

**THE STRENGTH OF WEAK TIES YOU CAN TRUST:
THE MEDIATING ROLE OF TRUST IN EFFECTIVE KNOWLEDGE TRANSFER**

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ABSTRACT

Recent research suggests that people obtain useful knowledge from others with whom they work closely and frequently (i.e., strong ties). Yet there has been limited empirical work examining why this is so. Moreover, other research suggests that weak ties provide useful knowledge. To help integrate these multiple findings, we propose and test a model of two-party (dyadic) knowledge exchange, with strong support in each of the three companies surveyed. First, the link between strong ties and receipt of useful knowledge (as reported by the knowledge seeker) was mediated by competence- and benevolence-based trust. Second, once we controlled for these two trust dimensions, the structural benefit of *weak* ties became visible. This latter finding is consistent with prior research suggesting that weak ties provide access to non-redundant information. Third, we found that competence-based trust was especially important for the receipt of tacit knowledge. We discuss implications for theory and practice.

Promoting knowledge creation and transfer within organizational settings is an increasingly important challenge for managers today (Kogut & Zander, 1992). Organizations that can make full use of their collective expertise and knowledge are likely to be more innovative, efficient, and effective in the marketplace (Grant, 1996; Wernerfelt, 1984). Yet ensuring effective knowledge creation and transfer has proven a difficult challenge. At least three separate literatures—on social networks, trust, and organizational learning/knowledge—have addressed aspects of the knowledge transfer problem. We propose and test empirically a theoretical approach that synthesizes these three streams.

Structural Characteristics of Knowledge Transfer

Social network researchers have offered clear evidence of the extent to which knowledge diffusion occurs via social relations (e.g., Rogers, 1995). Work dating to Pelz and Andrews (1968), Mintzberg (1973), and Allen (1977) indicates that people prefer to turn to other people rather than documents for information. For example, Allen (1977) found that engineers and scientists were roughly five times more likely to turn to a person for information than to an impersonal source such as a database or file cabinet. More recently, Cross (2001) found that even people with ready access to well-populated electronic and paper-based sources of information reported seeking information from colleagues significantly more than from these sources. In general, researchers have found relationships to be important for acquiring information (Burt, 1992); learning how to do one's work (Lave & Wenger, 1991); making sense of ambiguous environments or events (Weick, 1979); and solving complex problems (Hutchins, 1991).

Social network theorists have focused much of their attention on structural properties of networks (Adler & Kwon, 2002), such as structural holes at the network level (Burt, 1992) and tie strength at the dyadic level (Granovetter, 1973). Tie strength characterizes the closeness of a relationship between two parties, in our case a knowledge seeker and knowledge source, and is

usually operationalized as a combination of closeness and interaction frequency (Granovetter, 1973; Hansen, 1999; Marsden & Campbell, 1984). In recent years, researchers have investigated the optimal mixture of strong versus weak ties for a particular actor (Hansen, 1999) and for the larger network in which that actor is embedded (Uzzi, 1996). At the dyadic (two-party) level, which is the focus of our study, research has found advantages to both strong and weak ties. Granovetter (1973), in his study of how people find jobs, theorized that weak ties—those characterized as distant and by infrequent interaction—were more likely to be sources of novel information, because strong ties tend to be connected to others who are close to a knowledge seeker and so likely to be trafficking in information that the seeker already knows. Subsequent research on the importance of weak ties has demonstrated that they can be instrumental not only to finding a job (Lin, 1988) but also to the diffusion of ideas (Granovetter, 1982; Rogers, 1995) and technical advice (Constant, Sproull, & Kiesler, 1996).

On the other hand, strong ties have been claimed important because they are more accessible and willing to be helpful (Krackhardt, 1992). In fact, many studies have shown that, overall, strong ties are of greater benefit to the receipt of useful knowledge (Ghoshal, Korine, & Szulanski, 1994; Hansen, 1999; Szulanski, 1996; Uzzi, 1996, 1997). Despite the noted benefits of strong ties for the receipt of useful knowledge, there has been relatively little investigation as to why this is so. Clarifying substantive characteristics of relationships that promote receipt of useful knowledge may help resolve the multiple findings on the benefits of weak versus strong ties. We turn to one such relational characteristic, trust.

Relational Characteristics of Knowledge Transfer

Mayer, Davis, and Schoorman (1995: 712) define trust as “the willingness of a party to be vulnerable.” Our focus here is on the closely related concept of perceived trustworthiness—that quality of the trusted party that makes the trustor willing to be vulnerable. As a short hand in

this paper, however, we will use the abbreviated term *trust* in place of *perceived trustworthiness*. The trust literature (see Dirks & Ferrin, 2001; Mayer et al., 1995 for reviews) provides considerable evidence that trusting relationships lead to greater knowledge exchange. When trust levels are higher, people are more willing to give useful knowledge (Andrews & Delahay, 2000; Penley & Hawkins, 1985; Tsai & Ghoshal, 1998; Zand, 1972) and also more willing to listen to and absorb it (Levin, 1999; Mayer et al., 1995; Srinivas, 2000). Trust also makes knowledge transfer less costly (Currall & Judge, 1995; Zaheer, McEvily, & Perrone, 1998). These effects have been shown at the individual and organizational levels of analysis in a variety of settings.

Although having a close working relationship with someone might mean you also trust that person (Currall & Judge, 1995; Sniezek & Van Swol, 2001), the two concepts—tie strength and trust—are not necessarily synonymous. For example, tie strength—especially the frequency of interaction—can be a function of work interdependence beyond the voluntary control of the individual worker. In such situations a relationship can be characterized as a strong tie, yet not result in one person trusting a coworker with whom he or she is forced to work. By way of preview, in the current study, 18% of the ties analyzed were “not-fully-trusted strong ties”; i.e., above-average in tie strength but below-average for at least one dimension of perceived trustworthiness. Conversely, sometimes people *do* trust someone whom they do not know very well. For example, temporary groups, with little or no prior history, have been found to develop swift trust (Meyerson, Weick, & Kramer, 1996). In our study, 22% of the ties were “trusted weak ties”: below-average in tie strength but above-average in one or more dimensions of perceived trustworthiness. So while trust and tie strength are related—indeed, Gulati (1994) has used tie strength as a proxy for trust—they appear to be both conceptually and empirically distinct.

A few researchers have looked simultaneously at the impact of structural and relational issues on the receipt of useful knowledge. For example, Levin (1999), in his study of scientists

and engineers, found that strong, trusting ties usually helped improve outcomes but that trust alone could substitute when only weak ties existed. Drawing on Coleman (1988) and others, Tsai and Ghoshal (1998: 465), at the department level, found that the “structural dimension of social capital, manifesting as social interaction ties, [will] stimulate trust and perceived trustworthiness, which represent the relational dimension of social capital,” which will in turn lead to the exchange of more resources (including knowledge) between departments. Tsai and Ghoshal (1998), however, conceptualized trustworthiness as a single dimension, whereas the trust literature has come to identify multiple dimensions (Mayer et al., 1995). In the current study, we therefore focus on two distinct trust dimensions—benevolence and competence (i.e., ability)—that seem most relevant to the receipt of useful knowledge by individuals. We decided not to include the third dimension, integrity, as it did not seem to add anything over and above the concept of benevolence for explaining the knowledge benefits of strong ties. For example, the notion of malevolent integrity—“I will work towards your downfall but at least I am honest and consistent about it”—may apply to purely competitive arenas (e.g., sports teams) and maybe even certain market transactions, but it did not seem relevant to us in the advice-seeking context. Drawing on the above evidence, we propose that *both* benevolence- and competence-based trust mediate the link between strong ties and receipt of useful knowledge. Thus, we advocate synthesizing in greater depth structural and relational perspectives by suggesting that learning benefits of strong ties can be traced back to relational characteristics such as trust. In addition, we suggest a third element not addressed by Tsai and Ghoshal (1998): characteristics of the knowledge itself.

Knowledge Characteristics of Knowledge Transfer

The organizational learning and knowledge literature often focuses on the issue of knowledge complexity (Szulanski, 1996). In particular, researchers frequently divide

organizational knowledge into two types: *explicit* knowledge—i.e., knowledge that is more easily codified—and *tacit* knowledge—know-how that is difficult to codify or explain (Hansen, 1999; Nonaka, 1994; Polanyi, 1966; Zander & Kogut, 1995). While there are various benefits of tacit knowledge, it turns out to be quite difficult to transfer. For example, tacit knowledge tends to slow down the transfer of manufacturing capabilities (Zander & Kogut, 1995) and new product development projects (Hansen, 1999).

Besides the direct effect of tacit knowledge, Hansen (1999) has proposed a moderator effect that synthesizes this knowledge characteristic with the structural characteristic of tie strength discussed earlier. In particular, he found that projects in divisions receiving mainly explicit knowledge from other divisions were completed more quickly when more of these ties to the other divisions were weak (versus strong) ties. However, when the transferred knowledge was tacit, projects were completed faster in divisions with a greater mixture of strong ties. Hansen (1999) concluded that, since weak ties are less costly to maintain, having a network of predominantly weak ties is advantageous for projects requiring the receipt of mostly explicit knowledge. At the dyadic level, though, it is less clear that the logic for such an interaction effect applies. Here we are interested not so much in the knowledge seeker's overall performance as a result of a portfolio of ties, but in the knowledge benefits flowing from each dyadic tie. Moreover our emphasis is on the benefits from, and not the costs of maintaining, a given tie. In this way we hope to focus more precisely on the underlying mechanisms involved in the process of learning from others.

All Three Aspects of Knowledge Transfer

We propose that all three characteristics—structural, relational, and knowledge-related—be considered as part of any theoretical modeling of the knowledge transfer problem, or what Szulanski (1996) calls, “knowledge stickiness” (see Figure 1).

[Insert Figure 1 about here]

By focusing on individuals, we hope to gain a better understanding of the underlying processes involved in knowledge transfer at other levels of analysis as well. We now turn to some specific hypotheses, followed by our methods for conducting the research and results from our analysis. Finally we conclude with a discussion of the implications of our findings for theory and practice.

THEORETICAL MODEL

Tie Strength and Receipt of Useful Knowledge

Social network researchers have demonstrated benefits of both weak ties and strong ties on knowledge acquisition. Although contingencies have been proposed, the bulk of the evidence suggests that strong ties lead to greater knowledge exchange (Ghoshal et al., 1994; Hansen, 1999; Szulanski, 1996; Uzzi, 1996, 1997). Presumably such relationships are more likely to expend effort to ensure that a knowledge seeker sufficiently understands and can put into use newly acquired knowledge (Hansen, 1999; Krackhardt, 1992). Consistent with these findings, we suggest that strong ties are instrumental to providing knowledge that people use in their work. We are specifically concerned with knowledge that improves outcomes of a knowledge seeker's work, and so use the term *receipt of useful knowledge* to denote the perceived receipt of information and/or advice that has a positive impact on a knowledge seeker's work. (This term is more technically correct in our context than *knowledge transfer*, although we have used the terms interchangeably.) Stated formally:

H1: Overall, stronger ties—more so than weaker ones—lead to the receipt of useful knowledge.

Trust Mediates between Strong Ties and Receipt of Useful Knowledge

Why should strong ties be effective in providing useful knowledge? We argue, consistent with the work of Tsai and Ghoshal (1998), that such relationships are more likely to be effective

because they tend to be trusting ones. More specifically we suggest that benevolence- and competence-based trust mediate the link between strong ties and receipt of useful knowledge. Note that our interest is in the receipt of useful knowledge and *not* on people's propensity to seek out a knowledge source in the first place. While there may be several reasons unrelated to trust—such as convenience—for why people seek information from strong ties (Granovetter, 1982; Krackhardt, 1992), these reasons seem less clearly connected to usefulness of the knowledge received. Trusting a knowledge source to be benevolent and competent, however, should increase the chance that the knowledge receiver will be able to learn from the interaction.

When knowledge seekers ask for information, they become vulnerable to the benevolence of the knowledge source. For example, one's reputation can be significantly affected by such interactions (Burt & Knez, 1996). Further, benevolence-based trust likely shapes the extent to which knowledge seekers will be forthcoming about their lack of knowledge. Defensive behaviors can knowingly and unknowingly block learning by both individuals and groups (Argyris, 1982; Edmondson, 1999). Benevolence-based trust should thus create conditions for learning that enable the receipt of useful knowledge.

In addition, trust in another's competence—what Mayer, Davis, and Schoorman (1995) refer to as a belief in the ability of the trustee—should also lead to the receipt of more useful knowledge. Knowledge seekers who trust a knowledge source's competence to make suggestions and influence their thinking are more likely to listen to, absorb, and then take action on that knowledge source's advice. Competence-based trust is likely to be associated with strong ties (Chattopadhyay, 1999). Stated formally:

H2: The link between strong ties and receipt of useful knowledge is mediated by (a) benevolence-based trust, and (b) competence-based trust.

Trust Plus Weak Ties Leads to Receipt of Useful Knowledge

A weak tie is beneficial because it provides knowledge from more socially distant regions of a network (Burt, 1992; Granovetter, 1973). This effect is related to what people know, not their willingness to share and learn, and so is conceptually independent of trust. Moreover, if strong ties are beneficial to knowledge exchange because of trust, then we should be able to see the structural benefits of weak ties once both dimensions of trust are controlled for. That is, once a knowledge receiver's level of trust in a knowledge source is held constant, the structural benefit of a weak tie's ability to provide non-redundant information should become apparent.

H3: After controlling for competence- and benevolence-based trust, it is weaker ties—more so than stronger ones—that lead to the receipt of useful knowledge.

Note that we do not argue that strong ties will *hurt* a knowledge seeker with wrong or misleading knowledge. On the contrary, trusted strong ties are still presumably helpful in the knowledge they provide. What we argue is that trusted weak ties may be even more helpful.

Type of Knowledge as a Contingency

In some cases the impact of trust on receipt of useful knowledge, while positive overall, could be contingent on the type of knowledge that is transferred. When the knowledge is codified and straightforward, trust in the competence of the knowledge source might not be critical, as the knowledge seeker may be able to learn on his or her own. For example, a bank teller may ask for and receive a specialized training manual from a fellow bank teller whom she perceives as incompetent; however, the knowledge seeker in this case might still find the information given to her to be self-explanatory and useful. In contrast, the bank teller might not find it as useful if her incompetent coworker tried to explain a complicated procedure. Complex or difficult-to-understand knowledge may require that the knowledge seeker trust that the knowledge source knows what he or she is talking about. Thus, among knowledge transfers that involve tacit

knowledge, seekers are likely to receive more useful knowledge when they trust the source's competence. Stated formally:

H4: Competence-based trust is more important to the receipt of useful knowledge when that knowledge is tacit (i.e., not written or codified) than when it is explicit.

In contrast, benevolence-based trust is likely to always matter (H2). After all, if people think someone is out to harm them, they will be suspicious of everything that person says, no matter how simple or complex.

In sum, we propose a model of dyadic-level knowledge exchange whereby benevolence-based and competence-based dimensions of trust mediate the link between strong ties and the receipt of useful knowledge. Moreover, we argue that if we hold constant both of these dimensions of trust, structural benefits of weak ties will emerge. Finally, we propose that competence-based trust will be even more important when the knowledge received is tacit. Our theoretical model is presented graphically in Figure 2 below, along with significance levels.

[Insert Figure 2 about here]

METHODS

Sample

We surveyed a division of a U.S. pharmaceutical company, British bank, and Canadian oil and gas company. All three groups were composed of mid-level managers engaged in knowledge-intensive work (research and development, financial modeling, and oil exploration) who relied heavily on colleagues for information to solve problems and coordinate the work of others. Having sites from three different industries and three different countries increased our confidence in the external validity of the research. As we found no significant interaction effects between any of our predictor variables and dummy variables corresponding to the three firms (i.e., our results were the same in each firm), we pooled the data for analysis.

A total of 127 respondents—42 from the pharmaceutical company, 41 from the bank, and 44 from the oil and gas company—completed the entire survey (response rate=48%). As described below, each respondent reported on four relationships, thereby generating an initial total sample of 508 observations. Respondents, 61% of whom were men, did not differ significantly by gender or office location from the group of people sent surveys. Most respondents (70%) were in their 30s or 40s, with a median age in the early 40s. The average respondent had worked in his or her division for 5.2 years; company, 10.4 years; and industry, 15.3 years. Nearly half (47%) of respondents had a graduate or professional degree, and more than two-thirds (68%) had graduated from college.

Data Collection

We used a two-part survey, administered via e-mail as a Microsoft Excel attachment, which took approximately 40-60 minutes to complete. Participants were guaranteed that their responses would be held confidential and only aggregate-level data reported back to their organization. Further, all surveys were returned directly to the researchers to reduce the likelihood of biased answers. Before finalizing the survey, we added, deleted, and revised various items based on a pre-test with 20 respondents not at the three firms.

Using standard egocentric network survey techniques (Burt, 1992; Wasserman & Faust, 1994), we asked respondents: “Consider a project that you are currently involved with or that ended recently (in the past three months) that you feel holds significance for your career.” Most (77%) chose an on-going project. The median length of project involvement, for both on-going and completed projects, was six months. Respondents then listed up to 10 or 15 people to whom they had turned to for information, knowledge, or advice to get their work done on that project.

To get a balanced view of each person’s network, we then asked respondents to choose the two most helpful and the two least helpful advice givers from their list. We chose this

approach because it should result in a less biased sample than if we had simply asked respondents to pick the top four advice givers. The rest of the survey then asked questions about the four people chosen (e.g., how much did you trust this person?). Within a week or so after completing part A, respondents received part B of the survey, which asked additional questions about the four people (e.g., how useful was the knowledge received from each person?). Though trust is typically reciprocated (Butler, 1991), the nature of many knowledge exchanges is asymmetric; i.e., knowledge seekers and sources can have different perceptions of the value of an interaction. For example, knowledge sources may have no idea how valuable their knowledge was to someone else's project. As a result, we focus on the knowledge seeker's perception.

We considered using additional data sources (e.g., project results, supervisor ratings), but concluded that—at the *dyadic* level of analysis—a knowledge seeker is the best, perhaps the only, judge of the usefulness of knowledge received from a particular knowledge source. Doty and Glick (1998), who examined the potential for bias from this “common methods” approach, found that bias is more pronounced when constructs are not concrete, but less pronounced when there is a time interval between data collection periods (as in our study). Overall, they conclude, “most observed relationships are 26% more positive than the true relationships. [Thus], we need to consider if reported results would still be significant if the observed relationship was 26% more negative” (p. 400). Even after such a correction, however, all of the direct effects in our study would still be significant. Further, Brockner, Siegel, Daly, Tyler, and Martin (1997) have noted that common methods bias is less of a concern for studies (like ours) with an interaction effect, since it shows that respondents did not unthinkingly rate all items as either high or low. Thus, we conclude that our findings are fairly robust to any possible common methods bias.

We were also able to rule out another validity concern, raised by a pre-test respondent, who noted that all of the information he received from one source was sound, but for unrelated

reasons, the project went in a different direction and so that information turned out to be useless. To make sure our outcome variable was not confounded by such unforeseen factors, we asked: “To what extent were your answers on this Outcomes page affected by circumstances completely beyond the control of this person?” [1 = to no extent; 2 = to little extent; 3 = to some extent; 4 = to a great extent; 5 = to a very great extent]. We then interacted this *no control* variable with the predictor variables and detected no interaction patterns. Thus, we conclude that our findings are robust to circumstances perceived to be beyond the control of the knowledge source.

Variables

We adapted the survey items (see Appendix) from pre-existing scales in the literature. All multi-item constructs showed good discriminant validity (based on factor analysis) and good convergent validity (all Cronbach’s alphas above .7). All multi-item variables were based on an unweighted average of the relevant items.

Outcome variable. We combined eight items, adapted from Hansen (1999), Hansen and Haas (2001), Keller (1994), and Szulanski (1996), to create *perceived receipt of useful knowledge*: four items related to project efficiency in terms of time and budget and four items related to project effectiveness. These eight items asked to what extent the knowledge received from each person hurt or helped key aspects of the project’s outcomes. Since prior research has suggested that organizational performance is multidimensional (e.g., Hirsch & Levin, 1999), we included multiple outcomes; however, a factor analysis yielded only a single overall factor.

Predictor variables. A factor analysis confirmed that the items for tie strength and the two trust dimensions were all tapping distinct constructs; i.e., the “elbow” in the scree plot of the eigenvalues clearly suggested the presence of three factors. Table 1 shows the resulting three-factor solution, using principal axis factoring with direct oblimin rotation.

[Insert Table 1 about here]

(In another factor analysis, we found that, as expected, none of these items cross-loaded with the items for the perceived receipt of useful knowledge, and vice versa.)

The first two items for *tie strength*—closeness of a working relationship and frequency of communication—were adapted from Hansen’s (1999) stand-alone, two-item construct of tie strength. While researchers often use an emotional dimension to operationalize tie strength (Marsden & Campbell, 1984), we followed Hansen’s (1999) approach of employing a work-related meaning of closeness, given the organizational context. Based on pre-test feedback, we added the following instruction before these two items, which were on a 1-7 scale (later reverse-scored): “If you had no prior contact at all with this person before you sought information/advice from him or her on this project, please choose 7 for the next two questions. Otherwise, answer to the best of your recollection.” To enhance reliability, we also added a third item later on in part A of the survey on the frequency of interaction. Because the three items used different scales, we normalized each before creating the overall variable. As a validity check, we also tested tie strength in all our analyses based solely on Hansen’s (1999) two unstandardized items and also based on just the two normalized items for frequency of communication and of interaction (Cronbach’s alphas > .80), all with the same results. This latter analysis was done to rule out the alternative explanation that the closeness item somehow overlapped with trust, even though the factor analysis in Table 1 suggested no overlap. Some people may also see this alternative version of tie strength as having greater conceptual clarity.

Benevolence-based trust was adapted from three items used by Johnson, Cullen, Sakano, and Takenouchi (1996). These items are similar to those used by Mayer and Davis (1999). *Competence-based trust* was adapted from the two top-loading items used in McAllister’s (1995) cognition-based trust. These two items were also used by Chattopadhyay (1999) and are similar to those used by Mayer and Davis (1999) for their ability dimension of trustworthiness.

We assessed *tacit knowledge* using Hansen's (1999) three items. To measure the interaction between competence-based trust and tacit knowledge, we multiplied the two variables together to create *competence-based trust * tacit knowledge*. To avoid a problem of multicollinearity, we used deviation scores for competence-based trust (initial mean = 6.04) and tacit knowledge (initial mean = 4.04), a procedure which left unchanged each variable's standard deviation (Jaccard, Turrisi, & Wan, 1990). Since the two trust dimensions were somewhat skewed, we re-ran all of the regressions with a logarithmically transformed version of each variable ($= -\log[8 - \text{initial score on 1-7 scale}]$), with the same results.

Control variables. In an effort to rule out alternative explanations, we systematically controlled for the relative position of the knowledge seeker and knowledge source in the formal structure of the organization in terms of *organizational closeness*, *physical proximity*, and *on same project* (a form of task interdependence). In addition, Trey (1999) has found that managers who are perceived as more powerful are trusted more; ironically, other research suggests that powerful actors are less trustworthy and act more unethically (Lewicki, Saunders, & Minton, 1999: 254). To control for this issue, we included the variable, *hierarchical level*, and recoded the "does not apply" responses as missing values. To make sure we could still generalize our results to knowledge sources outside the hierarchy, we re-ran the regression analyses without this control variable, and with the "missing values" thus added back in, with the same results.

To control for people's social affinity for similar others (homophily), we asked if the knowledge source was the *same gender* as the respondent. Respondents also indicated if the knowledge source was the same age plus or minus five years (the reference category), or if that person was a *younger source* by more than five years or an *older source* by more than five years.

Finally, respondents who felt they already had a lot of knowledge might not find additional knowledge received from others to be very useful, or they might not feel the need to

trust the knowledge senders as much as novices did. To control for this issue, we included the variable, *receiver's expertise*, based on three dyad-specific items adapted from Srinivas (2000).

Analysis Techniques

We analyzed the data using hierarchical linear modeling (HLM) (Hoffman, 1997; Raudenbush & Bryk, 2002; Snijders & Bosker, 1999; Wellman & Frank, 2001) with the statistical package HLM 5 (Raudenbush, Bryk, Cheong, & Congdon, 2001). This analytic technique is particularly well suited to egocentric network studies as it accounts for the inherent nesting in the data. With egocentric data, characteristics of each contact (or “alter”) and the relationship between the survey respondent and contact are nested “within” each respondent (or “ego”). A strength of HLM is that it does not rest on the assumption of independent observations, a cornerstone of ordinary least squares (OLS) procedures. While we could use dummy variables in OLS, this taxes our degrees of freedom and also does not entirely correct for non-independence. With HLM we first estimated “level one” parameters describing the relationship between predictor and outcome variables. At this lower level, we used characteristics of relationships (e.g., same gender) and of alters (e.g., perceived benevolence) to predict our outcome variable: receipt of useful knowledge for each dyad. A parameter established by this process models the “within” respondent/network variance similarly to an OLS regression. Once fitted, the intercept and slope estimates in the “level one” model become the outcome variables for the “level two” analysis, which in our case entails characteristics of the respondent (e.g., age, gender). A parameter established by the “level two” equation models the “between” respondent/network variance and can provide evidence of cross-level interaction effects.

In our analysis we first fit a model whereby our “level one” predictor variables (controls, tie strength, etc.) were used to predict the outcome variable (perceived receipt of useful knowledge) at the same level of analysis. In this process, requiring a listwise deletion of missing

values, we fit a model using fixed effects across all predictor variables and then allowed the predictor variables to vary across respondents. First, a one-way ANOVA with random effects model allowed us to partition variance in our outcome variable into “within” and “between” respondent components. The intraclass correlation coefficient measures the proportion of variance that resides between respondents (Raudenbush & Bryk, 2002: 24), which in this case was a relatively low 11%, indicating that the majority of the variance to be accounted for in this model resided at the alter and relational level of our hypotheses. A chi-squared test on the residual variance did indicate that significant level-two (or “between” respondent) variance existed (chi-square = 190.72, $p < .001$); however, when we tested respondent-level controls (education; age; gender; company; project involvement status; division-, company-, and industry-related tenure), none were significant. With the full model (discussed later as Equation 5), chi-squared tests revealed insufficient variance in either the intercept or slopes of the theoretically important predictor variables to warrant investigation of an “intercept and slopes as outcome model” (Raudenbush & Bryk, 2002: 27). However, as our primary rationale for applying HLM was to account for the lack of independence of observations, we conducted our level-one analysis with HLM.

To test for robustness and multicollinearity, we re-ran the analyses using OLS regression with dummy variables that corresponded to each respondent, with the same results. We tested for multicollinearity in OLS and found no evidence of it, as the variance inflation factors (VIFs) for our predictor variables were all below 5 (well below the standard cut-off of 10).

RESULTS

Table 2 shows the means, standard deviations, and simple correlations among the variables used in the regression equations in Tables 3 and 4. We computed R-squared values based on within-group variance (Hoffman, Griffin, & Gavin, 2000: 484).

[Insert Tables 2-4 about here]

H1: Strong Ties

As predicted by H1, strong ties did have a positive and statistically significant ($p < .001$) overall effect on the receipt of useful knowledge (Equation 2 in Table 3). In a separate analysis not shown here, we detected no statistically significant interaction effect between tie strength and tacit knowledge, contrary to Hansen's (1999) findings for a division's mixture of strong versus weak ties. We attribute this difference to our focus on the benefits received from each dyadic tie.

H2: Trust as Mediator

To demonstrate that benevolence- and competence-based trust mediate the link between strong ties and receipt of useful knowledge, four conditions must hold. *First*, tie strength alone must have a positive impact on the outcome variable. We see in Table 3's Equation 2 that it did. *Second*, tie strength must have a positive impact on benevolence- and competence-based trust. In Equation 7 of Table 4, we see that the addition of tie strength had a significant positive effect on benevolence-based trust ($p < .001$); in Equation 9 of Table 4, we see that the addition of tie strength also had a significant positive effect on competence-based trust ($p < .001$). *Third*, benevolence- and competence-based trust must have a positive impact on the outcome variable. We see in Table 3's Equation 3 that both benevolence-based trust ($p < .001$) and competence-based trust ($p < .001$) did. *Fourth*, the positive effect of strong ties on outcomes must disappear once we control for the positive effect on outcomes of the two dimensions of trust. Again, both dimensions of trust had a positive and significant effect on the receipt of useful knowledge, over and above the impact of tie strength (Equation 4 in Table 3); moreover, the negative regression coefficient for tie strength in Equations 4 and 5 indicates that the positive effect of strong ties disappeared once we controlled for the two trust dimensions. Although tie strength remained statistically significant, its sign became negative (see H3 below); thus, we consider it a

reasonable and intuitive interpretation to think of trust as the mediator of “strong ties.”

Since the regression results effectively passed all four tests for mediation, we can say that the positive impact of strong ties on the receipt of useful knowledge appeared to be positive *because* strong ties were typically associated with benevolence-based and competence-based trust. (Although we leave open the possibility for future research that strong ties might have both direct and indirect effects on the two trust dimensions.) Thus, as predicted by H2a and H2b, we find that taking these two dimensions of trust into account eliminated any positive effect on outcomes that came from strong ties.

H3: Weak Ties (Controlling for Trust)

As predicted by H3, the direct effect of strong ties on the receipt of useful knowledge was less than that of weak ties once we controlled for trust. That is, we see a “switch” from the overall benefit of strong ties (before controlling for trust) to the benefit of *weak* ties (after controlling for trust). Knowledge received from strong ties still contributed positively to project outcomes (i.e., if we plug the relevant values into Equation 4, the result is above the neutral point of 4 on the 1-7 outcomes scale), but the knowledge received from weak ties contributed even more positively. These results appear to be due to a suppression effect (Cohen & Cohen, 1983: 94-96) and not a problem of multicollinearity given the low variance inflation factors we found. In addition, multicollinearity leads to unstable regression coefficients and very large standard errors (Cohen & Cohen, 1983: 116), neither of which were the case in Equations 3-5.

H4: Type of Knowledge as a Contingency

As predicted by H4, there was an interaction effect for competence-based trust with tacit knowledge ($p = .015$). By inserting a high (one standard deviation above the mean) and low (one standard deviation below the mean) value for tacit knowledge into Equation 5, we can see the specific nature of this interaction. Controlling for everything else in Equation 5, competence-

based trust had a major impact on knowledge transfers involving highly tacit knowledge (slope = .31). For transfers involving codified knowledge, though, competence-based trust did not provide as much benefit (slope = .13). Thus, the more that a knowledge transfer involved tacit knowledge, the more crucial it was—if the knowledge received was to be of any use—that the knowledge receiver trust the competence of the source. However, when a knowledge transfer involved only well-documented information, competence-based trust was less critical.

Ruling Out Alternative Explanations

To help rule out the alternative explanation that it was friendship—and not trust—that mediated the relationship between strong ties and receipt of useful knowledge, we added a measure for *friendship* to Equations 3-5 in Table 3 (not shown). Since the term *friend* is ambiguous and can be used by people to characterize a great many “non-relative others” in a fairly unsystematic fashion (Fischer, 1982), we sought to operationalize friendship as nonwork-related interaction via two items (Cronbach’s alpha = .62). The regression results for Equations 3-5 in Table 3 were unchanged with or without this friendship variable, which was not statistically significant in these equations in any event. Thus, it does not appear that this study’s trust measures were merely proxies for nonwork friendships.

Krackhardt (1992), quoting Granovetter (1982: 113), noted that “strong ties have greater motivation to be of assistance and are typically more easily available.” Thus, to rule out the alternative explanation that it was a knowledge source’s perceived willingness to be open and available—and not trust—that mediated the relationship between strong ties and effective knowledge transfer, we added measures for both *openness* and *availability* to Equations 3-5 in Table 3 (not shown). Each variable was a three-item measure (Cronbach’s alphas > .8) adapted from Butler (1991). When we added both variables to Equations 3-5 in Table 3, there was no change in statistical significance of the variables in our model (and so hypotheses). Overall,

availability was never statistically significant, while openness was significant but with considerably less impact than trust. Thus, while there may be a small role to be played by the perceived openness of a knowledge source, this does not diminish the dominant role played by benevolence- and competence-based trust in the receipt of useful knowledge.

DISCUSSION AND CONCLUSION

We undertook this research as a first step toward integrating structural, relational, and knowledge-related research on knowledge transfer. As part of this effort, we assessed the role of dyadic trust as a critical mechanism underlying the knowledge benefits of strong ties. Although trust has been shown in prior research to be correlated with effective knowledge transfer (Andrews & Delahay, 2000; Penley & Hawkins, 1985; Tsai & Ghoshal, 1998; Zand, 1972), no one to our knowledge has investigated it specifically as a mediator between strong ties and receipt of useful knowledge, either as a multidimensional concept (benevolence and competence) or at the micro (interpersonal) level. In this paper we provide empirical support for a model of knowledge transfer with three key findings. *First*, we show that benevolence- and competence-based trust mediate the link between strong ties and the receipt of useful knowledge. *Second*, once we hold constant these two trust dimensions we uncover the benefits of weak ties to the receipt of useful knowledge. This finding is consistent with Granovetter's (1973) argument that weak ties provide access to non-redundant information. *Third*, we show that while benevolence-based trust improves the usefulness of both tacit and explicit knowledge exchange, competence-based trust is especially important for tacit knowledge exchange.

It is worth noting that this study's three main findings held even after controlling for individual attributes, homophily, knowledge-related factors, and relative position in formal structure. Further, we were able to replicate our findings in three different companies in different industries and countries, thereby enhancing this study's external validity. Finally, these results

were also robust to possible alternative explanations and to various ways to operationalize a number of key variables in the analysis.

Of course our study has limitations that should be acknowledged. For instance, we chose to focus on dyadic trust to gain a more detailed understanding of its role in knowledge transfer. However, there is undoubtedly a cultural element of trust that influences dyadic interactions. For example, Edmondson (1999) has demonstrated “psychological safety” to be a group-level construct related to learning. In this study we did not find significant differences across the diverse companies in our sample. However, we also did not consider the way in which collective-level trust might relate to dyadic trust from either a theoretical or empirical standpoint. We hope that future research will address this issue. Another limitation is that our study relies on respondents being able to accurately report on past perceptions of a relationship. To minimize retrospective bias, we instructed respondents to answer questions “to the best of your recollection, regardless of whether or not you had a prior relationship with this person.” While we cannot completely rule out the alternative explanation that the knowledge transfer itself led to greater trust and that respondents then recorded this post-transfer level of trust on the survey, we took several steps to reduce this possibility. For example, we began questions with the phrase, “Prior to seeking information/advice from this person on this project, ...” to emphasize continually to respondents that we were interested in what their thoughts and feelings were *before* the knowledge transfer. In addition, by having respondents choose only on a current (77%) or recent (23%) project, we hoped to reduce problems associated with recollection.

This study’s theoretical contribution is to both the social network and the knowledge/organizational learning literatures. To the social network literature, we propose and test a conceptual model (see Figure 2) to help integrate the multiple, and sometimes conflicting, findings on the benefits of strong versus weak ties. Our model also refines Adler and Kwon’s

(2002) three-category description of social capital—opportunity (in our study, ties), motivation (benevolence), and ability (competence)—by demonstrating the interconnections among these concepts, rather than treating them as isolated ideas. Our evidence provides a theoretical mechanism—namely, benevolence- and competence-based trust—that enables strong ties to yield receipt of useful knowledge. Further, we provide support for the idea that the characteristics of a relationship (e.g., trust) are distinct from the mere existence or strength of a relationship. These two network perspectives, relational and structural, could benefit from continued integration. For example, in the current study, controlling for the effects of trust allowed us to uncover the hidden benefits of weak ties in knowledge exchanges—benefits that had been suppressed when trust was not considered as a concept separate from tie strength. We therefore join Adler and Kwon (2002) in calling for future work to place greater emphasis on trust and other relational characteristics to complement structural analyses.

In contribution to the knowledge transfer and organizational learning literature, this study provides a more detailed understanding of two unique dimensions of dyadic trust and their effect on both explicit and tacit knowledge transfers. We also show how relational factors like competence-based trust can interact with more traditional knowledge factors, such as tacit knowledge. Thus, our findings suggest a need to better understand the role of relational factors—such as trust and emotion—in facilitating or inhibiting effective knowledge transfer. Indeed, although theorists have suggested that an organization’s “absorptive capacity”—its ability to take in and make use of new knowledge—is a product of both the “character and distribution of expertise within the organization” (Cohen & Levinthal, 1990: 132), few have focused on this latter issue of the distribution of expertise. That is, while much research on absorptive capacity has focused on the character, especially the *amount*, of expertise within an organization, very little research has focused on the way in which social relations help to *integrate* such expertise.

Our study suggests a better understanding of how characteristics of relationships, such as trust, make the social fabric of organizations more (or less) effective in transferring knowledge.

Finally, we feel our work holds significance for practitioners. With the popularization of the concept of social capital, there has been an increased interest among practitioners in the role of trust and networks in organizational settings (e.g., Cohen & Prusak, 2001). Our research offers two main insights that can be helpful to practitioners. First, we offer evidence that benevolence-based trust consistently matters in knowledge exchange and that competence-based trust matters most when the exchange involves tacit knowledge. Awareness of this finding can help executives target appropriate points where investments in interventions designed to promote trust are more likely to have a payoff for the organization. Second, our results suggest that individuals and organizations could benefit from developing trusted weak ties, not just strong ties, although this strategy does carry the risk of misplaced trust. Nevertheless, our finding on the benefits of trust plus weak ties seems particularly promising for practitioners in light of the fact that prior research has suggested that weak ties may also be less costly to maintain (Hansen, 1999). As a result, we feel that practitioners will find it fruitful to focus on ways to improve trust as a relatively inexpensive and practical way to improve the flow of useful knowledge and advice in their organization. Indeed, some organizations are already undertaking such interventions by training for and assessing trustworthy behavior through evaluation procedures or by investing in processes to create a shared vision and language so that trust can flourish.

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FIGURE 1
Selected Cites of Structural, Relational, and Knowledge-related Aspects of Knowledge Transfer

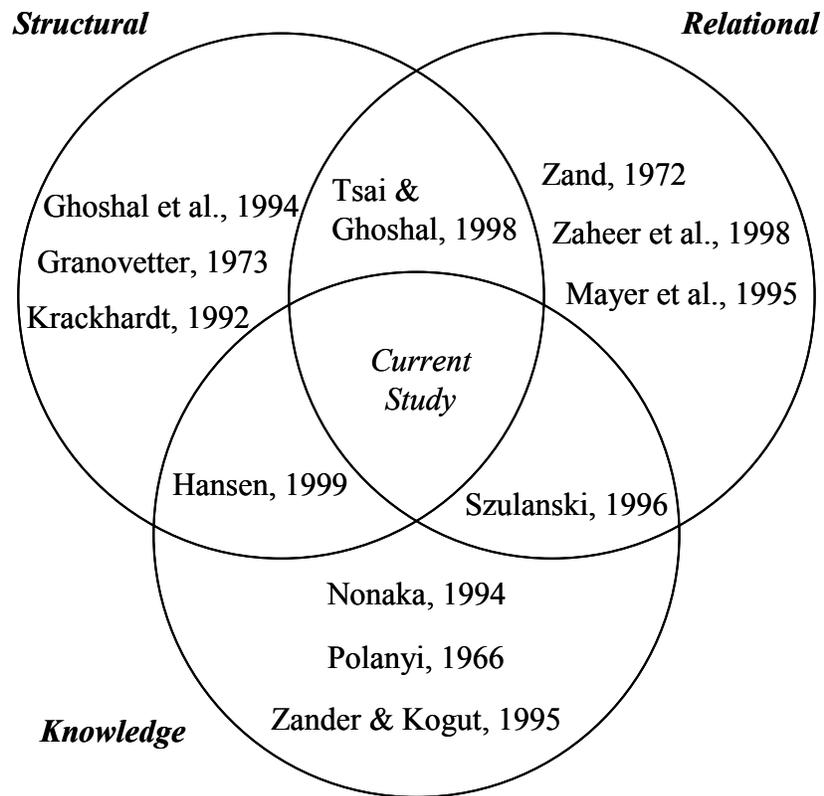
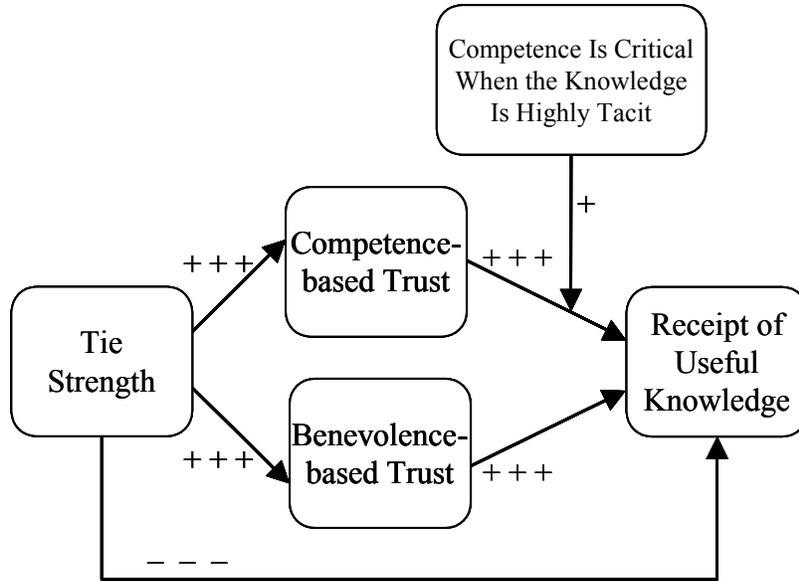


FIGURE 2
Results for Tie Strength and Trust ^a



^a Based on regression coefficients in Equation 5 of Table 3 and Equations 6 and 8 of Table 4. Control variables not shown.

TABLE 1
Factor Analysis of Trust Dimensions and Tie Strength ^a

Survey Item	Benevolence-based Trust	Tie Strength	Competence-based Trust
Look out for me	.91	.08	.00
Avoid damaging me	.87	-.05	-.03
Care about me	.64	-.17	.16
Closeness	.05	-.87	.05
Communication	.01	-.85	-.04
Interaction	-.03	-.84	.01
Professional/dedicated	-.05	-.02	.88
Competent/prepared	.07	.03	.75

^a $n = 400$. Boldfaced factor loadings indicate the items retained.

TABLE 2
Means, Standard Deviations, and Correlations ^a

Variable	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Receipt of Useful Knowl.	5.29	1.09													
2. Organizational Closeness	3.52	1.31	.04												
3. Physical Proximity	4.08	1.76	.21**	.46**											
4. On Same Project	0.76	0.43	.29**	.04	.14**										
5. Hierarchical Level	3.12	1.26	-.05	.02	.01	-.10									
6. Same Gender	0.67	0.47	.04	-.14**	-.05	.02	-.05								
7. Younger Source	0.27	0.44	.14**	.01	.08	.07	-.35**	-.03							
8. Older Source	0.32	0.47	.00	.01	-.03	-.02	.31**	.02	-.41**						
9. Receiver's Expertise	4.44	1.57	.12•	.06	.05	-.06	.01	-.12•	.03	-.01					
10. Tacit Knowledge	0.00	1.67	-.39**	.13**	-.04	-.26**	.25**	-.06	-.24**	.11•	-.07				
11. Tie Strength	0.00	0.91	.28**	.35**	.38**	-.02	.09	-.04	.06	-.04	.31**	-.04			
12. Benevolence Trust	5.11	1.38	.51**	.14**	.27**	-.03	.06	.05	.06	.00	.18**	-.15**	.57**		
13. Competence Trust	-0.01	1.10	.49**	.11•	.21**	.02	.10•	.02	.12•	.05	.17**	-.22**	.41**	.63**	
14. Competence * Tacit	-0.40	1.83	.15**	.00	.03	-.06	.02	.06	.01	.10•	-.07	.05	-.01	.17**	.35**

^a $n = 400$. Two-tailed tests; • $p < .05$; ** $p < .01$

TABLE 3
HLM Regression Results Predicting the Perceived Receipt of Useful Knowledge ^a

Variable	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5	
Intercept	5.19*** (.06)	5.19*** (.05)	5.22*** (.04)	5.21*** (.04)	5.21*** (.04)	
Organizational Closeness	.02 (.03)	-.02 (.02)	-.00 (.03)	.00 (.03)	.00 (.03)	
Physical Proximity	.10*** (.03)	.08** (.03)	.05** (.02)	.06** (.02)	.07** (.02)	
On Same Project	.45*** (.11)	.48*** (.11)	.42*** (.08)	.42*** (.08)	.45*** (.08)	
Hierarchical Level	.05 (.03)	.04 (.03)	.01 (.03)	.01 (.03)	.01 (.04)	
Same Gender	.02 (.07)	.02 (.07)	.02 (.06)	.02 (.06)	.03 (.06)	
Younger Source	.21* (.10)	.20* (.10)	.17 (.09)	.16 (.09)	.15 (.09)	
Older Source	.07 (.08)	.05 (.08)	.01 (.07)	.01 (.07)	.00 (.07)	
Receiver's Expertise	.02 (.04)	-.01 (.04)	-.00 (.03)	.00 (.03)	.00 (.03)	
Tacit Knowledge	-.23*** (.04)	-.22*** (.03)	-.16*** (.03)	-.16*** (.03)	-.16*** (.03)	
Tie Strength		.21*** (.05)		-.08** (.03)	-.08*** (.02)	
Benevolence Trust			.20*** (.04)	.22*** (.04)	.22*** (.04)	
Competence Trust			.23*** (.05)	.23*** (.05)	.22*** (.05)	
Competence * Tacit					.05* (.02)	
	R ² =	.56	.57	.69	.70	.71

^a $n = 400$. Unstandardized coefficients shown, with standard errors in parentheses.

• $p < .05$

•• $p < .01$

••• $p < .001$

TABLE 4
HLM Regression Results Predicting Each Dimension of Trust ^a

Variable	Benevolence-based Trust		Competence-based Trust		
	Equation 6	Equation 7	Equation 8	Equation 9	
Intercept	5.00*** (.08)	5.01*** (.07)	5.99*** (.06)	5.99*** (.06)	
Organizational Closeness	.14** (.05)	-.02 (.04)	.08* (.03)	-.02 (.04)	
Physical Proximity	.17*** (.03)	.07* (.03)	.10*** (.03)	.06* (.02)	
On Same Project	.06 (.17)	.06 (.15)	-.03 (.14)	.04 (.12)	
Hierarchical Level	.07 (.05)	.05 (.04)	.07 (.04)	.05 (.03)	
Same Gender	.19 (.11)	.07 (.10)	.11 (.10)	.09 (.10)	
Younger Source	.31 (.16)	.22 (.13)	.40** (.13)	.31** (.12)	
Older Source	.21 (.14)	.12 (.1)	.28* (.12)	.24* (.11)	
Receiver's Expertise	.12** (.05)	-.02 (.04)	.07 (.04)	.00 (.04)	
Tacit Knowledge	-.11* (.05)	-.08* (.04)	-.14*** (.04)	-.11*** (.03)	
Tie Strength		.81*** (.08)		.40*** (.06)	
	R ² =	.19	.47	.15	.31

^a $n = 400$. Unstandardized coefficients shown, with standard errors in parentheses.

• $p < .05$

•• $p < .01$

••• $p < .001$

APPENDIX Survey Items ^a

Perceived Receipt of Useful Knowledge

The information/advice I received from this person made (or is likely to make) the following contribution to (1) client satisfaction with this project, (2) this project team's overall performance, (3) this project's value to my organization, (4) this project's quality, (5) this project's coming in on budget or closer to coming in on budget, (6) reducing costs on this project, (7) my being able to spend less time on this project, (8) shortening the time this project took. (1=contributed very negatively; 2=contributed negatively; 3=contributed somewhat negatively; 4=contributed neither positively nor negatively; 5=contributed somewhat positively; 6=contributed positively; 7=contributed very positively)

Tie Strength

Prior to seeking information/advice from this person on this project, (1) how close was your working relationship with each person? (R) (1=very close; 4=somewhat close; 7=distant), (2) how often did you communicate with each person? (R) (1=daily; 2=twice a week; 3=once a week; 4=twice a month; 5=once a month; 6=once every 2nd month; 7=once every 3 months or less (or never)), (3) to what extent did you typically interact with each person? (1=to no extent; 2=to little extent; 3=to some extent; 4=to a great extent; 5=to a very great extent)

Benevolence-based Trust

Prior to seeking information/advice from this person on this project, (1) I assumed that he or she would always look out for my interests, (2) I assumed that he or she would go out of his or her way to make sure I was not damaged or harmed, (3) I felt like he or she cared what happened to me. (1=strongly disagree, 2=disagree, 3=somewhat disagree, 4=neutral, 5=somewhat agree,

^a Items are given verbatim, with "R" used to indicate reverse-scored items.

6=agree, 7=strongly agree)

Competence-based Trust

Prior to seeking information/advice from this person on this project, (1) I believed that this person approached his or her job with professionalism and dedication, (2) given his or her track record, I saw no reason to doubt this person's competence and preparation. (1=strongly disagree; [etc.]; 7=strongly agree)

Tacit Knowledge

(1) Was all this information/advice sufficiently explained to you in writing (in written reports, manuals, e-mails, faxes, etc.)? (1=all of it; 4=half of it; 7=none of it) (2) How well documented was the information/advice that you received from this person? Consider all the information or advice. (1=very well documented; 4=somewhat well documented; 7=not well documented) (3) What type of information/advice came from this person? (1=mainly reports, manuals, documents, self-explanatory software; 4=half know-how, half reports/documents; 7=mainly personal practical know how, tricks of the trade)

Organizational Closeness

Please indicate each person's location at the time of this project. (R) (1=in the same function in this office; 2=in the same function but in a different office; 3=in a different function but in this office; 4=in a different function and in a different office; 5=outside the company)

Physical Proximity

Please indicate each person's physical proximity to you at the time of this project. (R) (1=worked immediately next to me; 2=same floor and same hallway; 3=same floor but different hallway; 4=different floor; 5=different building; 6=different city; 7=different country)

Hierarchical Level

Please indicate each person's hierarchical level relative to your own at the time of this

project. (1=two or more levels below mine; 2=one level below mine; 3=equal to mine; 4=one level above mine; 5=two or more levels above mine; 6=does not apply)

Receiver's Expertise

Prior to seeking information/advice from this person on this project, (1) I had a full understanding of the subject matter in which I turned to this person, (2) I didn't have adequate expertise to feel comfortable with the subject matter about which I turned to this person (R), (3) was confident in my ability to perform successfully all the activities myself in the subject matter about which I turned to this person. (1=strongly disagree; [etc.]; 7=strongly agree)

Friendship

Prior to seeking information/advice from this person on this project, (1) I would have felt awkward talking to this person about a non-work related problem (R), (2) I knew this person well outside of work-related areas. (1=strongly disagree; [etc.]; 7=strongly agree)

Openness

Prior to seeking information/advice from this person on this project, I assumed that (1) this person would generally tell me what was on his or her mind, (2) , in general, this person would share his or her thoughts with me, (3) this person would generally tell me what he or she was thinking. (1=strongly disagree; [etc.]; 7=strongly agree)

Availability

Prior to seeking information/advice from this person on this project, I assumed that (1) it would generally be hard for me to get in touch with this person (R), (2) in general I could find this person if I wanted to talk to him or her, (3) he or she would usually be around if I were to need him or her. (1=strongly disagree; [etc.]; 7=strongly agree)