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Structure, culture and Simmelian ties in entrepreneurial firms

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Abstract

This article develops a cultural agreement approach to organizational culture that emphasizes how clusters of individuals reinforce potentially idiosyncratic understandings of many aspects of culture including the structure of network relations. Building on recent work concerning Simmelian tied dyads (defined as dyads embedded in three-person cliques), the research examines perceptions concerning advice and friendship relations in three entrepreneurial firms. The results support the idea that Simmelian tied dyads (relative to dyads in general) reach higher agreement concerning who is tied to whom, and who are embedded together in triads in organizations. © 2002 Elsevier Science B.V. All rights reserved.

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1. Introduction

Human behavior is embedded in social networks that facilitate the flow of knowledge and other resources between individuals and groups. The very culture of the organization exists as shared knowledge in the minds of organizational members, and this shared knowledge is distributed and interpreted through social networks (Krackhardt and Kilduff, 1990). In work organizations, such social networks include advice networks and friendship networks. The structure of relationships within which the individual is embedded can constrain and enable knowledge transfer, specifically knowledge about the culture. In this paper, we focus on the ways in which social structure influences cultural understanding.

Most approaches to culture (including organizational culture) proceed from an ethnographic perspective that focuses on the rich texture of rituals and activities within specific

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domains (e.g. Turnbull, 1962). Recently, researchers have begun to draw upon sociological theory and cognitive anthropology to forge a social network approach to culture that emphasizes underlying structures of relations rather than the content of ceremonies and rituals (see discussion in Kilduff and Corley, 2000). A focus on the ways in which patterns of informal relations affect patterns of understanding can help pose and answer, “a novel set of researchable questions” concerning organizational culture (Pettigrew, 2000, p. xv).

The sociological inspiration for a network approach to organizational culture derives from classic thinkers, such as Marx, Durkheim and Simmel for whom, “the forms and patterns of social relations were more important than the content” (Mizruchi, 1994, pp. 329–330). The work of Georg Simmel, in particular, focused attention on the many social situations that could be analyzed in terms of relationships within three-person groups. We build on this work in this paper.

Research from the tradition of cognitive anthropology treats culture as a cognitive system transmitted through social interactions. Each culture develops its own system of knowledge (Romney and D’Andrade, 1964) and this knowledge is dispersed both among experts and novices (Romney et al., 1986). Interaction between group members results in knowledge diffusion (Carley, 1991) concerning important aspects of the culture, such as the distribution of roles and relations (D’Andrade, 1984, p. 110). Effective action within a specific culture requires an understanding of how that particular world is organized (D’Andrade, 1995, p. 182). That is, an important part of cultural knowledge is the knowledge of how to operate in this complex web of relations and dependencies. This knowledge in turn depends in part on knowing who is related to whom in important ways (Krackhardt, 1990).

Anthropological studies of culture have emphasized the degree to which consensus concerning kinship and other social relations serves to define different cultures (Romney and D’Andrade, 1964; Romney et al., 1986, 1987). Network structures in traditional societies determine “most of one’s positions . . . and most of what one will be expected to do” (D’Andrade, 1995, p. 19).

An important question that any approach to culture must address is the relationship between culture and social structure (see discussion in D’Andrade, 1984). In bringing together Simmel’s emphasis on triadic relationships with cognitive anthropology’s emphasis on culture as a system of knowledge, we bring a fragmentation perspective to this question (cf. Martin, 1992, pp. 130–167). From a fragmentation perspective, cultural knowledge is clustered in the minds of interacting individuals. The organization resembles a magnetic field “of personal forces” (Barnard, 1938, p. 75) in which individuals and groups attract and repel each other, developing idiosyncratic interpretations of the culture that are reinforced through social interactions (cf. Krackhardt and Kilduff, 1990). Respondents “may give strikingly different descriptions” of the network relations within a particular group (Geertz and Geertz, 1975, p. 1). To understand the culture is to understand how the network ties between individuals shape their perceptions of the social world.

2. The structure of cultural agreement

Individuals who interact with each other are likely to have a higher agreement concerning the culture than non-interacting individuals (Krackhardt and Kilduff, 1990). Further, some

relations (strong ties, for example) are likely to produce more cultural agreement than others.

Simmel (1950) moved beyond the distinction between strong and weak ties by examining the special nature of dyadic ties embedded within triads. He suggested that relations embedded in a triad are stronger, more durable, and in particular more able to produce agreement between actors than relations not so embedded. Research confirms that dyadic relations embedded in triads (relative to dyadic relations in general) are more stable over time (Krackhardt, 1998) and exert more pressure on people to conform to clique norms and behavior (Krackhardt, 1999). Due to Simmel's pioneering work in this area, we refer to dyadic ties embedded in three-person cliques as Simmelian ties.

The culture of the organization is communicated through social networks (Krackhardt and Kilduff, 1990). But part of what is communicated is information about the social network itself. The social network is, therefore, both the vehicle through which cultural meaning is communicated and an important topic of cultural communication (see the related discussion in D'Andrade, 1984). Clusters of individuals reinforce potentially idiosyncratic understandings of many aspects of organizational culture including the structure of roles and relationships.

2.1. Advice and friendship relations in organizations

Thus, cognitions about social relations are an important aspect of culture. In modern organizations, informal advice and friendship relations are critical for decision making and resource allocation (see discussion in Krackhardt and Hanson, 1993). The structure of these networks resides as tacit knowledge in the minds of organizational members in the form of cognitive maps (Krackhardt and Kilduff, 1999; Kumbasar et al., 1994). To the extent that people agree about the structure of advice and friendship relations in organizations, they share an understanding of important aspects of the culture of the organization.

Our focus on knowledge concerning advice and friendship networks enables us to examine both instrumental and expressive domains (cf. Lincoln and Miller, 1979). Knowledge about advice relations is instrumental in the sense that such knowledge is the key to understanding how work gets done, how daily routine exceptions are handled, and who the experts are in the organization. Knowledge of who goes to whom for advice can be advantageous in short-circuiting long indirect chains of information gathering in the firm. Knowledge about friendship relations, on the other hand, is useful in determining who can trust whom, who is more likely to cooperate with whom, and who is likely to go to whose defense in a political scrap (Krackhardt, 1990, 1992).

2.2. Dyadic and Simmelian ties

As advice and friendship networks develop in a firm, how does cultural agreement emerge? Certainly, agreement could follow the structure of the ties themselves. As two people interact in an advice relationship, for example, they are likely to share information about who else advises others. Dyadic ties are, therefore, likely to induce similarity in beliefs about the advice network. Similarly, friends may influence each other in their beliefs about who is a friend of whom in the firm.

But, if Simmel is to be believed, these similarities in perceptions should be enhanced through the agreement-creating force of Simmelian triads (see discussion in Krackhardt, 1999). The likelihood that two friends or advice partners will reach agreement concerning the structure of social networks should increase if these two people are members of the same strong clique. Disagreements within the clique are more likely to be mediated by a third party friendly to two antagonists in a three-person clique than in a dyad. Further, sense-making processes within such cliques are likely to be particularly effective in providing individuals with opportunities to compare beliefs with similar others (cf. Festinger, 1954) thus facilitating the process of clarification concerning many aspects of organizational culture including information about who the informal leaders are and who is connected to whom.

Hypothesis 1. Relative to dyads in general, dyads embedded in Simmelian triads are likely to have higher agreement concerning who is tied to whom in the organization.

Dyads embedded in Simmelian triads (relative to dyads in general) are likely to exhibit agreement on many other aspects of the structure of the social worlds in which individuals' careers are formed. The social structure of organizations is likely to be opaque and subject to discussion and interpretation. For example, an important aspect of social structure is the organization of the network into cliques. From the perspective of coalition formation, knowledge about cliques is likely to be useful in predicting where alliances might form (see discussion in Murnighan and Brass, 1991). The members of Simmelian triads are, we argue, likely to share understandings concerning who is Simmelian tied to whom. Of course, dyads in general will tend to share beliefs about who is in which informal group, but dyads embedded in Simmelian triads are likely to influence each other even more toward agreement on such judgments.

Hypothesis 2. Relative to dyads in general, dyads embedded in Simmelian triads are likely to have higher agreement concerning who are embedded together in triads in the organization.

3. Method

3.1. Participants

To test the general proposition that Simmelian ties produce more conformity in cultural beliefs than raw dyadic ties, we examined the structural relations and beliefs about these structural relations among employees in three entrepreneurial firms. These firms were all small (less than 200 employees) and involved in state-of-the-art technologies in each of their areas. They all faced stiff competition from much larger players in their industries but were doing well within their particular niches.

At each of the three sites described below, participants were promised and given an overview of the findings. At all three sites, the same questionnaire was used as described in the Section 3.2. The high response rates (varying from 92 to 100%) reduced problems associated with non-response bias.

3.1.1. Site 1: Silicon Systems (SilSys)

This firm installed advanced computer information and communication systems for hospitals, schools, banks and small manufacturing firms. All 36 employees (28 men and 8 women) were included in the study, and all but three people completed the network questionnaires. (For more information, see Krackhardt, 1990, 1992, 1998; Kilduff and Krackhardt, 1994).

3.1.2. Site 2: Pacific Distributors (PacDis)

This firm distributed high tech electronic equipment to client manufacturing firms across the country. Offices were located in five different places nationwide, but most of the 162 employees worked at the headquarters. The sample consisted of 48 managers and key supervisory personnel (25 men and 23 women); 47 employees completed the questionnaire. (For more details, see Krackhardt and Kilduff, 1990).

3.1.3. Site 3: High Tech Manufacturing (HiTechMfg)

This firm manufactured specialized and sophisticated measuring equipment for sale to other manufacturing and service companies. The sample consisted of all 21 managers and supervisors (out of a total of 111 employees). All 21 people (all men) completed the questionnaire. (For more information, see Krackhardt and Kilduff, 1999).

3.2. Social network measures

To capture the participants' perceptions of advice and friendship relations, we used the same cognitive social structure (Krackhardt, 1987) questionnaire across all three sites. For example, to capture friendship perceptions, 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." Thus, John Meredith, of Silicon Systems, was asked a series of 36 questions concerning the friendships of the 36 employees of the firm. These questions were in this form: "Who would Jane Asch consider to be a personal friend?" "Who would Jerry Bonavue 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, for example, his perceptions concerning who Jane Asch considered to be her personal friends. (For more details, see Kilduff and Krackhardt, 1994).

Each respondent, then, gave us a complete cognitive map of his or her perceptions concerning who were friends with whom in the organization, and who went to whom for advice about work related matters.

3.2.1. Dyadic ties

The raw dyadic ties (R_{ij}) were created from the locally aggregated structure (Krackhardt, 1987). The procedure was the same for both the friendship and advice networks. A tie existed from person i to j only if person i claimed that i was a friend of (or asked advice from) j and person j agreed that person i was a friend of (or asked advice from) j . Thus, a friendship or advice link from i to j was defined as existing when both parties agreed that it existed. If both respondents did not confirm the existence of this relationship, then the tie was considered to not exist. If either person did not fill out the questionnaire, then the other's response was

taken as a valid indication of the relationship. If neither of the two people filled out the questionnaire, then the relationship was deemed to exist if and only if the majority of others in the sample said that the particular relationship existed.

3.2.2. *Simmelian ties and hypergraphs*

Simmelian ties are dyadic in nature (they occur between pairs of people) but they require more than dyadic information to ascertain. To generate the S matrix of Simmelian ties from R , the matrix of raw dyadic ties, the hypergraph \mathcal{H} matrix was first created (see Berge, 1989; Wasserman and Faust, 1994, for more information on hypergraphs). This hypergraph recorded every instance in which an actor belonged to a complete triad (defined as a triad in which each actor was tied to every other actor).

Let \mathcal{H} represent the hypergraph of all N actors mapped onto the set of complete triads; $\mathcal{H}_{ij} = 1$ if and only if actor i is a member of the triad j , else $\mathcal{H}_{ij} = 0$. We can use this representation to uncover Simmelian ties by multiplying the matrix form of \mathcal{H} by its transpose and then taking the boolean of that matrix:

$$S = \text{bool}[\mathcal{H}\mathcal{H}].$$

S will be an $N \times N$ matrix such that $S_{ij} = 1$, if actors i and j are Simmelian tied to each other, $S_{ij} = 0$ otherwise. One implication of this S matrix is that it not only reveals who are in the same connected triple but also, by implication, who are in the same strongly connected informal group or clique in the organization (Krackhardt, 1999). That two actors are Simmelian tied implies that they are co-members of the same clique and vice versa, or in other words S is a dichotomized clique co-membership matrix.

3.2.3. *Cultural agreement within dyads*

We assessed the degree to which dyads reached an agreement concerning the structure of social networks as follows. Each person's cognitive slice, B , of the structure of raw ties in the organization was taken directly from the individual's responses to the questionnaire (see Krackhardt, 1987). Thus, for the advice network for respondent k , $B_{ij(k)} = 1$ if and only if person k checked person j 's name in response to the question "Who does i go to help or advice?"; else $B_{ij(k)} = 0$. Thus, B is a matrix of what person k perceives the network to be.

A cultural similarity matrix, C , was created by calculating an agreement measure (Pearson's r) between each pair of individuals' perceptions as given in B . As illustrated in Fig. 1, the 2×2 table reflected two individuals' perceptions of the set of dyads among all the actors in the firm. Methods of calculating Pearson's r for such a table are numerous, use different nomenclatures (e.g. ϕ , point biserial correlation, Spearman's rho, S14) but all yield identical values (see Harris, 1975, p. 226, for a discussion). We used the S14 formula to calculate r (Gower and Legendre, 1986; see Krackhardt, 1990, for an example).

The four cells in Fig. 1 contain frequency counts. For example, A is the number of dyads where both persons 1 and 2 agree a tie goes between two other actors in the system (from i to j); B is the number of dyads where person 1 claimed a tie existed from i to j and person 2 claimed that no tie existed from i to j ; and so on. C then is the matrix of these measures of agreement, where $C_{ij} = r$ for the corresponding cell values in $B_{(i)}$ (B as perceived by respondent i) and $B_{(j)}$ (B as perceived by respondent j).

		Person 2's Perception of <i>i</i>'s relation to <i>j</i>	
		<i>i</i> tied to <i>j</i>	<i>i</i> not tied to <i>j</i>
Person 1's Perception of <i>i</i>'s relation to <i>j</i>	<i>i</i> tied to <i>j</i>	A	B
	<i>i</i> not tied to <i>j</i>	C	D

Fig. 1. Comparison of network perceptions of two people.

To calculate the extent of dyadic agreement concerning Simmelian ties, each person k 's belief matrix $B_{(k)}$ had to be converted to a corresponding perceived Simmelian tie matrix, $S_{(k)}$. Each $S_{(k)}$ was created in the same manner as before. A hypergraph matrix $\mathcal{H}_{(k)}$ was created based on $B_{(k)}$ and then converted to a boolean $S_{(k)}$. A matrix of agreement concerning these Simmelian ties, K , was created by calculating r for each pair of $S_{(k)}$. Thus, K_{ij} is the Pearson correlation of the corresponding cell values in $S_{(i)}$ and $S_{(j)}$.

3.3. Data analysis

In order to test the hypotheses, we assessed the overall relationship between the cultural agreement matrices (C and K) and the structural matrices (R and S) using Goodman and Kruskal (1963) gamma. We chose gamma as a measure of association because of its direct interpretation in this context: it reveals the proportional reduction in error in "guessing" whether one pair of people will be in more agreement than a second pair given that the first pair of people is related (directly or Simmelian tied), and the second pair is not. In other words, gamma tells us the extent to which our theory is making correct predictions (those people linked together are more similar in their perceptions than those who are not linked together).

The other important methodological issue to be raised here is that C , S and K are all symmetric matrices by construction. However, R (the matrix of raw dyadic ties) is not symmetric; indeed, many of the advice ties themselves are asymmetric. It is much more difficult for two matrices, one being symmetric and the other being non-symmetric, to be strongly correlated with each other than two symmetric matrices. Thus, our predictions that Simmelian tie structures (which are symmetric) predict cultural agreement (also symmetric) better than raw dyadic ties (which are non-symmetric) would become artificially supported.

To eliminate this source of substantial bias, we temporarily symmetrized R (using a union rule for symmetry) before calculating the correlation (gamma) between R and the two cultural agreement matrices C and K . This union rule (as opposed to intersection rule) was chosen because it more closely reflects a solid theoretical interpretation of the social phenomenon under scrutiny. To see this, consider the two cases separately,

one with a union rule and one with an intersection rule. For the advice network (the more asymmetric of the two relations under consideration), a tie is retained in the symmetrized version if either person i goes to person j or vice versa. In either of these cases, interaction occurs between i and j , and this interaction (no matter who initiates it) can lead to the exchange of information and influence in assessing what the rest of the network looks like. If we were to restrict the symmetrized network to an intersection case, then those cases where one person goes to another for advice (but not vice versa) would be ignored (set to 0). Thus, they would be considered the same as two people who do not interact at all. It is the interaction of these people, and not just who initiates it, that creates the opportunity for influence and exchange of information. Thus, the union rule for symmetry makes more theoretical sense in this context than the intersection rule.

This temporary symmetry adjustment permitted us to interpret the gamma correlation between the raw network R and C (or K) as the extent to which a tie from either i to j or from j to i , through interaction and the exchange of information, predicted cultural agreement between i and j .

4. Results

Our hypotheses, derived from cultural agreement theory, were that dyads embedded in Simmelian triads (relative to dyads in general) would exhibit greater agreement concerning the social structure of the organization. Table 1 presents the results of tests of the hypotheses for the network of advice relations.

In general, the results supported the hypotheses. Specifically, when two people joined by an advice relation were embedded in a three-person advice clique, then those two people were more likely to have higher agreement concerning which other people in the organization were: (a) joined by an advice relation, and (b) joined by an advice relation that was embedded in a clique. The gamma correlations on the right hand side of Table 1 are larger than those on the left hand side, showing that dyads embedded in Simmelian triads had higher agreement than ordinary dyads. The strongest result was found in the

Table 1

Gamma correlations showing the extent to which (for advice networks in three organizations) dyads linked by raw or Simmelian ties exhibited agreement concerning organization-wide raw and Simmelian ties

Dyadic agreement about ties	Dyadic structure	
	Raw tie	Simmelian tie
Raw tie	SilSys = 0.06 PacDis = 0.19 HiTecMfg = -0.10	SilSys = 0.20 PacDis = 0.24 HiTecMfg = 0.17
Simmelian tie	SilSys = 0.07 PacDis = 0.34 HiTecMfg = 0.06	SilSys = 0.37 PacDis = 0.49 HiTecMfg = 0.57

Note: SilSys, Silicon Systems; PacDis, Pacific Distributors; HiTecMfg, High Tech Manufacturing. The highest correlations for each site are bold.

Table 2

Gamma correlations showing the extent to which (for friendship networks in three organizations) dyads linked by raw or Simmelian ties exhibited agreement concerning organization-wide raw ties and Simmelian ties

Dyadic agreement about ties	Dyadic structure	
	Raw tie	Simmelian tie
Raw tie	SilSys = 0.42	SilSys = 0.65
	PacDis = 0.50	PacDis = 0.64
	HiTecMfg = 0.49	HiTecMfg = 0.67
Simmelian tie	SilSys = 0.33	SilSys = 0.44
	PacDis = 0.31	PacDis = 0.53
	HiTecMfg = 0.56	HiTecMfg = 0.57

Note: SilSys, Silicon Systems; PacDis, Pacific Distributors; HiTecMfg, High Tech Manufacturing. The highest correlations for each site are bold.

bottom right hand quadrant of the table where the gammas for the three organizations were 0.37, 0.49 and 0.57. Being a member of a Simmelian advice clique appeared to predict particularly high agreement concerning which other people were embedded in similar cliques.

Dyads embedded in Simmelian advice cliques may be prone to reaching agreement concerning the structure of social worlds, but is the same true for the friendship network? The answer is: yes. Table 2 shows that, relative to ordinary friendship dyads, dyads embedded in Simmelian friendship cliques, tended to have high agreement concerning both aspects of social structure that we investigated. All of the correlations on the right hand side of Table 2 are higher than the corresponding correlations on the left hand side of the table, indicating that Simmelian tied dyads tended to have higher agreement concerning: (a) who was friends with whom in the organization, and (b) which friendship pairs were embedded in Simmelian triads.

Comparing Table 2 with 1, we see that the correlations for friendship agreement were consistently higher than those for advice agreement. Further, whereas dyads embedded in Simmelian advice triads tended to reach the highest agreement on the question of which advice pairs were similarly embedded in Simmelian triads, the pattern was different for the friendship network. The highest friendship correlations are in the top right hand quadrant of Table 2: dyads embedded in Simmelian triads tended to be most in agreement concerning which others in the organization formed friendship pairs (irrespective of whether the pairs were Simmelian tied). The correlations for this quadrant across the three organizations were 0.64, 0.65 and 0.67.

5. Discussion

The results support the idea that Simmelian tied dyads (relative to dyads in general) reach a higher agreement concerning the informal social structure of organizations. The degree of agreement appears to vary depending on the type of structure, the type of network and the particular organization.

In testing the effects of Simmelian ties on cultural agreement, we built on research concerning the ways in which social structures constrain the expression and interpretation of culture (e.g. Krackhardt and Kilduff, 1990). We articulated the idea that the structure of an organization consists of the relationships among the actors of that organization. In network terms, the structure is a set of dyadic statements describing who is related to whom on particular dimensions, such as friendship and advice.

Krackhardt and Kilduff (1990) argued that cultural beliefs emerged through a negotiated, dyadic process. Cultural agreements are far from uniform across the organization but rather occur between pairs of actors. Subcultures evolve as one group within the system forges agreement on one set of beliefs while other groups emphasize different cultural truths. Culture itself, then, becomes structured to the extent that different actors agree with other specific actors within the system. Each dyad can be characterized by the extent to which the two individuals in the dyad agree on a particular cultural domain; this level of agreement between the actors constitutes a belief relationship between those two actors. The aggregate set of dyadic belief relations among the actors of an organization can be considered one aspect of the structure of culture.

The results are compatible with the Simmelian argument we have presented but leave room for alternative explanations. For example, the data are binary and provide no information concerning tie strength. An alternative explanation might be that Simmelian ties are stronger ties, and that if one were to measure the strength of actors' relations and not simply whether actors are members of the same clique, one might find that stronger ties predict more agreement. Although this "strength of ties" argument is plausible, such an explanation is certainly consistent with the Simmelian argument. Simmel would argue that co-cliqued relations *will* be stronger relations. But if stronger ties lead to more cliquing (rather than the other way around), then Simmelian ties are spuriously related to agreement. Our guess is that both explanations are true: cliques lead to stronger ties and stronger ties lead to cliques in a reciprocating process that reinforces the relationship between Simmelian ties and agreement. It would be useful to have better access to "strength of tie" data to be able to explore this alternative explanation in more detail.

Despite this possible tweaking of the underlying explanation of these results, we find support consistent with the theory that the social structure influences cultural understandings. The relation between social structure and culture appears much stronger for friendship structures than for advice structures. It is possible that friendship structures, with their implications of trust and cooperation, are more critical to the dynamic operation of work organizations. More energy may be spent on monitoring and sharing information about friendships than about advice relations.

Simmelian ties predict higher levels of cultural agreement than raw ties. This appears to be true, independent of firm or of cultural domain (raw ties or Simmelian ties; advice or friendship). That such group-based ties are sources of powerful conformities speaks to the wisdom of Simmel's original thesis. As Romney et al. (1986) discovered in a similar argument, the agreement takes on a group form, and different groups can create their own cultural definitions. Their insight was an important first step. We have gone one step further in suggesting that dyadic processes of agreement formation become particularly powerful in the context of a specific type of group—the Simmelian triad.

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