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Friendship and Advice Networks in the Context of Changing Professional Values

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In this article, I discuss the attributes of friendship and advice networks and hypothesize about their roles in maintaining and changing professional values. Advice networks sustain existing professional values in organizations. They are less likely to transmit new values because advice relations reflect current practice and may be negatively affected by changing values. Friendships rest on intimacy and trust rather than on existing task structures, so they can facilitate the development of new professional values without negatively affecting the friendship network. A longitudinal study of networks and teaching values in four public schools documented an initial alignment of advisors' and advisees' teaching values, followed by transmission of new teaching values through the friendship network. Changing professional values altered the advice network but did not affect the friendship network.●

In one of the earliest treatises on social influence, French (1956) proposed using social network analysis to predict changes in attitudes. He asserted that the attitudes of less powerful individuals shift toward the attitudes of their more powerful social contacts at a rate proportional to the discrepancy between their attitudes. Because social influence is presumed to occur simultaneously throughout a social system, this model predicts eventual consensus. Subsequent work (e.g., DeGroot, 1974; Salancik and Pfeffer, 1978; Carley, 1991) leads to the same conclusion: when all members of a social system are included in a network of social relations, their attitudes will converge.

In organizations, people develop attitudes about their jobs, including beliefs about what is important, what procedures are better or more effective, and what is ethically appropriate or desirable. Such attitudes, when they form among professionals regarding work-related processes and goals, constitute professional values. Evolving environments, new technologies, and innovative approaches to work can introduce new ideas that may lead to changing professional values within established organizations and industries. Such adjustments to professional values are ongoing in fields as disparate as engineering (Shuster, 2002) and health care (Reiser and Banner, 2003). As new ideas arise, informal networks carry information among professionals in organizations, with potential to influence change in professional values.

Despite evidence that social systems tend toward consensus, we observe discrepancies among individuals' values in organizations (e.g., Werner, Carmel, and Ziedenberg, 2004). This raises two related questions. First, which informal social forces support convergence and which foster divergence from established professional values? Second, as professional values change, how does this influence existing social networks? These questions pertain to processes that affect an organization's cultural diversity, acceptance of new approaches to work, and social structures over time. The answers will advance our understanding of the roles and stability of distinct social networks in organizations. By discerning which relations tend to reinforce existing values and which relations encourage changes in those values, we will be better able to

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predict and design organizational change. By understanding how shifting values are likely to affect informal networks, we will be more sensitive to the social concerns of organization members during change processes.

Two types of relations commonly occur in organizations: the relation between friends and the relation between advisor and advisee. Taken together, the collection of such relations in an organization forms its friendship network and its advice network. These interlaced social networks reflect distinct patterns of interaction that can exercise different kinds of social influence. Although they frequently overlap in organizations (Ibarra, 1992), friendship and advice networks perform distinct functions. Friendship has been linked with organizational commitment (Morrison, 2002), resource sharing during crisis (Krackhardt and Stern, 1988), and career-related decision making (Kilduff, 1990; Krackhardt, 1992). It enables coworkers to discuss sensitive issues that they would not share with non-friends (Sias and Cahill, 1998), and it supports organizational subcultures (Krackhardt and Kilduff, 1990). In contrast, advice networks are closely related to organizational power (Brass, 1992; Ibarra and Andrews, 1993). They influence work-related knowledge (Morrison, 2002), job performance (Sparrowe et al., 2001), student performance (Baldwin, Bedell, and Johnson, 1997), and self-efficacy and attitudes toward technology (Burkhardt, 1994). People discuss work problems with coworkers, but they seek counseling and companionship from friends (Fischer, 1982). Task-oriented relations and friendship play discrete roles in terms of mobility at work (Podolny and Baron, 1997), and people replace lost advisors more quickly than they adopt new friends (Shah, 2000). These distinctions in function reflect intrinsic differences in the nature of the relations themselves.

In this article, I discuss the attributes of friendship and advice networks and hypothesize about their relations with changing professional values. Both networks distribute ideas, but neither is likely to facilitate discussions that threaten the defining relation. Work-related information transfer defines the advice network, so it provides channels to coordinate existing activities and reinforce organizational norms. This controlling function of the advice network should enhance organizational stability, but it may inhibit change. In contrast, positive affect, intimacy, and trust define the friendship network. These characteristics enable open communication that can change people's beliefs. As professional beliefs diverge in some dyads and converge in others, the advice network is more likely than the friendship network to experience change.

SOCIAL NETWORKS AND CHANGING PROFESSIONAL VALUES

Friendship Networks

Friendship, which often begins with attraction to similar others (Verbrugge, 1977; Carley, 1991), develops over time through shared experiences, frequent interaction, and growing affection (Krackhardt, 1992). It is voluntary, egalitarian, trusting, and enduring (Bell, 1981). Friendship enhances cooperation and open communication (Jehn and Shah, 1996), possibly because of the emotional attachment (Brass, 1992)

and intimacy (Wiseman, 1986) that are intrinsic to the relation. Altruism, which has been defined as "social behavior carried out to achieve positive outcomes for another rather than for the self" (Rushton, 1980: 8), is more likely to occur between close friends than in other non-kin relations (Ma, 1985). Positive emotional ties and expectations that others will behave altruistically both increase trust (McAllister, 1995; Rempel, Holmes, and Zanna, 1985), which is a primary attribute of friendship (Bell, 1981). Combining many of these characteristics, Greeley (1971) defined friendship as a trust-based exchange relation in which we give ourselves to induce the other person to do the same.

Trust has been defined as "the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party" (Mayer, Davis, and Schoorman, 1995: 712). Trust is multidimensional and has been studied from various angles, but a consistent distinction has been made between affect-based and cognition-based trust. Cognition-based trust results from estimates of a partner's likely behavior under particular circumstances, but affect-based trust results from positive perceptions about partners' motives (McAllister, 1995). According to Lewis and Weigert (1985), affect-based trust tends to be more enduring than cognition-based trust. Further, affect-based trust applies across situations, while cognition-based trust applies to relatively specific behaviors. Friendship often includes foundations for cognition-based trust in the form of an interaction history and social similarity, but these are not specific to this relation. It is the affect-based trust, tied to beliefs about mutual altruism between friends, that creates a safe environment for sharing ideas that make one vulnerable to the actions of another. This same tendency to place faith in friends' good intentions probably increases willingness to consider their suggestions.

By creating generalized trust, friendship enables people to risk vulnerability to each other across a broad spectrum of circumstances. A trusting relation fosters joint efforts (Gambetta, 1988) and influences the kinds of information that people are willing to share (Hosmer, 1995; Lewis and Weigert, 1985). Trust supports negotiations (Bazerman, 1994) and organizational change (Scott, 1980; Lawler, 1992), and it leads to risk taking in relationships (Mayer, Davis, and Schoorman, 1995). Generalized trust in one's partner becomes increasingly important under conditions of greater uncertainty, so friendship is likely to be the relation of choice for discussing untested or controversial ideas at work.

Friendship's other attributes, including intimate communication, perceived social similarity, expectations of altruistic behavior, and stability, strengthen the potential for professional values to develop between friends. Intimacy between friends creates shared understandings, clear communication, and acceptance of partners' viewpoints. Friends' social similarities, both real and perceived, further enhance the development of beliefs through comparison and imitation (Erickson, 1988). Altruism between friends supports expectations that

novel ideas come with good intentions, and the stability of the relationship provides a safe venue for mutually exploring unproven thoughts. Because friendship is based on personal attraction and mutual positive affect, changes in professional ideas or practices are not threatening to the relationship. This unique combination of attributes enables friendship to support the creation or expansion of professional beliefs and values.

Advice Networks

An organization's internal network of professional advice relations develops over time as people seek information, advice, and opportunities for problem solving among their colleagues. Social interactions may be fostered at first by proximity (Festinger, Schachter, and Back, 1950; Shaw, 1981), similarity between tasks (Carley, 1991), or by formal lines of communication (Brass, 1992). People whose expertise is valued by others accumulate advice relations and become more central in the advice network, as do those who coordinate organizational tasks. Higher-status members of an organization are also likely to become central because they will receive greater amounts of communication (Berelson and Steiner, 1964).

Repeated interactions linger in the minds of participants (Freeman, Romney, and Freeman, 1987), creating patterns of exchange and dependency. Those patterns define each advisory relation and the roles of both parties to the relationship. Experience may build cognition-based trust in an advisor's competence or willingness to help with job-related issues. Yet, unless the participants become friends, conversations are likely to remain bounded by caution (Sias and Cahill, 1998), and generalized trust is unlikely to develop (Lewis and Weigert, 1985). If the nature or perceived value of the interactions changes, one may expect parallel shifts in the relationships.

Although advice networks form around the transfer of information, they can operate as devices for control over systemwide information flow. Because the advice network mirrors existing dependencies, task distributions, and formal communication demands, future transactions should likewise reflect those structures. Just as precise and rigid job descriptions inhibit innovation by individuals (Kanter, 1983), a stable advice network may limit the transfer of innovation between individuals. For example, dissemination of job-related knowledge or norms is compatible with an advice network, so we can expect these to transfer through advice relations. Information that falls outside customary communications or introduces controversy may be less likely to travel through the advice network.

Those who have power seldom seek to alter structures that support their positions in the organization (Donaldson, 1990), and constituencies that stand to lose power will actively resist change (Kanter, Stein, and Jick, 1992). Position within an advice network is closely related to power in the organization (Brass, 1984; Krackhardt, 1990). An advisor retains power and influence as long as advisees perceive the benefits obtained through this relation to be greater than those

that might be obtained through alternative advisory relations (Thibaut and Kelley, 1986). In resource dependence terms, the power held by an advisor is directly related to the perceived criticality of his or her advice. New professional values can make old expertise seem less critical, thus reducing the power of existing advisors while indicating alternative types of information that could provide greater utility for advisees. Such changes endanger the positions of dominant players and the structure of the network itself, making the advice network unlikely to promote the redefinition of professional values.

As professional values shift, the perceived usefulness of another's information or expertise is likely to depend on the increasing or decreasing alignment of values. Diverging values indicate divergence in types of information that are wanted. Converging values indicate convergence in types of information that are wanted. As people seek to maximize the utility of their advice relations, they can be expected to seek less advice from those having divergent values and more advice from those having convergent values. Over time, this process changes the nature and extent of the advice relationships.

Same People, Different Influences on Change

Friendship and advice networks emerge through different kinds of interactions, represent dissimilar relations, and serve diverse purposes, yet these networks overlap in an organization because many of the same people participate in both. Coworker relations sometimes develop into friendship, introducing tensions related to maintaining both types of relations (Bridge and Baxter, 1992). As friendship deepens, the coworkers relax. Their tendency to discuss work-related problems increases, as does the breadth of their discussions (Sias and Cahill, 1998). Relation-based shifts in discussion topics indicate that differences in social influence through advice or friendship networks depend on the type of relation and its role in the social system, not on the particular individuals. Although members of an organization generally participate in both networks, fundamental differences in the networks affect their propensities for changing professional values as well as their responses to value divergence or convergence.

Propositions

Simultaneous operation of friendship and advice networks implies concurrent, but not necessarily congruent, social influence. The advice network arises through transmission of job-related information, so it may encourage task-oriented and norm-supporting interactions that lend stability to the organization. Advice relations probably promote entrenched organizational values, and they could be endangered by changes in alignment of advisors' and advisees' professional values. Friendship includes intimacy, emotional commitment, and personal trust that advisory relations lack. In new or changing situations, the friendship network provides comfortable opportunities to discuss uncertainties and concerns with peers. It has the potential to create divergence from established norms and practices by carrying novel beliefs from

friend to friend. Friendship ties are stable, enduring, and more difficult to replace than are advice relations (Shah, 2000). Although friendships might be threatened by divergence in some personal values, they are unlikely to be threatened by divergence of professional values.

In accordance with the nature and construction of the two network types, friendship should act as a catalyst for change amid forces in the advice network toward inertia. Changes in professional beliefs and values should then change the advice network without significantly altering the friendship network. These premises are expressed in the following propositions:

Proposition 1: Existing advice networks will support alignment of professional values with the status quo.

Proposition 2: Existing advice networks will not promote changes in professional values.

Proposition 3: Friendship networks will support change in professional values by facilitating discussion and exchange of novel ideas.

Proposition 4: Convergence of professional values between advisor and advisee strengthens the advisory relation; divergence of professional values diminishes the advisory relation.

Proposition 5: Convergence or divergence of professional values between friends is unlikely to affect the friendship relation significantly.

The above propositions were used as the basis for hypothesizing about social networks and changing professional values in a study of four public schools whose professionals were recently introduced to problem-based learning, an innovation that required a change in values about teaching.

Changing Professional Values

Problem-based learning differs from other teaching innovations by introducing an entirely new philosophy of teaching, not just a set of skills or techniques that might be added to a teacher's pedagogical toolbox. It requires teachers to drastically change the way they view their profession and their jobs. As the name implies, problem-based learning relies on definition, diagnosis, and solution of complex problems by self-directed learners.

Advocates of problem-based learning believe that it creates foundational thinking skills that traditional methods fail to develop. Objectives include complex problem solving, critical reasoning, and the ability to synthesize information from various sources and formats. Problem-based learning opposes the use of lectures, memorization of facts, explicit homework assignments, and paper-and-pencil tests. Hands-on research and oral presentation of project results are crucial aspects of the approach. A typical problem-based learning test involves handing a team of students a complex problem and turning them loose to solve it. Assessments include the processes used, the variety of information accessed, incorporation of multiple viewpoints or data sources, quality/feasibility of solutions, and communication of the solutions to the relevant audience.

The doctrine associated with problem-based learning requires teachers to abandon many prior beliefs about teaching and to adopt new and very different values. Rather than seeing themselves as directors of students' learning, problem-based learning teachers become coaches and assistants to their students. In contrast to standard practice, they provide no information or training at the beginning of a unit. Instead, the problem-based-learning teacher presents an ill-defined, multifaceted problem to the students and allows them to define it, gather relevant information, explore options, and propose solutions. Throughout this process, the teacher avoids lectures and resists the temptation to put students "back on track" if they seem to be straying. While a traditional teacher might outline best practices for completion of a project, a problem-based learning teacher allows the students to struggle with the task and learn from their own mistakes. When students ask a traditional teacher how to solve a problem, the teacher may give hints or demonstrate the necessary steps. The problem-based learning teacher responds by asking students where they might find the answers.

To design a problem (unit of study), teachers map related concepts and issues that define a problem space. An effective problem integrates multiple subjects and can be given to students with minimal explicit direction. The teacher works behind the scenes to coordinate necessary field trips, facilitate access to relevant information, and enable students to discover what they need to know. Lecture is forbidden, as is structuring the problem for students. The method is difficult to master, and proponents argue that partial application defeats the purpose. Problem-based learning challenges many established teaching norms, and it tends to be controversial.

In this study, I observed the roles of friendship and advice networks in the transmission of professional values that differentiate problem-based learning (PBL) from traditional teaching methods. For the purposes of this examination, I defined professional values among educators as each individual's appraisal of what is or is not important for teaching and/or learning. Social influence through an advice network is here defined as the collective values of each person's advisors, with greater potential influence occurring through frequent-advice relations than through occasional-advice relations. Social influence through a friendship network is here defined as the collective values of each person's friends, with greater potential influence occurring through close friendships than through casual friendships.

Advice relations should transmit and maintain the existing values of the organization. If proposition 1 is correct, the professional values of advisors will generally be reflected in the professional values of advisees. Therefore, when PBL had only recently been introduced, and there had been limited time for informal discussion or decision making about its tenets, the relevant values of advisors should have predicted the values of advisees:

Hypothesis 1a: The PBL-related values of advisors will predict simultaneous PBL-related values of advisees shortly after the introduction of the innovation to an organization.

Although support for H1a would lend credence to the theory presented here, it would not indicate whether the advice network is primary in supporting entrenched values. A strong test of the theory requires that the effects of advisory relations be distinguishable from the effects of friendship relations. If advice networks are more influential in maintaining existing professional values than are friendship networks, we should find that friends' values are less predictive than advisors' values during periods when values are not changing:

Hypothesis 1b: Friends' PBL-related values will be less predictive of individuals' PBL-related values than will advisors' PBL-related values shortly after the introduction of PBL to the organizations.

In contrast to established professional values, new ideas are likely to travel through a friendship network. If proposition 3 is correct, friendship networks will transmit changes in professional values following the introduction of PBL:

Hypothesis 2a: The PBL-related values of an individual's friends shortly after the introduction of PBL will predict changes in that individual's professional values a year later.

Because current advice relations have been built around the issues and values that were most critical in the past, this network may be less suitable for the discussion of discrepant ideas. If power-based theories of interpersonal influence (e.g., French, 1956) are correct, and attitudes held by more-powerful people transfer without qualification to their partners, the problem-based learning values of advisors will cause changes in advisees' professional values. In contrast, if proposition 2 is correct, advice networks will be less supportive of change than will the friendship networks:

Hypothesis 2b: The initial PBL-related values of an individual's friends will have a stronger positive effect than will advisors' values on changes in that individual's professional values a year later.

Because the alignment of professional values is particularly relevant to the advisory relation, convergence or divergence of professional values has the potential to influence subsequent advice relations. If proposition 4 is correct, people will seek less advice from those whose professional values are diverging from their own and seek more advice from those whose values are converging with their own:

Hypothesis 3: Changes in the extent to which PBL-related values correlate between persons will positively influence advisory relations.

Although similarity of values can influence friendship, the relation's broad base should minimize the effect of professional beliefs on the overall relationship. If proposition 5 is correct, changes in the extent to which PBL-related values correlate between persons will not significantly influence friendship relations.

RESEARCH DESIGN AND METHODS

The hypotheses were tested in four public schools over a period of one year. Two of the schools were part of a county-wide district in which administrators had begun to support new approaches to education. The other two had innovative principals who wanted to make new ideas and techniques available to their teachers. All four schools had recently been introduced to problem-based learning through training opportunities coordinated by a state-run organization in the American Midwest.

The sample of people I surveyed included all "certificated" professionals from three high schools and one elementary school. Certificated professionals include teachers, librarians, counselors, and administrators who hold certificates issued by state agencies as indicators of professional qualification for positions in public schools. The first organization, which I will call BlueCollar High School, served a largely blue-collar and farming community. The focus of this West Coast school was to provide job training for teenagers who would enter a trade. The second site, which I will call SmallTown High School, was one of two public high schools in a small town. The focus of this West Coast organization was generally academic. At the time of the study, SmallTown was recovering from internal political skirmishes while competing for resources with the other high school. The third site, which I will call Resort High School, was located in a peaceful resort area. The focus of this midwestern organization was to provide a variety of academic and practical learning opportunities. At the time of the study, plans were underway for refurbishing its large facilities. The final site, which I will call BigCity Elementary, was located in an upscale neighborhood of a large midwestern city. The focus of this organization was on developing foundational skills and thinking processes. Unlike the other schools, where department heads held permanent positions, leadership at this site rotated among the largely female faculty. In all of the schools, questionnaires were used to measure networks and professional values at two points in time.

Survey Procedure and Responses

A pilot survey was sent to all of the certificated professionals at BlueCollar (N = 34). Twenty-nine of these were completed and returned. Based on respondents' comments about the survey, one minor addition was made to the instructions for one question, but no content changes were deemed to be necessary. Therefore, the pilot survey results were included in the study. Questionnaires were then distributed to all of the certificated people at each site. At three of the schools, data collection was coordinated through administrators. At SmallTown, a county-level administrator arranged a faculty meeting at which the surveys were distributed by a teacher, who also collected completed surveys. Of the 246 certificated professionals surveyed, 207 individuals completed and returned their questionnaires, producing an overall response rate of 84 percent. BlueCollar, used to pilot the questionnaire, returned 85 percent (29 out of 34) of the surveys. SmallTown returned 94 percent (64 out of 68), Resort returned 75 per-

cent (85 out of 113), and BigCity returned 94 percent (29 out of 31). On average, respondents had 17.8 years of teaching experience, were 43 years of age, and had obtained a Master's degree; 50.2 percent of the respondents were female, but the proportion varied significantly across organizations.

One year later, I conducted a follow-up survey in these organizations. Administrators again distributed and collected individually addressed and sealed questionnaires at BlueCollar, Resort, and BigCity, and the same teacher coordinated the survey at SmallTown. Of the initial 207 respondents, 126 completed surveys at Time 2, for an overall retention rate of 61 percent. BlueCollar returned 34 percent (10 out of 29), SmallTown returned 66 percent (42 out of 64), Resort returned 65 percent (55 out of 85), and BigCity returned 66 percent (19 out of 29). The Time 1 personal information for the reduced sample was similar to that of the entire sample. On average, people who completed surveys at both time periods had 18.5 years of teaching experience, were 44 years of age, and had obtained a Master's degree at Time 1; 53.6 percent of them were male. In addition, 14 new people completed and returned questionnaires, but their data were not used in this study. Organizational attributes and response rates for each school are summarized in table 1.

Measures

The initial questionnaire combined structured and open questions to measure respondents' perceptions about their profession, organization, advice and friendship networks, and teaching practices. The front of the survey presented a teaching values index designed to span the ideological space addressed by problem-based learning, with particular focus on the points where it deviates from traditional approaches and values. Subsequent pages measured PBL know-how, friendships, advice relations, sources of PBL information, and demographics. The Time 2 questionnaire re-measured teaching values and the friendship and advice networks.

Friendship network. For the purposes of this study, a friend is someone whom the individual identifies as such. Friend-

Table 1

Attributes of Research Sites

Attribute	BlueCollar	SmallTown	Resort	BigCity
Location	Western U.S.	Western U.S.	Midwest, U.S.	Midwest, U.S.
School type	High school	High school	High school	Elementary
Number surveyed	34	68	113	31
Time 1 survey				
Respondents	29	64	85	29
Response rate	85%	94%	75%	94%
T1–T2 retention*				
Respondents, T1 & T2	10	42	55	19
T1–T2 retention rate	34%	66%	65%	66%
Network densities†				
Friendship	.24	.29	.18	.34
Advice	.14	.11	.07	.23
Percent women, Time 1	50.0%	31.8%	50.6%	89.7%

* Several people had left each organization during the intervening year. Newcomers were surveyed at Time 2, but their data are not included in the current analyses.
† Network densities were calculated using Time 1 relations that were confirmed by both parties.

ship can involve varying intensities of attachment, or tie strength, so respondents were asked to "indicate the extent to which you consider each person a friend." Names of all professional members of the organization were listed on the survey. Possible responses included "prefer not to interact" (N), "no relation" (0), "casual friend" (1), and "close friend" (2). These items provided data on the perceived closeness of the relation, which was expected to affect the amount of social influence transmitted through the relationship. Each respondent was also asked to report "the extent to which each person whom you know considers you a friend." To minimize missing data in the friendship matrix, I used this information (aggregated from all responses to this question) to represent the relations of ten respondents who declined to answer the friendship question. I combined individual responses to represent the friendship network within each school. The vector of the respondent's relation with each other person became a $1 \times n$ row in the $n \times n$ matrix representing the entire friendship network. Each cell of the matrix contains either a –1 (prefer not to interact), a 0 (no relation), a 1 (casual friend), or a 2 (close friend). The intersection of two non-respondents was marked as "missing." The same procedure was repeated at Time 2. Directed, weighted relations, as reported by the respondents, were used for all analyses. This approach allows each person to define his or her own relationships, which is particularly important given that I was testing the effects of relation types on acceptance of others' values and subsequent friendship choices. Each person's set of friends forms his or her friendship ego network.

Advice network. For the purposes of this study, an advisor is defined as someone to whom another person claims to go for advice. Advice relations can be directed, meaning that one person habitually approaches the other for information, and they can be enacted with varying frequencies, which indicates tie strength. I measured the advice network by asking each member to indicate beside every name "how often you go to that person to discuss work-related issues or to obtain advice." Possible responses included "prefer not to" (N), "no advice seeking" (0), "occasionally, generally more than once per month" (1), or "frequently, generally more than once per week" (2). Perceived frequency of advice-seeking was expected to affect the amount of social influence transmitted through the relationship. Each respondent was also asked to indicate "how often each person comes to you to discuss work-related issues or to obtain advice." To minimize missing data in the advice matrix, I used this information to represent the advice-seeking behaviors of six people who declined to answer the advice question and to complete information about a seventh who stopped halfway through the advice network question. The vector of the respondent's relation with each potential advisor became a $1 \times n$ row in the $n \times n$ matrix representing the entire advice network. Each cell of the matrix contains either –1 (prefer not to), 0 (no advice relation), 1 (seek advice occasionally), or 2 (seek advice frequently). The intersection of two non-respondents was marked as "missing." The same procedure was repeated at Time 2. To best reflect each person's perceptions, I used directed, weighted relations, as reported by the respon-

dents, for all analyses. Each person's set of advisors forms his or her advice ego network. A few people chose both N and a number to represent an advice relation. Because N represents preference not to seek advice, and a number indicates interaction, the advice network includes the N as a –1, but the reported interaction is included in the ego network.

Teaching values. The index of teaching values was written in collaboration with the person who designed the problem-based learning training program for these schools. He included a range of teaching practices that are supported or contested by key PBL beliefs. In contrast with a single-construct scale, this index yields a ratio measure of a multifaceted value system. The questions began with "Educators use many different approaches and have many different teaching objectives. How important to you are the following aspects of teaching?" Items included "Lectures," "Interdisciplinary approach," "Student-directed learning," "Teacher-directed lessons," and eight others. Each item was followed by a 1–7 scale ranging from "not at all important" to "extremely important." Items that conflict with PBL principles were reverse-scored, and the average value of all items became each respondent's "PBL-values" score. The index was administered again in the survey at Time 2.

Values held in ego networks. The weighted ego network (including values of 0, 1, and 2 to represent levels of interaction) was multiplied times the vector of others' PBL-values scores. This vector was then divided by the row sums to produce standardized scores for each individual's network of friends or advisors. Similar procedures have been used in prior studies of social influences (e.g., Krackhardt and Porter, 1986). The score for the advice network represents the average values of one's advisors at Time 1, weighted by tie strength. Similarly, the score for the friendship network represents the average values of one's friends at Time 1, weighted by tie strength. This method relies on firsthand information from many people to produce a weighted average of PBL values within one's personal friendship and advice networks. I used this measure to test network effects on individuals.

Pairwise convergence or divergence of values. I measured convergence or divergence of values within pairs by correlating each person's answers to the twelve values questions with each other person's answers in each organization. Time 2 correlation minus Time 1 correlation represented the change in values correlation. A positive number indicates convergence; a negative number indicates divergence.

Control variables. I measured several organizational variables, such as size, network densities, and organizational gender composition as potential controls in regressions testing effects on individuals' values at all four schools. I included each individual's score on a test of PBL know-how as a control variable because I expected it to influence related values. The 16-item index, written in collaboration with the change agent who adapted PBL as a teaching method for use in these schools, asked respondents about basic aspects of problem-based learning. I measured gender, age, level of education, and tenure with single open questions at the end

of the Time 1 survey. To predict network changes within each school, I also measured the transfer of information about PBL at the end of the survey. The survey asked respondents to identify people who had given them information about PBL and those to whom they had given information about PBL by circling 1 (at least once), 2 (occasionally, generally more than once per month), or 3 (frequently, generally more than once per week) beside the others' names on the list provided.

Analysis

I tested the effects of advice and friendship ego networks on individuals' professional values at both times using OLS regression. To test whether advice and friendship differed significantly in their effects on values, I used the method prescribed by Cohen et al. (2003, appendix 2) for comparing beta coefficients from the same sample. This procedure determines significance in the difference between effect sizes, taking into account the correlation between predictor variables as well as the relationship between each variable and the dependent variable. I used weighted, directed, self-reported relations to capture everyone's perceptions about the nature and intensity of his or her relations.[1]

I tested the effects of shifting values on the advice and friendship networks at the dyadic level. First, I compared relationship changes in pairs whose values converged with relationship changes in pairs whose values diverged during the year in each organization. I defined convergence as a positive change in correlation of values between Time 1 and Time 2, divergence as a negative change in correlation of values between Time 1 and Time 2, and zero change as neither convergence nor divergence. I then compared weighted means across organizations using t-tests to determine, for both the advice and friendship networks, whether convergence versus divergence of professional values resulted in significantly different relationship changes. To further examine the effects of relative change in values on the advice and friendship networks, I used the Quadratic Assignment Procedure (QAP) correlation and multiple regression (MRQAP) functions in Ucinet 5.0 (Borgatti, Everett, and Freeman, 1999). QAP determines the significance of relations between matrix variables by calculating the correlation coefficient, permuting the rows and columns of one matrix, storing the correlation coefficient, and permuting them again. The distribution of the stored correlation coefficients indicates the significance level of the observed correlation. For example, if 1 percent of the permutations yield a greater correlation than what was observed, it is considered to be significant at the .01 level. MRQAP uses a similar procedure to obtain *p*-values for each coefficient and for the overall regression model. The *p*-value for the model indicates the proportion of chance models that produced a better fit. Although R^2 is calculated during this process, it cannot be interpreted as in OLS regression because the structure of network data limits the possible correlations (Krackhardt, 1988). Further, equivalent correlation values may not be equally significant. The statistic of primary interest in these non-parametric tests is the *p*-value. To determine whether the overall results supported the predictions, I used the meta-analytic procedure outlined by Krackhardt and Kil-

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Because some researchers prefer to represent relations at the minimum level reported by each member of the dyad, I also tested such confirmed relations. Results remained consistent with those reported here, but the restriction on perceived strong ties slightly reduced the significance of some variables.

duff (1999). This procedure requires conversion of *p*-values into *z*-scores, which are then averaged across the four organizations and divided by their standard error. The *p*-value that corresponds to the overall *z*-score indicates significance of results across all of the independent samples.

RESULTS

Preliminary Analyses

The correlation between the controls for organization size and network density was high ($r = -.88$, $p < .001$ for the advice network; $r = -.83$, $p < .001$ for the friendship network). Therefore, I included indicators for each organization, rather than separate variables for school size and network densities, in the regressions to control for differences across organizations. PBL know-how items, included with values items in a factor analysis, all loaded onto one factor. PBL know-how correlated with PBL values ($r = .467$, $p < .001$ at Time 1), so it was retained as a control variable, but it also correlated with PBL values among individuals' advisors ($r = .345$, $p < .001$ at Time 1) and friends ($r = .288$, $p < .001$ at Time 1), possibly reflecting social influences on know-how. Although some individual difference variables correlated modestly with PBL values, none remained significant when entered into the regression equations. Therefore, none were retained in the models presented below.

The teaching-values index demonstrated acceptable reliability as a measure of professional values alignment with problem-based learning (Cronbach's alpha equals .74 at Time 1 and .79 at Time 2). Principal components analysis revealed three subcomponents at each time period. Factor 1 indicates belief in situated learning that includes interdisciplinary study and student-led inquiry. These are concepts that problem-based learning promotes. Factor 2 indicates belief in teacher-directed activities, including lectures, drills, and tests. These are traditional practices that PBL explicitly opposes. Factor 3 includes items that align with PBL principles, as well as negative relations with values opposed by PBL (lectures at Time 1, drill at Time 2). Loadings at Time 1 ranged from .46 to .81. At Time 2, loadings ranged from .57 to .78. Cronbach's alpha for the PBL know-how index in the longitudinal dataset was .95. Principal components analysis revealed a single-factor structure for this index.

The friendship and advice networks overlapped significantly in all organizations. The correlation between the weighted friendship and advice networks ranged from .37 to .53 at Time 1 and from .42 to .55 at Time 2. Dichotomizing the networks with a cutoff between 0 and 1 to represent the presence or absence of a relationship yields correlations ranging from .36 to .50 at Time 1 and from .41 to .60 at Time 2. To test the feasibility of using others' reports about relationships to fill in missing data, I transposed the matrix of reported incoming relations (extent to which each person comes to me) and correlated it with the matrix of outgoing relations (extent to which I go to each person) for each network in every school at each time. This compares what each person said the other believes about the relation with what the other person actually said. These correlations were significant in all

networks in all organizations ($p < .001$ for all, except BlueCollar Time 1 friendship $p = .002$).

Predicting Individuals' Initial Values

Correlations among the variables are presented in table 2. Hypothesis 1a, that the PBL values of advisors would predict individuals' concurrent values, was tested with multiple regression analysis. As expected, the social influences were significantly correlated with each other ($r = .835$, $p < .001$) and with individuals' values (advice $r = .557$, $p < .001$; friendship $r = .552$, $p < .001$). Regression results are presented in table 3. Reported models exclude cases in which any data were missing.

Model 1 includes only the control variables to predict individuals' values. PBL know-how was a positive, significant predictor, as were the indicator variables for Resort and BigCity.

Table 2

Means, Standard Deviations, and Correlations among Ego-centered Variables

Variable	Mean	S.D.	1	2	3	4
1. Individual PBL values (Time 1, N = 125)	4.704	.682				
2. Friendship ego network PBL values (Time 1, N = 126)*	4.719	.382	.552			
3. Advice ego network PBL values (Time 1, N = 126)*	4.783	.430	.557	.835		
4. Individual PBL know-how (Time 1, N = 102)	4.705	.682	.467	.288	.345	
5. Individual PBL values (Time 2, N = 124)	4.676	.714	.790	.593	.572	.468

* The Time 1 ego-network PBL values variables consist of values reported by members of individuals' personal networks in the Time 1 (N = 207) data. Each focal person's self-reported relations were multiplied by all others' PBL values scores, then divided by the sum of self-reported ties. The means presented here are weighted averages of all ego-network values scores, including people who did not complete a survey at Time 2.

Table 3

Results of Regressions Predicting Individuals' PBL Values, Time 1*

Variable	Model 1	Model 2	Model 3	Model 4	Model 5†
Social influences					
Advice network		.536••		.470•	.581•
PBL values		(3.06)		(2.29)	(2.07)
Friendship network			.379•	.127	.145
PBL values			(2.09)	(.60)	(.62)
Control variables					
Individual					
PBL know-how	.398•••	.352•••	.388•••	.354•••	.343•••
	(6.08)	(5.37)	(5.98)	(5.39)	(4.04)
Organizational					
SmallTown	–.036	–.053	–.052	–.056	.421
	(–.24)	(–.37)	(–.36)	(–.39)	(1.82)
Resort	–.373••	–.243	–.298	–.234	.258
	(–2.64)	(–1.69)	(–2.07)	(–1.61)	(1.08)
BigCity	.434••	.0003	.159•	–.039	.373
	(2.70)	(.00)	(.77)	(–.18)	(1.31)
R-squared	.386•••	.420•••	.402•••	.422•••	.475•••
F (equation)	24.63	22.63	21.00	18.85	14.34
D.f.	(4,157)	(5,156)	(5,156)	(6,155)	(6,95)

• $p < .05$; •• $p < .01$; ••• $p < .001$.
* Non-standardized regression coefficients are reported. T-ratios are reported in parentheses.
† Model 5 reestimates the complete model, using only data from people who subsequently responded at Time 2.

Model 2 adds the advice-network impact, which was positive and significant; and model 3 includes controls plus the friendship impact, which was also positive and significant. Because the goal was to discern the network effects, I then entered friendship and advice network values simultaneously in the regression equation. This diminishes the potential significance levels for each variable, but it also partials out the overlapping effects and shows the unique contributions from each network. Model 4 includes the control variables and social-network impacts on individuals' values. When the effects of systemwide variance and know-how are controlled, the effect of the friendship network becomes non-significant, but the effect of the advice network remains ($p < .05$). These results support H1a: the professional values of advisors predicted individuals' values shortly following the introduction of the innovation. The professional values of friends did not significantly predict individuals' values at this time. To test hypothesis 1b, that advisors' values would be more influential than friends' values at Time 1, I ran model 4 with standardized (beta) coefficients and compared the coefficients of the two variables. Advice effects ($\beta = .310$) significantly exceeded friendship effects ($\beta = .074$), $t(155) = 3.695$, supporting hypothesis 1b.

As previously reported, 61 percent of the respondents at Time 1 remained in the study at Time 2. Because hypotheses 2a and 2b concern changes over time, it was important to be sure that the reduced sample was not different in the areas of interest. Therefore, the complete model testing hypothesis 1 was rerun using only data from people who remained in the study the following year. Regression analysis using this restricted dataset leads to the same conclusion (see model 5). I retested hypothesis 1b by comparing the standardized (beta) coefficients of the two variables in the restricted dataset. Advice effects ($\beta = .378$) significantly exceeded friendship effects ($\beta = .091$), $t(95) = 3.698$, again supporting hypothesis 1b.

Predicting Changes in Professional Values across Time

As shown in table 2, the correlation between friends' values and subsequent individual values at Time 2 was high ($r = .593$, $p < .001$), as was the correlation between advisors' values and subsequent individual values ($r = .572$, $p < .001$). Hypothesis 2a, that values of friends would predict change, was tested by partialling out the variance due to one's own prior values when predicting values a year later. Regression results are provided in table 4.

Model 1 includes only control variables and individuals' prior PBL values. Model 2 includes controls plus advice impacts (from Time 1), and model 3 includes controls plus friendship impacts (from Time 1). Entered separately, each social influence has a significant effect. Model 4 includes prior values, control variables, and both social influences. The organizational control variables have negative coefficients and are significant predictors. This indicates that BlueCollar, the standard against which these are compared, shifted farther toward PBL values than did the others. The null effect of PBL know-how suggests that its effect was absorbed in the initial val-

Table 4

Results of Regressions Predicting Individuals' PBL Values, Time 2*

Variable	Model 1	Model 2	Model 3	Model 4
Social influences				
Advice network		.370•		.097
PBL values (T1)		(2.03)		(.45)
Friendship network			.435••	.390•
PBL values (T1)			(3.01)	(2.21)
Control variables				
Individual				
PBL know-how (T1)	.070	.066	.067	.066
	(.98)	(.93)	(.98)	(.96)
Prior PBL values (T1)	.700•••	.653•••	.650•••	.643•••
	(9.21)	(8.35)	(8.67)	(8.36)
Organizational				
SmallTown	–.347	–.297	–.366•	–.351•
	(–1.93)	(–1.66)	(–2.12)	(–1.99)
Resort	–.493••	–.362•	–.421•	–.394•
	(–2.85)	(–1.98)	(–2.51)	(–2.20)
BigCity	–.188	–.402	–.469•	–.496•
	(–.98)	(–1.85)	(–2.26)	(–2.29)
R–squared	.693•••	.706•••	.720•••	.720•••
F (equation)	42.88	37.59	4.27	34.25
D.f.	(5,95)	(6,94)	(6,94)	(7,93)

• $p < .05$; •• $p < .01$; ••• $p < .001$.
* Non–standardized regression coefficients are reported. T–ratios are reported in parentheses.

ues of individuals. The friendship network remains a positive, significant predictor of individuals' Time 2 values when advisors' values are entered simultaneously. This demonstrates that friends' values from Time 1 positively influenced changes in individuals' values beyond the effect of the advice network and also beyond any systemwide effects of the informal networks, supporting hypothesis 2a. As expected, the advice network did not significantly influence changes in individuals' values. To test hypothesis 2b, that friends' values would be more influential than advisors' values in bringing change over time, I compared the standardized (beta) coefficients of the two variables in model 4. Friendship effects ($\beta = .241$) significantly exceeded advice effects ($\beta = .062$), $t(93) = 3.126$, supporting hypothesis 2b.

Predicting Effects of Changing Values on the Social Networks

Means, standard deviations, and correlations among dyadic variables are reported in table 5. I tested hypothesis 3, that changes in the pairwise PBL-values correlation would affect advice relations without influencing friendship relations, in two steps. First, I sorted all pairs according to values convergence or divergence, calculated pairwise shifts in advice and friendship relations, and then conducted t-tests to determine if the mean shifts differed significantly across conditions. Mean shifts and standard deviations are broken out by values divergence versus convergence in table 6. Results indicated significant influences on the advice network ($t(4538) = –3.66$, $p = .001$), but not on the friendship network ($t(4477) = –0.72$, $p = .236$, ns).

To further examine the effects of values convergence and divergence on the social networks, I ran QAP regressions predicting Time 2 relations, controlling for Time 1 relations

Table 5

Means, Standard Deviations, Sample Sizes and Correlations among Dyadic Variables*

A. BlueCollar and SmallTown High Schools†

	BlueCollar								SmallTown	
Variable	Mean	N	1	2	3	4	5	6	Mean	N
1. Advice relations, T1	.208 (.834)	957		.388•••	.425•••	.272•••	–.036	.112•••	.130 (.802)	4278
2. Friendships, T1	.608 (.718)	858	.433•••		.265•••	.472•••	–.006	.066••	.523 (.749)	4278
3. Advice relations, T2	.174 (.843)	507	.450•••	.322•		.421•••	.069	.146•••	.029 (.807)	3456
4. Friendships, T2	.521 (.754)	507	.449•••	.687•••	.534••		.060	.065•••	.511 (.806)	3456
5. Change in values correlation	.145 (.417)	90	–.105	.072	–.055	.120		–.041	.023 (.356)	1560
6. PBL info. transfer, T1	.110 (.418)	957	.270••	.161•	.272••	.116	–.120		.029 (.213)	4416

B. Resort High School and BigCity Elementary School‡

	Resort								BigCity	
Variable	Mean	N	1	2	3	4	5	6	Mean	N
1. Advice relations, T1	.058 (.658)	9007		.525•••	.497•••	.472•••	.086	.292•••	.505 (1.016)	757
2. Friendships, T1	.413 (.666)	8960	.371•••		.317•••	.458•••	.122	.268•••	.749 (.862)	757
3. Advice relations, T2	.067 (.652)	6783	.429•••	.298•••		.553•••	.093	.244•••	.614 (.941)	570
4. Friendships, T2	.390 (.678)	6545	.370•••	.566•••	.464•••		.058	.162•	.768 (.798)	570
5. Change in values correlation	–.031 (.367)	2862	–.015	.040	.063	.031		.060	.034 (.201)	342
6. PBL info. transfer, T1	.047 (.272)	9520	.263•••	.230•••	.114••	.246•••	–.039		.361 (.763)	757

• $p < .05$; •• $p < .01$; ••• $p < .001$.

* Standard deviations are in parentheses. The structure of network data sometimes limits potential correlations, so equivalent correlation values may not be equally significant. The statistic of primary interest in these non–parametric tests is the *p*–value.

† BlueCollar correlations are reported in the lower left of section A; SmallTown correlations are reported in the upper right of section A.

‡ Resort correlations are reported in the lower left of section B; BigCity correlations are reported in the upper right of section B.

and direct transfer of PBL information as reported at Time 1. Results appear in table 7. Section A presents regression models for advice relations in each organization, with a meta analysis of the results. Section B presents regression models for friendship relations in each organization, with a meta analysis of the results. The change in values correlation significantly and positively influenced advice relations ($z = 2.105$, $p = .016$) but did not influence friendship relations ($z = 1.080$, $p = .140$). Because the response rate at Time 2 in BlueCollar was extremely low, the meta analysis was repeated using only results from the other three schools. Results remained consistent (advice $z = 2.356$, $p = .009$; friendship $z = 1.045$, $p = .147$), supporting hypothesis 3.

Supplemental Analyses

In trying to find the optimal model for predicting professional values, I requested a stepwise regression for each time period. The solutions were clean and elegant. Advisors' values

Table 6

Mean Shifts in Social Networks over Time by PBL Values Convergence and Divergence*

Shift	BlueCollar	SmallTown	Resort	BigCity	Weighted mean
			Advice Networks		
Values diverged	–.125 (.960) N = 32	–.095 (.876) N = 716	–.030 (.682) N = 1434	.081 (1.004) N = 135	–.045 (.765) N = 2317
Values converged	–.069 (.640) N = 58	.025 (.862) N = 805	.046 (.754) N = 1216	.110 (.943) N = 172	.040 (.804) N = 2251
T–test comparing means					t = –3.66 p = .00013 (4538 d.f.)
			Friendship Networks		
Values diverged	–.063 (.428) N = 32	–.050 (.833) N = 720	.006 (.604) N = 1412	.119 (.761) N = 135	–.006 (.682) N = 2299
Values converged	–.034 (.524) N = 58	.039 (.807) N = 801	–.007 (.651) N = 1185	.000 (.842) N = 172	.009 (.719) N = 2216
T–test comparing means					t = –.719 p = .236 (4477 d.f.)

*Standard deviations are in parentheses.

Table 7

Effects of Values Convergence over Time on Social Networks*

	BlueCollar	SmallTown	Resort	BigCity	Meta analysis
A. Regression Models Predicting Advice Relations at Time 2					
Advice relations, Time 1	.593••	.413•••	.410•••	.438•••	P = .000
Change in values correlation	.060	.186•	.116	.405	Z = 2.105 P = .0158
PBL information transfer, Time 1	.172	.380•••	–.001	.161	Z = 2.745 P = .0030
Model p-value	.000	.000	.000	.000	P = .000
B. Regression Models Predicting Friendship Relations at Time 2					
Friendship relations, Time 1	.810•••	.479•••	.545•••	.462•••	P = .000
Change in values correlation	.104	.150	.024	–.034	Z = 1.080 P = .1401
PBL information transfer, Time 1	–.038	.182	.265•	.051	Z = 2.080 P = .0178
Model p-value	.000	.000	.000	.000	P = .000

• $p < .05$; •• $p < .01$; ••• $p < .001$.
* BlueCollar N = 90; SmallTown N = 1,521; Resort N = 2,650 predicting advice ties, 2,597 predicting friendship ties; BigCity N = 307.

and PBL know-how explained 44.8 percent of the variance in PBL values at Time 1. Prior PBL values and friends' values explained 68.9 percent of the variance in PBL values at Time 2.

DISCUSSION

The friendship and advice networks played discrete and significant roles in shaping individuals' professional values. In

the initial, stable environment, values held by advisors had a greater influence than did those of friends. During the year after teachers brought problem-based learning into the organization, however, the friendship network was responsible for changes in values. These results demonstrate the advice network's function as a stabilizer of professional values and the friendship network's function as a catalyst for change.

Individuals' values moved closer to those of people in their friendship networks during the year, probably through multiple interactions that alloyed participants' ideas into shared values. Influence through the advice network was more restricted. Advisors' values did not foster change among advisees. Instead, an increasing disparity in professional values had a negative impact on advisory relations, and an increasing alignment of professional values fostered new interactions to obtain work-related information.

Although homophily along salient personal dimensions affects friendship development (McPherson, Smith-Lovin, and Cook, 2001), congruence in professional values does not seem necessary to support the relation. Combining the current results with research showing that friendship among professionals is sensitive to similarity in personal but not professional attributes (Gibbons and Olk, 2003), we may characterize friendship as a stable relation during periods of organizational change. Instead of recoiling from controversial discussions, people used the friendship network as a channel for developing professional values. Advice relations, in contrast, are susceptible to shifting professional values, which can trigger systemwide changes in the network. Combining the current results with research showing that advice relations among professionals are sensitive to innovation adoption (Burkhardt and Brass, 1990), we may characterize advice relations as vulnerable during periods of change. This vulnerability follows from at least two sources: resistance to consulting someone whose values diverge from one's own and changing needs for information.

Many people became less favorable to problem-based learning as they heard more about it, but some became supporters. The changes in attitude varied within and across schools, and negative stories circulated alongside success stories. A few of the teachers adopted the whole method, and many others experimented with the general approach or used PBL principles for one or more small units within their otherwise traditional curricula. About 41 percent of the teachers had tried some aspect of PBL by the end of the year. Because of limited experience, social information may have played an especially large role in shaping values. Values, in turn, had some effect on use of the innovation. PBL values correlated .249 with any use of PBL (as an indicator variable) and .459 with the level of PBL use by those who had tried it at Time 2.

As ideas traveling through friendship networks introduce divergent values to an organization, the advice networks adjust accordingly. At that point, the opinions of one's new advisors may be shared with friends, and opinions of one's friends may be shared with advisors. After the new advisory relations become established around a set of professional

values and exchanges, these transmissions may not continue to occur equally in both directions. In particular, since the friendship networks seem to be more open to the transmission of new ideas, individuals may be more likely to share unfamiliar information or beliefs with their friends that they receive from their advisors than the reverse. This pattern would then continue until another competence-shattering innovation arises and becomes a point of discussion and persuasion among friends, thus mingling the stabilizing influence of the advice network with the innovative influence of the friendship network over time and social space.

The timing of this study during the introduction of a controversial innovation limits generalization of the findings to an organization in its normal state. Concurrent measurement of individuals' PBL know-how and values may also have produced a bias, but this concern diminishes in the network measures, which rely on information from all members of the system. Finally, by using descriptors such as "casual" and "close" friend to elicit information about the relationship, I left the interpretation in the minds of the respondents. This approach avoids imposing an external metric for how they should experience friendship, but it also leaves room for variance in meaning from person to person.

Another limitation of this study is the highly educated population, working in loosely coupled institutions and maintaining more friendships than advice relations at work. Because these people are specialists who have considerable autonomy, their informal networks might differ from those in more structured organizations. These aspects of the participants and their environment do not preclude application of the results to other professionals, but they restrict generalization to less educated, more constrained populations. Greater social distance between people, a more structured workflow, and larger variance in skill or education have the potential to create a more hierarchical advice network. This could intensify the differences between friendship and advice roles and affect their impacts on individuals in the organization.

The public school setting neither requires nor prohibits friendship between coworkers, but some organizational cultures do. In circumstances in which friendship is expected of people who maintain an advice relation, the networks' effects may become less distinguishable. By merging these relations, such cultures are likely to constrain the discussion of ideas that challenge existing practices, and professional values should be slow to change. Further, cultures that encourage friendship across all subgroups would be likely to experience a greater homogeneity of values throughout the organization. In contrast, cultures that discourage friendship across subgroups or hierarchical levels may foster similar values within groups, greater diversity between groups, and a less unified culture overall.

Managerial Implications

The distinct roles of friendship and advice relations during periods of change imply that proactive attention to both networks is warranted. Managers who want to build on existing beliefs may safely rely on existing advice relations, but values

that demand radically new processes or devalue current expertise are unlikely to be supported by the advice network. In that case, opportunities for unmonitored conversations among people who like and trust each other could be crucial for acceptance and internalization of the new values.

People whose advisory positions are not threatened by the change and whose friendships give them access to many others could be ideal allies for beginning a positive dialog about new ideas. Managers who seek to champion cultural change themselves should first establish trusting, friendly relations with people in their organization. If this is not possible, they might step away from the process and allow trusted insiders to introduce new perspectives and facilitate the social process of redefining professional values. Those whose social positions are tied to existing beliefs stand to lose status through changing values. To reduce resistance to change, these people might be given early information or positions that align with the new values, or they might need to be transferred elsewhere.

Research Directions

The current study examined friendship and advice networks' roles in changing professional values, but the underlying arguments rest on intrinsic differences in the nature of the relations. It seems likely that each network facilitates and is affected by categories of transactions that may be identified by their relevance to the relationship. For example, new beliefs that promote competition among coworkers for rewards might disrupt friendship more than advice relations because of friends' expectations of mutual altruism. Recognizing this possibility, one may be less likely to share those inclinations with friends than with advisors or advisees. What happens when advisors become friends? Do the information-sharing tendencies of both relations expand the range of relationship functions more than the constraining tendencies reduce it? A systematic examination of the discrete and cumulative roles of these and other relation types within organizations could be very fruitful.

Because more intense ties provide more interaction and opportunities to bond, a correlation between close friendship and frequent advice ties may be particularly relevant when we consider the joint effects of the networks. Such multiplex relations occurred in all of the schools in this study. Correlations between close friendship and frequent advice ranged from .358 in SmallTown to .498 in BigCity at Time 1. At Time 2, close friendship and frequent advice correlations ranged from .410 at SmallTown to .600 at BigCity. The correlation between advice and friendship networks indicates a need for statistical and methodological caution. Although the extent of multicollinearity in the current data was within standard tolerances (variance inflation factors of 1.2 to 6.4), it may have reduced the significance levels of the impact of advice and friendship networks on individual values when both were included in the regression equations. Because of the nature of the question, concurrent testing was necessary to ascertain which network was responsible for observed effects. Models including either of the networks, but not both (tables

3 and 4), return significant coefficients because of the overlap in the two networks. This raises the possibility that some prior results ascribing organizational consequences to either network, without testing both, may include spurious effects from the network that was not measured. In the worst case, a type of network that actually has no effect may appear to be influential if it co-occurs frequently with a type of relation that does matter. These thoughts could be useful to keep in mind as we move forward in this area of research.

Also worthy of note is the relationship between the current findings and those of others (e.g., Burt, 1987; Galaskiewicz and Burt, 1991) who observed contagion between structurally similar people within a network. Of necessity, the extent of structural similarity between two parties correlates positively with the similarity of direct social influence on them (Ibarra and Andrews, 1993), and the current study does not discern between the two. Identifying attitude shifts in response to friends' rather than advisors' aggregated beliefs does, however, imply that new professional values develop through collegial sensemaking.

Interactive effects of network types and structures merit exploration. For example, the broadly distributed structures that support information flow in an advice or communication network may not provide equal support for the development of values in a friendship network. Instead, a more clustered network, whether through triads or larger cliques, could provide safe havens where new ideas can incubate. Brass, Butterfield, and Skaggs (1998) have argued that the development of shared norms and values may only occur within dense networks. This corresponds with Podolny and Baron's (1997) observation that well-defined performance expectations arise from small, dense networks among individuals at work.

In the more general case, dense local friendship networks may be the most effective social structures for sensemaking about organizational change. Further, distinct kinds of transfers, such as resource exchange, information sharing, and values assessment, are likely to occur through different relations. Longitudinal observation of multiple processes in a single social setting would probably reveal interactions between types and structures of networks affecting each process. Because women and men tend to form different sorts of networks in different ways (Brass, 1985), we might also find a gender-based moderation of these effects.

Although much research has examined the roles of various relations within and beyond organizations, few attempts have been made to characterize network types and theorize about the effects of those characteristics on organizational processes. By taking that approach, the current work has documented different functions of friendship and advice networks with regard to changing professional values. More importantly, this study highlights the linkage between the fundamental attributes of the relations that compose a network and the network's function in an organization. Ongoing identification of the principles that relate network types to processes could

expand and sharpen existing theories of social influence in organizations.

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