

The Impact of Social Context on Interaction Patterns

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ABSTRACT: This paper examines the degree to which the constraints imposed by various social contexts influence social interaction. We draw on two data sets. In each, we compare the patterning of interaction of the same individuals across different contexts. If minimal constraints are imposed, then the interaction patterns among the individuals in the two contexts should be similar. But if one of the contexts involves major constraints, then interaction patterns in the two should differ. The results suggest further that the constraints found in any context are not unlimited in their impact. Moreover, individuals who can, apparently do manipulate the context to minimize the constraint imposed by the context.

Introduction: The Problem

People generally seem to believe that the patterning of human interaction -- who interacts with whom and how much -- is simply a matter of individual choice on the part of those involved. Partners for interaction are believed to be chosen on the basis of individual feelings, or sentiments.

Many sociologists have embraced a modified version of this view. They believe as Newcomb, Turner and Converse (1965, p. 218, italics added) put it, "we communicate most frequently, *if we can*, with those toward whom we are most strongly attracted." The qualifier "if we can" suggests that although individuals do make sentiment-based choices of interaction partners, such choices are not completely unrestricted (Simmel, 1908/1950, 1923/1955; Homans, 1950; Blau, 1964/1986, 1977; Fischer et al. 1977; Feld, 1981; Fischer, 1982; Blau and Schwartz, 1984, Marsden and Campbell, 1984; Freeman, 1992; van der Poel, 1993). From this perspective, then, the choices made by individuals are seen as *constrained*, as Blau (1964/1986, p. xiv) put it, by "external conditions that provide or restrict the opportunities to realize these choices."

The sociologists' version of this idea has great intuitive appeal. And, at one level, it is almost certainly true. People do seem to choose their partners for interaction, but all sorts of external factors have the obvious potential to facilitate or to inhibit interaction between two individuals. Communication between particular workers may be an explicit requirement of their employment contracts. Avoidance between specified relatives may be dictated by a cultural rule that entails a strong sanction to be imposed on violators. Direct communication between two individuals who happen to be physically distant from each

other may be impossible if they lack a written language, telephones or radios, but relatively simple for those with the appropriate technology (Festinger, Schachter and Back, 1950; Hagerstrand, 1967; Coombs, 1973; Freeman, 1979). According to Homans (1950, pp. 88-94), Feld (1981) and Fischer (1982), who interacts with whom can be constrained by all sorts of physical, technical, social and cultural aspects of the environment, or *context*, in which the interaction takes place.

The core of this intuitive idea is that, based on their personal preferences, individuals have more or less stable dispositions to interact with particular others, but that these individual dispositions are constrained by features present in the contexts in which interaction takes place. Thus, who interacts with whom in any particular context will depend both on preferences and on the constraints that are operating in that context. Our problem here is to determine how much impact the constraints have in a given context.

If there were some context that mobilized *no* constraints at all, we would expect the patterning of interaction to reflect the pure preference patterns of the individuals. And if the constraints present in a context *completely governed* who interacted with whom, the patterning of interaction would reveal nothing about the preference structure at all. In real life, of course, we would never expect to observe either of these extremes. As Granovetter (1985, p.487) put it, "Actors do not behave or decide as atoms outside a social context, nor do they adhere slavishly to a script written for them by the particular intersection of social categories that they happen to occupy. Their attempts at purposive action are instead embedded in concrete, ongoing systems of social relations." So, realistically, we should expect to find some contexts in which constraints have a major impact and others in which their impact is small.

We could examine the question of how much constraint was imposed by a particular context by recording, for that context, how much each individual interacted with each other individual and comparing that patterning with the patterning of interaction in a different context. From that comparison, we can learn something about their impacts. We begin with a collection of individuals who interact in more than one context. Suppose we select two of those contexts and observe interaction in each. If we select them in such a way that we would expect neither one to impose much constraint at all, we would expect that individual choices would play a major role in both contexts. In that case, the patterning of who interacts with whom should correspond closely in the two. But if we select two contexts such that we would expect major constraints to operate in one and only minor ones to be present in the other, we should see a large impact of constraints in the first context, and only a small impact in the second. In that case, the patterning of who interacts with whom would be quite different in the two contexts.

That is precisely the approach of the present paper. We will introduce two data sets. Each of the data sets is based on systematic observation of the interaction frequencies linking the members of a bounded collection of individuals. And, in each case, interaction patterns are observed in two different contexts. In the first of our two data sets, there is no reason to believe that either of the two contexts of interaction should impose much constraint on who interacts with whom. In our second data set, one of the contexts can be expected to impose little constraint, but, because of the functional requirements of the organization, the other context can be expected to impose severe restrictions on interaction. By comparing the similarities and differences in the patterning of the two pairs of measures under these differing constraint conditions, we should be able to assess directly the degree to which interaction frequencies are vulnerable to at least some kinds of context-based constraints.

The First Data Set: A Residence Hall

Cynthia Webster (Webster, 1993; 1994) collected the first data set in a university residence hall during

the third term of the school year. The residence hall housed 42 undergraduate students. Thirty-nine residents, 19 females and 20 males, participated in the study. The residents, of course, interacted in a wide range of social activities. To compare the subjects' interaction patterns, two different contexts were chosen and interaction in each of these contexts was systematically observed over an eight-week period

Subjects were observed eating together in the dining facility. The facility accommodated 1223 students who resided in one of 23 different residence halls. The facility contained three separate rooms for dining and was open for two hours at each mealtime. All residents were free to choose when, where and with whom among the 1223 others to eat. The participants in this study were observed in the dining facility for 26 mealtimes, 14 lunches and 12 dinners. Records of who ate with whom were made. There were 157 occasions in which two or more of the subjects were observed eating a meal together at the same table. These observations were summed and a 39 by 39, person by person, *EAT* matrix was constructed. Each cell in the *EAT* matrix is a record of the number of occasions on which the row person and the column person were observed eating together. The principal diagonal is the number of occasions on which the person in question was seen eating with anyone.

Subjects also were observed once a week for two hours at a regularly scheduled social meeting. The meetings took place in the common room of the residence hall, not the dining facility. The announced purpose of the meetings was to get the residents together to talk, eat and have a break from studying. Similar to the first context, attendance was not mandatory and there were no formal rules limiting interaction. Unlike the eating context, the meetings were open only to the participants. Collections of individuals observed in conversation with one another were noted. In total, there were 139 events in which two or more subjects were seen interacting. These observations were summed in the same way and a 39 by 39, person by person, *MEET* matrix was constructed

For the Residence data, then, both of the contexts in which data were recorded appear to be relatively unconstrained. There were no specified rules requiring or inhibiting interaction. The second data set is different in this respect.

The Second Data Set: A Restaurant

Christa Aufdemberg, who acted as a participant observer on the staff of an established Southern California restaurant, collected the second data set. The restaurant served lunch six days and dinner four nights a week. The owners were a married couple who managed a staff of 18 employees. These included 8 females (all working as waitresses) and 10 males (one working as a waiter, three as cooks, four as busboys, one as a salad maker and one as a dish washer). These employees ranged from 19 to 44 years of age.

Two distinct contexts to record data on interaction among the people who work in this restaurant were chosen. Over an eight-week period, the observer was present each day and kept systematic records of who interacted with whom over all of the shifts during each workday. These records were summed for the period of observation and recorded as a 20 by 20 *WORK* matrix.

During the same eight-week period, the observer was also present before the start and after the end of each workday. She noted all the occasions on which restaurant employees arrived or departed together or commented on, or made plans for, joint outside activities. These were summed and recorded as a 20 by 20 *PLAY* matrix.

Given our intuitive conception of the link between interaction and constraint, it is reasonable to expect

that these two matrices, **WORK** and **PLAY**, might differ. Like the **EAT** and **MEET** matrices described above, there is no basis for assuming that the **PLAY** matrix is subject to any major external constraints.

Although some of these individuals had other jobs, spouses, children and recreational interests that made demands on their time, they were free to spend their leisure time with, or apart from, any of their restaurant co-workers. But, in contrast, when they were at work at least some of their interactions were apt to be dictated by the tasks at hand.

As restaurant personnel, these 20 individuals were responsible for the purchase, preparation and delivery of food and for maintaining the appearance of the restaurant. The goal of the organization was to attract and maintain customers, and a good deal of interaction was necessary to achieve that goal. The managers needed to interact with all of their employees about schedules. They also had to interact with servers about floor assignments and seating customers and with cooks about menu planning and ordering food. Servers needed to interact with cooks about food orders and with busboys about setting up and clearing tables. Cooks had to interact with each other and with the salad maker in order to get food ready and to fill orders. Everyone involved in the enterprise had at least some organizational responsibilities that involved interaction with specific others. Each person had a distinct job at work and that job had the potential to constrain a good deal of his or her interaction on the job.

Analysis

Our basic hypothesis, then, is that in the Residence data, because they are both relatively unconstrained, the **EAT** and **MEET** matrices should embody individual preferences and should therefore reflect similar patterns of interaction. In the Restaurant data however, because the **PLAY** matrix is relatively unconstrained while the **WORK** matrix can be expected to reflect the effects of organizational constraints in a major way, the **WORK** and **PLAY** matrices should display systematic differences in patterning.

We can calculate an overall measure of association for each of the matrix pairs by using the quadratic assignment procedure (QAP) (Hubert and Schultz, 1975) as implemented in UCINET 5 (Borgatti, Everett, and Freeman, 1999). The results are shown in Table 1. As expected, the **EAT** and **MEET** matrices are substantially more similar than are the **WORK** and **PLAY** matrices.

	Value	Significance	Average	Std. Dev.	Proportion as large
EAT*MEET					
Pearson Correlation	0.481	0.000	0.001	0.038	0.000
Simple Matching	0.710	0.000	0.641	0.016	0.000
Jaccard Coefficient	0.336	0.000	0.117	0.020	0.000
Goodman-Kruskal Gamma	0.746	0.000	-0.001	0.123	0.000
WORK*PLAY					

Pearson Correlation	0.270	0.000	0.001	0.076	0.000
Simple Matching	0.163	0.246	0.146	0.021	0.246
Jaccard Coefficient	0.388	0.190	0.356	0.031	0.190
Goodman-Kruskal Gamma	0.255	0.190	0.016	0.228	0.190

Table 1. QAP results for the *EAT* and *MEET* matrices and for the *WORK* and *PLAY* matrices.

To determine the degree to which each individual displays the same pattern of association with others in each of these matrix pairs, we calculated the correlation between each individual's row (or column) in one matrix and the corresponding row (or column) in the other. The distributions of these correlations for both data sets are shown in Tables 2 and 3 and in Figure 1.

The differences between the two data sets are dramatic. All of the correlations produced by the Residence data set are positive and most are relatively high. In contrast, the correlations produced by the Restaurant data set are much lower. In a good many cases they are actually negative. The average correlation between *EAT* and *MEET* in the Residence data set is $r = .58$; it accounts for 33% of the variance. The average correlation between *WORK* and *PLAY* in the Restaurant data set is $r = .15$; it accounts for only 2% of the variance. This difference is striking, and it is, of course, significant ($p < .001$). It is clear that the constraints of the work context do have a dramatic impact on who interacts with whom.

A	0.52	U	0.13
B	0.77	V	0.67
C	0.63	W	0.89
D	0.84	X	0.90
E	0.48	Y	0.42
F	0.35	Z	0.05
G	0.34	a	0.17
H	0.43	b	0.03
I	0.52	c	0.87
J	0.90	d	0.53
K	0.97	e	0.63
L	0.82	f	0.62
M	0.57	g	0.02
N	0.78	h	0.87
O	0.95	i	0.72
P	0.61	j	0.07
Q	0.70	k	0.06
R	0.72	l	0.58
S	0.90	m	0.67
T	0.42		

Table 2. Correlations between each individual's interaction frequencies with all of the others in the *EAT* and in the *MEET* contexts.

A	0.43
B	0.51
C	0.30
D	0.29
E	0.47
F	0.38
G	0.09
H	-0.40
I	0.01
J	0.57
K	0.58
L	-0.06
M	0.17
N	-0.05
O	0.24
P	-0.32
Q	-0.09
R	-0.12
S	0.35
T	-0.33

Table 3. Correlations between each individual's interaction frequencies with all of the others in the *WORK* and in the *PLAY* contexts.

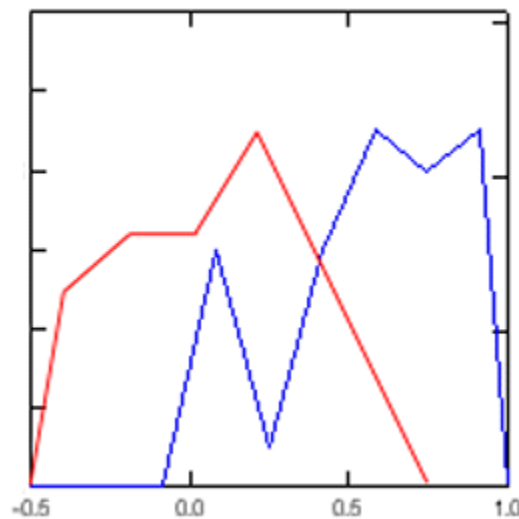


Figure 1. Distributions of the correlations in the two data sets; *EAT* versus *MEET* is blue and *WORK* versus *PLAY* is red.

We can get a more detailed sense of this difference by examining visual images. Important structural features of a proximity matrix can be revealed by determining its principal components (Belsley, Kuh, and Welsch, 1980). The advantage of such treatment is that the structural features of the matrix are arranged in terms of their importance -- the first principal axis captures the most variance, the second

captures the next most, and so on. The result, of course, is that we can determine the preeminent structural features of a data matrix simply by examining the first few eigenvectors of the output.

To produce such an image, the two Residence matrices were stacked into a single 78 by 39 matrix and calculated the row-row correlations. These correlations were used to extract the principal components simultaneously for both the *EAT* and the *MEET* data. The results reveal the similarities and differences between the two contexts. A plot of the first two principal components is shown in Figure 2. And a similar plot of the first two principal components of the stacked *WORK* and *PLAY* matrices from the Restaurant is shown in Figure 3.

Each individual is represented twice in these figures. In Figure 2, for example, the degree to which people's eating patterns are similar is displayed in the proximities of the red letters to one another. Letters that are in close proximity represent individuals who frequently ate with the same others; those that are spaced farther apart represent people who seldom if ever ate with the same others. Similarly, the patterning of inter-individual conversations in the *MEET* data is illustrated by the proximities of the blue letters; distances between them represent people's tendencies to interact at the meetings. But most revealing, the picture also shows similarities between individuals' eating and their meeting behaviors. Each individual's red letter (for eating) and blue letter (for meeting) are connected by a line to assist in the comparison of the two contexts. To the degree that an individual displays similar patterns of interaction with others in both the dining hall and the meeting context, the two representations of that individual will be located in close proximity to the same others.

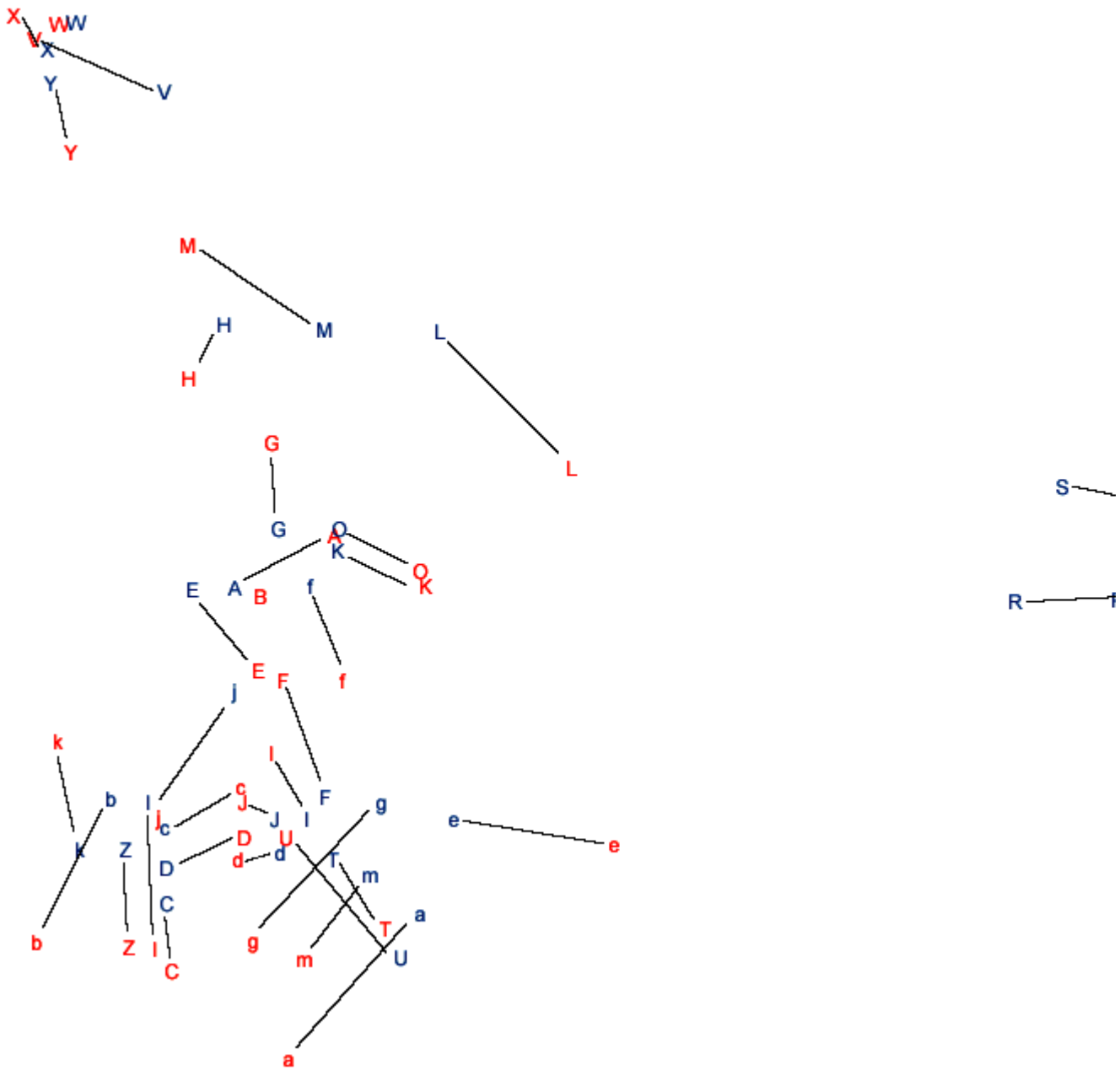


Figure 2. Principal components of *EAT* and *MEET* data; *EAT* data are red and *MEET* data are blue.

Figure 2 shows, that among the individuals in the residence hall, each individual's location in the *EAT* space is quite close to his or her location in the *MEET* space; points do not shift to different regions of the picture. There seem to be six more or less distinct clusters of individuals who form relatively cohesive subgroups. On the lower left, there are two closely related clusters. The first grouping contains individuals *k, b, Z, l, C, D* and *c*. The second includes *I, J, U, d, g, m, a, T* and *e*. Just above these is a third group consisting of *G, B, E, f, K, O* and *A*. Point *F* is in the third group for eating, but joins the second group below at meetings. And person *j* eats with the first group but meets with the third group. Above these is a triple consisting of *H, M* and *L*, and above them a group of four, *X, V, W* and *Y*. The other seven points, *P, S, Q, R, N, h* and *i* are all clustered on the right side of the diagram.

Essentially the same six groupings are displayed in both data sets. Only a few individuals switch groups. In the overwhelming majority of cases, the same sets of people find one another both to eat together and as partners in conversation at meetings. There is, however, some individual variation in just how similar each person's two images are. For example, *O* and *K*, in the middle left side of the diagram are extremely close to one another both in eating and in meeting. Point *j*, on the other hand, moves a considerable distance from one group to another; it therefore may be assumed that *j* meets and eats with somewhat different collections of individuals. These differences also are reflected in the individual variation in correlations between *MEET* and *EAT* shown in Table 1.

Some correlations in this data set turn out to be relatively low. They cannot be produced by systematic rules governing eating or meeting activities; there simply were no such rules. Interviews revealed that the factors that produced variations in the two contexts are almost all the result of scheduling conflicts with class, work and other university activities. For example, as a consequence of their differing work schedules, individual *U* usually ate alone at the end of each mealtime while individual *Z* was rarely able to attend the social meetings. And individual *g* played on an intramural sports team that had scheduled games on the same evenings as the social meetings. It would seem, then, that the main constraints on these subjects' behaviors are what Homans (1950) called "external."

Personal considerations also led to constraints on individuals' behaviors. Individuals *b* and *k* were very dedicated to their studies which limited their participation at the social meetings. Individual *j* was a shy quiet person who seemed to avoid socializing in large groups. And both scheduling conflicts and personal reasons were factors constraining the behaviors of individuals *L* and *M*. The two characterized each other as "best friends" and were always together at the social meetings, but they had very different eating behaviors. Individual *L* had to eat evening meals early because of a class conflict and, as a consequence of being on a strict diet, *M* rarely ate.

The Residence data, then, do display a strong tendency toward consistency in terms of who interacts with whom in differing contexts. But, at the same time, the observed consistency is far less than perfect. The observed differences, however, seem to have stemmed from constraints that were based on individual and idiosyncratic conditions.

The Restaurant data display a very different kind of patterning. Figure 3 shows the inter-individual proximities at *WORK* with red letters and those at *PLAY* with blue letters. If we examine the projections of individuals in these two contexts, it is apparent that very few of the individuals interact with the same others; the *WORK* and *PLAY* data project almost everyone into pairs of locations that are quite different from each other. These different groupings are consistent with the low and negative correlations for the Restaurant employees shown in Table 1.

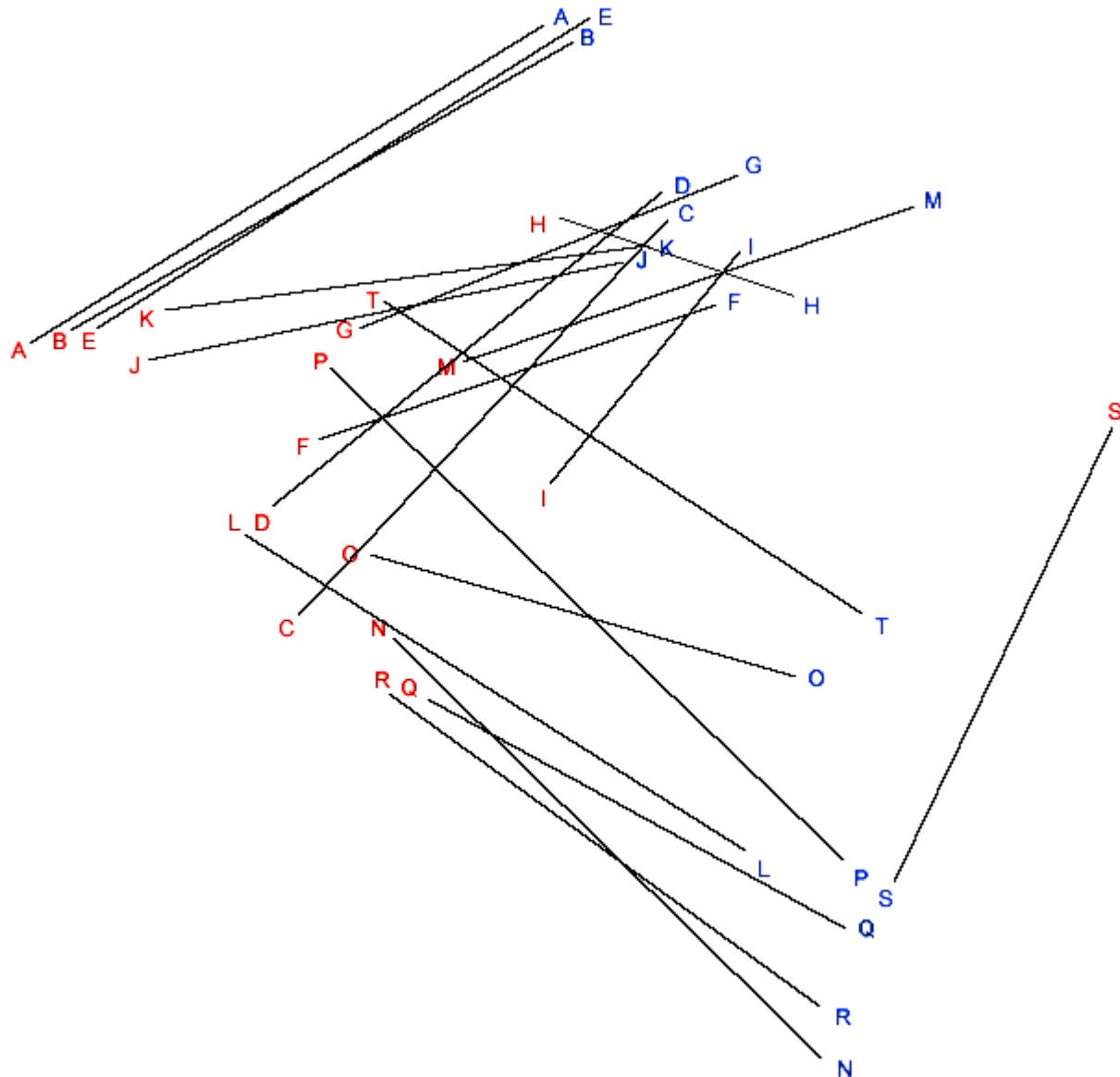


Figure 3. Principal components of *WORK* and *PLAY* data;
WORK is red and *PLAY* is blue.

The form of the distribution of the red letters representing work proximities suggests that work-related tasks are the critical factor in locating individuals in this space. There is a cluster containing five individuals, *A*, *B*, *E*, *K* and *J*, on the left. It includes three waitresses, *A*, *B* and *E*, and the two managers, *J* and *K*. Much of their interaction was focused on problems of reservations and table assignments; they seem to make up a kind of service-oriented management team. One person, *S*, is isolated at the extreme right. He was the dishwasher. He worked alone and his work required practically no interaction with any other person. Finally, the loose cluster in the middle of the picture includes everyone else, cooks, servers, busboys and the salad maker. Their interaction seems to involve the sort of coordination between food preparation and service described above that is required to run the restaurant.

The distribution of *PLAY* is shown in the locations of the blue letters. Most of its variation occurs in the vertical dimension, and its basis is clear. If we draw a horizontal line in the gap between the top 12 individuals and the bottom 8, the separation reflects ethnic and linguistic differences. The individuals represented by the top 12 blue letters include the managers, all of the servers and one assistant cook, all of whom are native speakers of English. In contrast, the bottom eight letters represent individuals who share an Hispanic background; Spanish is the first language for all of them. Thus, in social terms, the restaurant people seem to divide themselves up along ethnic-linguistic lines.

At least some employees are able to maintain the same pattern of proximities in both work and play; *A*, *B*, and *E*, and *J* and *K* are examples. These are the core group of restaurant employees -- the managers and the established servers -- who have enough flexibility to negotiate their own work schedules. They have input in decisions about the days and shifts they work, and therefore they have some control over determining the others with whom they will interact at work. Their correlations are all positive and uniformly greater than .4. In contrast, the newer servers, the cooks and the busboys are all locked into rigid schedules that cannot be negotiated. All their correlations are lower and seven of them are negative.

The Restaurant data, then, present a very different picture than the Residence data. They show much less consistency between interaction patterns in the two contexts in which data were collected. The organizational imperatives of the enterprise seem to dictate a good deal of the patterning of who will interact with whom at work. But, notwithstanding this constraint, the data indicate that those individuals who occupy positions that provide some flexibility will use that flexibility to arrange that those with whom they work are the same individuals as those with whom they play.

Discussion

We have provided a systematic presentation of some empirical evidence that supports an old intuitive idea. The results demonstrate clearly that interaction frequencies can be, and are, warped by context-based constraints. It is clear that organizational requirements both can, and do, induce interaction patterns that depart from those that are displayed when people are relatively free to choose their own alters.

The data suggest further that, as Granovetter (1985) argued, neither the freedom nor the constraint is unlimited. Even in contexts where organizational rules do not dictate anything about who should interact with whom, factors outside of the context intrude. Thus, even if they are entirely free from formal constraints, different contexts do yield somewhat different patterns of association.

In both sets of data, there are massive individual differences in the degree to which constraints impact behavior. Although most individuals interact with the same others in contexts in which no explicit rules exist to constrain behavior, there are individuals whose behavior is less consistent. And, in contexts in which organizational constraints do loom large, those individuals who can, apparently do manipulate the context to maximize the similarity between their interaction patterns in, and out of, the context.

This last result was unanticipated and it calls for further examination. Homans (1950, p. 107) proposed that: "The two aspects of group life that we call the external systems and internal systems are continuous with one another. The group elaborates further tendencies of its own, which react so as to modify the adaptation to the environment." This suggests that the individual variation displayed here may be partially due to the fact that different individuals occupy different social positions. Within the university context, for example, most constraints that led to discrepancies between proximities in the two contexts

resulted from scheduling differences between the individuals involved. Those pairs who displayed small discrepancies were able to maintain a constant pattern of proximities. They were apparently able to manipulate the context in order to free themselves up enough to interact with those others whom they chose. Seniors, for example, frequently can register early. They can, therefore, arrange their classes in such a way that there is minimal conflict with the schedules of their close associates.

In the restaurant context, this differential freedom from constraint is even more pronounced. Clearly, the owners could arrange schedules in such a way that they could maximize their opportunities to interact with those they chose. To some extent, this ability was also displayed by the lead wait people -- those who had the longest tenure and who related well with the managers. They could set their schedules and choose their stations. In that way, they could enhance their interaction with chosen others. In contrast, kitchen staff and busboys were afforded relatively little opportunity to choose. For the most part, they had to interact in the work context with the others chosen by the management.

These results are anecdotal. But they suggest the need for further research along this line. They indicate, moreover, that such research should compare formal and informal constraints in multiple contexts. And, at the same time, it should attempt to index the degree to which each individual is subject to constraints of each kind.

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