Journal of Personality and Social Psychology
1999, Vol. 76, No. 5, 770–782

0022-3514/99/$3.00

Whether Close or Far: Social Distance Effects on Perceived Balance in Friendship Networks

David Krackhardt
Carnegie Mellon University

Martin Kilduff
The Pennsylvania State University

Under what circumstances are individuals' perceptions of friendship relations shaped by the balance schema? Using data from 4 organizations varying in size from 21 to 33 members, the authors investigated how ego's perception of the social distance from ego to alter affected the proportion of alter's friendships perceived by ego as balanced. Balance involves both (a) reciprocated friendships between 2 people, and (b) transitive triplets, in which 2 friends of a person are themselves friends. Graphical and regression analyses supported a composite curvilinear model that combined the predictions of emotional tension and cognitive miser perspectives: People tended to perceive relations close to and distant from themselves as more balanced than relations of intermediate distance.

Human beings are social creatures who depend on links to others to accomplish many of life's tasks. The networks of relations within which each person is embedded include family, friends, and acquaintances of various degrees of closeness. The embeddedness of human activity in such networks is true not just for primal activities such as child rearing but also for economic activities such as finding a job (Granovetter, 1974).

Indeed, business organizations themselves are held together not only by formal relations of authority, but also by informal links that connect people across departmental and hierarchical boundaries. Starting with the Hawthorne studies (Roethlisberger & Dickson, 1939), researchers have investigated the importance of informal networks for job satisfaction (e.g., Roy, 1954), organizational conflict (e.g., Whyte, 1948), worker output (e.g., Jones, 1990), organizational power (e.g., Brass, 1984), and many other aspects of social and organizational life (reviewed in Wasserman & Galaskiewicz, 1994).

Only recently, however, has research attention focused on actors' perceptions of the structure of relations in social settings. On the one hand, actors' perceptions of the social networks within which they are embedded affect the decisions they make (see the discussion in Burt, 1982, chap. 5), and these perceptions are subject to considerable bias (Krackhardt, 1987a; Kumbasar, Romney, & Batchelder, 1994). On the other hand, how others perceive the structure of relations surrounding the individual affects not only the individual's power to act (Krackhardt, 1990) but also the individual's reputation (Kilduff & Krackhardt, 1994). Perceptions of the social network, then, help to determine whether the individual takes action and how effective the action is likely to be. The structure of relations can both enable and constrain action, and this social structure rests on the underlying pattern of perceptions in people's minds.

In previous research, we predicted and found that the perceptions in people's minds concerning whether a target individual was a friend of a prominent person significantly affected the target individual's reputation concerning work performance in an organization (Kilduff & Krackhardt, 1994). The actual existence of friendship links, recognized by both parties in each link, had no significant effect on other people's perceptions of an individual's reputation as a high performer. This research showed that people's perceptions of relations helped to determine reputations, whereas the actual structure of relations had no effect.

In this article, we focus again on perceptions of the friendship network, this time investigating how perceptions are shaped by preexisting expectations. We chose the friendship network to study because this network affects important choices individuals make. Previously, we investigated personality differences in the degree to which individuals are influenced by their friends in making decisions (Kilduff, 1992). We also investigated how friendship patterns affected individuals' decisions to change jobs (Krackhardt & Porter, 1986). In the current research we ask, Under what circumstances are individuals' perceptions of the friendship network shaped by schemas concerning how people typically behave in the friendship role?

The role of *friend* is well understood in society, as indicated by the high level of agreement within societies concerning how friends should act in relation to each other (Argyle & Henderson, 1985, p. 92). People have access to a schema or strategy that specifies how individuals typically act in this role (see the discussions in DiMaggio, 1991, and Swidler, 1986). Cognitive psychologists have described schemas as mental structures that enable people to anticipate the general features of recurring situations

David Krackhardt, Heinz School of Public Policy and Management, Carnegie Mellon University; Martin Kilduff, Department of Management and Organization, The Pennsylvania State University.

We thank Dan Brass, John Engberg, Dennis Gioia, Ajay Mehra, and John Padgett for helpful comments on earlier versions of this article.

Correspondence concerning this article should be addressed to David Krackhardt, Heinz School of Public Policy and Management, Carnegie Mellon University, Pittsburgh, Pennsylvania 15213, or to Martin Kilduff, 424 Beam, Smeal College of Business Administration, The Pennsylvania State University, University Park, Pennsylvania 16802. Electronic mail may be sent to krack@andrew.cmu.edu or to mkilduff@psu.edu.

(Neisser, 1976, pp. 51–78). Schemas allow people to search for and recognize relevant features of the person, situation, or process. The schema that has been most actively researched in the literature on friendship is the balance schema (for reviews, see Crockett, 1982; Markus & Zajonc, 1985; Wasserman & Faust, 1994, chap. 6).

According to Heider's (1958, p. 205) explanation of the balance schema, perceivers tend to treat positive sentiment relations such as friendship as if they were symmetric and transitive. Symmetry refers to the perceiver's assumption that friendship relations will be reciprocated. Thus, if the perceiver sees that A chooses B as a friend, the perceiver will anticipate that B will also choose A as a friend. Transitivity refers to the perceiver's assumption that friendship relations will be complete. Thus, if the perceiver knows both that A is friends with B and that A is friends with C, the perceiver will anticipate that B and C will also be friends. The balance schema, then, consists of a set of cognitive expectations concerning the likely structure of the social world in terms of reciprocity and transitivity.

In the balance theory literature, however, there are several explanations for why people tend to perceive friendship relationships as balanced. We explore three perspectives: an emotional tension model, a cognitive miser model, and a composite model that combines the predictions of the other two.

Three Models of Social Interaction and the Perception of Balance

The Emotional Tension Model

The first model emphasizes the emotional tension that results from discrepant cognitions, such as the perception of unbalanced friendship relations. People are motivated to resolve such cognitive discrepancies either by altering cognitions or by taking action in the world. Thus, if Jack perceives that his friendship overtures to his colleague Randolph are unreciprocated, the discrepant cognitions (e.g., "I'm Randolph's friend, but Randolph doesn't like me") will prompt either a change in cognition ("Perhaps I'm not really his friend") or a change in behavior ("I need to work harder to make this friendship work").

Individuals who perceive that their friendship relations are unbalanced may react with strong emotions rather than with cool analytical reasoning. The balance schema, from this perspective, functions as a deep-seated goal of human interaction (see the discussions in D'Andrade, 1992, and Fiske, 1992). People strive to see friendship relations as balanced because the perception of unbalance induces feelings of uncertainty, instability (Festinger & Hutte, 1954), and nervousness (Sampson & Insko, 1964). As Heider (1958) suggested, ego's perception of an unstructured region in the environment functions as a barrier that "makes action and therefore control difficult if not impossible" (p. 71).

The region closest to ego includes ego's own personal friendships. Ego has power to directly influence whether these friendships are balanced or not. If, for example, Jane finds that her attempts at friendship with Ruby are unrequited, then Jane can sever the friendship link or try even harder to elicit tokens of friendship from Ruby. Ego has considerable potential power to balance friendship relations through direct action of this sort. Similarly, if Jane finds that her friendships with Alice and Shirley have not led Alice and Shirley themselves to become friends, then Jane can endeavor to bring her two friends together—over lunch in the cafeteria, for example. Within the region of the network where ego is connected to his or her friends, then, ego is potentially able to balance relationships through direct action.

As ego surveys the friendship relations of his or her friends and of friends of friends, however, ego's power to impose balance becomes considerably weakened. Further, if an alter (i.e., another individual) at some distance from ego is perceived to be involved in friendship relations that are unbalanced, this can disturb ego, because alter is still part of ego's social world and as such is part of the mutually shared environment in which ego is involved every day. Perturbations affecting alter affect ego because ego encounters alter and alter's friends in the daily round. The region occupied by an alter with unbalanced relations is likely to be perceived as one of uncertainty and tension.

For relations close to ego, therefore, motivation is strong to balance relationships, and ego has the power to impose balance. As ego surveys relations at distances farther and farther from ego's own position, however, the power to act is diminished, but the emotional uncertainty induced by perceived imbalance is also likely to be diminished. The unbalanced friendship relations of friends of friends represent areas of uncertainty and tension in the social world as perceived by ego. However, the prospect of uncertainty and tension derived from unbalanced distant relations is likely to be less troublesome than the immediacy of uncertainty and tension derived from unbalanced relations within ego's own friendship circle.

How quickly are the tension and uncertainty that are induced by perceived unbalanced friendship relations reduced as ego scans the social relations of friends, friends of friends, and so on out to the periphery of the social world? There has been some discussion of this issue. Heider (1958, p. 71) mentioned the problematic nature of unstructured regions anywhere in the mutually shared environment, whereas Insko (1981, pp. 322–323) suggested that ego is likely to suffer little tension to the extent that ego has low involvement with individuals whose relations are unbalanced. Our working assumption is that the emotional pressure to perceive relations as balanced sharply diminishes but does not disappear as ego looks beyond his or her own friendship circle.

Previous research has shown that people will alter relations or cognitions to preserve balance in close relations (Kumbasar et al., 1994; Newcomb, 1961), and that individuals tend to seek out information that reduces dissonance and to avoid information that increases it (Ehrlich, Guttman, Schonbach, & Mills, 1957). Considerable evidence also indicates that people prefer balanced relations in general, even when they themselves are not directly connected to the individuals concerned (De Soto, 1960; Freeman, 1992). In the everyday world of social relationships, individuals are frequently brought into contact with acquaintances whose friendship relations may be unbalanced. In other words, individuals may be required to negotiate social pathways that are perceived to be unstructured and therefore problematic. Avoiding people with friendship problems may be either not possible or not compatible with, for example, a productive career. Thus, if Alice sees John as someone whose attempts at friendship are unreciprocated, she may want to avoid John; interacting with him may be bothersome because of the presumed tension he is under. However, Alice may have to work with John to accomplish her own tasks. Thus,

the perceived imbalance in John's friendships can affect Alice even if John himself is not a personal friend of Alice. We assume that the effect of alter's unbalanced relations on ego diminishes sharply but does not disappear as ego considers alters farther and farther away from ego.

To summarize, an emotional tension perspective on perceived balance leads to the prediction that ego's close relations will tend to be perceived by ego as balanced, because ego has both the motivation and the power to arrange for them to be balanced. The convex curve in Figure 1 illustrates how ego's perception of balance may be affected by social distance. As ego looks beyond the immediate circle of close friends, the emotional pressure to perceive relations as balanced sharply diminishes. Thus, as ego assesses the likelihood of balance among strangers on the remote horizon of ego's social world, the degree of perceived balance should approach its minimum.

The Cognitive Miser Model

A contrasting perspective that represents a more recent paradigm in the field of social cognition views the person as a cognitive miser who, under circumstances of "unavailability or indeterminacy of important information" (Taylor, 1991, p. 195), relies on short cuts or heuristics to fill in the blanks in knowledge. The cognitive miser perspective emphasizes that even when people believe they are using complete information to form impressions or make decisions, they may be relying on only one or two salient cues (Dawes, 1976; Taylor, 1981; Taylor & Fiske, 1978). People are cognitive misers in the sense that they tend to avoid devoting the time and effort required to locate and use all relevant information prior to forming an opinion or perception.

Applied to perceptions of friendship networks, this perspective suggests that people utilize schemas to help make sense of the mass of potential relations they observe. People may avoid expending cognitive energy keeping track of the potential relations characteristic of social groups. To the extent that an individual uses a well-developed schema, many details of the social world may be filled in by the schema rather than derived from actual perception

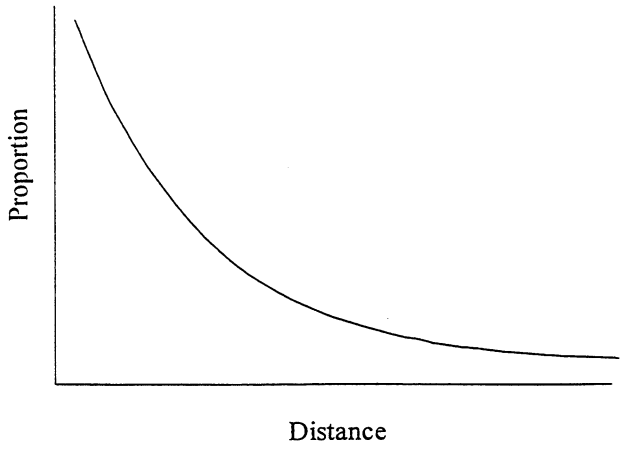

Figure 1. Illustration of the emotional tension model's prediction that the proportion of relations perceived by ego as balanced declines with social distance from ego.

(see the review by Mandler, 1979). The balance schema, then, provides ego with a way to infer the existence of relations when information is incomplete (Freeman, 1992). In particular, as people consider the friendship relations of those increasingly distant from themselves, they will have less and less knowledge of possible unbalanced relations (cf. McPherson, Popielarz, & Drobnic, 1992, p. 155). The farther away the relationship, the less information ego has regarding it and the more likely, therefore, ego is to assume that relations are balanced (Kuethe, 1962).

There is a further reason why, from a cognitive miser perspective, people may rely increasingly on assumptions concerning balance as they scan distant relations: As people scan relations at greater and greater distances from themselves, they incorporate more and more people into their social world, and the number of possible relationships they must keep track of increases disproportionately. The effect of increasing group size on the number of possible relations in a group was dubbed "the law of family interaction" in an influential article by Bossard (1945, p. 292). As the group increases from 4 to 8 members, for example, Bossard calculated that the number of possible relations increased from 6 to 28 (p. 293). Other researchers have offered refinements concerning how quickly the number of possible relations increases as each additional member is added to the group (e.g., Kephart, 1950), but all echo Bossard's observation that the larger the group becomes, the more disproportionate the increase in possible personal relationships between members. From a cognitive miser perspective, people are likely to use the balance schema to fill in the blanks in their social knowledge rather than try to keep track of the large numbers of possible relations involving people at farther and farther distances from their own friendship circles.

The law of family interaction suggests, therefore, that ego faces a daunting cognitive task in trying to keep track of relations of people at farther and farther distances. From this perspective, ego may tend to rely on the balance schema as a useful heuristic for making sense of distant relationships. Instead of keeping track of which relationships are reciprocated or transitive, ego may tend to assume that distant relationships are generally balanced.

Within ego's own social circle, however, unbalanced relations concerning ego's own personal friends may be hard to ignore. Research suggests that people are more likely to notice evidence of unbalance than balance. For example, angry faces are found more efficiently in happy crowds than are happy faces in angry crowds (Hansen & Hansen, 1988). Heider (1958) suggested that unbalanced relations about which we have personal knowledge "stimulate us to further thinking" and "have the character of interesting puzzles" (p. 180). In their review of the literature on the recall of schema-consistent and schema-inconsistent information, Markus and Zajonc (1985) suggested that schema-inconsistent information is likely to be recalled if it competes with the information in the schema and if the cognitive task requires the participant to make use of it. People are likely to remember the existence of unbalanced friendship relations in which they themselves are involved because this imbalance competes with the structures suggested by the balance schema, and the cognitive task of making sense of the immediate social world requires people to keep track of unbalance. This is true, for example, in work organizations where individuals are likely to see their friends every workday and are therefore reminded daily of the absence of reciprocity and transitivity.

In summary, the cognitive miser perspective suggests that people are likely to notice unbalanced relations among those close to themselves. However, as people scan distant relations, they are likely to rely on the balance heuristic to fill in the blanks of the relations of these distant others. Figure 2 offers one possible representation of the cognitive miser model, depicting an increasing probability of perceived balance for relations farther and farther away from ego.

The Composite Model

Despite the apparent contradiction between the emotional tension and cognitive miser models, there is a way to combine these two views: The balance schema may be imposed on close relationships (to avoid emotional tension) and attributed to the friendship relations of distant others (to fill in the blanks in social knowledge). If one accepts the extensive evidence that people are likely to suffer discomfort when they perceive their own friendship relations as imbalanced, then the major results of the emotional tension model are accommodated. According to this model, people are relatively unaffected by the perception of imbalance among those with whom they have no friendship ties. The motivation to change perceptions in favor of balance, then, is likely to affect mainly the perceptions of ego's own friendship relations. If ego is not directly involved, little discomfort results from perceived imbalance.

According to the cognitive miser model, however, while casting one's gaze outward over the friendship relations of those with whom one has no direct links, one is likely to have less and less knowledge concerning such details as whether the relations are reciprocated or transitive. The less information that is available, the more one relies on the balance schema to fill in the blanks in one's knowledge.

The composite model, then, suggests that the hypothesized graphs in Figures 1 and 2 can be joined to display a curvilinear relationship between social distance and the degree of balance perceived. In summary, according to the composite model, individuals perceive both their immediate friendship circle and the periphery of their social networks as more balanced than social worlds of intermediate distance.

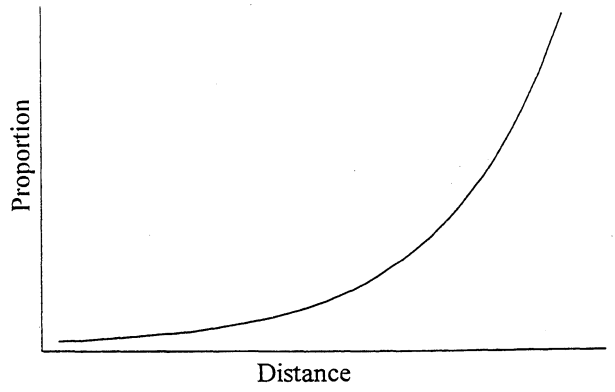

Figure 2. Illustration of the cognitive miser model's prediction that the proportion of relations perceived by ego as balanced increases with social distance from ego.

Method

Participants

At each of the four sites described below, participants were promised and given an overview of the findings. At all four sites, the same questionnaire was used, as described in the *Measures* section. Nonrespondents were excluded from all analyses. The relatively high response rates (which varied from 86% to 100%) reduced problems associated with nonresponse bias.

Site 1: High-Tech Managers (HT)

The participants at this site consisted of all 21 managers of a West Coast entrepreneurial firm of approximately 100 people employed in the manufacture of high-tech machinery. The managers were all men. David Krackhardt collected the data as part of an effort to explore the effects of a previous organizational development intervention conducted by external consultants. All 21 participants completed the questionnaire, and no compensation was offered to the participants. (See Krackhardt, 1987a, for further details.)

Site 2: Government Office (Gov)

This work group consisted of 36 professional staffers in the federal bureaucracy. Their job included advising the executive branch concerning courses of action that would facilitate the current public policy agenda. Each person in this work group had an advanced degree at the master's level or higher. The group's composition changed yearly as new staffers were added from different departments and others rotated out. The leadership of the group, however, had been in place for years. Thirty-one of the 36 people in this office completed a questionnaire, and no compensation was offered to the participants.

Site 3: Silicon Systems (Sil)

The participants included all 36 employees (28 men and 8 women) of a small, entrepreneurial firm located in the Bay Area of California. The employees were mostly semiskilled workers, who installed computers and trained their clients in their use. Thirty-three of the 36 employees accepted $3 each to complete the questionnaire. (See Kilduff & Krackhardt, 1994, for more details.)

Site 4: Pacific Distributors (Pac)

The participants included all 33 supervisory and managerial personnel (15 men and 18 women) located at the headquarters of a small, rapidly growing regional distributor of electronic components. The company employed 162 people in its headquarters and four branch offices. All 33 people accepted $10 each to complete the questionnaire. (See Krackhardt & Kilduff, 1990, for more details.)

Measures

Perceived Friendship Network

To capture participants' perceptions of friendship relations, we used the same questionnaire across all four sites. At each site, every respondent answered the following question about every other person in the organization: "Who would this person consider to be a personal friend? Please place a check next to the names of those people who that person would consider to be a friend of theirs." For example, John Meredith of the Sil sample was asked a series of 36 questions concerning the friendships of his 36 coworkers. The questions were in this form: "Who would Jane Asch consider to be a personal friend?" Each question was followed by the list

of 35 employees' names. John Meredith then checked the names that indicated his perceptions of who Jane Asch considered to be her personal friends. (For more details, see Kilduff & Krackhardt, 1994.)

Each respondent, then, gave us a complete cognitive map of his or her perceptions concerning who was friends with whom in the organization. To measure perceived friendship links we used the following procedure: A friendship tie as perceived by person k existed between person i and person j only if k responded on the questionnaire that i considered j a friend.

Perceived reciprocity. We measured the extent to which each person in the network was perceived by every other person in the network to be involved in reciprocated friendships. We created a matrix of scores for each site, with each cell in the matrix indicating (according to person i's perceptions) the proportion of person j's dyadic relationships that were reciprocated. More formally, the perceived reciprocity matrix was defined as follows: $S_{ij} = NS_{ij}/(NS_{ij} + NN_{ij})$, where NS_{ij} is the number of reciprocated dyadic relations that i perceives j to be involved in, and NN_{ij} is the number of unreciprocated dyadic relations that i perceives j to be involved in.

Perceived transitivity. We measured the extent to which each person in the network was perceived by every other person in the network to be involved in transitive friendship relations. We created a matrix of scores for each site, with each ij cell representing (according to i's perceptions) the proportion of j's triadic relationships that were transitive. Given that we separately analyzed perceptions of reciprocity from perceptions of transitivity, we chose the conservative path of considering only reciprocated ties in the transitivity analysis. Although there is a tradition within social network analysis of considering transitivity among unreciprocated relations as balanced (e.g., Holland & Leinhardt, 1977), it is clear from Heider's (1958, pp. 206–207) discussion of transitivity that he considered positive relations to be balanced only if the transitive relations were also reciprocated.

Therefore, following Heider, when we refer to friendship relations in our definition of what constitutes a transitive triad, we are referring to reciprocated friendship relations. To compute transitivity, we temporarily symmetrized ego's perceptions of friendship relations using the intersection rule that for a friendship relation between i and j to exist in ego's perceptions, ego must perceive both a friendship link from i to j and a friendship link from j to i. Formally speaking, then, for any triple of actors i, j, and k, given that i and j are friends and j and k are friends, the triple ijk is transitive if and only if i and k are friends. Transitivity is violated (i.e., the triple is intransitive) if, given that i and j are friends and j and k are friends, i and k are not friends. Vacuously transitive triples, triples that do not meet the conditional requirement that i and j are friends and j and k are friends, are not considered in this analysis.

The formula for computing each cell in the matrix T of perceived transitivity scores was as follows: $T_{ij} = NT_{ij}/(NT_{ij} + NI_{ij})$, where NT_{ij} is the number of transitive triples that i perceives j to be involved in, and NI_{ij} is the number of intransitive triples that i perceives j to be involved in. If $NT_{ij} + NI_{ij} = 0$ (i.e., if none of the triads perceived by i that include j meet the preconditions of transitivity), then T_{ij} was set equal to a missing value.

Actual Friendship Network

To measure actual friendship links (distinct from perceived friendship links), we determined the locally aggregated structure (Krackhardt, 1987a) as follows: A friendship tie existed between persons i and j only if person i claimed person j as a friend and person j agreed that person i claimed person j as a friend. Thus, an actual friendship link from i to j was defined as existing when both parties agreed that it existed.

Actual reciprocity. We created a matrix for each site in which each column in the matrix indicated the proportion of person j's dyadic relationships that were actually reciprocated (as validated by both parties to the friendships). Thus, whereas person i might perceive that person j's friendships were 40% reciprocated, if j's friendships were in fact reported by j and j's friendship partners to be 60% reciprocated, the column of scores for j in the actual reciprocity matrix would consist of .6 repeated in each cell of the column.

Actual transitivity. We created a matrix for each site in which each column in the matrix indicated the proportion of person j's triadic relationships that were actually transitive. We first symmetrized the actual friendship matrix, using the intersection rule that for a reciprocated tie to exist between persons i and j, person i had to report a friendship tie from i to j and person j had to report a friendship tie from j to i. Then, following the procedure outlined in the computation for perceived transitivity, we calculated the actual proportion of triads involving person j that were transitive. Each column in the matrix indicated the extent to which person j was involved in transitive triads.

Social Distance

We measured the extent to which each person in the network perceived himself or herself to be distant from every other person. Thus, our measure of social distance was a perceptual measure of how close or far ego perceived alter to be from ego. In a graph, the path distance between two points is the length of the shortest path (or geodesic) that connects them (Harary, 1969). As Feld and Grofman (1989) pointed out, when networks are represented as graphs, the path distance between any two points is a good proxy for social distance. We measured the shortest path distance between each pair of individuals i and j as perceived by i. Thus, if respondent Sam Berkowitz perceived that the shortest path connecting him to Alan Hobbs consisted of four lines, the distance from Berkowitz to Hobbs was measured as 4.

We treated social distance within any individual's cognitive map as a symmetric concept. That is, if ego perceived the distance from ego to alter as equal to some value x, then this implied that ego also perceived the distance from alter to ego as equal to x. Thus, we symmetrized ego's perception of the friendship network before calculating social distance. For example, if ego perceived that ego was a friend of j and also perceived that j considered k a friend, then we deemed the social distance between ego and k equal to 2. Conversely, if ego perceived that k considered j a friend and that j considered ego a friend, then this was also deemed to be a distance of 2 between ego and k.

In calculating the social distance measure used in predicting the degree of reciprocity in ego's perceptions, we symmetrized ego's cognitive map of the network using the union rule: A friendship relationship existed if ego perceived either of the people to have a friendship tie to the other. In contrast to the reciprocity analyses, the transitivity analyses were conducted on matrices that had already been symmetrized using the intersection rule: A friendship relation existed if ego perceived both of the people to have a friendship tie to each other. To be consistent, we calculated the social distance measure used in predicting the degree of transitivity in ego's perceptions on the matrix symmetrized using the intersection rule.

For both the reciprocity and transitivity tests, we considered distances of infinity (indicative of the absence of paths between the two nodes) to be missing values. We also performed analyses with the infinite distances recoded as distance N (the number of nodes in the network), and although the meta-analysis results were the same, the large distances tended to act as outliers, obscuring the true underlying relationships. In this article, we restricted our presentation of the data to those cases where distances were "real" (that is, the actors were mutually reachable) and not infinite. Distance squared was calculated in a straightforward manner but was mean centered (i.e., the mean was subtracted from all values) before the term was squared. This reduced collinearity problems in the regression because the correlation between a variable and its mean-centered squared term is 0, whereas the correlation between a variable and its (non-mean-centered) square can be high, resulting in unstable coefficient estimates.

Density

We assessed the density of each respondent's cognitive map as the number of lines in the map divided by the maximum possible number of lines (Scott, 1991, p. 74). Some respondents perceived many friendship links, whereas other respondents perceived few links. We controlled for this variation in density across perceivers' cognitive maps as follows: For each respondent, we calculated a number between 0 and 1 that indicated the proportion of all possible friendship links that were perceived to exist.

As with the distance measure, the density measure was based on the specific matrix that predicted either transitivity or reciprocity. That is, densities in the models used to predict transitivity were based on the symmetrized friendship networks from which the transitivities were calculated. Densities in the models used to predict reciprocity, on the other hand, were based on the nonsymmetrized friendship networks from which the reciprocity proportions were calculated.

Data Analysis

Social network data are often not amenable to standard statistical tests, such as ordinary least squares analysis, because the observations cannot be assumed to be independent. For example, in the current research, the transitivity matrix for the Pac site includes 33 scores from each person in the sample. Each of the 33 scores within a row of this matrix derives from the same source (the cognitive map of the respondent) and therefore exhibits systematic interdependence. To deal with this problem, we used the Multiple Regression Quadratic Assignment Procedure (MRQAP), which has been explained in detail in previous work (e.g., Kilduff & Krackhardt, 1994; Krackhardt, 1987b, 1988).

To assess the extent to which the combined results of our analyses across four sites offered support to the expected relationships between variables, we performed a meta-analysis (Hedges & Olkin, 1985). Typically, the null hypothesis for a meta-analysis is that all samples are drawn from populations in which there is no relationship between the variables of interest (these variables being, in our case, distance, distance squared, and proportions of balance). If the meta-analysis shows that the null hypothesis is rejected, the conclusion follows that for at least one of the samples there is a significant relationship between the variables of interest. However, finding an effect for only one of the samples scarcely ranks as "persuasive evidence of the efficacy of a treatment" (Hedges & Olkin, 1985, p. 45).

However, the studies from four sites being combined in our analysis use exactly the same measurement instruments and replicate exactly the same regression model. In such a case, we can test the likelihood that the distance-squared coefficients we are interested in are not significantly different across the four samples, and whether we can therefore interpret the combined p value to refer to a common population.

Hedges and Olkin (1985) described many situations for which such a test can be performed using a Q statistic. However, the data we collected, with its autocorrelated structure requiring a nonparametric MRQAP analysis, falls outside the situations described. This is unfortunate because the problems of autocorrelated data are common in the study of social networks. The arguments of Hedges and Olkin can nevertheless be extended to our case by using the information in the permuted values of the regression coefficients to replicate the weighted mean estimates of the population beta and the estimate of the standard error of the beta. Because this is the first time, to our knowledge, that such a Q test for meta-analysis has been applied to social network models such as ours, we describe here in detail the procedure we used in calculating and testing Q.

Notation is drawn from Hedges and Olkin (1985). Q is a test statistic that compares the observed betas β_i from each sample i with a weighted estimate of the population beta β_+:

$$Q = \sum_{i=1}^{k} \left[\frac{(\beta_i - \beta_+)^2}{\hat{\sigma}^2_{(\beta i)}} \right] \tag{1}$$

where k is the number of samples, and $\hat{\sigma}^2_{(\beta i)}$ is the estimated variance of each beta, which has been estimated by calculating the variance of the betas generated across all 999 permuted values of the dependent variable under the null hypothesis. The Q statistic is asymptotically distributed as a chi-square with $(k - 1)$ degrees of freedom.

$$\beta_+ = \frac{\sum_{i=1}^{k} \left[\frac{\beta_i}{\hat{\sigma}^2_{(\beta i)}} \right]}{\sum_{i=1}^{k} \frac{1}{\hat{\sigma}^2_{(\beta i)}}}. \tag{2}$$

The β_+ parameter is estimated by calculating a weighted average across the k sites, where each weight is inversely proportional to the variance of β_i in each sample. For both the reciprocity and transitivity analyses, the following computations had to be made for each site i: β_i, $\hat{\sigma}^2_{(\beta i)}$, $\beta_i - \beta_+$, $(\beta_i - \beta_+)^2$, $(\beta_i - \beta_+)^2/\hat{\sigma}^2_{(\beta i)}$.

To test for the possibility (suggested by a colleague) that in calculating transitivity we might have created a positive correlation with distance (and distance squared), we randomly generated raw friendship data. For 100 samples, the regression coefficients for distance squared in the prediction of reciprocity and transitivity were not significantly different from 0, and thus the distance-squared analyses appear to be unbiased. A slight but significant negative bias was uncovered for the coefficient for distance in the transitivity model. To ensure that the results were not affected by this bias, we recalculated the significance levels of this coefficient against a null hypothesis of the mean of the simulated samples, using the standard error generated by the simulations. The results of the meta-analysis become even stronger when we use this conservative test. Thus, the results we report below cannot be attributed to an artificial bias introduced by the analytic procedure itself.

Results

Table 1 provides a summary of the variables used in this analysis. The proportions of reciprocity and transitivity perceived by individuals in friendship networks differed slightly across the four sites, as shown in Table 2. The mean proportion of perceived reciprocity ranged from .39 to .49, whereas the mean proportion of perceived transitivity ranged from .20 to .30.

Tables 3 and 4 present information addressing the issue of whether the regression coefficients differed significantly across the four sites, and whether it is therefore acceptable to interpret meta-analysis results as referring to a common population. The Q statistics at the bottom of Table 3 and Table 4 are nonsignificant, indicating that the regression coefficients for distance and distance squared did not differ significantly across the four sites in either the reciprocity or the transitivity analyses. For example, in Table 3 the overall B_+ for distance squared was 0.016, which was calculated by summing the four entries for distance squared in the third column of the table. This yielded a nonsignificant Q of 0.476 (p = .924, df = 3). Thus, we conclude that the four distance-squared coefficients in the reciprocity model were not significantly different from one another. On the basis of nonsignificant Q statistics for distance and distance squared in Tables 3 and 4, we can assume that the results of meta-analyses on these coefficients refer to a common population.

Figure 3 presents the results of the reciprocity analyses for the combined data across all four sites and for each site individually. The overall graph shows a distinct curvilinear shape, indicating a tendency for ego to perceive close and distant relations as more

Table 1
Summary of Research Variables

Variable	Definition of each cell in matrix
Dependent matrices	
Perceived reciprocity	Respondent *i*'s perception of the proportion of pairs including *j* that were reciprocated
Perceived transitivity	Respondent *i*'s perception of the proportion of triads including *j* that were transitive
Independent matrices	
Distance	Length of the shortest path between *i* and *j* as perceived by *i*
Distance squared	Mean-centered distance squared
Control matrices	
Density	Number of links in respondent *i*'s cognitive map divided by the maximum number of links possible
Actual reciprocity and transitivity	Using the rule that both individuals must agree that each considers the other a friend before a friendship link is established, each cell contains the actual proportion of pairs (or triads) including *j* that were reciprocated (or transitive)

reciprocated than relations in the middle distance of about 2 to 5 links from ego. This overall U-shaped curve provides support for a composite model that includes both the emotional tension model's prediction (higher perceived reciprocity for close relations) and the cognitive miser model's prediction (higher perceived reciprocity for more distant relations).

As Figure 3 shows, the graphs reached their minima at values of social distance ranging from 2.12 (at the Pac site) to 5.8 (at the HT site). These minima were within the range of the data we collected: The maximum values for social distance for each site were as follows: Pac = 5, Gov = 7, Sil = 9, and HT = 7.

Figure 4 presents the results of the transitivity analyses for the combined data across all four sites and for each site individually. Again, the overall graph shows distinct U-shaped curvilinearity, supporting the predictions of the composite model. The graph for the Pac site, however, differs from the graphs for the other sites, showing a rather linear downward slope. At this site, therefore, the proportion of relations perceived as transitive tended to decrease with increasing distance from ego. As Figure 4 shows, for the three sites exhibiting positive curvilinear graphs, the graphs reached their minima at values of social distance ranging from 2.8 (at the HT site) to 3.5 (at the Sil site), all within range of the data we collected. The maximum values for social distance for each site were as follows: HT = 5, Gov = 5, Sil = 7, and Pac = 7.

Table 2
Proportions of Perceived Balance in Friendship Networks

	Site			
Variable	HT $n = 21$	Gov $n = 31$	Sil $n = 33$	Pac $n = 33$
Reciprocity				
M	.39	.44	.44	.49
SD	.35	.35	.36	.35
Transitivity				
M	.20	.30	.25	.24
SD	.26	.31	.27	.30

Note. HT = high-tech managers; Gov = government office; Sil = Silicon Systems; Pac = Pacific Distributors.

Table 5 presents the results of regression analyses predicting proportions of perceived reciprocity at each of the four sites, whereas Table 6 presents the equivalent results for perceptions of transitivity. These results provide the basis for the meta-analysis results summarized in Table 7, where data from all four sites are combined. Consistent with the information evident in Figures 3 and 4, the meta-analysis confirms that the overall data exhibited curvilinearity (as assessed by the positive distance-squared term): The coefficients for overall distance squared were significant for both reciprocity ($Z = 2.432$, $p = .008$) and transitivity ($Z = 2.301$, $p = .011$).

We can conclude from the evidence in the graphs and in the statistical analyses that the data are probably best fit by a U-shaped curve. In other words, the evidence lends support to a composite model that combines the downward curving prediction of the emotional tension model (less perceived reciprocity as ego looks beyond his or her immediate friendship circle) and the upward curving prediction of the cognitive miser model (more perceived reciprocity as ego's gaze includes the friendship relations between dyads relatively unfamiliar to ego).

In the statistical analyses reported in the tables we controlled not just for the linear effects of social distance and the density of ego's network but also for the actual proportion of balance in specific friendship dyads. We were able to focus explicitly on the question of how social distance affected perceptions of balance in friendship relations while controlling for the possibility that perceptions might, in fact, align with reality. Controlling for people's tendency to perceive balance where the members of the friendship pair confirmed that it existed, we found evidence for a curvilinear effect of social distance on perceived balance. In other words, the analyses allow us to reject the possibility that curvilinearity in the data derives not from perceptions but from the distribution of actually occurring friendship reciprocity and transitivity.

Discussion

The results of both the graphical and statistical analyses suggest that individuals tend to perceive both close and distant relations as balanced. We found support for a composite model that includes both an emotional tension effect (close relation-

Table 3
Summary of Q Analyses Determining Whether Reciprocity Regression Coefficients Differed Across Four Samples

	Individual site statistics					
			$(B_i - B_+)^2$	All four sites combined		
Variable	B_i	Variance of B_i	Variance of B_i	B_+	Q	p
Site 1						
Distance	−0.0894209	0.0017081	0.3814442			
Distance squared	0.0111083	0.0003310	0.0790133			
Site 2						
Distance	−0.0777464	0.0011510	0.1666685			
Distance squared	0.0235878	0.0002434	0.2228960			
Site 3						
Distance	−0.0717410	0.0005120	0.1202192			
Distance squared	0.0145674	0.0000565	0.0484558			
Site 4						
Distance	−0.0057950	0.0013735	2.4577374			
Distance squared	0.0249318	0.0006016	0.1260871			
All four sites combined (df = 3)						
Distance				−0.0638959	3.127	.373
Distance squared				0.0162220	0.476	.924

ships tend to be perceived as balanced) and a cognitive miser effect (distant relationships tend to be perceived as balanced). The results of the meta-analyses were consistent for both perceived reciprocity and perceived transitivity and suggest a unifying perspective on how individuals cognitively structure their social worlds.

Previous research has shown that people tend to prefer balanced rather than imbalanced relations in both perceived networks (De Soto, 1960; Freeman, 1992) and behavioral networks (Davis, 1979). The current research across work organizations suggests that this general preference has specific significant effects on ego's perceptions of friendship relations both close to and distant from ego. Close to ego, the motivation to perceive one's own interpersonal world as balanced may be to avoid emotional upset. Far from ego, the motivation to perceive the relations of relative strangers as balanced may be to fill in the blanks in social structure. Thus, the explanation of balanced structures in social networks can combine both hot (emotional) and cold (knowledge) approaches to social cognition.

One of the puzzles of the current research concerns the anomalous result for perceptions of transitivity in Site 4. The sample for this organization differed from the samples from the other organizations in that we collected data only from the managerial core at headquarters, not from all the people at headquarters. The composite model that we present may well apply only to bounded groups such as those in Sites 1, 2, and 3.

Table 4
Summary of Q Analyses Determining Whether Transitivity Regression Coefficients Differed Across Four Samples

	Individual site statistics					
			$(B_i - B_+)^2$	All four sites combined		
Variable	B_i	Variance of B_i	Variance of B_i	B_+	Q	p
Site 1						
Distance	−0.1242139	0.0039149	0.8911572			
Distance squared	0.0640057	0.0016400	1.0929966			
Site 2						
Distance	−0.1134550	0.0017719	1.3169683			
Distance squared	0.0511434	0.0005701	1.5240775			
Site 3						
Distance	−0.0484082	0.0011504	0.2494559			
Distance squared	0.0164252	0.0004052	0.0678201			
Site 4						
Distance	−0.0293083	0.0012974	0.9900603			
Distance squared	−0.0029419	0.0003810	1.5893159			
All four sites combined (df = 3)						
Distance				−0.0651483	3.448	.328
Distance squared				0.0216671	4.274	.233

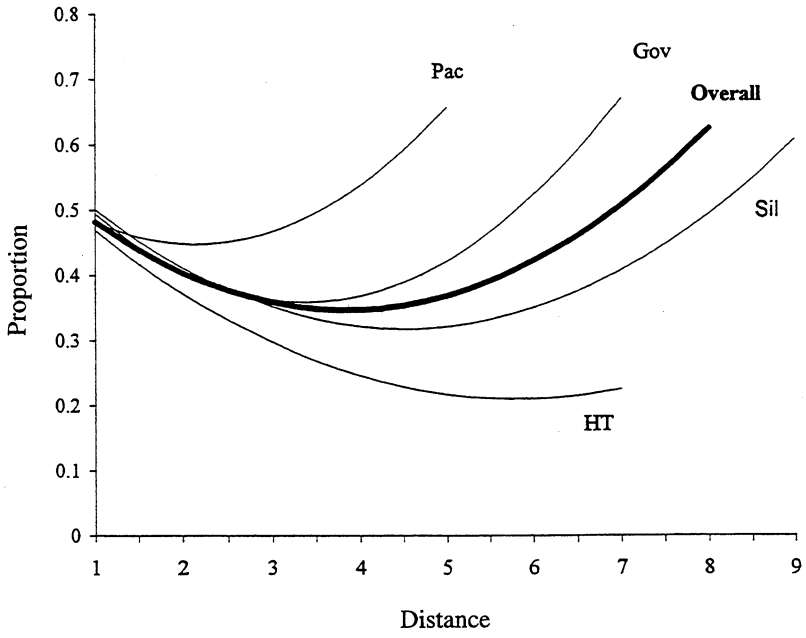

Figure 3. Proportions of perceived reciprocity of people's relations at four sites as a function of social distance from ego. HT = high-tech managers; Gov = government office; Sil = Silicon Systems; Pac = Pacific Distributors.

Site 4 was also different in being a relatively large organization compared with the other three sites. In larger groups, the task of organizing the relations among the large set of alters may be difficult. Extensive previous research (reviewed by Moreland & Levine, 1992) has shown that most natural groups are quite small, averaging two to three members and rarely exceeding five or six members. People appear to have difficulty coordinating social interactions that involve more than five persons (Despartes & Lemaine, 1986). The minimum for reciprocity varied more than the minimum for transitivity across the different sites. Transitivity, as an indicator of balance, may be difficult to assess beyond a distance of 4 because it involves organizing six directional ties rather than the two ties involved in reciprocated relations. The task of mapping transitivity relations is relatively complex even in

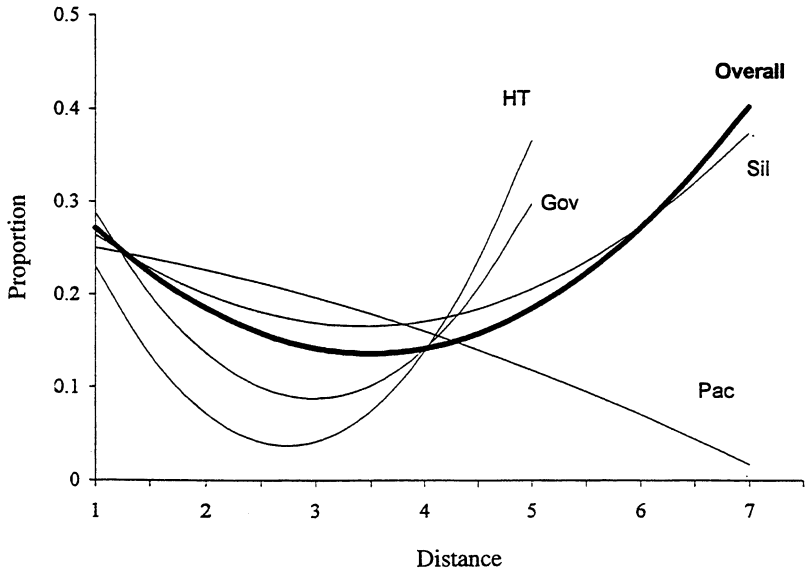

Figure 4. Proportions of perceived transitivity of people's relations at four sites as a function of social distance from ego. HT = high-tech managers; Gov = government office; Sil = Silicon Systems; Pac = Pacific Distributors.

Table 5
Summary of Multiple Regressions Predicting Proportions of Perceived Reciprocity in Friendship Networks

Variable	*B*	β	*p*
Site 1: HT (n = 21)			
Distance	−8.942	−26.659	.984
Density	−2.443	−0.370	.502
Distance squared	1.111	8.600	.275
Actual proportion	9.768	9.895	.170
Site 2: Gov (n = 31)			
Distance	−7.775	−21.294	.990
Density	46.564	12.767	.109
Distance squared	2.359	15.605	.069
Actual proportion	−3.454	−2.514	.686
Site 3: Sil (n = 33)			
Distance	−7.174	−25.013	.999
Density	−27.498	−3.883	.693
Distance squared	1.457	16.381	.034
Actual proportion	17.616	16.718	.033
Site 4: Pac (n = 33)			
Distance	−0.580	−1.603	.542
Density	21.742	3.736	.449
Distance squared	2.493	9.808	.169
Actual proportion	14.174	12.649	.067

Note. Coefficients were multiplied by 100 for ease of presentation. Infinite distances are deemed missing values. All tests are one-tailed; thus, all negative coefficients have p values greater than .5. HT = high-tech managers; Gov = government office; Sil = Silicon Systems; Pac = Pacific Distributors.

small organizations once ego's gaze travels beyond his or her familiar acquaintances.

Our study differs from previous research in the way that we measured social distance. Whereas in the present study we used a continuous measure of distance, previous work (Kumbasar et al., 1994) dichotomized alters into those who were at a distance of 1 from ego and those who were at a distance greater than 1 from ego. The dichotomization of distance prevents discovery of a curvilinear relationship even if one exists in the data.

In the present research we aimed to go beyond the laboratory to study the effects of schema use in actual social settings, in keeping with calls for more field-based studies of human cognition (e.g., Funder, 1987). We tested our models in four quite different social arenas rather than resting content with the standard single setting common in social network studies (e.g., Burkhardt & Brass, 1990; Kilduff, 1992; Krackhardt, 1990; Walker, 1985). A further strength of the current research is the inclusion in the statistical tests of variables derived from naturally formed networks of friendships as well as perceptions of those networks. This allowed us to focus on how schemas shape perceptions while taking account of the possibility that reality shapes perceptions.

One of the strengths of the current research—data collected from actual social settings—is accompanied by a potential weakness. Because we have not experimentally manipulated the causal factor (social distance) to which we attribute the findings, the possibility remains that our causal logic could be reversed. Thus, it is possible that people tend to either draw close to or keep quite distant from those whose relationships they perceive as balanced. In the current cross-sectional analyses, we are unable to track dynamic processes of this sort, and this suggests that future work could explore the effects of social distance on perceived balance in more controlled settings.

The attempt to understand transitivity in triads has a long but rather confused history. One of the leading researchers in the field was led to declare that "after a decade of matrix grinding, I have no more idea of why triads are transitive than I did when I began" (Davis, 1979, p. 60). Whereas reciprocity is well established as a defining feature of human society (Gouldner, 1960) and is espe-

Table 6
Summary of Multiple Regressions Predicting Proportions of Perceived Transitivity in Friendship Networks

Variable	*B*	β	*p*
Site 1: HT (n = 21)			
Distance	−12.421	−45.997	.973
Density	281.260	36.541	.058
Distance squared	6.401	39.184	.065
Actual proportion	6.666	4.952	.357
Site 2: Gov (n = 31)			
Distance	−11.346	−38.802	.994
Density	203.022	47.681	.004
Distance squared	5.114	31.453	.014
Actual proportion	47.936	28.180	.012
Site 3: Sil (n = 33)			
Distance	−4.821	−21.331	.929
Density	152.721	17.578	.118
Distance squared	1.643	17.709	.167
Actual proportion	21.258	14.661	.114
Site 4: Pac (n = 33)			
Distance	−2.931	−13.123	.768
Density	262.219	35.824	.122
Distance squared	−0.294	−2.999	.530
Actual proportion	12.161	7.965	.278

Note. Coefficients were multiplied by 100 for ease of presentation. Infinite distances are deemed missing values. All tests are one-tailed; thus, all negative coefficients have p values greater than .5. HT = high-tech managers; Gov = government office; Sil = Silicon Systems; Pac = Pacific Distributors.

Table 7
Summary of Meta-Analysis Results Across Four Sites Predicting Proportions of Perceived Balance in Friendship Networks

	Reciprocity		Transitivity	
Variable	p, one-tailed	Z	p, one-tailed	Z
Site 1: HT (n = 21)				
Distance	.984	−2.144	.973	−1.927
Distance squared	.275	0.598	.065	1.514
Site 2: Gov (n = 31)				
Distance	.990	−2.326	.994	−2.512
Distance squared	.069	1.483	.014	2.197
Site 3: Sil (n = 33)				
Distance	.999	−3.090	.929	−1.468
Distance squared	.034	1.825	.167	0.966
Site 4: Pac (n = 33)				
Distance	.542	−0.105	.768	−0.732
Distance squared	.169	0.958	.530	−0.075
All four sites combined				
Distance	.999	−3.833	.999	−3.320
Distance squared	.008	2.432	.011	2.301

Note. All tests are one-tailed; thus, all negative coefficients have p values greater than .5. HT = high-tech managers; Gov = government office; Sil = Silicon Systems; Pac = Pacific Distributors.

cially evident among adults in the world of work (Gouldner, 1973, p. 268), transitivity appears most prominently in groups of junior high school students (Davis, 1979, p. 61). Transitivity, of course, involves an ordering of relations among a three-person group, whereas reciprocity involves relations among only two people at a time. Ego has greater control over whether a friendship link from alter to ego is reciprocated than whether two of ego's friends decide to complete the third link of a transitive triplet. In other words, it is easier for ego to impose reciprocity relative to transitivity on perceptions of friendship relations (Doreian, Kapuscinski, Krackhardt, & Szczypula, 1996). The current research, in proposing that perceived transitivity is a function of social distance, offers a parsimonious explanation for when transitivity in social organizations is likely to be found, an explanation that works equally well for transitivity as for reciprocity.

The importance of reciprocity and transitivity as structural principles of group organization has been widely recognized. Gouldner (1960) suggested that reciprocity functions to counter bureaucratic impersonality and to maintain the division of labor in work organizations. He quoted Simmel to the effect that all contacts among people "rest on the schema of giving and returning the equivalence" (Gouldner, 1960, p. 162). Recent work examining social relations across diverse studies confirmed the pervasiveness of the reciprocity heuristic in perceptions of liking (Kenny, Bond, Mohr, & Horn, 1996; Kenny & DePaulo, 1993). The principle of transitivity has been described as the "key structural concept in the analysis of sociometric data" (Holland & Leinhardt, 1977, pp. 49–50). The expectation that friendships will be balanced may serve to stabilize but not rigidify organizational systems in which patterns of interaction are reproduced daily.

The assessment of perceived friendship in our research is two-valued, consistent with Heider's (1958) discussion: People are either friends or not friends. Transitivity, therefore, can be understood as an instance of the logical principle known as the multiplicative rule. This rule implies that, for example, the multiplication of two positives (i.e., friendship relations between A and B and between A and C) results in a positive (i.e., a friendship relation between B and C). Because a two-valued approach to balance theory is perfectly compatible with traditional logic (as Insko, in press, and Runkel & Peizer, 1968, point out), a preference for perceiving two-valued relations as transitive can be understood as a preference for perceiving the world as a logical, ordered place. One potentially valuable extension of the current research would be to examine preferences for balance using a many-valued rather than a two-valued approach (for two experimental investigations, see Tashakkori & Insko, 1979, 1981).

In focusing on perceived balance in work organizations, we are helping to uncover the ways in which people structure the social worlds where careers are established and where much of the business of the modern world is conducted. The current research suggests that if people in organizations perceive unbalanced relations close to themselves, they will act to balance these relations either by changing relationships or by changing cognitions. Further, people tend to perceive friendship relations far from ego as balanced because of increased reliance on the balance schema to organize perception. It is in the middle ground—the area around the minimum—that ego is likely to be troubled by persistent imbalance. In this middle area ego has no power to act decisively to change relationships, and ego may know too much about the relations of these people on the margins of ego's world to be able to organize their relations using the principles of balance. Future research, then, could focus on this area around the minimum as the site of ego's perceived dissatisfactions and opportunities. Ego is likely to be unhappy at work to the extent that he or she perceives relations in the middle distance as unbalanced. However, unbalanced relationships represent structural holes to be bridged (see the discussion in Burt, 1992). To the extent that ego perceives, for example, that groups of individuals who should be communicating with each other are not doing so or are doing so ineffectively, ego may be able to seize the initiative to bridge the gap and bring the people together. As Weick (1995) has emphasized, perceptions have a way of becoming reality. Thus, perceived gaps in communication and friendship patterns may lead to actual movements of people to bridge perceived gaps, irrespective of whether such gaps actually exist. In a striking example of the "grass is greener" effect, people in organizations may perceive more opportunities for entrepreneurial action just outside their own friendship circles.

The reproduction and transformation of structure in social systems depends in part on the systemwide effects of the positions (Brass, 1984) and roles (DiMaggio, 1991, p. 94) occupied by individuals. A sense-making perspective emphasizing the perception of relations can help explain how individuals structure the social worlds to which they belong. Individual perceptions of social structure are important because such perceptions shape reputations across internal labor markets (Kilduff & Krackhardt, 1994). The process we have described connects the intimate world of friends and acquaintances with the distant world of relative strangers. The extent to which the perceiver finds the periphery of the social world resembles the proximate may enable individuals to anticipate familiar patterns of interaction across social boundaries and structural holes. The individual, then, in extending a vision of a balanced world to the relations between comparative strangers, may sustain a logic of confidence that promotes action across social divides.

References

Argyle, M., & Henderson, M. (1985). *The anatomy of relationships and the rules and skills needed to manage them successfully.* London: Heinemann.

Bossard, J. H. S. (1945). The law of family interaction. *American Journal of Sociology, 50,* 292–294.

Brass, D. J. (1984). Being in the right place: A structural analysis of individual influence in an organization. *Administrative Science Quarterly, 29,* 518–539.

Burkhardt, M. E., & Brass, D. J. (1990). Changing patterns or patterns of change: The effect of a change in technology on social network structure and power. *Administrative Science Quarterly, 35,* 104–127.

Burt, R. S. (1982). *Toward a structural theory of action: Network models of social structure, perception, and action.* New York: Academic Press.

Burt, R. S. (1992). *Structural holes: The social structure of competition.* Cambridge, MA: Harvard University Press.

Crockett, W. H. (1982). Balance, agreement, and positivity in the cognition of small social structures. *Advances in Experimental Social Psychology, 15,* 1–57.

D'Andrade, R. G. (1992). Schemas and motivation. In R. G. D'Andrade & C. Strauss (Eds.), *Human motives and cultural models* (pp. 23–44). Cambridge, England: Cambridge University Press.

Davis, J. A. (1979). The Davis/Holland/Leinhardt studies: An overview. In

P. W. Holland & S. Leinhardt (Eds.), *Perspectives on social network research* (pp. 51–62). New York: Academic Press.

Dawes, R. (1976). Shallow psychology. In J. Carroll & J. Payne (Eds.), *Cognition and social behavior* (pp. 3–12). Hillsdale, NJ: Erlbaum.

De Soto, C. B. (1960). Learning a social structure. *Journal of Abnormal and Social Psychology, 60,* 417–421.

Despartes, J.-P., & Lemaine, J.-M. (1986). Les groupes humains dans la nature: Nouvelle analyse des distributions de leurs effectifs [Naturally occurring human groups: A new analysis of size distributions]. *Annee Psychologique, 87,* 567–580.

DiMaggio, P. (1991). The macro–micro dilemma in organizational research: Implications of role-system theory. In J. Huber (Ed.), *Macro–micro linkages in sociology* (pp. 76–98). Newbury Park, CA: Sage.

Doreian, P., Kapuscinski, R., Krackhardt, D., & Szczypula, J. (1996). A brief history of balance through time. *Journal of Mathematical Sociology, 21,* 113–131.

Erlich, D., Guttman, I., Schonbach, P., & Mills, J. (1957). Post-decision exposure to relevant information. *Journal of Abnormal and Social Psychology, 54,* 98–102.

Feld, S. L., & Grofman, B. (1989). Toward a sociometric theory of representation: Representing individuals enmeshed in a social network. In M. Kochen (Ed.), *The small world* (pp. 100–107). Norwood, NJ: Ablex.

Festinger, L., & Hutte, H. A. (1954). An experimental investigation of the effect of unstable interpersonal relations in a group. *Journal of Abnormal and Social Psychology, 49,* 513–523.

Fiske, A. P. (1992). The four elementary forms of sociality: Framework for a unified theory of social relations. *Psychological Review, 99,* 689–723.

Freeman, L. C. (1992). Filling in the blanks: A theory of cognitive categories and the structure of social affiliation. *Social Psychology Quarterly, 55,* 118–127.

Funder, D. C. (1987). Errors and mistakes: Evaluating the accuracy of social judgment. *Psychological Bulletin, 101,* 75–90.

Gouldner, A. W. (1960). The norm of reciprocity: A preliminary statement. *American Sociological Review, 25,* 161–179.

Gouldner, A. W. (1973). The importance of something for nothing. In *For sociology: Renewal and critique in sociology today* (pp. 260–299). New York: Basic Books.

Granovetter, M. (1974). *Getting a job.* Cambridge, MA: Harvard University Press.

Hansen, C. H., & Hansen, R. D. (1988). Finding a face in the crowd: An anger superiority effect. *Journal of Personality and Social Psychology, 54,* 917–924.

Harary, F. (1969). *Graph theory.* Reading, MA: Addison-Wesley.

Hedges, L. V., & Olkin, I. (1985). *Statistical methods for meta-analysis.* Olrando, FL: Academic Press.

Heider, F. (1958). *The psychology of interpersonal relations.* New York: Wiley.

Holland, P. W., & Leinhardt, S. (1977). Transitivity in structural models of small groups. In S. Leinhardt (Ed.), *Social networks: A developing paradigm* (pp. 49–66). New York: Academic Press.

Insko, C. A. (1981). Balance theory and phenomenology. In R. E. Petty, T. M. Ostrom, & T. C. Brock (Eds.), *Cognitive responses in persuasion* (pp. 309–338). Hillsdale, NJ: Erlbaum.

Insko, C. A. (in press). A balance-logic perspective on Kruglanski and Thompson's single-route approach to persuasion. *Psychological Inquiry.*

Jones, S. R. G. (1990). Worker independence and output: The Hawthorne studies reevaluated. *American Sociological Review, 55,* 176–190.

Kenny, D. A., Bond, C. F., Mohr, C. D., & Horn, E. M. (1996). Do we know how much people like one another? *Journal of Personality and Social Psychology, 71,* 928–936.

Kenny, D. A., & DePaulo, B. M. (1993). Do people know how others view them? An empirical and theoretical account. *Psychological Bulletin, 114,* 145–161.

Kephart, W. M. (1950). A quantitative analysis of intragroup relationships. *American Journal of Sociology, 55,* 544–549.

Kilduff, M. (1992). The friendship network as a decision-making resource: Dispositional moderators of social influences on organizational choice. *Journal of Personality and Social Psychology, 62,* 168–180.

Kilduff, M., & Krackhardt, D. (1994). Bringing the individual back in: A structural analysis of the internal market for reputation in organizations. *Academy of Management Journal, 37,* 87–108.

Krackhardt, D. (1987a). Cognitive social structures. *Social Networks, 9,* 109–134.

Krackhardt, D. (1987b). QAP partialling as a test of spuriousness. *Social Networks, 9,* 171–186.

Krackhardt, D. (1988). Predicting with networks: Nonparametric multiple regression analysis of dyadic data. *Social Networks, 10,* 359–381.

Krackhardt, D. (1990). Assessing the political landscape: Structure, cognition, and power in organizations. *Administrative Science Quarterly, 35,* 342–369.

Krackhardt, D., & Kilduff, M. (1990). Friendship patterns and culture: The control of organizational diversity. *American Anthropologist, 92,* 142–154.

Krackhardt, D., & Porter, L. T. (1986). The snowball effect: Turnover embedded in communication networks. *Journal of Applied Psychology, 71,* 1–6.

Kuethe, J. L. (1962). Social schemas. *Journal of Abnormal and Social Psychology, 64,* 31–38.

Kumbasar, E. A., Romney, K., & Batchelder, W. H. (1994). Systematic biases in social perception. *American Journal of Sociology, 100,* 477–505.

Mandler, J. M. (1979). Categorical and schematic organization in memory. In C. R. Puff (Ed.), *Memory organization and structure* (pp. 259–299). New York: Academic Press.

Markus, H., & Zajonc, R. B. (1985). The cognitive perspective in social psychology. In G. Lindzey & E. Aronson (Eds.), *Handbook of social psychology* (3rd ed., pp. 137–230). New York: Random House.

McPherson, J. M., Popielarz, P. A., & Drobnic, S. (1992). Social networks and organizational dynamics. *American Sociological Review, 57,* 153–170.

Moreland, R. L., & Levine, J. M. (1992). The composition of small groups. *Advances in Group Processes, 9,* 237–280.

Neisser, U. (1976). *Cognition and reality: Principles and implications of cognitive psychology.* New York: Freeman.

Newcomb, T. M. (1961). *The acquaintance process.* New York: Holt, Rinehart & Winston.

Roethlisberger, F. J., & Dickson, W. J. (1939). *Management and the worker: An account of a research program conducted by the Western Electric Co., Hawthorne Works, Chicago.* Cambridge, MA: Harvard University Press.

Roy, D. (1954). Efficiency and "the fix": Informal intergroup relations in a piecework machine shop. *American Journal of Sociology, 60,* 255–266.

Runkel, P. J., & Peizer, D. B. (1968). The two-valued orientation of current equilibrium theory. *Behavioral Science, 13,* 56–65.

Sampson, E. E., & Insko, C. A. (1964). Cognitive consistency and conformity in the autokinetic situation. *Journal of Abnormal and Social Psychology, 68,* 184–192.

Scott, J. (1991). *Social network analysis: A handbook.* London: Sage.

Swidler, A. (1986). Culture in action. *American Sociological Review, 51,* 273–286.

Tashakkori, A., & Insko, C. A. (1979). Interpersonal attraction and the polarity of similar attitudes: A test of three balance models. *Journal of Personality and Social Psychology, 37,* 2262–2277.

Tashakkori, A., & Insko, C. A. (1981). Interpersonal attraction and person

perception: Two tests of three balance models. *Journal of Experimental Social Psychology, 17,* 266–285.

Taylor, S. E. (1981). A categorization approach to stereotyping. In D. L. Hamilton (Ed.), *Cognitive processes in stereotyping and intergroup behavior* (pp. 83–114). Hillsdale, NJ: Erlbaum.

Taylor, S. E. (1991). The interface of cognitive and social psychology. In J. H. Harvey (Ed.), *Cognition, social behavior, and the environment* (pp. 189–211). Hillsdale, NJ: Erlbaum.

Taylor, S. E., & Fiske, S. T. (1978). Salience, attention, and attribution: Top of the head phenomena. *Advances in Experimental Social Psychology, 11,* 249–288.

Walker, G. (1985). Network position and cognition in a computer software firm. *Administrative Science Quarterly, 30,* 103–130.

Wasserman, S., & Faust, K. (1994). *Social network analysis: Methods and applications.* New York: Cambridge University Press.

Wasserman, S., & Galaskiewicz, J. (Eds.). (1994). *Advances in social network analysis: Research from the social and behavioral sciences.* Newbury Park, CA: Sage.

Weick, K. E. (1995). *Sensemaking in organizations.* Thousand Oaks, CA: Sage.

Whyte, W. G. (1948). *Human relations in the restaurant industry.* New York: McGraw-Hill.

Received September 10, 1998
Revision received November 4, 1998
Accepted November 4, 1998 ■