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## **Strong Ties, Weak Ties: Relational Dimensions of Learning Settings**

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## INTRODUCTION

Social interactions provide powerful learning opportunities. Such opportunities may occur in classrooms as teachers educate students, inside and outside of classrooms as students collaborate and so learn from each other (e.g., Bruffee, 1993), or in apprenticeship settings as students learn by emulating masters (Lave & Wenger, 1991). Learning opportunities occur in educational institutions, online settings, or workplaces. Each exchange between one person and another builds a social network of learners, with various kinds of exchanges tapping relationships to provide differentiated returns.

Social exchanges depend not only on the intrinsic preferences and perceived status differences of the individuals involved, but also on the larger pattern of relations within which both social actors are embedded. Triggering these relations requires one to negotiate the in's and out's of often ambiguous group situations, relying on the perceived strength of relations between social actors to reaffirm with others what is already known and acquiring from others what is not.

Valuable active learning occurs through the exchange of opinions, exposure to new ideas, and the sharing of experiences. In social network terms, such learning exchanges call on the unique strengths of both weak and strong social ties. Exposure to newer ideas comes from interaction with those with whom we are weakly tied, because such individuals travel in different social circles (Kadushin, 1966) and thus have access to information and resources that we do not (Granovetter, 1973). Yet, those to whom we are only weakly connected are less motivated to share this information. We are more likely to receive information or other resources from those with whom we are more strongly tied; a set of people we trust, work with closely, and with whom we share more personal information. These are the people we are most likely to work with on projects, trusting each other to complete work in a timely and conscientious fashion (Haythornthwaite, 2002).

The distinct advantages and limitations of weak and strong ties point out the complexity of learning in areas where new instrumental knowledge is as important as the transfer of socio-emotional support. Moreover, consideration of such ties highlights an aspect of learning groups that is not visible unless the ties and relations between actors are examined.

This paper sets out to achieve two goals. First, we call attention to a model of learning that underscores the importance of weak ties. To do so, we revisit the fundamental tenets of this well-researched model and then review empirical cases at both individual and collective levels that demonstrate the paradoxical importance of these ties in social exchanges that occur within and across differentiated contexts. Second, we present a strategy to test two of the model's basic tenets. Using data from an early distributed learning context, we demonstrate: 1) the stronger the tie between two people, the more their social worlds overlap; and 2) the stronger the tie between two people, the

less likely the relation will serve as a bridge to other social worlds. We close with a discussion on the ways in which the benefits of strong and weak ties can be leveraged in situations relevant to schooling organizations.

### REVISITING THE STRENGTH OF WEAK TIES ARGUMENT

The core of the weak ties argument first proposed by Granovetter (1973) asserts that our acquaintances (weak ties) are less likely to be socially involved with one another than our close friends (strong ties). Thus, the set of people made up of any individual and his or her acquaintances comprises a low-density network (one in which many of the possible relational lines are absent) whereas the set consisting of the same individual and his or her close friends will be densely knit (many of the possible lines are present).

To clarify this overall structural picture, consider the situation of some arbitrarily chosen individual referred to as Ego. Ego will have a collection of close friends, most of whom are in touch with one another—a densely knit subgroup of social structure. The strength of these interpersonal ties can be intuitively defined as “a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding) and the reciprocal services which characterize the tie” (Granovetter, 1973: 1361). Moreover, Ego will have a collection of weakly tied acquaintances, few of whom know one another [Figure 1]. Each of these acquaintances, however, is likely to have close friends in his own right and therefore to be embedded in a densely knit subgroup of social structure, but one different from Ego’s [Figure 2]. The weak tie between Ego and his acquaintance, therefore, becomes not just some merely trivial acquaintance tie but rather a crucial bridge relation between the two densely knit subgroups of close friends [Figure 3]. To the extent that this assertion is accurate, these subgroups would not, in fact, be connected to one another at all were it not for the existence of weak ties. Through this bridge, and perhaps only through this bridge, a member in one group may learn and gain information about the other group. If that information is useful, then whoever has access to the bridge and uses it will gain an advantage over another member of the same group (Lin, 2001).

The social learning implications of this argument, then, become quite obvious. Individuals with few weak ties will be deprived of information from distant parts of the social system and will be confined to the provincial news and views of their close friends. In other words, the exchanges that occur within such socially isolated subgroups become highly redundant. This deprivation will not only insulate them from the latest ideas and newest practices but may put them at a disadvantaged position in various exchange systems. This deprivation has been found to be evident in the uneven acquisition of occupational status (Lin, Ensel & Vaughn, 1981), cognitive flexibility (Coser, 1975), and technical advice (Constant, Sproull and Kiesler, 1996). Furthermore, such individuals may be difficult to organize or integrate into political movements of any kind, since membership in movements or goal-oriented organizations typically results from being recruited by friends (Gould, 1995). While members of two or more subgroups may be efficiently recruited, the problem is that, without weak ties, any momentum generated in

this way does not spread beyond the subgroup's boundaries. As a result, most of the population will be untouched.

What this model does is bring together both the big and small in a somewhat problematic manner. The macroscopic side of this communications argument is that social systems lacking in weak ties will be fragmented and incoherent. New ideas will spread slowly, scientific endeavors will be handicapped, and subgroups separated by race, ethnicity, geography, or other exogenous characteristics will have difficulty reaching a common interactional space, a goal of most diverse learning settings.

Here, we see the link between micro-level interactions and macro-level patterns. The personal experience of individuals—whether getting advice, acquiring a skill, or meeting a new friend—is closely bound up with larger-scale aspects of social structure, well beyond the control of particular individuals.<sup>1</sup> Such linkage, however, generates frustrating paradoxes: weak ties, typically considered as generative of alienation (Wirth, 1938) are indispensable to learning opportunities and to their integration into communities; strong ties, breeding local cohesion, lead to overall fragmentation. As Granovetter (1983) points out, these paradoxes, however, should be considered a welcome antidote to theories which attempt to explain everything too neatly.

Building from Granovetter's initial observations on the strength of weak ties, we can review varied benefits at distinct levels of analyses. These benefits have direct implications on the typical interaction patterns evident in learning settings.

### The Effects of Weak Ties on Individuals

The positive effects of weak ties on individuals have been identified in various social systems. These benefits are closely related to certain classic themes in sociology. In the evolution of social systems, perhaps the most important source of weak ties is the division of labor, since increasing specialization and interdependence result in a variety of specialized role relationships in which one knows only a small segment of the other's personality (Simmel, 1950). One needs to look no further than the modern schooling structure to find evidence in support of this claim. Role segmentation, according to this Durkeimian view (1997), does not lead to alienation, as the exposure to a wide variety of different viewpoints and activities is an essential prerequisite for the social construction of individualism.

Consider this idea in the context of a learning setting consisting of students with diverse interests and socio-cultural frames (Goffman, 1974). Each Ego in this setting has a role set—using Merton's (1957) term for the plurality of others with whom Ego has role relations—, which Coser (1975) describes as a “seedbed of individual autonomy.” According to Coser (p. 241), (restating Simmel's [1950] view) “the fact that an individual can live up to expectations of several others in different places and at different times makes it possible to preserve an inner core, to withhold inner attitudes while confronting to various expectations.” This speaks to Ego's ability to maintain a complex identity, say, as a high achieving male African American student, in spite of cross-cutting

pressures to perform for different audiences and their varied expectations simultaneously. In the case of this Ego's role set, these cross-cutting pressures on high achieving male African American students have been well documented (Fordham and Ogbu 1986; Persell and Cookson, 1991). Furthermore, persons deeply embedded in localized relations—what Toennies (1963) referred to as *Gemeinschaft*—may never become aware of the fact that their lives depend on what happens not only within the group but also on social forces beyond their radar and hence beyond their control. The *Gemeinschaft* may prevent individuals from articulating roles in relation to the complexities of the outside world. As Coser (p. 242) concludes, “there may be a distinct weakness in strong ties.”

Coser further elaborates on this conundrum and its implications for an individual's cognitive development. “In a *Gemeinschaft* everyone knows fairly well why people behave in a certain way. Little effort has to be made to gauge the intentions of the other person ... If this reasoning is correct ... the manner of communication will tend to be different in a *Gesellschaft* [the broader society bound together by instrumental goals]. Hence, the type of speech people use should differ in these two types of structures” (p. 254). Coser goes on to relate this difference to Basil Bernstein's (1971) distinction between restricted and elaborated codes of communication. Restricted codes are simpler—more meanings are implicit and taken for granted as the speakers are so familiar with one another, a point also evident in Willis's (1981) classic ethnography of working class kids. Elaborated codes are complex and universal—more reflection is needed in organizing one's communication when there is a greater difference between those to whom the speech is addressed.

While some weak ties may connect individuals who are quite similar, there is empirical evidence showing that the stronger the tie connecting two individuals, the more similar they are in various ways (Granovetter, 1973). Thus Coser's argument applies directly to the distribution of both weak and strong ties. She concludes that in “elaborated speech there is a relatively high level of individualism, for it results from the ability to put oneself in imagination in the position of each role partner in relation to all others, including oneself” (p. 257). An extension of this line of thinking suggests that the social structure of classrooms consisting primarily of children of lower socioeconomic backgrounds does not encourage the complex role set that would, in turn, facilitate the development of intellectual flexibility and self-direction.

In addition to facilitating instrumental returns on ones' cognitive development, the value of weak ties can also be observed at the individual level in the generation of good ideas. Recent work by Burt (2004) has shown that traversing relations across the metaphorical levels of *Gemeinschaft* and *Gesellschaft* relies on what he refers to as brokerage, a social mechanism that produces a whole set of favorable individual returns. This divide between the localized community bound together by convention and the global society bound together by its pursuit of instrumental goals is what he refers to as a “structural hole” (Burt, 1992), quite literally a gap between clusters of opinion and behavior. Gaps between clusters are holes in the structure of information flow, or more simply structural holes. A structural hole between two groups need not mean that people in groups are unaware of one another. It only means that the people are focused on their

own activities such that they do not attend to the activities of people in other groups. These holes are like buffers, like insulators in an electric circuit. People on either side of the structural hole circulate different flows of information, or, referring back to Bernstein (1971), different codes of communication. Structural holes are the empty spaces in social structure, and we know where a hole is by where it is not.

Patterns of school cafeteria interaction vividly display these holes as homophily<sup>2</sup> shapes how the clusters of students are arranged, divided socially as well as physically from table to table (Tatum, 1997). The gaps between the tables, then, are akin to structural holes. What Burt demonstrates is that those leaping from table to table are at a greater risk of having a good idea.<sup>3</sup> One implication of this is that educational settings that provide and promote opportunities for movement between close-knit groups create conditions for more powerful learning.

To study this proposition at the level of individual people proposing ideas, Burt draws on data describing 673 managers who ran the supply chain in 2001 for one of America's largest electronics companies. Here, as in most walks of life, these managers varied in the quality of their ideas. The trick, of course, is to figure out which structural attributes positioned these managers in ways that triggered ideas. To do so, Burt collected background data from personnel records and network data from a standard survey method of name generators and interpreters. These data not only showed the performance advantages—salary, rank, promotion—of mobilizing weak ties through brokerage, but the data also demonstrate that this mechanism is associated with good ideas. Managers whose networks spanned structural holes were more likely to express an idea and discuss it with colleagues, have the idea engaged by senior management, and have it judged valuable. This rigorous empirical support invites detailed study of the processes by which information arbitrage occurs. More generally, the results have implications for creativity and the reproduction of social structures in which ideas emerge. If one objective of schooling is to foster student creativity, then attention should be given to the weak ties that enable individuals to tap sources of opinion and behavior that are not locally exchanged. The central point is, good ideas just simply don't pop out of nowhere. Good ideas emerge from the intersection of different social worlds.

In addition to fostering one's cognitive development and creativity, the mobilization of weak ties is inherent to the process of knowledge transfer, unarguably the most explicit function of schooling. Promoting knowledge transfer within any organizational setting is an increasing challenge for any administrator (Kogut and Zander, 1992). Schools and other organizations that can make full use of their collective expertise and knowledge are likely to be more innovative, efficient, and effective (Grant, 1996). This knowledge transfer problem, however, is fraught with much complexity. The recent work of Levin and Cross (2002) highlights the structural, relational and knowledge complexity of this process. At the core of this complexity, however, is the idea that weak ties lead to the receipt of useful knowledge.

To test this proposition, Levin and Cross surveyed 127 mid-level managers from three different sectors who were engaged in knowledge-intensive work and relied heavily

on colleagues for information to solve problems and coordinate the work of others. Though not totally analogous, one could speculate that these managers are engaged in work that does not differ too greatly from that of a typical high school student who, too, is confronted with issues of task completion and coordination. The results obtained by Levin and Cross show the mediating influence of trust in the process of knowledge transfer via weak ties. Specifically, they show that strong ties do have a positive and significant effect on the receipt of useful knowledge. This reaffirms studies that have also shown that strong ties are of greater benefit to the receipt of useful knowledge (Hansen, 1999; and Uzzi, 1996, 1997).

What makes this knowledge transfer possible, however, is the presence of a high degree of trust between strongly tied people. Taking trust into account eliminated any positive outcomes that came from strong ties. Once controlling for trust, the effect of strong ties on the receipt of useful knowledge was less than that of weak ties. That is, there is a “switch” from the overall benefit of strong ties (before controlling for trust) to the benefit of weak ties (after controlling for trust). Knowledge received from strong ties still contributed positively to project outcomes, but the knowledge received from weak ties contributed even more positively. This finding is consistent with Granovetter’s (1973) original argument that weak ties provide access to non-redundant information.

What Levin et al. have shown is that trust matters. The results suggest that individuals could benefit from developing trusted weak ties, not just strong ties, although this strategy does carry the risk of misplaced trust. Nevertheless, this finding is interesting in light of the fact that weak ties may be less costly to maintain (Hansen, 1999). The implication for schools and other learning organizations is that it may be fruitful to focus on ways to improve trust as a relatively “inexpensive” and practical way to improve the flow of useful knowledge and advice. Consistent with this general expectation, Bryk and Schneider (2002) found that in schools characterized by high relational trust, educators were more likely to experiment with new practices and work together with parents to make improvements which, in turn, resulted in greater learning.

Research over the past 30 years has shown that weak ties are beneficial for a varied set of individual outcomes. In addition to cognitive development, creativity and knowledge transfer, weak ties have been shown to be individually advantageous for political consolidation (Padgett and Ansell, 1993), status acquisition (Collins, 1998), and innovation adoption (Rogers, 1962). Benefits of weak tie mobilization, however, are not only observable at the level of the individual. Weak ties play an important role in organizing groups larger than the primary groups associated with microsociology. The integration of individuals into large groups depends primarily on these weaker ties.

### The Effects of Weak Ties on Social Organization

To demonstrate the effects of weak ties on social organization, more specifically, cohesion, we draw on three studies that show the effects of these ties on macrolevel integration. The foundation of this argument is best summarized by Blau (1974: p. 623) who stated that “intimate relations [strong ties] tend to be confined to small and closed

social circles ... they fragment society into small groups. The integration of these groups in the society depends on people's weak ties, not their strong ones, because weak ties extend beyond intimate circles and establish the intergroup connections on which macrosocial integration rests."

The integration of diverse groups in schools via weak ties is evident in the work of Karweit, Hansell, and Ricks (1979). Though their work did not present any new data, they did provide a stimulating review of the literature on how features of peer groups within schools affect educational aspirations and achievements of their members. After noting that numerous investigations have sought to document the socializing power of the peer group, they remark: "The dyadic view implies that peer socialization to different values occurs only through close friendship ties. However, other peer relationships—such as admiration for someone quite different from oneself—may be more important socialization sources than friendships" (p. 19). Further, they question whether it is proper policy to create a situation where the values of one group in school (such as high achievers) can be effectively assimilated by others. A more desirable peer structure, they suggest, would be one in which "diverse cultures can exchange information and support without necessarily becoming more similar" (p.19). More recently, Milner (2004) offers a similar prescription for creating a pluralistic secondary school in which communication between diverse status groups does not necessarily eradicate identifiable group boundaries.

Karweit et al. consider how the argument of weak ties may be applied to biracial school settings in the United States, suggesting that "racial integration in the classroom can be achieved by arranging classroom structures to produce enough weak contact to connect black and white cliques, rather than by encouraging strong biracial friendships [the typical strategy]. This result would be immediately applicable in schools because weak ties are easier to stimulate through realistic organizational innovations ... If the idea that racial integration has to occur in strong contacts at the dyadic level can be relaxed, many possibilities for planned intervention in schools to foster real accommodation become feasible" (p. 20). Finally, they suggest that a "good deal of student alienation from school may be associated with their lack of indirect contacts with student leaders and their consequent inability to contribute to student decision-making processes" (p. 26). This point, too, is evident in Milner's (2004) work in which he shows how student apathy results from clusters of isolated and antagonistic students—the "rednecks" and "metalheads" to name but two—lacking bridge relations. The larger point to which this speaks is that the strategy of encouraging bridging weak ties could have the effect of not only linking culturally different groups but of reducing student alienation and increasing social solidarity.

Looking at a case of successful integration demonstrates the value of weak ties in this process. Here, we review Blau's (1991) case of a children's psychiatric hospital in New York City.<sup>4</sup> This case shows that integration can only be understood by considering the role of an extensive network of weak ties. This public hospital had a staff of two hundred and served severely impaired children. Then, as now, treatment was difficult and outcomes uncertain. Although comparable institutions elsewhere were marked by



high staff turnover and low morale, Blau notes that this was decidedly not the case at the Children's Center. She attributes the high morale at the center to the surprising predominance of weak ties among staff members, with just about all being on a first-name basis. Interaction is so evenly distributed that there is an absence of cliques, though she did reveal a highly differentiated system of specialized staff relations forming stable networks.

These subnetworks have many different focal points of organization, reflecting the complex configuration of the hospital into departments, committees, programs, units and teams focused on specific sets of clients—similar to the subnetworks found in typical schooling organizations. If the ties in these stable networks were strong, the strength of weak ties argument would tend to close them off from one another, so that they would develop into disconnected cliques; the overwhelming predominance of weak ties, even if structured, produces and maintains, instead, a situation in which each subnetwork overlaps extensively with many others, and a large number of the weak ties serve bridging functions. Blau found, for example, that neither homogeneous work groups nor strong friendships could be identified. The institution's intolerance of close dyadic ties was expressed by the ritualized avoidance patterns among those who had a sexual or family alliance outside of the institution. This suggests that in a complex structure extensive weak networks can remain viable only when close ties are prohibited because when dimensions of structure intersect and staff is integrated in subnetworks of multiple crosscutting relations, close bonds with some will threaten working relations with others. Further, Blau goes on to show that an individual's access to learning opportunities and resources can only be leveraged if he or she is linked with others in diverse positions providing varied information, but strong ties tend to involve closed circles that limit such access. Since information was widely diffused across the hospital structure, it became imperative for staff to sustain bridging intergroup relations, which eroded bonds of ingroup cohesion. This by no means suggests that strong ties do not have macrosocial value as they have shown to be valuable sources of more expressive returns such as trust, advice, and support. But, Blau's work does show that strong ties tend to restrict the flow of information across differentiated organizational segments.

Weak ties have also been shown to benefit cooperative learning group interaction between students of different race and sex. The emphasis on this strand of research is also on the integrative benefits of weak tie activation. Drawing on Hansell's (1984) study of a cooperative group intervention designed to increase weak ties between naturally occurring peer groups, we once again find evidence of the benefits of weak ties on social cohesion. This particular study investigated several hypotheses about the structure of intergroup relations derived from Granovetter's (1973) theory of the strength of weak ties. Hansell's experimental research provided substantial support for this theory. First, it was found that pre-existing friendships between students of different races or sexes were predominantly weak, supporting the hypothesis that the strength of relationships varies directly with their homophily. This was consistent with the results of earlier studies (e.g. Singleton and Asher, 1979). The second finding was that cooperative group experience increases weak ties, and weak cross-race and weak cross-sex ties in particular, supports the potential usefulness of this classroom intervention in the

desegregation of schools, and raises many interesting issues for further research. At first it seems surprising that cooperative interaction in small groups would stimulate more than a few weak ties. Cooperative groups usually had two members of each race and sex, which would yield, at most, four new cross-race or cross-sex friendships. However, once a new interracial relationship is formed, the new friend's friends became likely candidates for friendship as well. Thus, we can deduce from this research that a small number of new interracial ties may greatly expand the potential pool of friends of the opposite race, even possibly, as posited by Slavin and Hansell (1983), beyond a single classroom. This introduces the possibility of using weak bridge relations between existing peer groups without fundamentally changing their composition.

The research on the advantageous effects of weak ties draws on varied evidence from diverse contexts. Though we have relied on evidence from outside the field of education, we contend that conclusions from other contexts can inform the work of educational researchers. Our review has also considered this breadth of work in regards to both individual effects—specifically cognitive development, creativity, and knowledge transfer—and group level effects such as social cohesion. The research cited is diverse in origin, and varies in its style of accompanying evidence, but most suggests convincingly that weak ties are indeed strong. We now turn to a case in which we test two of the theory's core propositions: 1) the stronger the tie between two people, the more their social worlds overlap; and 2) the stronger the tie between two people, the less likely the relation will serve as a bridge to non-overlapping groups.

#### THE STRENGTH OF WEAK TIES: AN EMPIRICAL TEST USING EIES DATA

Numerous researchers have devised sophisticated and robust measures for examining propositions that have been deduced from Granovetter's theory. Recent work has investigated the optimal mix of strong versus weak ties for a particular person (Hansen, 1999) and for the larger network in which that actor is embedded (Uzzi, 1996). These studies have relied, and rightly so, on hierarchical linear modeling techniques to account for the nested nature of the data and measure effects on certain outcome variables, whether it be knowledge accumulation, job acquisition, or reputation. We take a slightly different approach and then demonstrate this technique to offer further evidence of the strength in weak ties and the implications for learning settings.

First, we test the proposition that the stronger the tie between two people, the more their social worlds—or what we refer to as neighborhoods—overlap. To do so, we draw on data from Freeman and Freeman (1979). These data come from a computer conference among researchers working in the emerging scientific specialty of social network research sponsored by the National Science Foundation. These data were collected as part of a study on the impact of the Electronic Information Exchange System (EIES) housed at the New Jersey Institute of Technology. Fifty researchers interested in social network research participated. The data we report on focus on the 32 people who completed the study. These researchers included sociologists, anthropologists, statisticians and mathematicians. As part of the conference, a computer network was set-up and participants were given computer terminals and access to a network for sending

electronic mail messages to other participants. Consequently, this study involved what at the time was a novel way for researchers to communicate.<sup>5</sup>

Of particular interest are the network data arising from the study. Two relations, messages sent and acquaintanceships were recorded. We focus on the latter relation, which was measured by a questionnaire at the beginning of the study, and nine months later at the study's conclusion. Participants were asked to indicate, for every other participant, whether he or she did not know the other, had heard of the other participant, had heard of the other but had not met him or her, had met the other, was a friend of the other, or was a close personal friend of the other. Therefore, we have a relation coded from 0 (did not know the other) to 4 (close personal friend of the other) at the beginning and end of the study. These data are provided by Borgatti, Everett, and Freeman (2002).

To test the first proposition, the basic strategy proceeds as follows (Borgatti and Feld, 1994). First, we obtain the strength of ties among all pairs of researchers, and arrange these data as an actor-by-actor matrix labeled "Strength." This is a valued and directed matrix derived from the maximum reported acquaintance relation at either time point.

Second, we obtain a measure of the extent to which the neighborhoods of each pair of researchers overlap. In other words, for each pair we count the number of people that both are connected to. We then arrange these data as an actor-by-actor matrix as well, making certain that the order of actors is the same as in the "Strength" matrix. We then labeled this matrix, "Overlap." Some processing was also required to get this "Overlap" matrix. To do so, we first dichotomize the "Strength" matrix so all values greater than 0 were coded 1, 0 otherwise. We then multiply this dichotomized matrix by its transpose, giving us the "Overlap" matrix. The effect of this matrix multiplication was to count the number of times each pair of rows in "Strength" has a 1 in the same column, indicating that two actors are connected to the same third party.

These two matrices now enable us to test the proposition noted above. Since we are interested in both the correlation and its significance, we cannot use a significance test computed by standard statistical packages. These packages assume that the observations (which in this example are the dyads—pairs of researchers) are independently sampled from a population, which is clearly not the case here. Our dyads comprise a census of all dyads given the actors sampled. Furthermore, dyads located in the same row or column of the data matrices are not independent since they share the same actors as endpoints.

To get around the messy statistical issue of independence, we use the quadratic assignment procedure (QAP) (Hubert and Schultz 1976; Baker and Hubert 1981) which, in essence, compares the observed correlation with a distribution of random correlations generated according to the null hypothesis of no relationship between the matrices. The p-value is given by the proportion of random correlations that are as large as or larger than the observed correlation. The QAP procedure works by permuting the rows and columns (together) of one of the input matrices, and then correlating the permuted matrix

with the other data matrix. This process is repeated hundreds of times to build up a distribution of correlations under the null hypothesis. While certain usages of QAP may in fact be biased (Krackhardt 1992), Krackhardt's (1987, 1988) simulations show that QAP analyses are more likely to discriminate between significant and insignificant correlations than are conventional OLS (Ordinary Least Squares) statistics.

Following this procedure, we report that the EIES data provide strong evidence in support of the proposition that the stronger the tie between two people, the more their social neighborhoods overlap. Or, in other words, the strength of relationship between two researchers predicts the number of acquaintances they have in common. The Pearson correlation between strength of tie and neighborhood overlap is .756,  $p < 0.001$ .<sup>6</sup>

Another interpretation of the strength of weak ties theory is that the stronger the tie between two people, the less their tie serves as a connection between their non-overlapping social connections to others. This proposition as applied to non-overlap is only equivalent to its application to overlap under the unlikely condition that overlap is perfectly negatively correlated with non-overlap (i.e. there is no variation in acquaintance volume). In general, then, it is useful to separately explore the implications of strength of ties for non-overlap as well as for overlap.

To extend the previous technique for application to non-overlap, we construct a "Non-overlap" matrix that can be correlated with strength. Recall the dichotomized "Strength" matrix and its transpose. We first calculate the complement of "Strength". Then, we multiply "Strength" times its complement and then add that new matrix to its transpose. This gives us the "Non-overlap" matrix. Once this non-overlap matrix has been obtained, we then correlate it with "Strength" in the same way we did with the "Overlap" matrix, except this time we expect a negative correlation, and the p-value is given by the proportion of random correlations that are as small as or smaller than the observed.

Applying this technique to the EIES data, we observe a Pearson correlation of -.425 between "Strength" of tie and "Non-overlap,"  $p < .001$ .<sup>7</sup> This result further supports the theory, and suggests that the stronger the relation between two researchers, the less likely the relation will serve as a bridge to other neighborhoods. An extension of this suggests that as researchers become closer friends, the less likely they are to connect to others outside of their local neighborhood, perhaps leading to greater fragmentation across the entire network.

### Discussion and Implications of EIES Data

The EIES data set represents a learning setting that consists of researchers, bound together by the subgroup affiliation of the discipline within which they work, engaged in information exchanges that have some professional relevance. This setting is somewhat analogous to what one may find in a typical classroom—people with various interests and areas of expertise engaging in information exchanges towards some desirable end.

Though there is strong evidence supporting propositions derived from the strength of weak ties theory, this does not necessarily mean that these strong, non-overlapping ties among subsets of researchers are a bad thing. We can speculate that these ties put researchers at a disadvantage, cutting them off from possibly new or contradictory practices. This by no means is meant to suggest that researchers with strong ties should set out to construct large networks of weak acquaintances, as there certainly are individual benefits to maintaining these strong ties. Though access to new information may be constrained by strong ties, strong ties are important because they are more accessible and willing to be helpful (Krackhardt, 1992). Why might, then, strong ties be effective in providing useful knowledge? Consistent with the work of (Tsai and Ghosal (1998), such relationships are more likely to be effective because they tend to be trusting ones. Trust mediates the link between strong ties and the receipt of useful knowledge (Levin, et al., 2003). Note that the focus here is on the receipt of useful knowledge, not on people's propensity to seek out a knowledge source in the first place. Trusting a knowledge source to be benevolent and competent increases the chance that the knowledge receiver will learn from the interaction. What we observe in the EIES data are clusters of non-overlapping subsets receiving useful information from within relatively small, tightly-bounded groups. This trusted interaction could have very well served the interests of these researchers. After all, when it comes to receiving information that has professional relevance, it only makes sense that one trust the source of that information, particularly when the information being exchanged is complex and inexact. Strong ties provide the basis for this support.

The strong ties among researchers in the EIES data also constitute a base of trust that can provide comfort and stability in the face of uncertainty. Given that these researchers were working in a specialty area whose core ideas and methods were emerging, we can infer that there was a degree of uncertainty circulating among these researchers. Settings dominated by strong friendship ties are better suited to adapting to environmental changes and uncertainty (Krackhardt and Stern, 1988). We can then conclude that there is strength in strong ties in situations of uncertainty. Change is not facilitated by weak ties, but rather by a particular type of strong tie, what Krackhardt (1992) succinctly defines as a *philos tie*. These are the ties that generate expressive returns (Lin, 2002) such as trust, support and social control in the form of discouraging malfeasance. They are also valuable when it comes to the transfer of complex forms of knowledge (Hansen, 1999), as demonstrated by the researchers in the EIES data set.

This value can be attributed to the idea that the stronger the relationship, the more likely the sharing and exchanging of resources (Lin, 2001). Mutual support and recognition go hand in hand with promotion of Ego and Alter's resources, including their reputation. Thus, such relationships are mutually tolerant and even encourage social debts and credits, as well as forgiveness of debts. This suggests that strong ties based on sentiment, trust, and sharing of resources support the maintenance and reinforcement of existing resources.

Maintaining these strong ties, however, is significantly more costly than maintaining weak ones (Boorman, 1975). These ties typically require frequent

interaction, and much of this interaction is not directly related to a specific problem and hence distracts individuals from more pressing and immediate tasks.

Our analysis has focused on two related propositions that have been derived from Granovetter's strength of weak ties argument. We did not set out to test or expand this argument. Rather, we sought to achieve two objectives. First, we have provided a method by which propositions derived from the theory could be evaluated using standard sociometric data. Second, our analysis of the EIES data did not connect weak ties to any instrumental advantage. Rather, we focused on the expressive benefits of strong ties in settings where trust neutralizes the effects of uncertainty. This analysis attempted to refocus our attention on the importance of strong ties in learning settings. The paradox, of course, is that strength can be found in both weak and strong ties, depending on the returns one seeks.

## CONCLUSIONS

Weak ties versus strong ties? Which matter more under what conditions? The first half of this paper discussed the individual and collective benefits of weak ties, demonstrating the positive, typically instrumental returns that weak ties provide. The second half of this paper put forth arguments for the benefits of strong ties and their expressive returns in learning settings. Citing data from Freeman and Freeman's EIES study, we offered reasons as to why strong ties among sets of researchers were, in this case, advantageous. Our reason for doing so was not to present a muddled, incoherent image of the social dynamics at play in learning settings. Rather, we attempted to draw attention to both the instrumental and expressive content of relations. The competing forces of weak and strong ties show the complexity of learning in areas where new instrumental knowledge is as important as the transfer of socio-emotional support, highlighting the interplay between both behavior and affect. To clarify this structural picture, we now consider three cases that highlight the competing benefits of weak and strong ties in learning settings.

### School Size and Interracial Contact

Feld and Carter (1998) put forth a reason—increasing interracial contact—for increasing school size that calls on the advantages of weak ties. If two schools with similar racial distributions are combined, then the overall potential for interracial contact is doubled, and their models suggest that there is likely to be a sizable increase in the number of interracial weak ties that develop. Of course, there are numerous reasons why policy makers would not want school sizes to be too large, and there may be other reasons why they might want there to be several separate schools. When there are several schools of various sizes, Feld and Carter's analysis indicates that allowing some concentrations of minorities in the larger schools is likely to facilitate the development of interracial weak ties that ultimately lead to greater overall cohesion.

There are, of course, practical considerations to this argument. It is apparent that there are often many structural features of schools that resegment blacks and whites

within schools (Epstein, 1985; Oakes, 1986), and students own preferences for homophilus relations (Hallinan and Williams, 1989) further reinforce these boundaries. Nevertheless, there is evidence that increasing the potential for interracial contact does tend to increase the amount of interracial relation to some extent (Hallinan and Smith, 1985). The simple presence of intergroup opportunities has important effects on the frequencies of intergroup social ties. By simply providing opportunities for interracial weak ties to develop, schools will likely experience greater interracial cohesion.

### At-Risk Student Interventions

At-risk students are often characterized by the social isolation reflected and recreated by their daily schooling experience (Rubin and Mills, 1993). This virtual isolation negates any intervention to change behavior in ways that are consistent with the aims of schooling. This change, however, is not something that can be fostered by simply putting these individuals in touch with others who may potentially help them. Rather change, the product of strong, affective, and time-honored relationships, can only be triggered by strong ties. A major resource that is required to bring about such a change is trust in the propagators of that change (Krackhardt, 1992).

One might then imagine an intervention strategy that overtly develops trusting relationships between at-risk students and those that work with them. This strategy would likely have three generic features:<sup>8</sup> 1) Small size, allowing attention to individual needs of students through frequent face-to-face interactions and monitoring; 2) A more expansive and collaborative conceptualization of what it means to be a teacher, enabling teachers to attend to the needs of the "whole student" which creates in students a sense that they are cared for, and the sense of collegiality which binds together the team of teachers working in the program and; 3) A sense of kin-like cohesion among members that measures success at a more collective level. Schools, however, are often wary or ill-equipped to invest the necessary resources in programs that require such a significant proportion of organizational resources. Without focusing on the development of trust, any intervention strategy that targets the needs of these students is unlikely to produce any enduring positive effects.

### Faculty Cohesion

Developing cohesion among teachers in schooling organizations has historically posed a problem. Much of this can be attributed to the physical isolation of teaching within the confines of one's classroom (Lortie, 1975). In addition to the classroom, the typical organizational subunits of schooling also play a significant role. By affiliating teachers with grades, content areas, and levels of student ability, schools implicitly create social fissures that inhibit the development of a cohesive faculty and the limit the learning opportunities afforded through integration. To counteract these mechanisms, schools might want to consider ways to enhance the integrative functions performed by informal organization and the personal relationships that develop among participants. Here, the focus would be on structuring relations in a manner that distribute weak ties evenly while simultaneously prohibiting the development of tightly-bound cliques.

There are three ways in which schools could approach this. First, schools could consider implementing an informal observation process that randomly assigns teachers to observe other teachers. The purpose of this evaluation would not be to inform decisions regarding retention or dismissal, but to rather identify best practices across the content areas. Another type of activity that would spur the development of weak ties would be ones that placed greater responsibility on faculty to coordinate tasks typically associated with the administration. Take, for example, curriculum. Imagine a faculty committee, whose composition rotated every year or two, which had the ability to develop and adopt curricula across the organization. Such interaction across the school's subunits would require individuals to coordinate with others outside of their most immediate interests. A third way in which the formal structure could be used to encourage the development of weak ties would be to organize curricula in such a way that it cannot be firmly attached to one specific content area. Rather, curricula could be organized according to tasks that require the content knowledge and expertise from a variety of disciplines. If, for example, a student's entire school year were organized around the development of a small-business plan, one could imagine the collaboration that such an activity would require among teachers from just about every required content area. Undermining these three proposed strategies is the idea that weak tie development can tap into collective expertise and trigger individual innovation, efficiency, and effectiveness, while simultaneously bidding one to the goals of the schooling organization.

We do not present any of the above possibilities as proposals of sure-fire interventions. Rather, our intent is to demonstrate how focusing on the relations within and across learning settings can generate ideas for activities and interventions that are more likely to produce enduring and favorable results. If learning is a social process embedded in a context of overlapping relationships that vary in both purpose and content, then the strength of relations should be the pivotal focal point in designing meaningful learning opportunities. Whether the ties are strong or weak, each type produces certain returns that affect the outcomes that learners experience.



## REFERENCES

- Baker, F.B., and L.J. Hubert. "The Analysis of Social Interaction Data: A Nonparametric Technique." *Sociological Methods and Research* 9 (1981): 339-61.
- Bernard, H.R., P.D. Kilworth, and L. Sailer. "Informant Accuracy in Social Network Data V: An Experimental Attempt to Predict Actual Communication from Recall Data." *Social Science Research* 11 (1982): 30-66.
- Bernstein, B. *Class, Codes and Control: Towards a Theory of Educational Transmission*. Vol. 1. London: Routledge & Kegan Paul, 1971.
- Blau, J., and N. Goodman, eds. *Social Roles and Social Institutions: Essays in Honor of Rose Laub Coser*. Boulder, CO: Westview Press, 1991.
- Blau, P. "Parameters of Social Structure." *American Sociological Review* 39, no. 5 (1974): 615-35.
- Boorman, S.A. "A Combinatorial Optimization Model for Transmission of Job Information through Contact Networks." *Bell Journal of Economics* 6 (1975): 216-49.
- Borgatti, S. P., Everett, M.G. and Freeman, L.C. (2002). *Ucinet for Windows: Software for Social Network Analysis (Version 6)*. Cambridge, MA: Analytic Technologies.
- Borgatti, S.P., and S.L. Feld. "How to Test the Strength of Weak Ties Theory." *Connections* 17, no. 1 (1994): 45-46.
- Bruffee, K.. *Collaborative Learning Higher Education, Interdependence, and the Authority of Knowledge*. 2nd ed. Baltimore: Johns Hopkins University Press, 1998.
- Burt, R.S. *Structural Holes: The Social Structure of Competition*. Cambridge, MA: Harvard University Press, 1992.
- . "Structural Holes and Good Ideas." *American Journal of Sociology* 110, no. 2 (2004): 349-99.
- Bryk, A.S. and Schneider, B. (2002). *Trust in Schools: A Core Resource for Improvement*. New York: Russell Sage.
- Collins, R.. *The Sociology of Philosophies: A Global Theory of Intellectual Change*. Cambridge MA: Harvard University Press, 1998.
- Constant, D., L. Sproull, and S. Kiesler. "The Kindness of Strangers: The Usefulness of Electronic Weak Ties for Technical Advice." *Organization Science* 7 (1996): 119-35.

Coser, R. "The Complexity of Roles as Seedbed of Individual Autonomy." In *The Idea of Social Structure: Essays in Honor of Robert Merton*, edited by L. Coser, 237-64. New York: Harcourt Brace Jovanovich, 1975.

Durkheim, E. *Division of Labor in Society*. Translated by G. Simpson. New York: The Free Press, 1997.

Epstein, J.L. "After the Bus Arrives: Resegregation in Desegregated Schools." *Journal of Social Issues* 41 (1985): 23-43.

Feld, S.L., and W.C. Carter. "When Desegregation Reduces Interracial Contact: A Class Size Pradox for Weak Ties." *American Journal of Sociology* 103, no. 5 (1998): 1165-86.

Fordham, S., and J. Ogbu. "Black Students' Success: Coping with the Burden of "Acting White"." *Urban Review* 18 (1986): 176-206.

Freeman, L.C., and S.C. Freeman. "A Semi-Visible College: Structural Effects of Seven Months of EIES Participation by a Social Networks Community." In *Electronic Communication: Technology and Impacts*, edited by M.M. Henderson and M.J. MacNaughton, 77-85. Washington D.C.: American Association for the Advancement of Science, 1980.

Freeman, S.C., and L.C. Freeman. "The Networkers Network: A Study of the Impact of a New Communications Medium on Sociometric Structure." Irvine, CA: University of California, 1979.

Goffman, E. *Frame Analysis*. New York: Harper and Row, 1974.

Gladwell, M. *The Tipping Point: How Little Things Can Make a Big Difference*. New York: Little Brown, 2000.

Gould, R.V. *Insurgent Identities: Class, Community, and Protest in Paris from 1848 to the Commune*. Chicago: University of Chicago Press, 1995.

Granovetter, M.S. "The Strength of Weak Ties." *American Journal of Sociology* 78, no. 6 (1973): 1360-80.

———. "The Strength of Weak Ties: A Network Theory Revisited." *Sociological Theory* 1 (1983): 201-33.

Grant, R.M. "Prospering in Dynamically-Competitive Environments: Organizational Capability as Knowledge Integration." *Organization Science* 7 (1996): 375-87.

Hallinan, M.T., and S.A. Smith. "The Effects of Classroom Racial Composition on Students' Interracial Friendliness." *Social Forces*, no. 61 (1985): 56-72.

- Hallinan, M.T., and R. A. Williams. "Interracial Friendship Choices in Secondary Schools." *American Sociological Review* 54 (1989): 67-78.
- Hansell, S. "Cooperative Groups, Weak Ties, and the Integration of Peer Friendships." *Social Psychology Quarterly* 47 (1984): 316-28.
- Hansen, M.T. "The Search-Transfer Problem: The Role of Weak Ties in Sharing Knowledge across Organization Subunits." *Administrative Science Quarterly* 44 (1999): 82-111.
- Haythornthwaite, C. "Building Social Networks Via Computer Networks: Creating and Sustaining Distributed Learning Communities." In *Building Virtual Communities: Learning and Change in Cyberspace*, edited by K.A. Renninger and W. Shumar, 159-90. Cambridge, UK: Cambridge University Press, 2002.
- Homans, G.C. *The Human Group*. New York: Harcourt, Brace, 1950.
- Hubert, L., and J. Schultz. "Quadratic Assignment as a General Data Analysis Strategy." *British Journal of Mathematical and Statistical Psychology* 29 (1976): 190-241.
- McDill, E.L., G. Natriello, and A.M. Pallas. "A Population at Risk: Potential Consequences of Tougher School Standards for Student Dropouts." *American Journal of Education* 94, no. 2 (1986): 135-81.
- Milner, M. *Freaks, Geeks and Cool Kids: American Teenagers, Schools, and the Culture of Consumption*. New York: Routledge, 2004.
- Kadushin, C. "The Friends and Supporters of Psychotherapy: On Social Circles in Urban Life." *American Sociological Review* 31 (1966): 786-802.
- Karweit, N., S. Hansell, and M. Ricks. "The Conditions for Peer Association in Schools." Baltimore: Center for Social Organization of Schools, Johns Hopkins University, 1979.
- Kogut, B., and U. Zander. "Knowledge of the Firm, Combinative Capabilities, and the Replication of Technology." *Organization Science* 3, no. 3 (1992): 383-97.
- Krackhardt, D. "A Caveat on the Use of the Quadratic Assignment Procedure." *Journal of Quantitative Anthropology* 3 (1992): 279-96.
- . "Predicting with Networks: Nonparameteric Multiple Regression Analysis of Dyadic Data." *Social Networks* 10, no. 359-381 (1988).
- . "QAP Partialling as a Test of Spuriousness." *Social Networks* 9 (1987): 171-86.

———. "The Strength of Strong Ties: The Importance of Philos in Organizations." In *Networks and Organizations: Structure, Form, and Action*, edited by N. Nohria and R. Eccles, 216-39. Boston: Harvard Business School Press, 1992.

Krackhardt, D., and R. Stern. "Informal Networks and Organizational Crises: An Experimental Simulation." *Social Psychology Quarterly* 51, no. 123-140 (1988).

Lave, J., and E. Wenger. *Situated Learning: Legitimate Peripheral Participation*. Cambridge: Cambridge University Press, 1991.

Levin, D.Z., and R. Cross. "The Strength of Weak Ties You Can Trust: The Mediating Role of Trust in Effective Knowledge Transfer." *Management Science* 50, no. 11 (2004): 1477-90.

Lin, N. *Social Capital: A Theory of Social Structure and Action*. New York: Cambridge University Press, 2001.

———. "Building a Network Theory of Social Capital." In *Social Capital: Theory and Research*, edited by K. Cook N. Lin, R.S. Burt, 3-30. New York: Aldine de Gruyter, 2002.

Lin, N., W.M. Ensel, and J.C. Vaughn. "Social Resources and Strength of Ties: Structural Factors in Occupational Status Attainment." *American Sociological Review* 46, no. 4 (1981): 393-405.

Lortie, D.C.. *Schoolteacher*. Chicago: University of Chicago Press, 1975.

Marsden, P.V., and K. E. Campbell. "Measuring Tie Strength." *Social Forces* 63 (1984): 483-501.

Merton, R. "The Role-Set: Problems in Sociological Theory." *British Journal of Sociology* 8 (1957): 106-20.

Oakes, J. *Keeping Track: How Schools Structure Inequality*. New Haven: Yale University Press, 1986.

Padgett, J.F., and Ansell, C.K. "Robust Action and the Rise of the Medici, 1400-1434." *American Journal of Sociology* 98, no. 6 (1993): 1259-319.

Persell, C. H., and P.W. Cookson Jr. "Race and Class in American Prep Schools: African-Americans as the "Outsiders within"." *The Journal of Negro Education* 60, no. 12 (1991): 219-28.

Rogers, E. *The Diffusion of Innovation*. 4th ed. New York: Free Press, 1995.

Rubin, K. H., and Mills, R. S. L. (1993). Socialization factors in the development of social withdrawal. In K. Rubin & J. B. Asendorpf (Eds.), *Social withdrawal, inhibition, and shyness in childhood* (pp. 117-148). Hillsdale, NJ: Lawrence Erlbaum Associates.

Simmel, G. *The Sociology of Georg Simmel*. Translated by Kurt Wolff. Glencoe, IL: Free Press, 1950.

Singleton, L.C. , and S.R. Asher. "Racial Integration and Children's Peer Preferences: An Investigation of Developmental and Cohort Differences." *Child Development* 50 (1979): 936-1041.

Slavin, R.E., and S. Hansell. "Cooperative Learning and Intergroup Relations: Contact Theory in the Classroom." In *Friends in School*, edi

Tatum, B.D. "Why Are All the Black Kids Sitting Together in the Cafeteria?" and Other Conversations about the Development of Racial Identity. New York: Basic Books, 1997.

Toennies, F. *Community and Society (Gemeinschaft Und Gesellschaft)*. Translated by Charles P. Loomis. New York: Harper & Row, 1963.

Tsai, W, and S. Ghosal. "Social Capital and Value Creation: The Role of Intrafirm Networks." *Academy of Management Journal* 41 (1998): 464-76. ted by J.L. Epstein and N. Karweit. New York: Academic Press, 1983.

Uzzi, B. "Social Structure and Competition in Interfirm Networks: The Paradox of Embeddedness." *Administrative Science Quarterly* 42 (1997): 35-67.

———. "The Sources and Consequences of Embeddedness for Economic Performance of Organizations: The Network Effect." *American Sociological Review* 61 (1996): 674-98.

Willis, P.. *Learning to Labor*. New York: Columbia University Press, 1981.

Wirth, L. "Urbanism as a Way of Life." *American Journal of Sociology* 44 (1938): 1-24.

Figures

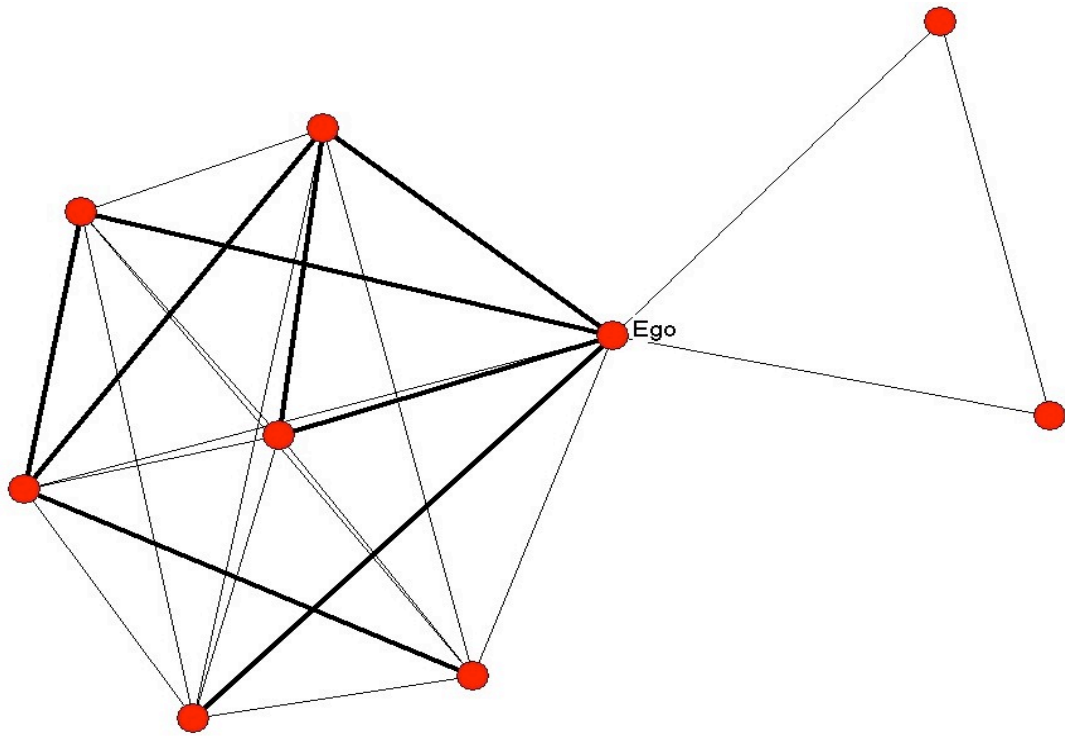


Figure 1: Ego and collection of alters. Line thickness indicates strength of relationship between Ego and alters.

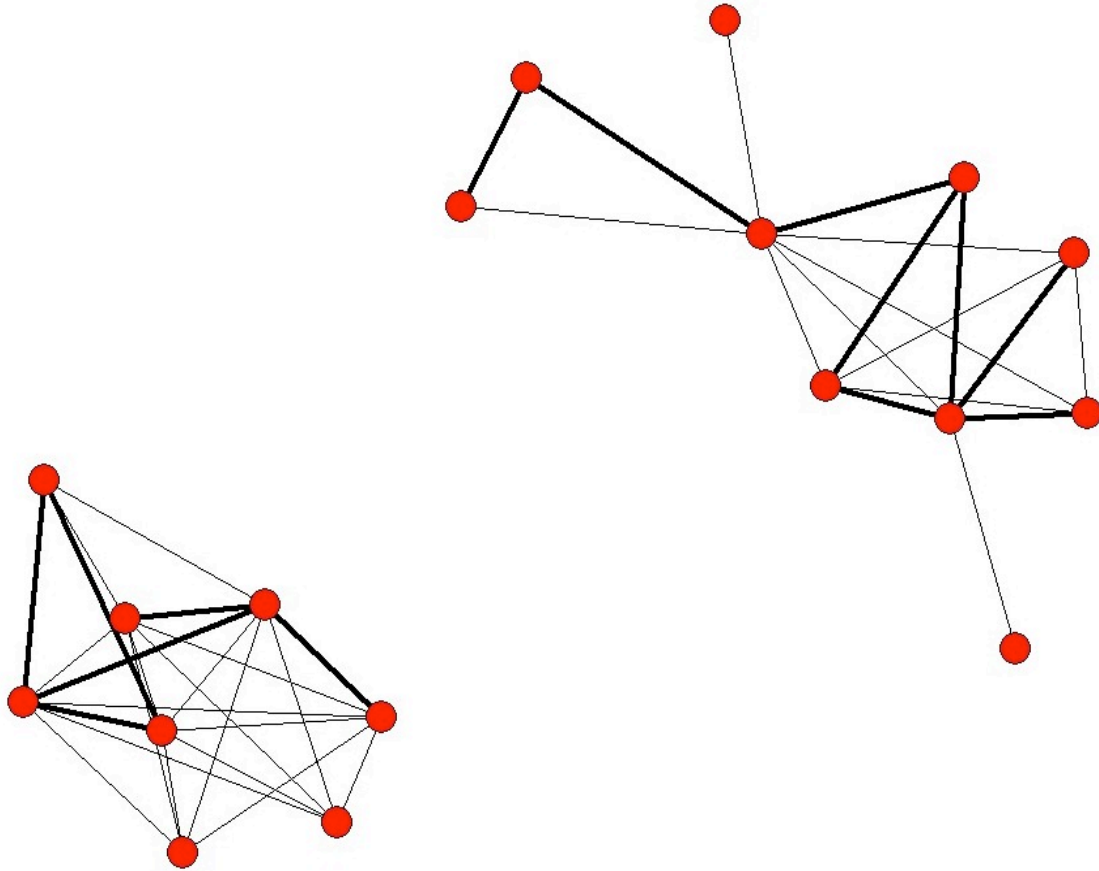


Figure 2: Network of Alters minus Ego. Both clusters represent two fairly tight subsets of individuals that, without Ego, are disconnected.

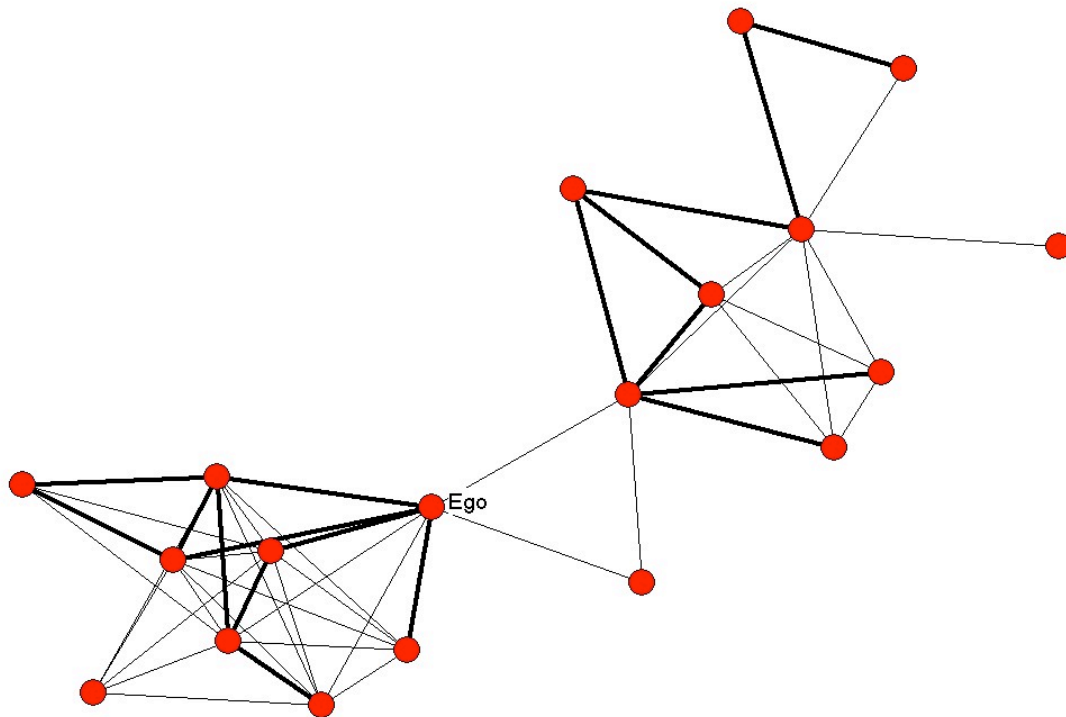


Figure 3: Ego demonstrating a bridge relation that connects two otherwise disparate components of social structure.

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<sup>1</sup> This linkage of micro and macro levels—what Lin (2002) refers to as the meso-level—is of central importance to the development of any sociological theory.

<sup>2</sup> Homophilus interaction characterizes relations between two actors who have similar resources, including wealth, power, status, and lifestyle (Homans, 1950).

<sup>3</sup> Gladwell (2000) discusses several profiles of individuals who are particularly effective in bridging roles. He designates those who use weak ties to bridge groups as “connectors,” those who are key sources of information for members as diverse groups as “mavens,” and those who are unusually effective in persuading others to accept new things as “salespeople.”

<sup>4</sup> These data were first reported by Blau in 1980 and discussed by Granovetter (1983).



<sup>5</sup> For more details of the study, see Freeman and Freeman (1980) and Bernard, Killworth, and Sailer (1982).

<sup>6</sup> The  $p$ -value reported is the proportion of random correlations that are as large or larger than the observed correlation.

<sup>7</sup> The  $p$ -value given is the proportion of random correlations that are as small or smaller than the observed.

<sup>8</sup> These features are mentioned in McDill, Natriello and Pallas (1986), but are not explicitly discussed using the concept of strong ties.