

The Kindness of Strangers: The Usefulness of Electronic Weak Ties for Technical Advice

David Constant • Lee Sproull • Sara Kiesler

Department of Social and Decision Sciences, Carnegie Mellon University, Pittsburgh, Pennsylvania 15213

School of Management, Boston University, Boston, Massachusetts 02215

Department of Social and Decision Sciences, Carnegie Mellon University, Pittsburgh, Pennsylvania 15213

Abstract

People use weak ties—relationships with acquaintances or strangers—to seek help unavailable from friends or colleagues. Yet in the absence of personal relationships or the expectation of direct reciprocity, help from weak ties might not be forthcoming or could be of low quality. We examined the practice of distant employees (strangers) exchanging technical advice through a large organizational computer network. A survey of advice seekers and those who replied was conducted to test hypotheses about the viability and usefulness of such electronic weak tie exchanges.

Theories of organizational motivation suggest that positive regard for the larger organization can substitute for direct incentives or personal relationships in motivating people to help others. Theories of weak ties suggest that the usefulness of this help may depend on the number of ties, the diversity of ties, or the resources of help providers. We hypothesized that, in an organizational context, the firm-specific resources and organizational motivation of people who provide advice will predict the usefulness of advice.

We investigated these theories in a study of employees of a global computer manufacturer. We collected survey and observational data on the relationships between information seekers and information providers; the number, diversity, resources, and motivations of information providers, and subjective ratings of the usefulness of the advice (from both parties in the exchange) and whether or not the advice solved information seekers' problems.

We found that information providers gave useful advice and solved the problems of information seekers, despite their lack of a personal connection with the seekers. The data support the main hypotheses and provide some support for resource and diversity explanations of weak tie influence. We discuss how this organization's culture sustained useful information exchange through weak ties.

(Organizational Behavior; Communication; Computer Networks; Social Networks; Helping; Altruism; Organizational Citizenship; Information Exchange; Information Systems)

In geographically dispersed organizations, employees cannot always get useful advice from their local colleagues. If expertise is not available locally, simply finding out who has it may be difficult. Inducing those who have it to share it may be even more difficult. People in organizations usually prefer to exchange help through strong collegial ties, which develop with physical proximity (e.g., Allen 1977, Monge et al. 1985, Kraut et al. 1988), group membership (Zurcker 1965, Crane 1971), a history of prior relationships (Krackhardt 1992, 1994a), and demographic similarity (Wagner et al. 1984, Zenger and Lawrence 1989). Depending upon unknown employees at distant locations for technical advice requires depending upon the kindness of strangers.

Computer networks, which are being used by growing numbers of organizations, make it relatively easy and inexpensive to ask distant acquaintances for advice via e-mail. They also make it possible to ask strangers for advice. A person can post a query of the form, "Does anybody know . . . ?" to a large electronic distribution list, electronic conference, or computer bulletin board without knowing who might read it. People who read the query can reply without having to know the person who posted it. Computer networks can link people in the absence of acquaintance, physical proximity, group membership, a history of prior relation-

ships, and demographic similarity. This paper explores the process of giving and receiving technical advice over an organizational computer network. We draw upon theories of weak ties and prosocial motivation to suggest how this process can lead to useful advice and we use data from one multinational firm to illustrate the process.

Theoretical Framework and Predictions

A theory of "the strength of weak ties" proposed by Granovetter (1973) suggests that relative strangers could offer an advantage over friends and colleagues in obtaining useful information. Granovetter (1973, 1982) argues that strong-tie relationships occur among people who are similar in many respects; similar people are likely to know the same things and are unlikely to know dissimilar things. When information is unavailable through strong ties, people may obtain it through weak ties: relationships characterized by absent or infrequent contact, lack of emotional closeness, and no history of reciprocal services. Weak ties serve as information bridges across cliques of strong ties and can offer people access to resources that are not found in their strong-tie relationships. Subsequent research has given some support to this "strength-of-weak-ties" hypothesis (Granovetter 1982, Brown and Reingen 1987, Stevenson and Gilly 1991, Weenig and Midden 1991).

Weak tie theorists have proposed three arguments for why weak ties are useful. One argument is simply that weak ties comprise more numerous potential helpers than strong ties do (Friedkin 1982). Statistically, if weak ties are more numerous than strong ties, then calling on weak ties increases the probability that at least one contact will have useful information. If an employee broadcasts a request for technical information on a computer network, many people will see the request. Numerous replies increase the probability of finding one correct answer. If the problem is additive, that is, the solution is made up of many parts, numerous replies could increase the total usefulness of contributions. This argument leads to our first hypothesis: *Advice from more people will be more useful than advice from fewer people.*

There are some reasons for arguing that numerous weak ties might not result in more useful advice, however. A bigger sample of weak ties is likely to increase bad advice as well as good advice. Very poor advice might be especially costly, causing confusion, uncertainty, or "information overload." Numerous weak ties, therefore, will be useful only to the extent that the

benefits of more good advice outweigh the costs of more bad advice.

Perhaps it is not the number of people giving advice, per se, that makes weak ties useful but the range or diversity of those ties. Burt (1983) points out that if all of a person's weak-tie contacts are themselves members of the same strong-tie group, then the expertise offered by those ties will be redundant. He suggests that it is the extent to which weak-tie contacts tap diverse groups that makes weak ties useful. A diverse range of ties increases the probability of finding a useful answer if expertise is heterogeneously distributed across groups but homogeneously distributed within groups. Group diversity also could increase alternative solutions (people offer different answers) or provide pieces to a multi-part solution (people offer partial advice that can be combined into a solution). This argument leads to our second hypothesis: *Advice from more diverse ties will be more useful than advice from less diverse ties.*

Useful weak ties might draw upon not merely diverse resources, but superior resources. Lin, Ensel, and Vaughn (1981) argue that those using weak ties will solicit help from people having desirable resources: wealth, status, prestige, power, or access to others (see also Lin, Vaughn, and Ensel 1981, Lin 1982, DiMaggio and Mohr 1985, Lin and Dumin 1986, Marsden and Hurlbert 1988). Investigations evaluating this idea have been concerned primarily with job mobility. Referrals to attractive jobs come from people who have more seniority, higher job status, or more desirable employers. Useful weak-tie contacts therefore tend to have resources that are superior to those of seekers. In this view, the number and range of ties are important only insofar as they tap superior resources.

In the context of technical advice, superior resources are ones that increase the probability of a contact's offering correct or otherwise useful advice. In an organization, a contact's personal resources and social resources derived from his or her organizational position, department, or location might be differentially helpful (e.g., Krackhardt 1992). Personal resources important in technical help might be the contact's technical expertise, industry experience, and firm experience. The more technical expertise and experience a contact has, the more likely that contact will provide useful technical advice. Resources relevant to technical help that depend on job or position are the contact's physical proximity to the technical center of the organization and the contact's hierarchical status. Physical proximity to other experts has been shown to be important for the exchange of technical information (Allen 1977,

Kraut et al. 1990, Finholt 1993, Lave 1991). Thus proximity to the technical center of the organization can be viewed as a useful resource.

The relationship of hierarchical position to useful technical help is problematic. Hierarchical position is an important social resource for organizational power (Krackhardt 1990). However, power may not be relevant to technical advice. An organizational cliché is that people whose technical knowledge is outdated are promoted into management. In this view, a contact's hierarchical status would be negatively related to useful technical knowledge. Alternatively, even though managers may no longer have useful technical information themselves, they may know who does have it. In this case, a contact's hierarchical status would be positively related to useful technical knowledge. Because we had no way of gauging which organizational resources would be most important for giving useful advice, we posed the following general resource hypothesis: *Advice from people with more resources will be more useful than advice from people with fewer resources.*

The Problem of Motivation

The usefulness of computer network help from strangers is problematic. The help seeker has no direct way of assessing the provider's reliability, expertise, possible strategic motives for misinformation, or knowledge about the seeker's situation. The seeker also has no control over the provider's incentives. The provider has little information about the seeker and therefore may misunderstand the request for help or advice, use inappropriate assumptions in generating a response, or formulate that response using language or concepts not shared by the seeker. These difficulties should increase with the weakness of the tie, i.e., with the physical and social distance of the information provider from the seeker. Some theorists suggest that if help is offered in the absence of direct reciprocity, it may not be very useful (e.g., Thorn and Connolly 1987). In this view strangers who could offer high quality help will find it too costly to do so. Only those who have "nothing better to do" may offer assistance, which is likely to be of poor quality.

Even when weak ties are potentially helpful, the motivation of strangers to help may be poor. People provide help to people they know, people they like, people who are similar, and people who have helped them (e.g., Festinger et al. 1950, Fulton et al. 1977, Kelley and Thibaut 1978, Dovidio 1984, Williamson and Clark 1989, Amato 1990, Heimer 1992, Krackhardt 1992). In personal relationships, benefactors themselves benefit from providing help, either through in-

creasing the beneficiary's obligation to reciprocate or through receiving the beneficiary's esteem or both.

Generalized requests for help over a computer network do not meet the requirements of personal connection. Why would someone respond to a request for help from a stranger when the likelihood of direct personal benefit is low? Friendship and similarity are unlikely explanations. Personal friendships are uncommon across the geographic distances spanned by computer networks (Feldman 1987). Computer networks offer few cues to make demographic similarity salient to a potential benefactor (Sproull and Kiesler 1986). Also, computer networks do not provide a very rich medium for proffering esteem and gratitude (Daft and Lengel 1986).

Theories of prosocial motivation suggest two alternative processes that could lead people to provide useful technical help to strangers, even when this help is personally costly. First, some theorists have posited that people are not only pragmatic but also expressive of feelings, values, and self-identities (Bandura 1986, Schlenker 1985, Shamir 1991). If technical expertise is important in self-identity, experts can gain personal benefits from helping strangers on a computer network with technical problems. Helping others can increase self-esteem, personal identification with the organization, self-respect, respect from others, and feelings of commitment (e.g., Orr 1989). This reasoning suggests that personal benefits can lead experts to offer technical help even in the absence of personal acquaintance, similarity, or the likelihood of direct reciprocity. However, the usefulness of advice from experts motivated by personal benefit is questionable since such advice may be provided idiosyncratically or without close attention to the requirements of information seekers.

A second theoretical argument is that instead of direct personal benefit, help on a computer network is founded on organizational citizenship (Bateman and Organ 1983, Brief and Motowidlo 1986) and norms of generalized reciprocity (Mauss 1967, Berkowitz and Daniels 1964, Titmuss 1971). Faced with a request for help, those who are organizationally motivated would be concerned with such things as how much they are needed, how they can be useful to others, and how their advice might solve organizational problems. People who have a strong organizational orientation are likely to be sensitive to the needs of help seekers and to adjust their advice to the requirements of those asking for help. Accordingly, we offer a fourth hypothesis: *Advice from people who are more organizationally motivated will be more useful than advice from people who are less organizationally motivated.*

Generalized reciprocity emerges when people have positive regard for the social system in which requests for help are embedded and show respect for it through offering help. Their regard may have an indirect basis in personal experience. For instance, they may have been helped by others on the computer network in the past or they may expect that someone on the network would help them in the future if they had a question.

Alternatively, their regard might stem from a more abstract view of the computer network as an organizational resource and worthy institution. In either case offering help is unrelated to direct reciprocity and more related to maintaining the social institution of the network as an organizational resource. Hence in opposition to the prediction developed from an economic rational theory of exchange (e.g., Thorn and Connolly 1987) that help providers will be unmotivated people who have nothing better to do and not much to offer, we offer a fifth hypothesis: *On average, information providers will represent a pool of people whose resources for helping are at least as good as and perhaps better than those of information seekers.*

Methodological Perspective

Previous research on weak ties has been conducted mainly through studies using retrospective accounts of the search for a successful outcome. These studies do not provide base rate data on all the weak ties that seekers of help tried, and do not include ties that proved useless (see Nohria 1992, for one exception). Lacking within-search comparisons of individuals' useful and useless contacts, we cannot estimate the true association between weak-tie connections and the outcome of seeking help through weak ties. Further, retrospective accounts often produce "good stories" (Ross 1989). Retrospective survey research on the search process may be biased in favor of stories that inflate the usefulness of weak ties.

Previous research also has not addressed the liabilities of weak-tie searches. Although weak ties potentially draw on resources that are more numerous, diverse, or better than strong ties do, they also could generate wasted effort and useless information. By collecting data from information seekers and each of their subsequent information providers, our study provides a way to estimate the overall value of search.

Method

Research Setting

The study was conducted at Tandem Computers Incorporated, a Fortune 500 computer manufacturer whose

headquarters and main technical organization are located in Silicon Valley. Tandem employs over 11,000 people worldwide in the manufacture and sales of its products. Virtually all employees use a corporate computer network, which allows employees to send and receive mail messages from computer terminals on their desks. The system is used extensively: employees from all levels of the company and from all locations feel free to (and in fact do) send messages to the president, to managers not in their direct chain of command, or to people outside their subunits; tens of thousands of messages are sent and received each day.

The e-mail system at Tandem organizes messages into first-class, second-class, and third-class mail. First-class mail is for person-to-person messages and for work-related distribution lists (e.g., All_Sales_Reps). Second-class mail is for work-related broadcast messages that go to the entire organization, including announcements from headquarters, industry news, and requests for information. Third-class mail is for extracurricular broadcast messages such as restaurant reviews or "want ads." The focus of this research is broadcast requests for information appearing on second-class mail. About 30% of the second class messages on the network contained such requests. An example of a query and responses found in second class mail is given in Appendix A.

Study Design and Data Collection

The study used an event-driven survey methodology, whose triggering event was a request for information broadcast in second-class mail. During the six-week research period, 82 employees broadcast one or more questions and announced they would make the replies available in public reply files on the network. When each question appeared, we sent survey questionnaires electronically to the information seeker who broadcast the question and to the information providers who replied to the question.¹ Information seekers received two surveys: the first asked them about themselves and requested that they keep all replies to their question; the second survey, sent one week later, asked them to evaluate each reply they had received. The survey sent to information providers asked them for information about themselves and about why they replied to the information seeker. We also captured the text of each question and all replies that had been placed in public reply files. We used Tandem's online organizational database to gather data on respondents' geographic location and hierarchical level.

For purposes of comparison we also collected data from an additional 67 employees who broadcast re-

quests for information but did not create public reply files. We captured the text of their questions and sent them both surveys but we did not collect data from their providers because their providers' replies had not been made public.

Independent and Dependent Variables

Strength of Ties and Relationship Variables. We measured the strength of ties by asking information providers how well they knew the information seeker on a 10-point scale (1 = "don't know at all" and 10 = "know very well"). We measured network history by asking how many questions they had posed and replies they had given in the past year on second class mail. We evaluated the demographic similarity of seekers to providers using difference scores on headquarters location (1 = seeker or provider at headquarters; 0 = both or neither at headquarters), managerial position (1 = seeker or provider is a manager; 0 = both or neither), hierarchical level (difference in the number of levels from the CEO), firm experience (difference in years of experience), and industry experience (difference in years of experience). Our measures of firm and industry experience similarity are roughly equivalent to demographic similarity variables used in prior research (Zenger and Lawrence 1989).

Resources. We used years of firm experience and years of experience in the computer industry as measures of resources for both seekers and providers. We estimated the expertise of information providers by asking them on a 10-point scale: "How informed are you on the subject matter of this question?" (1 = novice and 10 = expert). We also used three measures of resources associated with a person's organizational position. One was location at headquarters, the site of most engineering and product development (0 = no; 1 = yes). Another was whether or not the person held a managerial position. A third was hierarchical level, coded as lower when the employee reported through fewer levels to the CEO.

We used two estimates of the range or diversity of the social groups to which information providers belonged. Diversity is a group-level variable, a characteristic of the group of information providers who reply to the information seeker's request for advice. The measure of group diversity should be relevant to the usefulness of technical advice. Because Tandem has field offices all over the world, we operationalized diversity for each information seeker's set of providers as the number of different countries where information providers were based. Since the firm's products and

clients differ across countries, and since field offices in each country have staff who were educated in their native land, the more countries represented in a set of replies, the more those replies would be expected to reflect differences in people's resources for technical advice. We also operationalized diversity for each information seeker's providers as the number of different hierarchical levels of information providers. People at different levels often have different perspectives on a firm's approach to problems: for example, on whether a machine is worth fixing, or whether one should rely on experts at headquarters. The more hierarchical levels represented in a group of replies, the more perspectives the information seeker receives.²

Provider Motivation. We measured providers' motivations by asking them to allocate 100 points among several reasons that they might have had for replying to the information seeker. We listed four reasons associated with personal benefits and four reasons associated with organizational motivation.

Usefulness and Content of Aid. To measure the usefulness of advice, we asked information seekers to "please 'award' \$0 to \$25 to each answer based on how helpful it was to you." We asked information providers to award themselves \$0 to \$25 according to how useful they thought their reply was to the information seeker. We also asked information seekers to impose a "fine" of as much as \$25 on any answer that wasted their time. And we asked information seekers an open-ended question, "What have you done or what do you intend to do as a result of each reply?" We coded the responses to indicate whether one or more of the replies solved the seeker's problem (solved problem = 1, did not solve problem = 0).

A coder blind to the research hypotheses analyzed the texts of replies to determine their content using the following categories: technical content, story of personal experience, pointer to a person, document, database, or customer, inclusion of a document or e-mail from others, request for clarification, and expression of interest in seeing replies from others. The first author coded a subset of the responses to check for reliability. Scott's Pi for inter-coder agreement ranged from 0.75 to 1.0, with the exception of the story category, which had a Pi of 0.45, and was dropped from analysis.

Analyses

The data are grouped, with each group consisting of data about: (a) an information seeker, (b) the question broadcast by the seeker, (c) the information providers

who responded to that information seeker, and (d) the replies given by the information providers. We tested hypotheses involving individual characteristics, such as the resources of information providers, at the individual level controlling for group (information seeker). This procedure controls for dependence among providers and replies to the same question. We tested hypotheses involving group characteristics, such as diversity of contact resources, at the group level.

Results

Response Rates and Sample Characteristics

We collected 100% of the 82 question texts and sent two questionnaires sequentially to the 82 information seekers who posted them, 55 of whom completed both (67% response rate). These information seekers reported receiving 429 replies to their broadcast questions, an average of 7.8 replies per question. They gave us the names of 365 repliers to whom we sent surveys. We received 295 completed surveys from the repliers (80% response rate) and obtained the text of 263 replies. We obtained online organizational employee data for 92% of information seekers and providers.

For analyses combining data from different sources (seeker and provider characteristics, and question and reply characteristics), we used a core sample of information exchanges with no missing categories of data. These exchanges include the seeker's question, two completed questionnaires from the information seeker, a text file of public replies to the question, and completed questionnaires from the repliers. Full data were available for 48 of the 82 questions broadcasted, leaving an effective response rate of 58%: 48 information seekers, their 48 questions, their 263 information providers, and the 263 public replies they gave.

To explore possible effects of missing data, we compared the similarity of our research sample to (a) information seekers who kept their replies private, (b) public replies archived over the previous year, and (c) the general population of employees in the firm. We had data on the office location, hierarchical level, industry experience, firm experience, and self-reported experience with second-class e-mail of both public and private information seekers. They differed only in their reported experience with second-class e-mail; information seekers in our research sample had replied to others more, $p < 0.05$. Because we did not survey private information providers, we could not compare them with public information providers. However, insofar as we could determine, private and public transactions did not differ; there were no differences between

the two in number of replies, usefulness of replies, or whether replies solved the information seeker's problem.

Our research sample was similar to the population of employees who use second class mail. Sample employees are predominantly male professionals, proportionally the same as those who use second-class mail generally and the same as in the company as a whole. However, significantly more of our sample and of second-class e-mail users are in sales and field support positions than in the company as a whole, and more are located in smaller sites, in offices more distant from headquarters, and outside the United States.

Questions Asked and Information Received

Information seekers asked primarily technical questions that averaged nearly half a page (mean = 12.1 lines of text, s.d. = 8.7). They did not pose their questions lightly: 91% of information seekers reported querying at least one other information source before broadcasting their question. Information providers, on average, estimated they spent 9 minutes (s.d. = 4.1) on their replies. Replies averaged about three quarters of a page (mean = 19.1 lines, s.d. = 81.3). Fifty-four percent of the answers contained technical information, and 53% contained a referral to another source of information, such as a specific person or computer file.

Information seekers valued the usefulness of the average reply they received at \$11.30 (s.d. = \$8.70; min. = \$0, max. = \$25). (See Appendix A for an example of values given by one information seeker to the replies she received.) The value of the best reply was highly correlated with the value of the mean reply ($r[48] = 0.79$, $p < 0.0001$). This correlation suggests a "halo" response effect by information seekers, or that replies were additive. Information seekers used fines so infrequently—only 8.4% of replies were assigned any fine—that we did not use fines in the analysis. On average, information providers valued their own replies at \$13.20 (s.d. = \$8.00; min. = \$0, max. = \$25).

Half of the information seekers (49%) said that the replies they received solved their problem. The mean usefulness of information seekers' replies was positively but not significantly correlated with whether or not information seekers said their problem was solved ($r = 0.18$). The value of the best reply also was not significantly correlated with whether or not the problem was solved ($r = 0.20$). Since we cannot evaluate the comparative validity of these measures, we used both the dollar value of usefulness and whether or not the problem was solved as dependent variables in our

analyses. Usefulness can be used in both individual-level and group-level analyses whereas problem solution can be used only in group-level analyses.

If weak ties for technical help actually do provide useful advice, this usefulness should be reflected in the technical content of replies. To address the question of how the content of advice is related to its usefulness, we regressed the usefulness of information on the presence or absence of technical content and referrals to other sources of information, controlling for information seeker and the resources of providers. This analysis was performed at the individual level, so that the content and usefulness of each reply could be matched.³ The model is significant ($F[46, 159] = 2.60, p < 0.0001, R^2 = 0.429$) as is the improvement over a model with only provider resources and information seeker ($\Delta R^2 = 0.034, F[2, 159] = 5.50, p < 0.005$). The unstandardized coefficients for technical content and referrals are 2.74 (std. err. = 1.27, $p = 0.03$) and 3.36 (std. err. = 1.27, $p = 0.009$), respectively.

Strength of Ties and Basis of Relationship

As we had expected, people did not have a personal connection to the person they helped. Information providers did not know their seekers; 81% of the providers said they did not know the seekers at all; an additional 10% said they were barely acquainted. Acquaintance was uncorrelated with the number of replies ($r = -0.11$), with the usefulness of replies ($r = 0.07$), or with the solution of the seekers' problems ($r = 0.05$). A history of posting or answering questions on second-class e-mail was uncorrelated with acquaintance ($rs = 0$) nor did this history predict the number of replies ($rs = 0$) or their usefulness ($r = 0.06, r = 0.03$, respectively) or whether or not seekers' problems were solved ($r = -0.07, r = 0.03$). Providers did not help based on the friendliness, social content, or tone of the questions they saw. We used three "sociability" measures: whether the question included a greeting, a closing, or named the company. The presence of a personal opening or closing or both in the question was negatively correlated with the number of replies, $r[48] = -0.30, p < 0.05$. The social content of questions did not predict the usefulness of replies or whether or not the problem was solved.

Information providers generally did not help based on their similarity to the person needing help. On only one measure of similarity, whether both or neither person worked at a headquarters location, were information providers more similar to their "own" information seeker than they were to the mean of all the

information seekers. There was no similarity effect for managerial status, hierarchical level, firm experience, and industry experience. Group level correlations between the usefulness of replies and the similarity of information seekers to their information providers indicated that similarity of managerial status and similarity of firm tenure were negatively related to the usefulness of replies ($r = -0.12, p < 0.07$ and $r = -0.12, p < 0.05$, respectively) and similarity of industry tenure was related positively ($r = 0.13, p < 0.05$). However, adding similarity variables to a regression of usefulness on information provider did not improve the model (R^2 without similarity variables = 0.34; with similarity variables = 0.37, change $F = 1.64$, n.s.). The similarity of information providers to their information seeker also was not correlated with whether or not the seeker's problem was solved; none of the individual correlations was significant and a logistic regression of problem solution on information provider and similarity variables was not significant.

In sum, the data reported above do not describe a system of direct social exchange whereby people give useful help to those with whom they have a personal relationship, to those who are similar, or to those who have helped them. Neither acquaintance, a history of reciprocity using the network to exchange advice, nor similarity was very important in predicting the incidence or usefulness of replies.

The Usefulness of Information

We examined three hypotheses about the usefulness of weak-tie information: the number of replies will predict the usefulness of replies; the range or diversity of groups from which providers come will predict the usefulness of replies; the resources of information providers will predict the usefulness of replies. (See Table 1 for a correlation matrix of all variables used in these analyses.) In each analysis we used hierarchical regression to estimate the contribution of separate groups of variables to the overall model. At the individual level we can test hypotheses about how the number of replies and the resources of information providers predict usefulness. At the group level we can test hypotheses about how the number of replies and resource diversity predict problem solutions, as well as usefulness.

Number of Replies. We regressed the usefulness of replies on the number of replies controlling for information providers' resources. This regression is significant at $p < 0.01$ and the coefficient for the number of replies is negative. (See Table 2.) This result does not

support the hypothesis that the number of weak ties statistically increases the likelihood of obtaining good advice.

We explored this relationship further by investigating if the number of replies was positively related to the most useful reply, reasoning that more replies might offer more opportunity to find one truly useful answer. Regressions of the most useful reply on the number of replies were carried out at the group level, since each information seeker can have only one best reply (or several replies receiving a tie score for most usefulness). The coefficients are positive but not statistically significant, with and without controls for resources (bivariate $r = 0.22$, $p = 0.14$). The number of replies is more strongly related to the least useful reply (bivariate $r = -0.30$, $p < 0.04$). This relatively big drop in the usefulness of the worst reply when there were more replies could explain why mean usefulness declined with more replies. The same result was obtained in analyses using information providers' own assessments of the usefulness of their replies which, unlike seekers' assessments, are not affected by their evaluations of other replies.

The number of replies also did not predict whether or not information seekers' problems were solved. In sum, for these information seekers, more replies did not improve the net benefit of weak ties.

Information Provider Resources. As Table 2 shows, resources of information providers were positively related to seekers' usefulness ratings.⁴ At the individual level, controlling for the number of replies, there are significant coefficients at the 0.05 level for the resources of being a manager, hierarchical level, and expertise. In a similar analysis controlling for information seeker instead of number of replies, the only significant coefficient is the resource of expertise. These analyses generally support our hypothesis that weak ties for technical advice in an organization are useful to the degree they tap people with superior resources.

At the group level we used mean usefulness of replies as the dependent variable (Table 3) to test effects of groups of replies rather than of individual replies. A model with resources, controlling for number of replies, is significant at the 0.06 level. It contains significant coefficients at the 0.10 level for the resource of being a manager and at the 0.05 level for the resource of firm experience.

Diversity. We used the number of different countries and the number of different hierarchical levels represented in a group of replies as proxies for diver-

sity. We regressed mean usefulness on number of replies, resources, and diversity. (See second column of Table 3.) Diversity contributes to the prediction of usefulness but in a direction opposite to the hypothesis. In the combined model the resources of being a manager and firm experience, but fewer levels of the hierarchy represented in replies, contribute to usefulness. Adding diversity to a model containing number of replies and resources increases the R^2 by 0.09 ($p < 0.10$). This analysis suggests that advice from a less hierarchically diverse (rather than more diverse) set of ties increases usefulness.

Solving the Problem

A group-level model regressing solving the problem on resources, controlling for number of replies, is significant ($\chi^2 = 17.25$, $p = 0.02$). (See Table 4.) Within this model the coefficient for working at the technical center of the organization is significant at the 0.05 level.

In contrast to the findings for mean usefulness, the diversity of ties contributes positively to the model when problem solution is the dependent variable. Generally, the coefficients are positive in this analysis. In the full model, the resources of working at the technical center ($p < 0.01$) and being an expert ($p < 0.10$), but not being a manager ($p < 0.05$), and having more countries represented in the replies ($p < 0.10$) predict solving the problem. Diversity alone, controlling for number of replies, does not predict problem solution. The full model with resources and diversity, controlling for number of replies, is an improvement over a model without diversity ($\Delta\chi^2 = 4.85$, $p < 0.10$).

Effects of Motivation

When asked, "Why did you answer this question?" information providers gave reasons of personal benefit as well as reasons related to general organizational benefit, but they gave more of the latter than the former (paired- t [262] = 8.75, $p < 0.01$). That is, they favored reasons such as "Answering questions like this is part of being a good company citizen" over "I enjoy helping people" or "I enjoy solving problems." (See Table 5.) We found little evidence that providers' personal history of giving or receiving help over the network or their acquaintance with information seekers predicted the reasons they gave for helping.⁵

Table 6 shows individual level analyses regressing usefulness of advice on personal benefits and organizational motivations for answering questions. The regressions are shown with and without controls for resources. Column 1 shows that the personal benefit of earning respect ($p < 0.05$) and the organizational mo-

Table 1 Correlations among Measures of Replies and Information Providers' Resources

Individual Level ^a	2	3	4	5	6	7				
1. Usefulness of Reply	-0.05	0.08	0.08	0.17	0.11	-0.06				
RESOURCES										
2. HQ Location		0.01	-0.43	0.04	0.04	-0.13				
3. Manager			-0.13	-0.09	0.13	0.16				
4. Hierarchical Level ^b				-0.11	-0.17	-0.10				
5. Expertise					0.16	0.21				
6. Firm Experience						0.27				
7. Industry Experience										
Group Level ^c	2	3	4	5	6	7	8	9	10	11
1. Usefulness of Replies	0.18	-0.10	-0.03	0.26	0.16	0.22	0.41	0.04	-0.11	-0.34
2. Solved the Problem		-0.02	0.30	-0.24	0.00	0.28	0.22	0.13	0.06	0.01
3. Number of Replies			0.53	0.11	-0.18	-0.01	0.10	0.08	0.45	0.66
RESOURCES										
4. Mean Providers at HQ Location				0.02	-0.46	0.01	0.14	0.02	0.06	0.61
5. Mean Providers Who Are Managers					0.19	-0.35	-0.01	0.27	0.19	0.02
6. Mean Hierarchical Level of Providers ^b						-0.10	-0.01	-0.21	0.13	-0.33
7. Mean Expertise of Providers							0.28	-0.03	-0.26	-0.06
8. Mean Firm Experience of Providers								0.22	-0.09	0.08
9. Mean Industry Experience of Providers									0.00	-0.06
DIVERSITY										
10. Number of Different Countries										0.28
11. Number of Different Levels										

^aCorrelations of 0.12 and greater are significant at the individual level, $p < 0.05$. $N_s = 249-286$.

^bHierarchical level is coded as levels from the CEO; a smaller integer = higher hierarchical level.

^cCorrelations of 0.28 and greater are significant at the group level, $p < 0.05$. $N_s = 45-48$.

tivations of "it's part of my job to help" ($p < 0.05$) and "it's only fair to help" ($p < 0.10$) predict the usefulness of replies. Change statistics indicate that adding personal benefits to the model does not improve the model, but adding organizational motivation to the model does improve it ($p < 0.05$). Column 2 adds

resources and shows slightly stronger results in the same direction.

The results shown in Table 6 support our hypothesis that organizational motivations of information providers can predict the usefulness of their technical help. The personal benefit of earning respect also

Table 2 Regressions Predicting Reply Usefulness from the Number of Replies and Information Providers' Resources (Individual Level)

Variables	Models	
	b (se)	b (se)
Information Seeker ^a		**
Number of Replies ^b	-0.24** (0.06)	
Resources		
HQ Location	0.55 (1.33)	1.19 (1.35)
Manager	3.51* (1.65)	2.37 (1.60)
Hierarchical Level ^c	1.20* (0.60)	0.97 (0.62)
Expertise (1-10)	0.45* (0.23)	0.59** (0.23)
Firm Experience	0.32+ (0.18)	0.22 (0.18)
Industry Experience	-0.12 (0.09)	-0.12 (0.09)
R ²	0.119	0.414

+*p* < 0.10.**p* < 0.05.***p* < 0.01.

Note. The table contains unstandardized coefficients. Both models are significant, *p* < 0.01. *N* = 242.

^aA model using information seeker (*df* = 47) alone as a predictor variable explains 39% of the variance in usefulness (*F*[44,233] = 2.72, *p* < 0.01).

^bNumber of replies is automatically controlled when information seeker is controlled in the second model.

^cHierarchical level is coded as levels from the CEO; a smaller integer = higher hierarchical level.

predicted usefulness. Self reports of motivation may be suspect, particularly when they emphasize socially desirable items. However, there is no reason that providers' social desirability would be expected to have a positive relationship with seekers' usefulness ratings. Our results show that providers' organizational motivation items, and an item probably less socially desirable, "earning others' respect," predicted how seekers rated the usefulness of replies. Hence we have some cause to take providers' self-reported reasons at face value.

If information providers help simply because they have nothing better to do, their resources and the quality of their help is likely to be inferior. If, instead, information providers are motivated by a communal orientation to the needs of others and to the problems of the organization, they may represent a pool of helpers whose resources are as good or superior to those of information seekers. We argued that in a community where generalized reciprocity is a norm, people generally should be motivated to help others.

Table 3 Regressions Predicting Mean Reply Usefulness from the Number of Replies, the Mean of Information Providers' Resources, and the Diversity of Ties (Group Level)

Variables	Models	
	b (se)	b (se)
Number of Replies	-0.21 (0.13)	-0.01 (0.16)
Mean Resources		
Mean Providers at HQ	1.39 (4.47)	4.33 (4.53)
Location		
Mean Providers Who Are Managers	12.08+ (6.26)	12.91* (6.03)
Mean Hierarchical Level of Providers ^a	1.91 (1.86)	1.91 (1.86)
Mean Expertise	0.41 (0.67)	0.62 (0.68)
Mean Firm Experience	1.27* (0.55)	1.05+ (0.53)
Mean Industry Experience	-0.01 (0.25)	-0.19 (0.23)
Diversity of Ties		
Number of Different Countries from Which Providers Come		-0.05 (0.72)
Number of Different Hierarchical Levels from Which Providers Come		-2.15* (0.94)
R ²	0.29	0.38
F	2.18	2.44
df	7, 45	9, 45
p	0.06	0.03

+*p* < 0.10.**p* < 0.05.

Note. The table contains unstandardized coefficients. *N* = 46.

^aHierarchical level is coded as levels from the CEO; a smaller integer = higher hierarchical level.

Therefore, the pool of information providers should offer as good or better resources as the pool of information seekers. To examine this hypothesis, we compared the resources of information providers with those of information seekers. Providers did not have significantly more firm or industry experience than did seekers. Providers did have significantly more resources of managerial and hierarchical status and location at the technical center of the organization. We could not directly compare seekers and providers on expertise because we did not measure seekers' level of expertise. (See Table 7.)

Table 4 Logistic Regressions Predicting Whether or Not the Problem Was Solved from the Number of Replies, the Mean of Information Providers' Resources, and the Diversity of Ties (Group Level)

Variables	Models	
	b (se)	b (se)
Number of Replies	-0.12 (0.08)	-0.17 (0.10)
Mean Resources		
Mean Providers at HQ	8.00* (3.15)	11.00** (4.15)
Location		
Mean Providers Who Are Managers	-4.61 (2.92)	-6.36* (3.73)
Mean Hierarchical Level ^a of Providers	1.85 (1.02)	1.79 (1.15)
Mean Expertise	0.47 (0.34)	0.71 ⁺ (0.40)
Mean Firm Experience	0.13 (0.25)	0.15 (0.27)
Mean Industry Experience	0.08 (0.11)	0.06 (0.12)
Diversity of Ties		
Number of Different Countries from Which Providers Come		0.84 ⁺ (0.43)
Number of Different Hierarchical Levels from Which Providers Come		-0.49 (0.57)
χ^2	17.25	22.10
df	7	9
p	0.02	0.01

⁺ $p < 0.10$.^{*} $p < 0.05$.^{**} $p < 0.01$.Note. The table contains unstandardized coefficients. $N = 47$.^aHierarchical level is coded as levels from the CEO; a smaller integer = higher hierarchical level.

Discussion

In this study, weak ties established through a computer network offered information seekers technical information or referrals. Information providers gave useful advice and solved the problems of information seekers despite their lacking a personal connection with the seekers. Weak ties with superior resources provided more useful information. Controlling for those resources, the number of replies was not positively related to the average usefulness of replies, to the most useful advice, or to the solution of problems. The diversity of ties as well as the resources of information

Table 5 Information Providers' Reasons for Replying

Reasons	Mean (s.d.) Number of Points Given to Reason	Percentage of Information Providers Choosing This as a Most Important Reason ^a
<i>Personal Benefits</i>		
I enjoy helping others.	16.0 (15.3)	23
I enjoy solving problems.	9.5 (11.9)	15
I enjoy earning respect.	4.8 (7.7)	8
The company rewards information sharing.	0.9 (3.0)	1
Total personal benefits	31.2 (30.0)	
<i>Organizational Motivation</i>		
Being a good company citizen.	17.8 (18.5)	27
The problem is important to the company.	14.0 (17.8)	21
It's part of my job to answer questions like this one.	12.6 (18.8)	21
I expect others to help me, so it's only fair to help them.	11.8 (13.0)	17
Total organizational motivation.	56.2 (27.8)	
"Other"	12.6 (23.2)	23

Note. $N = 263$.^aThe most important reason is the reason given the most points, or the reasons tied for the most points.

providers contributed to whether or not seekers' problems were solved. Finally, replies from people responding out of organizational motivation were rated as more useful.

In this study, expertise contributed both to the usefulness of advice and to problem solving. But replies could be deemed useful without actually solving problems. Information seekers obtained advice they considered very useful (but that did not necessarily solve the problem) from ties with managers (being a manager is negatively related to expertise, $r = -0.35$, $p < 0.05$ at the group level; see Table 1) and from ties having more firm experience (positively correlated with expertise; $r = 0.28$, $p < 0.05$ at the group level). By contrast, information seekers' problems were solved through diverse ties from different countries (negatively correlated with expertise, $r = -0.26$, $p = 0.06$), and by hav-

Table 6 Regressions Predicting Reply Usefulness from Information Providers' Resources and Self-reported Motivations for Replying (Individual Level)

Variables	Models	
	b (se)	b(se)
Information Seeker Resources	***	***
HQ Location		1.32 (1.40)
Manager		2.04 (1.63)
Hierarchical Level ^a		0.80 (0.63)
Expertise (1–10)		0.32 (0.24)
Firm Experience		0.08 (0.18)
Industry Experience		–0.18* (0.09)
Personal Benefits Motivation		
Enjoy Helping Others	–0.01 (0.03)	–0.01 (0.03)
Enjoy Solving Problems	–0.03 (0.05)	–0.04 (0.05)
Earn Respect	0.14 ⁺ (0.07)	0.14 ⁺ (0.07)
Firm Rewards Sharing	–0.23 (0.19)	–0.22 (0.19)
Organizational Motivation		
Good Organizational Citizen	0.01 (0.03)	0.02 (0.03)
Important Firm Problem	–0.02 (0.03)	–0.02 (0.03)
Part of My Job to Help	0.07* (0.03)	0.07* (0.03)
It's Only Fair to Help	0.07 (0.04)	0.08 ⁺ (0.04)
R ²	0.46	0.48
F	2.93	2.80
df	49,221	55,221
p	< 0.01	< 0.01

⁺p < 0.10.

*p < 0.05.

**p < 0.01.

Note. The table contains unstandardized coefficients.

^aHierarchical level is coded as levels from the CEO; a smaller integer = higher hierarchical level.

ing more ties at the technical center and more ties with lower level people (both unrelated to expertise). Apparently information providers who solved people's problems and those who gave very useful advice were somewhat different groups; the type of information they offered may have been different too. For instance, it seems consistent with our data that repliers who solved the seeker's problem gave site-specific technical answers (which would be tapped more easily at the technical center as well as through more diverse ties)

Table 7 Mean Resources of Information Seekers and Information Providers

Resources	Information Seekers (n = 48)	Information Providers (n = 281)	t statistic
HQ location (yes = 1, no = 0)	14%	31%	2.88**
Manager (yes = 1, no = 0)	2%	12%	3.23**
Hierarchical level ^a	6.0 (0.8)	5.6 (1.0)	2.50*
Firm experience (years)	4.0 (2.7)	4.3 (3.0)	0.71
Industry experience (years)	12.2 (6.2)	13.8 (6.8)	1.52

*p < 0.05.

**p < 0.01.

^aHierarchical level is coded as levels from the CEO; a smaller integer = higher hierarchical level.

whereas those who gave especially useful advice gave broader firm-specific knowledge (which managers and people with longer firm experience would have).

We found that diversity of countries from which information providers came contributed to solving information seekers' problems. However diversity did not contribute to ratings of usefulness. These findings are consistent with a process in which diversity does not increase the likelihood of finding the best experts (in general) but might increase the likelihood of obtaining site-specific advice (for example, advice about a product used in only one or a few countries). The value of diversity might be especially high when experience is very widely and unevenly distributed in an organization and people encounter rare problems.

Our results are consistent with the theory that weak ties' usefulness is due to their bridging capacity as Granovetter (1982) and Burt (1983) have hypothesized, rather than to their sheer number, as has been suggested by Friedkin (1982). The computer network used to draw on weak ties linked people across distance, time, country, and hierarchical level and organizational subunit. Consistent with the resource arguments of Lin and his colleagues (e.g., Lin 1982), these links were useful to the degree they put people in touch with those offering superior resources; they were not useful nor did they have a greater likelihood of solving the information seeker's problem when they were simply greater in number. People who received more replies did get replies of high quality; they also received replies of very low quality. Perhaps many replies caused confusion or uncertainty, which detracted from potentially beneficial information.

Our results extend the superior resources formulation of weak ties to the domain of technical information exchange and suggest that the event-driven survey of information seekers and their information providers can be used to evaluate aspects of weak ties. In general, the results support the idea that the usefulness of weak ties for obtaining technical advice depends upon the help seeker's access to providers' resources. Information providers in this study had somewhat superior resources to those of information seekers, and those who had better resources gave more useful advice. Provider resources, however, must be evaluated in terms of the particular kind of information sought. For example, in this study, industry experience was not related to providing useful technical advice. By contrast, if help seekers had been looking for competitor information or for job information, industry experience might well have been positively associated with usefulness of advice.

Ours is a case study of weak-tie sharing within one geographically-dispersed organization. The firm we studied views the computer network as a critical corporate resource, encourages employees to use it, and rewards them for devising software that improves communication. We have no data on employees who did not help—the baseline statistics on the motivations or expertise of employees in general—so our inferences must be cautious. Yet it seems unlikely that, in the absence of a culture that supports information sharing and considers the network to be an organizational resource, the kinds of information exchanges among weak ties we observed could be sustained for long. The form of exchange we observed had been established more than six years before the data were collected, evidence of considerable stability. Technology alone will not impel this kind of weak-tie sharing over time; an organizational culture that fosters it also is necessary. In this organization strangers incur the costs of “kindness” because they can perform as experts and meet important needs of others. Norms of generalized reciprocity sustain kindness as a social institution and lead people who can provide useful help to do so.

Given a corporate culture that promotes information sharing, we suggest three probable scope conditions for our findings related to kind of information, degree of slack in employee time, and intensity of usage. Technical information is relatively more likely to be exchanged in a computer network weak-tie environment than are other kinds of information such as strategic, political, or personal information. For example, we never saw any broadcast questions of the form, “Does anybody know who will be named as the next engineer-

ing vice president?” or “Does anybody know what X is like as a boss?” Undoubtedly people used the computer network to search for non-technical information, but they probably did so within their strong-tie relationships rather than through weak ties. Although answering questions had relatively low costs, it was not costless; information providers had to have enough slack in their work day so that the nine minutes (on average) they reported it took them to produce a reply was not viewed as excessive. By contrast, in professional organizations that require employees to account for their time to the tenth of an hour for billing purposes, nine minutes of “free” help could be viewed as costly to the provider. The number of questions asked per day must be governed by self-limiting processes. We saw about seven questions a day; if there had been 700 or 7,000 the system would have been swamped and, presumably, would not have continued to yield useful answers.

Broadcasting requests for help over a computer network can be viewed as a public goods problem in which it is in no one's best interest to respond and in which people rich in resources will be particularly disinclined to respond (Thorn and Connolly 1987). Others have noted that a small “critical mass” can overcome this problem (e.g., Marwell et al. 1988). The models generally assume a situation where free riders cannot be excluded but neither increase the net cost to providers nor decrease the net benefit to recipients. These characteristics are true of the situation we studied, since neither information providers nor information seekers would notice free riders who read the public reply files. A remaining problem, however, is that a person's contribution may be inconsequential or redundant. Why would someone take the time to give advice when someone else could do it? Our data do not show that inconsequentiality was a problem. Information providers with more expertise tended to believe fewer others replied ($r[205] = -0.21, p < 0.01$). However, 73% of the information providers could give us the name of at least one other person who could answer the question. And the average provider estimated that 15.4 other people replied to the question to which they replied. These findings suggest that many providers, including experts, replied in spite of their apparent inconsequentiality.

Macy (1990) has argued that group members can learn to contribute despite their marginal significance or inconsequentiality when they observe others contributing and see rewards to the public good. Once a critical mass of contributors is achieved, the legitimacy and value of contributing can be self-reinforcing. Computer networks with public reply files and other facili-

ties for public information exchange, like those at the company we studied, may contribute to the creation of a critical mass by increasing the visibility of prosocial behavior (Cialdini et al. 1990). Computer networks make it physically easy to reach large numbers of people and make weak-tie contacts, and they also make it relatively easy to respond to information requests. They also offer more opportunities to see others contributing than would be available in face-to-face interactions. By facilitating social observation of technical information exchange, computer networks may encourage people to contribute for personal benefits such as pride, and they may reinforce norms of contribution within a culture that values it. Hence computer networks can provide a means for leveraging the "kindness of strangers."

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Appendix A. Broadcast Question and Replies on the Computer Network

(This example is verbatim from our sample, except that the proper names of employees and products have been changed. The "Value to Information Seeker" of each reply is the actual rating "Nadia" made of the usefulness of her replies.)

Question

SENT: 89-06-12 15:44
FROM: BOULANGER_NADIA
TO: DL.ALL_TANDEM @SLC
SUBJECT: 2:?? 2311 at 7 but still too dim ??
Hi all,

I am sure I'm not the first to ask this question but I can find no help in Quest [online database of previous public questions and replies] so I'm copying the world to see if I can get any answers.

I have a number of 2311's [computer terminals] (50+) installed at ABC Co. and many of them are starting to get too dim even at the max brightness setting. Is there any way to increase the brightness on these monitors or is the solution a replacement.

Any info would be greatly appreciated.
Replies if any at \SLC.\$CE.DIM2311.REPLYS [location of public replies file].

Regards, Nadia

Replies

SENT: 89-06-13 09:06
FROM: REICH_STEVE @AUSTIN
In Reply To: 89-06-12 15:44 FROM BOULANGER_NADIA
2:?? 2311 at 7 but still too dim ??

How long have these 2311s been installed? What is the duty power-on cycle (5days / 10hrs, 7days / 24hrs, etc.)? Are they / were they using screen-saver? If so, what was the value?

Value to Information Seeker = \$5.00

SENT: 89-06-13 08:37
FROM: GLASS_Phil @AUSTIN
In Reply To: 89-06-12 15:44 FROM BOULANGER_NADIA
2:?? 2311 at 7 but still too dim ??

Hi,

Try tweaking the potentiometer inside the monitor. I've had to do the same with the terminals and Agelbars (no comments please) when I worked in the private sector. I've never taken a 2311 apart, so I can't tell you the location of the pot, but you should see something on or near it to indicate that it controls brightness.

My only word of warning is to be damn careful when you stick a screwdriver in there. You may want to cover the shaft in a layer of electrical tape. Good luck.

Regards, Phil Glass

Value to Information Seeker = \$5.00

SENT: 89-06-13 01:18
FROM: SCHOENBERG_ARNIE @BELGIUM
In Reply to: 89-06-12 15:44 FROM BOULANGER_NADIA
2:?? 2311 at 7 but still too dim ??

Hallo Nadia,
No problem. With two screws you can easily remove the top cover of the 2311. Under the cover you will find the monitorboard and on that board the two potmeters for brightness and contrast.
Greetings, Arnie

Value to Information Seeker = \$25.00

SENT: 89-06-12 18:01
FROM: CAGE_JOHN @PRUNE
In Reply to: 89-06-12 15:44 FROM BOULANGER_NADIA
2:?? 2311 at 7 but still too dim ??

Nadia,
We had a few of 'em that we took apart and tweaked
up a pot labeled 'b rite' or 'brightness' or
some such. They're still working!

jc

Value to Information Seeker = \$20.00

SENT: 89-06-13 12:01
FROM: PENTLAND_BARBARA @ORCA
In Reply to: 89-06-12 15:44 FROM BOULANGER_
NADIA
2:?? 2311 at 7 but still too dim ??

THE COST TO MAINTAIN THESE UNITS WOULD GREATLY EXCEED THE PRICE IN WHICH WE BOUGHT THEM FOR. THE BEST SOLUTION IS TO THROW THESE UNITS OUT AND PURCHASE NEW ONES. BESIDES THAT REPLACEMENT PARTS ARE SLIM TO NONE..

Value to Information Seeker = none given

SENT: 89-06-14 10:11
FROM: SCHAEFFER_MURRAY @EASY
TO: BOULANGER_NADIA @SLC
SUBJECT: ?? 2311 at 7 but still too dim ??
In Reply to: 89-06-12 15:44 FROM BOULANGER_
NADIA
2:?? 2311 at 7 but still too dim ??

Nadia,
There is probably an adjustment inside the monitor. You should ask your CE [customer engineer] about adjusting the range with the internal pot.

Murray

Value to Information Seeker = \$5.00

SENT: 89-06-15 07:14
FROM: THEBERGE_PAUL @PITT
SUBJECT: 2311 BRIGHTNESS

HI THERE,

THERE IS AN INTERNAL BRIGHTNESS POT THAT CAN BE ACCESSED BY OPENING UP THE MONITOR. I HAVE ADJUSTED QUITE A FEW TERMINALS THIS WAY. I DON'T KNOW IF THIS IS THE PRESCRIBED METHOD BUT IT WORKS! HOPE THIS HELPS!

PAUL THEBERGE

Value to Information Seeker = \$20.00

SENT: 89-06-17 19:27
FROM: LEVERKUHN_ADRIAN @OMAHA
In Reply to: 89-06-12 15:44 FROM BOULANGER_
NADIA
2:?? 2311 at 7 but still too dim ??

Nadia, I had a couple of the Beta units and that was one of the problems, only it occurred after a

week. I tried getting inside and adjusting, just as I have done with 2316s with about the same results. You can crank up the brightness a bit but then you start to lose your contrast and get complaints of 'fuzzy' characters. We have found that the units, being FRUs [field-replaceable units] in-toto are not worth the effort. Adrian

Value to Information Seeker = \$15.00

Endnotes

¹In the case of 17 people who broadcast more than one question during the research period, we asked only about the first question. In the case of people who replied to more than one question, we sent a separate survey about each reply they sent up to three.

²Because diversity is a group level variable in our study, we could not use measures of demographic diversity that assess how individuals differ from one another within a group (e.g., Tsui et al. 1992). Other measures such as Blau's index of heterogeneity (1977) depend upon distributional assumptions that are untestable in this context. Our measures, while simple, are unbiased and relevant to technical advice and therefore are useful in this context (Krackhardt 1994b).

³In cases where the overlapping of dyadic data is pronounced, the violation of independence assumptions can be serious (Krackhardt 1988). In our case the number of overlapping dyads (those with a common seeker and/or replier) is small relative to the total number of dyads.

⁴We used hierarchical regression to separately examine the effects of two blocks of resource variables: personal resources (expertise, firm experience, and industry experience) and social resources attached to location or job position (location near headquarters, being a manager, and hierarchical position). Because we did not obtain consistent differences between these blocks of variables, we do not discuss them separately further.

⁵Of 24 correlations examined, 3 were significant at the 0.05 level. A history of replying in second class mail was correlated with the personal benefit, "I gain respect from others" ($r = 0.14, p < 0.05$). Acquaintance was positively correlated with saying "It's part of my job" ($r = 0.22, p < 0.001$) and negatively with "It's part of being a good citizen" ($r = -0.12, p < 0.05$).

References

- Allen, T. J. (1977), *Managing the Flow of Technology*, Cambridge, MA: The MIT Press.
- Amato, P. R. (1990), "Personality and Social Network Involvement as Predictors of Helping Behavior in Everyday Life," *Social Psychology Quarterly*, 53, 31-43.
- Bandura, A. (1986), *Social Foundations of Thought and Action: A Social Cognitive Theory*, Englewood Cliffs, NJ: Prentice-Hall.
- Bateman, T. S. and D. W. Organ (1983), "Job Satisfaction and the Good Soldier: The Relationship Between Affect and Employee 'Citizenship'," *Academy of Management Journal*, 26, 587-595.
- Berkowitz, L. and L. R. Daniels (1964), "Affecting the Salience of the Social Responsibility Norm: Effects of Past Help on the Response to Dependency Relationships," *Journal of Abnormal and Social Psychology*, 68, 275-281.

- Blau, P. M. (1977), *Inequality and Heterogeneity*, New York: The Free Press.
- Brief, A. P., and S. J. Motowidlo (1986), "Prosocial Organizational Behaviors," *Academy of Management Review*, 10, 710-725.
- Brown, J. J., and P. H. Reingen (1987), "Social Ties and Word-of-mouth Referral Behavior," *Journal of Consumer Research*, 14, 350-362.
- Burt, R. S. (1983), "Range," in R. S. Burt and M. J. Minor (Eds.), *Applied Network Analysis*, Beverly Hills, CA: Sage, 176-194.
- Cialdini, R. B., R. R. Reno, and C. A. Kallgren (1990), "A Focus Theory of Normative Conduct: Recycling the Concept of Norms to Reduce Littering in Public Places," *Journal of Personality and Social Psychology*, 58, 1015-1026.
- Crane, D. (1971), *The Invisible College*, Chicago, IL: University of Chicago Press.
- Daft, R. and R. Lengel (1986), "Organizational Information Requirements, Media Richness and Structural Design," *Management Science*, 32, 554-571.
- DiMaggio, P. and J. Mohr (1985), "Cultural Capital, Educational Attainment, and Marital Selection," *American Journal of Sociology*, 90, 1231-1261.
- Dovidio, J. F. (1984), "Helping and Altruism: An Empirical and Conceptual Overview," in L. Berkowitz (Ed.), *Advances in Experimental Social Psychology*, Vol. 17, New York: Academic Press.
- Feldman, M. S. (1987), "Electronic Mail and Weak Ties in Organizations," *Office: Technology and People*, 3, 83-101.
- Festinger, L., S. Schachter, and K. Back (1950), *Social Pressures in Informal Groups: A Study of Human Factors in Housing*, New York: Harper.
- Finholt, T. (1993), *Outsiders on the Inside*, Carnegie-Mellon University, Pittsburgh, PA: Unpublished doctoral dissertation.
- Friedkin, N. (1982), "Information Flow Through Strong and Weak Ties in Intraorganizational Social Networks," *Social Networks*, 3, 273-285.
- Fulton, J., R. Fulton, and R. Simmons (1977), "The Cadaver Donor and the Gift of Life," in R. Simmons, S. Klein, and R. Simmons (Eds.), *Gift of Life: The Social and Psychological Impact of Organ Transplantation*, New York: John Wiley and Sons, 338-376.
- Granovetter, M. (1973), "The Strength of Weak Ties," *American Journal of Sociology*, 78, 1360-1380.
- ____ (1982), "The Strength of Weak Ties: A Network Theory Revisited," in P. Marsden and N. Lin (Eds.), *Social Structure and Network Analysis*, New York: John Wiley and Sons, 105-130.
- Heimer, C. (1992), "Doing Your Job and Helping Your Friends: Universalistic Norms about Obligations to Particular Others in Networks," in N. Nohria and R. G. Eccles (Eds.), *Networks and Organizations: Structure, Form, and Action*, Boston, MA: Harvard Business School Press, 143-164.
- Kelley, H. H. and J. W. Thibaut (1978), *Interpersonal Relations: A Theory of Interdependence*, New York: Wiley.
- Krackhardt, D. (1988), "Predicting with Networks: A Multiple Regression Approach to Analyzing Dyadic Data," *Social Networks*, 10, 359-381.
- ____ (1990), "Assessing the Political Landscape: Structure, Cognition, and Power in Organizations," *Administrative Science Quarterly*, 35, 342-369.
- ____ (1992), "The Strength of Strong Ties: The Importance of Philos in Organizations," in N. Nohria and R. Eccles (Eds.), *Organizations and Networks: Structure, Form, and Action*, Boston, MA: Harvard Business School Press, 216-239.
- ____ (1994a), "Constraints on the Interactive Organization as an Ideal Type," in C. Heckscher and Anne Donnelan (Eds.), *The Post-Bureaucratic Organization*, Beverly Hills, CA: Sage, 211-222.
- ____ (1994b), Personal Communication
- Kraut, R. E., C. Egidio, and J. Galegher (1990), "Patterns of Contact and Communication in Scientific Research Collaborations," in J. Galegher, R. E. Kraut, and C. Egidio (Eds.), *Intellectual Teamwork: Social and Technological Foundations of Cooperative Work*, Hillside, NJ: Lawrence Erlbaum Associates, 149-172.
- ____, J. Galegher, and C. Egidio (1988), "Relationships and Tasks in Scientific Collaboration," *Human-Computer Interaction*, 3, 31-58.
- Lave, J. (1991), "Situating Learning in Communities of Practice," in L. B. Resnick, J. M. Levine, and S. D. Teasley (Eds.), *Perspectives on Socially Shared Cognition*, Washington, D.C.: American Psychological Association, 63-84.
- Lin, N. (1982), "Social Resources and Instrumental Action," in P. Marsden and N. Lin (Eds.), *Social Structure and Network Analysis*, Beverly Hills, CA: Sage.
- ____ and M. Dumin (1986), "Access to Occupations Through Social Ties," *Social Networks*, 8, 365-385.
- ____, W. M. Ensel, and J. C. Vaughn (1981), "Social Resources and Strength of Ties: Structural Factors in Occupational Status Attainment," *American Sociological Review*, 46, 393-405.
- ____, J. C. Vaughn, and W. M. Ensel (1981), "Social Resources and Occupational Status Attainment," *Social Forces*, 59, 4, 1163-1181.
- Macy, M. (1990), "Learning Theory and the Logic of Critical Mass," *American Sociological Review*, 55, 809-826.
- Marsden, P. V., and J. S. Hurlbert (1988), "Social Resources and Mobility Outcomes: A Replication and Extension," *Social Forces*, 66, 1038-1059.
- Marwell, G., P. Oliver, and R. Pahl (1988), "Social Networks and Collective Actions: A Theory of Critical Mass III," *American Journal of Sociology*, 94, 502-532.
- Mauss, M. (1967), *The Gift*, New York: Norton, 1st ed., 1925.
- Monge, P. R., L. W. Rothman, E. M. Eisenberg, K. L. Miller, and K. Kirste (1985), "The Dynamics of Organizational Proximity," *Management Science*, 31, 1129-1141.
- Nohria, N. (1992), "Information and Search in the Creation of New Business Ventures: The Case of the 128 Venture Group," in N. Nohria and R. G. Eccles (Eds.), *Networks and Organizations: Structure, Form, and Action*, Boston, MA: Harvard Business School Press, 240-261.
- Orr, J. E. (1989), "Sharing Knowledge, Celebrating Identity: War Stories and Community Memory among Service Technicians," in D. S. Middleton and D. Edwards (Eds.), *Collective Remembering: Memory in Society*, Beverly Hills, CA: Sage.

- Ross, M. (1989), "Relation of Implicit Theories to the Construction of Personal Histories," *Psychological Review*, 96, 341-357.
- Schlenker, B. R. (1985), "Identity and Self-Identification," in B. R. Schlenker (Ed.), *The Self and Social Life*, New York: McGraw-Hill.
- Scott, J. (1991), *Social Network Analysis: A Handbook*, Newbury Park, CA: Sage Publications.
- Shamir, B. (1991), "Meaning, Self and Motivation in Organizations," *Organization Studies*, 12, 405-424.
- Sproull, L. and S. Kiesler (1986), "Reducing Social Context Cues: Electronic Mail in Organizational Communication," *Management Science*, 32, 1492-1512.
- Stevenson, W. B. and M. C. Gilly (1991), "Information Processing and Problem Solving: The Migration of Problems through Formal Positions and Networks of Ties," *Academy of Management Journal*, 34, 918-928.
- Thorn, B. K. and T. Connolly (1987), "Discretionary Data Bases: A Theory and Some Experimental Findings," *Communication Research*, 14, 512-528.
- Titmuss, R. M. (1971), *The Gift Relationship: From Human Blood to Social Policy*, New York: Pantheon Books.
- Tsui, A. S., T. D. Egan, and C. A. O'Reilly (1992), "Being Different: Relational Demography and Organizational Attachment," *Administrative Science Quarterly*, 37, 549-579.
- Wagner, W. G., J. Pfeffer, and C. A. O'Reilly (1984), "Organizational Demography and Turnover in Top-Management Groups," *Administrative Science Quarterly*, 29, 74-92.
- Weenig, M. W. and C. J. Midden (1991), "Communication Network Influences on Information Diffusion and Persuasion," *Journal of Personality and Social Psychology*, 61, 734-742.
- Williamson, G., and M. Clark (1989), "The Communal/Exchange Distinction and Some Implications for Understanding Justice in Families," *Social Justice Research*, 3, 77-103.
- Zenger, T. R., and B. S. Lawrence (1989), "Organizational Demography: The Differential Effects of Age and Tenure Distributions on Technical Communication," *Academy of Management Journal*, 32, 353-376.
- Zurcher, L. A. (1965), "The Sailor Aboard Ship: A Study of Role Behavior in a Total Institution," *Social Forces*, 43, 389-400.

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