derived nonparametrically by generating 500 random permutations of the test matrix, computing the correlation for each of those matrices, and then comparing the original correlation to that distribution of 500 correlations (called the Quadratic Assignment Procedure, Hubert & Schultz, 1976). As with simple bivariate correlations, matrix correlations may involve interdependence among the predictor matrices. Therefore, multiple matrix regression was also used. As with the matrix correlations, Quadratic Assignment matrix regression computes an overall R value, and nonparametric significance tests for the overall equation and each of the separate matrices' unstandardized beta coefficients.

Results

Table Two provides descriptive statistics for the measures, and Table Three summarizes the types of positions, and number of specifically named persons, named as sources of help. Table Four presents the bivariate correlations.

TABLE 2
Descriptive Statistics

Variables		Mean	S.D.
Individual Influences			
Computer Experience:			
# years use home computer		2.3	3.5
% office automation	T1	35%	35%
% mainframe system	T1	45%	41%
% workstation support	T1	8%	18%
% office automation	T2	45%	35%
% mainframe system	T2	43%	39%
% workstation support	T2	15%	25%
Breadth of computer expertise	T1	3.4	1.3
Ease of Use:			
Easy to learn to use		4.7	1.3
Easy for difficult tasks		5.1	1.2
Little training needed		4.6	2.4
Little time to be competent		3.0	1.8
Gender (F = 1, M = 2):		69%	—
Structural Influences			
Network Centrality:			
Average in-degrees		.27	.21
Average out-degrees		.27	.10
Betweenness (cutoff at 4)		.9	2.8
Task Interdependency:			
Work with others		17.9	2.7
Share new ways of doing work		4.5	1.3
Share solutions to problems		4.9	1.3
Socialization:			
People socialization		3.3	.7
Task performance socialization		4.6	.5
Political socialization		4.3	.6
Months worked at CSO		70.2	53.7
Help Measures—Seeking or Being Sought (T2)			
Identified person or position you go to to seek help concerning the workstation support system or the pc:			
# of either named		1.2	1.0
# of people named		.5	.7
		0 = 47, 1 = 45, 2 = 27	
# of positions named		.7	.8
		0 = 35, 1 = 43, 2 = 41	
1 or 2 positions, mix, or 1 or 2 persons		43, 41, 31	
Named as help source (0 = N, 1 = Y)		.2	.4
# others naming respondent as source		.5	1.5
Sample Sizes		*Site X*	*Site Y*
	T1	n = 141	n = 39
	T2	n = 86	n = 26

Structural Description of the Organization

In order to provide a parsimonious description of the overall communication structure of CSO (both site X and Y), Figure One presents a metric multidimensional scaling (MDS) of the T1 work communication matrix. First, the communication matrix was converted into a correlation matrix, where each cell in the matrix indicates the similarity of the rows (communication to others) and columns

TABLE 3

Sources of Assistance, T2 (Position or Named Person), for Customer Support System and for Personal Computer

	Help Sought Concerning:			
	Customer Support System		Personal Computer	
	N	Pct	N	Pct
Position:				
Analysis Team	5	4.5	—	—
Conversion	1	.9	—	—
Coworker	5	4.5	1	.9
Cust Acct Team Leader	1	.9	1	.9
Depends-No Need Yet	1	.9	1	.9
Developer	1	.9	1	.9
Documentation Team	1	.9	1	.9
Don't Know Who To Ask	1	.9	—	—
Myself	—	—	1	.9
Platform Helpdesk	3	2.7	35	31.0
PI&M team	8	7.2	—	—
Team/Group	9	8.1	13	11.5
Tech Support site *Y*	—	—	5	4.4
Tech Support site *X*	1	.9	7	6.2
Trainer	21	18.9	—	—
Specific Named Person:	53	48%	47	59%
Total Respondents	111		113	

(communication from others) of each pair of people (including strong, weak, and absent relations). (This is a commonly used procedure; however, Euclidean distances or Fisher's z-transformation of the correlations may be more appropriate measures as they remove the nonlinearity in correlation measures; see Contractor et al., 1996, p. 465.) MDS then spatially represents the relations among the people in this symmetric similarity matrix in a minimal number of dimensions, attempting to minimize the overall value of "stress". Although the stress value is high here (.30), indicating a three-dimensional solution would be more accurate, we use the two-dimensional solution for parsimony in descriptively and generally representing the relationships. Actually, two dimensions work quite well when compared with the organization's team and location structures. The numbers in the Figure are the IDs of the respondents in the dataset. Underlined ID numbers indicate those people who were named as *sources* of help. The italicized numbers on the left indicate those people who work in the systems unit at location Y.

Next we applied a network analysis procedure called "blockmodelling" on the initial communication similarity/correlation matrix. This procedure attempts to identify "positions" in the network through iteratively separating the entire matrix into subsets of people who are more and more "structurally equivalent" to other members in that position. The relations among these more general positions, then, portray the underlying structure of the network. The top half of Figure Two shows that eight positions resulted, labelled from A to H. These are the eight encircled groups in the MDS plot of Figure One. By considering the location on the organizational chart of each of the IDs plotted in Figure One, each position can be easily identified and described, as listed at the bottom of Figure One. The average communication strengths across and within these sets of people varied from no

TABLE 4

Correlations and Regressions of Individual and Structural Influences with IT Help Variables

	Dependent Variables Seek Provider:						Sought as Provider:	
	# Persons Sought (0, 1, 2)		# Positions Sought (0, 1, 2)		Position (1), Mix (2), Person (3)		Yes (1) or No (2)	
Independent Variables	Corr.[a]	Reg.[b]	Corr.[a]	Reg.[b]	Corr.[c]	Reg.[b]	Corr.[c]	Reg.[d]
			Individual Influences					
H1a—Computer Expertise:								
# Years use home computer	−.14*		−.01		−.11		.13*	.12*
% office automation T1	−.09		−.10		.08		.22*	
% mainframe system T1	−.06		.03		−.04		−.22**	
% workstation support T1	.02		−.02		−.04		.12	
% office automation T2	−.03		−.04		.03		.10	
% mainframe system T2	−.02		−.05		.01		−.24**	
% workstation support T2	−.12		.10		−.18*		.09	
Breadth comp. expertise T1	−.09	−.15*	.18**	.21**	−.19**	−.27***	.17*	
H1b—Attitudes:								
Easy to learn to use	.01		.02		−.04		.00	
Easy for difficult tasks	−.01		−.03		−.03		−.06	
Little training needed	−.09		.07		−.10		.06	
Little time needed to become competent	−.09		.08		−.12		−.08	
H1d—Gender (F = 1, M = 2)	.02		−.08		.07		.10	
			Structural Influences					
H2d, H2e—Network Centrality:								
Average out-degrees	.04		.02		.04		.10	
Average in-degrees	.14*		−.10		.20**		.12*	
Betweenness	−.06		−.11		.07		.14*	
H2f—Task Interdependence:								
Work with others	.05		.04		−.04		.14*	
Satisfied with sharing new ways of doing work	−.02		−.08		.07		−.33**	−.65***
Satisfied with sharing solutions to problems	.01		−.04		.04		−.16**	
H2g—Socialization:								
People	.08		.13**		−.05		.04	
Task performance	−.15**	−.18*	.13**	.18*	−.21**	−.27***	−.16*	
Political	.00		.01		−.05		.03	
Months worked at CSO	.10		.03		.08		.08	
Adjusted R^2		.03		.05		.10		.20[e]
F-ratio		3.8*		5.3***		7.4***		$X^2 = 23.0$***[f]

N = from 93 to 186.
[a] = Pearson correlation.
[b] = Linear regression; values are standardized beta coefficients.
[c] = Spearman correlation.
[d] = Logistic regression; values are unstandardized beta coefficients.
[e] = Nagelkerke R^2 for logistic regression.
[f] = 95% correct for 0, 13% correct for 1, 76% overall.
*$p < .05$; **$p < .01$; ***$p < .005$.

communication (strength of 0) reported by members of position G (mainframe production support at the system location Y) with members of position D (data entry personnel at the service location X), to nearly daily (3.98) communication among members of position E (conversion and porting of data across systems at the service location X).

This, then, is the underlying, pre-existing communication structure of the CSO organization before implementation of the system. Provision of help seems to be mostly confined to pre-existing workgroups, with a few exceptions where transaction and information processes naturally cross boundaries, or where some roles are interdependent, such as data entry, data conversion or porting data between old and new systems.

Individual-Level Analyses

Table Four presents the correlation results.

H1a: Computer Expertise. *Seeking* help from specific *people* was not much associated with level of computer expertise, except less use of a home computer.

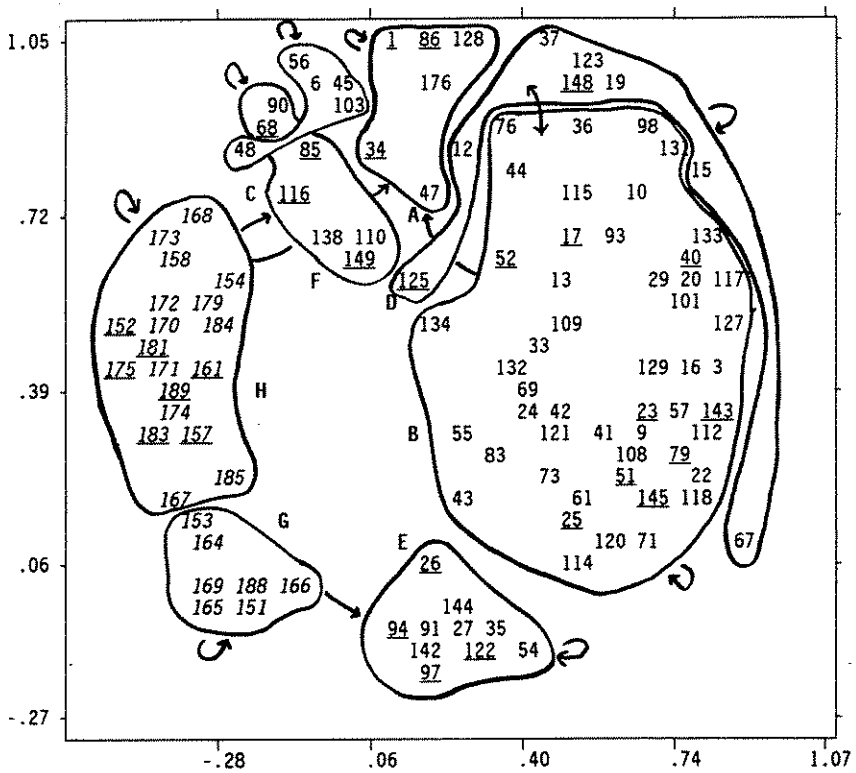

Figure 1. MDS Plot of T1 Work Communication among CSO Employees, Showing Only T2 Respondents, Identified by Relational Position, Technology Helper Status and Site Location

And seeking help from a formal *position* was correlated only with greater breadth of computer expertise. Naturally, then, there were few expertise influences on the combined variable of asking for help from specific individuals rather than formal positions: only less use of the workstation, and less general computer expertise. Perhaps people with less general and application-specific expertise preferred known individuals who may better understand the user's context, and provide a less uncertain communication context, rather than the more impersonal and formal positions, which may seem to require or represent more technical knowledge.

Several measures of computer expertise were related to being named as a *source* for IT help: greater home computer usage, greater general office automation usage, less mainframe usage (both T1 and T2), and greater breadth of computer expertise (all at T1). Note that use of the actual workstation support system itself was not related to being sought as a source of IT help: rather, more general computer expertise (at home and work), and not being associated with the older mainframe system (and worldview), were the primary influences.

H1b: Expectations of Ease of Use. Expected ease of use of the new workstation system was not related to any of the seeking or sought measures.

H1d: Gender. Gender was not related to any of the measures of seeking, or being sought for, IT help.

H2d, H2e: Centrality. *Out-degree* centrality was not correlated with any of the IT help variables. Thus, simple "sociability" or greater communication overall does not influence going to specific persons or positions, or being sought by others as a help provider. Greater *in-degree* centrality was significantly associated with the number of specific people sought, and seeking specific people rather than a formal position. Being named as a work communication partner by many others may increase the likelihood of seeking specific persons rather than formal positions due to the provider's increased knowledge of and trust toward requesting individuals. In contrast, the more complex structural measures of *betweenness* centrality was significantly correlated with being *sought* as a help provider. Lying on a greater number of short communication paths may enable an individual to know more about people's needs and the relation of a particular person's problem to others' problems and tasks, and to become more trusted by help seekers.

H2f: Task Interdependency. All three measures of task interdependency (those who worked more closely with others, and were less satisfied with current levels of sharing information about problems and solutions) were positively related to being named as a source of IT help. The dissatisfaction may have motivated some people to make extra efforts to improve the information-sharing situation, or increased their being seen as people who were more likely to want to overcome problems. Note that there was no hypothesis associating task interdependency and forms of IT help *seeking*, and indeed none of the correlations was significant.

H2g: Socialization. Being socialized as to "who's in the know" in the organization was significantly correlated only with naming more IT help positions. Greater task performance socialization predicted naming fewer people, more

positions, and positions rather than specific individuals, and to *not* being named as a source of IT help. Perhaps being socialized toward greater task performance fostered both greater confidence in, and a more positive approach toward, formal sources of help, but also projected an image of not wanting to be distracted or even seeing help requests as signs of low performance. Political socialization was not significantly correlated with any of the helping variables, indicating that in this organization, seeking or providing help is not associated with how much one is aware of power and status differentials and norms. This may indicate that there is a supporting norm for information sharing in these sites. Finally, simple organizational tenure was not related to any of the help relationships.

Individual-Level Multiple Regression Analyses

Summary regression results also appear in Table Four. *Seeking* IT help from a specific *person* at T2 was significantly predicted by two predictors: less breadth of computer expertise and low socialization into task performance (both measured at T1), although only 3% of the variance was explained. Seeking IT help at T2 from a formal *position* was significantly predicted by the same two variables, though with reversed signs, explaining 5% of the variance. Seeking IT help from the *combined* variable ranging from positions only to people only, the same two predictors were significant, explaining 10% of the variance. Thus only H1a, and some aspects of H2g (people and task, for seeking positions), were supported in the final regressions for seeking help.

For the logit regression equation predicting being *sought* for IT help (0 = no, 1 = yes), 20% of the variance was explained by two predictors: (dis)satisfaction with current levels of sharing new ways of doing work, and number of years using a home computer. Thus only H1a and H2f were supported in the final logit regression for being sought.

Structural Level Analyses

Table Five provides details of the matrix correlations and matrix regressions.

TABLE 5
Matrix Correlations and Regressions of T1 Structural Influences and Gender Homophily with T2 Help Seeking Matrix (both Symmetric and Asymmetric)

	Dependent Matrices: 112 × 112 Help Network				80 × 80 Help Network			
	Correlations		Unstandardized Regression Coefficients		Correlations		Unstandardized Regression Coefficients	
Indep. Matrices	Symm.	Asymm.	Symm.	Asymm.	Symm.	Asymm.	Symm.	Asymm.
Gender	.00	.00	.00	.00	.00	.00	.00	.00
Unit	.10***	.07***	.03***	.01***	.15***	.10***	.06***	.03***
Location	.06***	.04***	.01**	.06*	.08***	.06***	.01**	.01**
Relational	.14***	.10***	.01**	.01**	.18***	.13***	.01**	.01**
Matrix Regression R^2			.02***	.01***			.04***	.02***

Note: Symm. = symmetric Help network; Asymm. = asymmetric Help network.
†$p < .01$; *$p < .05$; **$p < .01$; ***$p < .005$.

The T2 Help network was not significantly correlated with the gender homophily matrix (rejecting H1b), but was significantly correlated with each of the proximity matrices (Unit, Spatial and Relational) (supporting H2a–H2c).

Matrix multiple regressions were conducted using the three proximity and one gender homophily matrices as predictors of the Help matrix (for both the symmetric and asymmetric forms). Using the symmetric Help matrix, only two percent of the variance was explained, with Unit, Spatial and Relational proximity as statistically significant predictors. Using the asymmetric Help matrix, the Unit and Relational matrices were significant (Spatial approaching significance), explaining 1% of the variance. Thus structural network factors are a significant, but weak, influence on IT helping relationships.

Note that these matrix comparisons consisted of the 112 respondents, who included a number of people who were not named by anyone, so that there are many zeroes in the Help Matrix. This might mask actual structural influences on helping relationships. So an additional set of matrix correlations and regressions used only those 80 respondents who either named a person as a source of help, or who were named by others as a source of help, at T2. Table Five shows that, indeed, all the correlations were stronger. The overall matrix regression explained 4% of the variance for the symmetric Help matrix, and 2% for the asymmetric matrix (both $p < .001$) of the variance, with Unit proximity (shared supervisor) the strongest influence.

Discussion

Primary Influences and Implications

The purpose of this study was to assess individual and structural influences on employees' involvement in relationships where they seek and/or are sought for IT help concerning a new workstation support system and personal computers. At the individual level, breadth of computer expertise and task performance socialization primarily influenced IT help seeking (number of individuals or positions sought (5% variance explained), and seeking IT help from individuals rather than formally appointed helpers (10% variance explained). Years using a home computer, and dissatisfaction with current levels of sharing new ways of doing work were the primary influences on being sought as an IT help provider (20% variance explained).

The influence of breadth of computer expertise reveals that some individual characteristics can predict help-seeking. Employees with greater breadth of computer expertise were more likely to seek help from a formally-appointed helping position, but less likely to seek help from individuals. This suggests that more expert IT users may come to value formalized, expert sources of technological expertise, without having to rely on personal relationships to overcome their uncertainty, as they seek more advanced knowledge in how to use IT. Conversely, less expert users may only require basic knowledge in how to cope with IT systems, or may be less comfortable with formal technical experts, and thus may be more confident with help from individual colleagues. Interestingly, the primary form of computer expertise that predicted being sought at a help provider was a rather generic kind: years using a home computer. While IT help problems may be problem- and application-specific, individuals with greater experience with the most generic of computing use may be the most accessible and helpful IT sources.

However, we cannot answer, in this study, whether or when seekers actually *know* which people have such greater expertise (in this small organization, it is possible, but would be unlikely in large multi-location organizations).

Socialization also influences the choice of informal versus formal help providers, since employees who are better socialized in regard to task performance are more likely to seek help from a formally-appointed position. This suggests that individuals who are more aware of the organization's task expectations may internalize the assumption that help is best sought from appointed professionals, they may be better acquainted with these positions, or the kind of information provided through formal positions is more congruent with organizational performance criteria.

Help providers seem to be dissatisfied with, and thus interested in improving, current job task interdependence. Thus, paradoxically, one management implication is that those very people who are dissatisfied with the information sharing aspects of interdependent tasks should be recognized and supported as help resources for others. Help providers' interest in task interdependence may lead other employees to perceive them as most qualified to help others integrate IT into their own job tasks.

At the dyadic or network level, both seeking and being sought were influenced by one's unit, location and relational networks (from 1% to 4% variance explained). The influence of structural factors on IT help suggests that employees' perceptions of—and behaviors in—IT helping relationships are socially constructed within a set of particular organizational (network) contexts.

The weak but significant influence of communication networks suggests that employees' help-seeking relationships depend only slightly upon with whom they interact, work in groups, and share space. Members are more willing to exchange innovative information via strong, multiplex (relating to several content areas) ties because these relationships are perceived as less risky, more accessible, and more likely to share a common understanding of the organization (Albrecht & Adelman, 1987; Albrecht & Hall, 1991a, 1991b; Johnson, 1993). The greater influence of relational proximity as compared to organizational unit and spatial proximity on IT help confirms other studies regarding the primary importance of individually-initiated interactions on IT behaviors (Rice & Aydin, 1991; Rice et al., 1990).

The fact that spatial proximity exerted the least network influence on help-seeking in the present study may be partially attributed to the measurement of spatial proximity as simply "working within the same building." A measurement of spatial proximity as co-existence within the same office or floor (rather than within the same building) may be more likely to reflect the spatial distance that influences involvement in IT help relationships. Nonetheless, other studies also find little effect of spatial proximity, once other network influences are considered (Rice & Aydin, 1991).

Recommendations for Information Systems Professionals

If informal help is crucial for successful day-to-day use and long-term implementation of organizational information systems, then IS professionals need to consider how they can best foster the individual and structural relationships that influence this help seeking and provision. The fact that employees seek help from others who are involved in other aspects of the organization (such as task

interdependence and work unit and communication networks) suggests that IS professionals need to foster established peer leaders or mentors as informal IT trainers, between members who are already strongly-tied (Clement, 1990; Eveland, Blanchard, Brown, & Mattocks, 1995). To encourage these relationships, IS professionals could ask one or more members of every friendship network or workgroup to act as liaisons who are responsible for passing on IT information and assistance to their colleagues. Formal and informal training should be undertaken in pre-existing groups whenever possible. A reward system (tangible or symbolic) should also be set up to provide members with incentives for taking on the burdens of this voluntary training role.

These suggestions seem to be common sense. However, there are a few twists implied from the current results. First, while greater computer expertise is an important factor in being selected as a help provider, experience with the former regime of mainframe computer may well disqualify one as an appropriate help provider. Also, generic home computing expertise may be a highly salient provider characteristic. Second, people who are currently dissatisfied with how information about innovative ways of accomplishing work, and about sharing problem solutions, may be the most sought-after help providers. It may be that those who are more aware of, and are more concerned about, structural and collective benefits aspects of work may well be the best beacons of help in complex organizations. Third, excessive socialization into high task performance may actually suppress some forms of IT help seeking and providing, possibly because of the increased deference to and valuing of formalized help positions, and possibly because of concerns about providing help as actually detracting from one's own performance. In this case, providing help needs to be emphasized, and rewarded, as also fostering high task performance.

This advice seems to contradict, somewhat, the present trend toward providing IT help remotely through Internet networks and on-line databases spread across the organization as a whole, or even shared between organizations (Attewell, 1996). Although on-line networks are not recommended as a primary source of IT help, they can provide important supplemental advice and support (Chitgopekar & Mabry, 1996; Constant, Sproull, & Kiesler, 1997). But informal helping resources are not an unalloyed good. Tenner (1996, pp. 198–199) reviews some of the disadvantages of "peer consultants". These include: providing help takes time away from highly paid executives' formal responsibilities, most related costs are never accounted for, real support demand does not surface formally to influence staffing strategies, and more support is spent in reacting to problems than in "planning and implementing more effective enterprise-wide computing". Also, on-line networks tend to be characterized by weakly-tied relationships, which are more likely to share new information about innovations such as new IT systems (Papa, 1993), but do not follow or reinforce current structural unit, spatial, or relational networks.

Future Research on Information Technology Help Relationships

Clearly, the small amount of variance predicted, especially by the dyadic structural influences, indicates that there are more influences on engagement in organizational helping networks than are analyzed here. We do not report the results for several candidate influences, such as locus of control, as they had no

significant influence yet required considerable review and operationalization. Certainly more fine-grained descriptions of the nature of the problems, time and space constraints on seeking help, the type of jobs, and the exact nature of others' expertise, would be necessary for a more complete understanding of help networks. Clearly a deeper analysis would also consider the usefulness of both seeking and providing relationships, and the extent to which seekers actually know of providers' characteristics ahead of time, or how they come to know these aspects. And admittedly some of the hypotheses, such as those concerning gender, are highly under-specified, as the influence of gender on helping (among other) behaviors is clearly contingent on other organizational factors (Ibarra, 1992, 1993).

In its measurement of IT help relationships, the present study follows previous research in focussing on the structural patterns of those relationships, but in addition to individual-level influences. The advantage of measuring IT help as relational linkages is that it allows researchers to describe the collective pattern of the relationships, as well as the associations between these patterns and other variables. However, it's clear that individual factors do play a role in influencing both seeking IT help and being sought for IT help, so networks are an insufficient explanation. Future research should consider more sophisticated methods for combining individual-level and network-level influences into a single multivariate model, such as the p* approach (Wasserman & Pattison, 1996).

A pervasive issue in analyzing communication networks is the reliance on self-report data. Here, two of the structural matrices (unit and spatial) are unobtrusive, but the help and relational matrices are self-report. On the one hand, it might be a valuable advance, though also fraught with validity threats, to monitor such behaviors to obtain more objective data (this issue has been widely discussed in the social networks literature). However, as Contractor et al. (1996) argue, the social constructivist argument underlying much use of network constructs values precisely the subjective, perceptual basis for analyzing self-reported networks.

Another disadvantage of measuring IT help solely as structural networks, however, is that it limits consideration of the associated social support processes. Social support is defined as communication "that reduces uncertainty about the situation, the self, the other, or the relationship, and functions to enhance the perception of personal control in one's life experience" (Albrecht & Adelman, 1987, p. 20). Future research should consider whether social support processes in IT-based relationships help employees cope with uncertainty, as they do in other organizational relationships (Kramer, 1996; Miller & Ray, 1994). Measures of IT relationships in the present study touched on aspects of (1) informational support or the exchange of "advice, suggestions, directives or information" (Adelman & Albrecht, 1987, p. 6), and, (2) tangible assistance with problem-solving or demonstration of skills (Johnson, 1993). However, the present study did not consider whether IT help involved emotional support to validate stressful feelings of helplessness and anxiety associated with IT use.

Future research should also consider the degree to which employees' perceived support needs are met in particular relationships and particular contexts. Miller and Ray (1994) propose that future network-level research should focus on "shared meanings of supportive or unsupportive communication among network members and how these meanings may influence various outcomes" (p. 215). A semantic network approach might explain why respondents were slightly more likely to seek informal help from specific individuals rather than from formal help

positions. For example, if employees in the same functional unit share "semantic linkages" or similar interpretations (Monge & Eisenberg, 1987; Rice & Danowski, 1993) of how to use IT in their job tasks or what the criteria for task performance using IT are, then they may perceive IT help from their colleagues as more supportive.

References

Albrecht, T. L., & Adelman, M. (1987). *Communicating social support.* Newbury Park, CA: Sage.

Albrecht, T. L., & Hall, B. (1991a). Relational and content differences between elite and outsiders in innovation networks. *Human Communication Research, 17,* 535–561.

Albrecht, T. L., & Hall, B. (1991b). Facilitating talk about new ideas: The role of personal relationships in organizational innovation. *Communication Monographs, 58,* 273–288.

Attewell, P. (1996). Technology diffusion and organizational learning: The case of business computing. In M. Cohen & L. Sproull (Eds.), *Organizational learning* (pp. 203–229). Thousand Oaks, CA: Sage.

Aydin, C., & Rice, R. E. (1991). Social worlds, individual differences, and implementation: Predicting attitudes toward a medical information system. *Information and Management, 20,* 119–136.

Bannon, L. J. (1986). Helping users help each other. In D. A. Norman & S. W. Draper (Eds.), *User centered system design: New perspectives on human-computer interaction* (pp. 399–410). Hillsdale, NJ: Lawrence Erlbaum.

Borgatti, S., Everett, M., & Freeman, L. (1992). *UCINETIV Version 1.0.* Columbia, SC: Analytic Technologies.

Bowman, B., Grupe, F. H., Lund, D., & Moore, W. (1993). An examination of sources of support preferred by end-user computing personnel. *Journal of End User Computing,* 4–11.

Burkhardt, M. E. (1994). Social interaction effects following a technological change: A longitudinal investigation. *Academy of Management Journal, 4,* 869–898.

Chao, G., O'Leary-Kelly, A., Wolf, S., Klein, H., & Gardner, P. (1994). Organizational socialization: Its content and consequences. *Journal of Applied Psychology, 79*(5), 730–743.

Chitgopekar, A. S., & Mabry, E. (1996, November). *Communicating supportiveness in on-line mentoring and peer helping relationships.* Paper presented at the annual meeting of the Speech Communication Association, San Diego, CA.

Clement, A. (1990). Cooperative support for computer work: A social perspective on the empowerment of end users. In *Proceedings of the 1990 Conference on Computer Supported Cooperative Work,* pp. 223–36. Los Angeles: Association for Computing Machinery.

Constant, D., Sproull, L., & Kiesler, S. (1997). The kindness of strangers: The usefulness of electronic weak ties for technical advice. In S. Kiesler (Ed.), *Culture of the Internet* (pp. 303–322). Hillsdale, NJ: Lawrence Earlbaum.

Contractor, N. S., Seibold, D. R., & Heller, M. (1996). Interactional influence in the structuring of media use in groups: Influence in members' perceptions of group decision support system use. *Human Communication Research, 22*(4), 451–481.

Davis, F., Bagozzi, R., & Warshaw, P. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science, 35*(8), 982–1003.

DeSanctis, G., & Poole, M. S. (1994). Capturing the complexity in advanced technology use: Adaptive structuration theory. *Organization Science, 5,* 121–147.

Dewhirst, H. D. (1970–71). Influence of perceived information-sharing norms on communication channel utilization. *Academy of Management Journal, 13–14,* 305–315.

Eveland, J. D., Blanchard, A., Brown, W., & Mattocks, J. (1995). The role of "Help Networks" in facilitating use of CSCW Tools. *The Information Society, 11,* 113–129.

Feldman, D. (1981). The multiple socialization of organization members. *Academy of Management Review, 6,* 309–319.

Fischer, C. (1986). Socialization, resocialization, and training: Reframing the research agenda. In I. Goldstein (Ed.), *Training and development in organizations* (pp. 376–416). San Francisco: Jossey-Bass.

Freeman, L. (1979). Centrality in social network: Conceptual clarification. *Social Networks, 1,* 215–239.

Fulk, J. (1993). Social construction of communication technology. *Academy of Management Journal, 36,* 921–950.

Gabarro, J. (1990). The development of working relationships. In J. Galegher, R. Kraut, & C. Egido (Eds.), *Intellectual teamwork: Social and technological foundations of cooperative work* (pp. 79–110). Hillsdale, NJ: LEA.

Gardner, W. L. III, Peluchette, J. V., & Clinebell, S. K. (1994). Valuing women in management: An impression management perspective on gender diversity. *Management Communication Quarterly, 8,* 115–164.

Hackman, J. R. (1983). The design of work teams. In J. W. Lorsch (Ed.), *Handbook of organizational behavior.* Englewood Cliffs, NJ: Prentice-Hall.

Hackman, J. R. & Oldham, G. R. (1980). *Work design.* London: Addison-Wesley.

Hubert, L. & Schultz, J. (1976). Quadratic assignment as a general data analysis strategy. *British Journal of Mathematical and Statistical Psychology, 29,* 190–241.

Ibarra, H. (1992). Homophily and differential returns: Sex differences in network structure and access in an advertising firm. *Administrative Science Quarterly, 37,* 422–447.

Ibarra, H. (1993). Personal networks of women and minorities in management: A conceptual framework. *Academy of Management Review, 18,* 56–87.

Johnson, B., & Rice, R. E. (1987). *Managing organizational innovation.* New York: Columbia University Press.

Kramer, M. W. (1996). A longitudinal study of peer communication during job transfers: The impact of frequency, quality, and network multiplexity on adjustment. *Human Communication Research, 23,* 59–86.

Krauss, R., & Fussell, S. (1990). Mutual knowledge and communicative effectiveness. In J. Galegher, R. Kraut, & C. Egido (Eds.), *Intellectual teamwork: Social and technological foundations of cooperative work.* (pp. 111–144). Hillsdale, NJ: LEA.

Kraut, R., Fish, R., Root, R., & Chalfonte, B. (1990). Informal communication in organizations: Form, function, and technology. In S. Oskamp & S. Spacapan (Eds.), *Human reaction to technology: Claremont symposium on applied social psychology* (pp. 146–199). Newbury Park, CA: Sage.

Lang, K. N., Auld, R., & Lang, T. (1982). The goals and methods of computer users. *International Journal of Man-Machine Studies, 17,* 375–399.

Lang, T., Lang, K. N., & Auld, R. (1981). Support for users of operating systems and applications software. *International Journal of Man-Machine Studies, 14,* 269–282.

Lee, D. M. S. (1986). Usage pattern and sources of assistance for personal computer users. *MIS Quarterly,* 313–325.

Louis, M. (1980). Surprise and sense-making: What newcomers experience in entering unfamiliar organizational settings. *Administrative Science Quarterly, 25,* 226–251.

Lucas, H., Jr. (1981). *Implementation: The key to successful information systems.* New York: Columbia University Press.

McGrath, J. (1990). Time matters in groups. In J. Galegher, R. Kraut, & C. Egido (Eds.), *Intellectual teamwork: Social and technological bases of group work* (pp. 23–62). Hillsdale, NJ: Lawrence Erlbaum Associates.

Miller, K., & Ray, E. B. (1994). Beyond the ties that bind: Exploring the "meaning" of supportive messages and relationships. In B. R. Burleson, T. L. Albrecht, & I. G. Sarason (Eds.), *Communication of social support: Messages, interactions, relationships and community* (pp. 215–223). Thousand Oaks, CA: Sage.

Morrison, E. W. (1993). Newcomer information seeking: Exploring types, modes, sources, and outcomes. *Academy of Management Journal, 36,* 557–589.

Orlikowski, W., & Gash, D. (1994). Technological frames: Making sense of information technology in organizations. *ACM Transactions on Information Systems, 12,* 174–207.

Pettigrew, A. (1972). Information control as a power resource. *Sociology, 6,* 187–204.

Ragins, B. R., & Cotton, J. (1991). Easier said than done: Gender differences in perceived barriers to gaining a mentor. *Academy of Management Journal, 19,* 97–111.

Rice, R. E. (1993). Using network concepts to clarify sources and mechanisms of social influence. In W. D. Richards & G. Barnett (Eds.), *Progress in communication sciences, XII* (pp. 43–62). Hillsdale, NJ: Ablex.

Rice, R. E., & Aydin, C. (1991). Attitudes toward new organizational technology: Network proximity as a mechanism for social information processing. *Administrative Science Quarterly, 36,* 219–244.

Rice, R. E., & Danowski, J. (1993). Is it really just like a fancy answering machine? Comparing semantic networks of different types of voice mail users. *Journal of Business Communication, 30*(4), 369–397.

Rice, R. E., Grant, A., Schmitz, J., & Torobin, J. (1990). Individual and network influences on the adoption and perceived outcomes of electronic messaging. *Social Networks, 12,* 27–55.

Rogers, E. M. (1986). *Communication technology: The new media in society.* New York: The Free Press.

Rogers, E. M., & Kincaid, D. L. (1981). *Communication networks: Towards a new paradigm.* New York: Free Press.

Schein, E. (1968). Organizational socialization and the profession of management. *Industrial Management Review, 9,* 1–16.

Schein, E. (1971). The individual, the organization, and the career: A conceptual scheme. *Journal of Applied Behavioral Science, 7,* 401–426.

Schmitz, J., & Fulk, J. (1991). Organizational colleagues, information richness, and electronic mail: A test of the social influence model of technology use. *Communication Research, 18,* 487–523.

Stevenson, W. B., & Gilly, M. (1991). Information processing and problem-solving: The migration of problems through formal positions and networks of ties. *Academy of Management Journal, 34,* 918–928.

Stevenson, W. B., & Gilly, M. (1993). Problem-solving networks in organizations: Intentional design and emergent structure. *Social Science Networks, 22,* 92–113.

Tannen, D. (1994). *Talking from 9 to 5: How women's and men's conversational styles affect who gets heard, who gets credit, and what gets done at work.* New York: William Morrow.

Tenner, E. (1996). The computerized office: Productivity puzzles. In *Why things bite back: Technology and the revenge of unintended consequences.* (pp. 184–209). New York: A. Knopf.

Wallace, J. (1996). *An investigation of agency control in expert-nonexpert information exchange: The case of computer experts and users.* Unpublished doctoral dissertation, Rutgers University, New Brunswick, NJ.

Wasserman, S., & Pattison, P. (1996). Logit models and logistic regressions for univariate and bivariate social relations: I. An introduction to Markov random graphs and p*. *Psychometrika, 60,* 401–425.