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Contents

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HELDREF PUBLICATIONS

Comments from the Guest Editors

This is one of the special issues devoted to sociometry, a multipurpose quantitative methodology. Sociometry is defined as the measurement of social relationships. This broad definition implies enormous flexibility of application. Sociometric instruments can be used to measure numerous types of interpersonal relationships in a large variety of settings. Based on an analysis of the responses given to various sociometric questions, specific relational patterns within a group emerge.

Sociometry is a useful tool for gaining a clear understanding about the positive, negative, and neutral attributes of a group as well as those of its individual members. Such an understanding provides a framework within which group directionality can be encouraged or individual intervention can be implemented.

The articles in this issue are concerned with applications of sociometry in the workplace. One article deals with the rating of interpersonal group behavior and an analysis of the ratings to determine how leaders are chosen. In another article, the authors trace the history of multidimensional scaling and illustrate how this can be an effective tool in management consulting.

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Applied Sociometry

MICHAEL D. BREEN

ABSTRACT. Today, even more than when Moreno wrote "Who Shall Survive?", it is clear we need all the help we can get for our planet to survive. Thus the need for sociometry. Some applications of sociometry that have worked within organizational settings, both public and private are described in this article. Furthermore, sociometric applications that have not worked and the rationale behind them are illustrated. Future research and applications of sociometry are discussed.

"Whom you know is more important than what you know."
And the quality of the know is as important as the whom you know.

SOCIOMETRY HAS A MULTITUDE OF applications and benefits to society, organizations, businesses, and individuals. For those of us who are consultants to organizations about training and planning, it is a precise auxiliary. The reason that it is not better used, better known, and appreciated is itself a sociometric problem. It has not been well linked to the psychodrama movement, by Moreno himself or by teachers or practitioners. So it is even less well linked to other academic disciplines dealing with organizational development and training. Also, sociometry is a powerful method. It makes reality visible, too much of which people cannot stand. Like a pneumatic drill, it is a robust tool. Such a robust tool requires time in which to learn to use it comfortably. However, if it were not robust, it would not be worth using. Has one ever heard of a good carpenter who sought only to use blunt saws because sharp ones could cause damage?

Organizational Sociometry at a Diamond Mining Company

Asked by a diamond mining company to assist in training managers, I was to address the management of performance. I had 1 day for the

job—the second to last in a 5-day program. So the team was fairly well built—at least there was a workable amount of cohesion. The session was to be conducted at the mine site, amid vast spaces of red soil, gruff outcrops of hills, and acid green vegetation. Initially, I warmed the group up to building on what was positive and healthy in their skill development. Because I knew it would be more productive to warm them up to roles they had experienced in their performance, I had them imagine three scenes.

The first was one in which they were being managed well and producing an excellent performance. After taking in the scene, its smells, colors, people, time, and so forth, I asked them to focus on what they were *thinking* or saying to themselves and to write this down. I asked them to do the same with what they were *feeling* and what they were *doing*. So we had in written form the elements of the role of excellent performer: the thinking, feeling, and actions. Second, we went to a scene where they were managing someone or others excellently. Again, after warming up to the scene they wrote about what they were thinking, feeling, and doing in that scene. Third, we went to a scene where they were not being managed well and wrote down the elements of the role of poorly managed person. The group then chose a member with whom to share the material from the three experiences. This helped reinforce their learning and their self-disclosure, which are needed for the next steps.

Then I taught a little about role theory, explaining the elements of a role, how roles developed, the roles and counter roles, and how human systems were networks of roles. We were going to become clearer on the roles a manager needs to manage performance.

After the participants shared what they had written, I wrote down what they said. I converted what they said into a role title. So, if someone said he or she was being well managed and was feeling excited, acting better than ever before and thinking, "I'm pushing beyond my limits," I wrote the role on the board as "excited limit breaker." We did that for all the roles gathered from the experiences of good and bad performance management.

Next, we gathered in groups of four to discuss and come to some agreement about the essential roles that promoted excellent performance and those that impeded it. We arrived at a list of roles the manager needs to stimulate excellent performance. I warmed the group up to an appreciation of what they had done and invited them to risk getting feedback from one another, based solely on the experiences of the week's training course. This would give them a picture of how they were seen and what roles they needed to develop to be a better manager. They agreed to listen to feedback.

For each of the roles, I set a sociometric choice exercise. If the role mentioned was "listener," I asked them to put their hand on the shoulder of the person they would choose to listen to them for 5 minutes. Hesitantly at first, but then with excitement, the group snaked and squirmed with the sociometric catharsis. I explained that this was but a momentary measure, a polaroid snapshot. I asked those not chosen or those unsure of why they were chosen to find out, either then and there or later, why they were or were not chosen. They then acted on the choice and listened for 5 minutes. For a further 5 minutes, they reversed roles and the listener was listened to.

We did this with each of the major roles of the manager of excellent performance that they had enumerated from their experience. To conclude, I had them work in mirror pairs. (A mirror pair is one in which both work on B's plan or issue concerns for half the time and half on A's issue, etc.) In these pairs, they consolidated what they had learned about the skills they had and developed a strategy to develop one or two more of the roles of manager.

When I evaluated the day's work, the evaluations were quite positive. In fact, that day's work stood out when the participants evaluated the whole week's work at the end of the course. Because of the success of the work described here, I was invited back to repeat such a session with another group of trainee managers.

Problems of Sociometric Repetition

Less successful was a repetition of this same exercise with a group of senior and middle managers from a construction company. I believe it did not work well for these reasons:

- The managers were mostly men from a very male, patriarchal industry.
- The roles enumerated were largely male roles, and so the women were not chosen on several criteria.
- This led the women to believe they were isolates or rejects rather than to see the role list as mostly "masculine."
- I should have included more roles, such as "empathetic person," "intuitive person," "gentle person." Had I done so, my guess is the women would have been chosen more often.

The exercise demonstrated, as a good diagnostic exercise should, the way women were seen in the organization and the unbalanced role system most managers expected. This view parallels perceptions in the Australian construction industry generally. Also, these managers *were* not as sophisticated, in terms of amount of training and development, as

the mining managers. That experience shows how much more needs to be done and in what directions.

Furthermore, the construction company managers had to work with one another in a smaller company on a day-to-day basis. The results of the choices made them feel more vulnerable than the mining company managers who were part of a larger group who came together only for training. Therefore, although there was more conflict and the exercise was described by one woman in the second group as "destructive," the diagnostic exercise had been useful. The test will be to see how well the group can work with what the exercise has shown about gender roles in the organization. I feel it is also significant and worth noting that the latter group has had more than the societal average of marriage and relationship breakups.

Some people distinguish between characteristically male and female interventions in groups. In masculine interventions, the director introduces a strong intervention and then deals with the consequences. The feminine intervention stems more from the role of producer, creating space and holding the process so that the group can lay out more and more of its sociometry. Perhaps, in working with a predominantly male system, I used more masculine interventions instead of balancing them with the roles of the producer. Readers should review the writings of Charlotte Joko Beck (1989, p. 49).

Subgroup Formation Based on Roles and Skills

In the choice of subgroups within a planning group, sociometry offers a leader opportunities to heighten productivity. If one asks for volunteers to plan something or to be the implementation team after a plan has been formed, one often gets people choosing themselves for the role of controller or hard-working martyr. A little dose of sociometry can make a huge difference. I shall explain the processes and then the benefits.

Step 1

Ask the group what skills or qualities are needed to do the job, for example, planning the redesign of a head office. They will come up with roles like experienced head-office person, systems thinker, honest person, empowering person, person with a sense of humor.

Step 2

Ask them to choose, either on paper or by placing hands on shoulders, people from the group for each of the roles. Ask the group, "Whom would you choose to be on the planning team solely for the role of em-

powering person?" and so on, for the other roles. Again, explain that this is not a popularity poll. Ask people to continue to assess their choice or nonchoice after or as part of the exercise.

Step 3

The planning team emerges with people chosen on the basis of a variety of roles necessary for the job. Few people, in my experience, are chosen on the basis of all the criteria.

The advantage of this procedure is that it obviates a popularity poll. One chooses a team precisely on the basis of necessary roles or skills. Those chosen have a clear picture of why they were chosen. This consolidates their competence in the roles in which they will do the job. Finally, this process heightens the team's acceptance of what they produce and reduces the resistance to what has been planned.

Sociometric Neglect or Malfunction

Now for an example that did not work well. After a corporate strategic planning exercise, a federal industry group wanted to choose a team to implement the corporate plan throughout Australia. Knowing how Australian groups usually choose, I knew the choice was likely to follow the battle of the supremacy of states and be normed by the agony of distance. So I asked them to pause and consider a sociometric choice. They agreed. I taught them the theory and directed them through the practice. The team did a fairly good job at implementing the corporate plan. However, they were impeded to a significant degree by one state group. On reflection, I remembered that the representative from that state had excluded himself from any sociometric choice. He sat outside the group on his own—a self-isolate. In my keenness to get on with the work, I neglected to inquire or include him or to find out why he resisted the exercise. We neglect what is obvious at our own peril, either then or later.

Future Research and Applications of Sociometry

Now I would like to make some general observations about sociometry and its application to organizations.

Usually, managers and supervisors are chosen by the people who employ them. Moreover, they are chosen (employed) to deliver a management or supervisory service. What would happen if we reversed the process and asked work groups to choose their own managers and supervisors? Many people think this is a recipe for chaos. But, is it any worse than the current situation? If a company cannot sell its products, it goes

out of business. Yet, if a manager manages badly, the staff still has to accept that person as manager. This is because of a choice by a senior person. The choice, based on some criterion or criteria unknown to the staff, is a decision enforced by direct power. If it were clear what services a manager is to deliver, the staff could choose managers or supervisors on a set of criteria based on those services. The services could be described in role terms, for example, "goal setter," "vision builder," and "team builder." Then, the functions of the role could be described—for example, goal setter takes goals from the leadership of the company and breaks these into tasks for different groups, setting goals for each task and outcomes that can be measured. The staff would choose on the basis of those criteria persons whom they believed could deliver the specific management services they would need to do their work.

This may seem revolutionary. One chief executive to whom I suggested this first smiled encouragingly at the idea and then frowned and said, "But what about my job?"

My other observation is that there is a multitude of applications of sociometry in the workplace. Sometimes a consultant makes a sociometric intervention; sometimes a consultant thinks like a sociometrist without sharing the sociometric thinking. Moreno (1954), in "Who Shall Survive," noticed the centrality of sociometric choice to our lives and even to our survival. Currently, major environmental issues have a sociometric underpinning, for example, on what criteria do poor families choose to have another child?

Sociometric Misapplications or Misuse

After visiting Russia last year, I became convinced that true communism never took place because there had always been an "in" group that was more equal—more included—than the rest and that had much more wealth and privilege. During periods of political upheaval and unrest, there is need for sociometric solutions to society's problems. Sociometrists, however, spend a lot of their time learning the method and applying it to psychodrama or to the training of psychodramatists. I would argue that, somehow, sociometry itself needs to be included to a greater degree in the mainstream of world thinking.

Sociometry of itself does not make anything happen. Its power is in making a map of what is happening. From this map, individuals or groups may choose to shift. However, its accuracy and power make it an important tool for strategic analysis of the internal or external environments of companies, nations, or even the globe. Leonardo da Vinci

said that most genius was in observation. Sociometry assists us to observe and to empower others through those observations.

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First Among Equals: Leaders, Peers, and Choice

RICHARD B. POLLEY
JARLE EID

ABSTRACT. Eighteen teams of Norwegian Naval Cadets rated interpersonal behavior and ranked each other as leaders and peers before and after an outdoor training exercise. An analysis employing Group Field Dynamics demonstrated that (1) leaders are chosen on the basis of dominance and conformity, whereas co-workers are chosen on the basis of friendliness; (2) these criteria are affected by the group's interpersonal context; and (3) under some group contexts, the exercise causes cadets to modify their criteria for leadership selection.'

ONCE A YEAR, THE NORWEGIAN NAVAL ACADEMY intentionally strands several teams of cadets somewhere along the coast of the Bergen Fjord. An instructor accompanies each group as it works through a 3-day series of survival and military exercises. The teams generally include six members, each of whom has the opportunity to lead for approximately 12 hours. For the past several years, extensive data have been collected on the functioning of the teams and their leaders. Both before and after the exercise, group process is measured by having team members rate one another, using the Norwegian version of the Group Field Dynamics form. At the same time, the cadets are asked to rank their fellow team members as leaders and as peers. Our purpose in the present study was to investigate the relationship between sociometric choice and interpersonal behavior. The first question we addressed was whether or not there is a difference between those chosen as leaders and those chosen as peers or co-workers. The second was whether or not the cadets change their criteria for these choices after having the opportunity to observe each team member both as leader and as peer. The final question concerned the sensitivity of team members to context. Were their choices dependent on the polarizations and coalitions in the team, or are

leadership and co-worker criteria universal within the broader context of the Naval Academy?

Group Field Dynamics

Group field dynamics (GFD) is an integration of group process (Bales et al., 1979; Bales, 1985), sociometry (Moreno, 1953; 1960), and Lewinian field theory (Lewin, 1948; 1951). The theory and methodology have been developed over the past several years through a series of publications (Polley, 1988a; 1989b). This brief introduction is intended only to give enough information to make the present study comprehensible.

GFD has as its core a three-dimensional conceptual space derived from the Bales, Cohen, and Williamson (1979) SYMLOG model. Bales (1985) has since pointed to a striking convergence in the dimensions of interpersonal behavior, emotions, values, and meaning as reflected in the work of scholars from a wide range of disciplines (Eysenck, 1954; McClelland, 1961; 1975; Mehrabian, 1980; Osgood, Succi, & Tannenbaum, 1957; Wundt, 1896). Polley (1987a) has noted that the same dimensions appear repeatedly in the organizational behavior literature (Blake & Mouton, 1964; Fiedler, 1967). The dimensions have been most clearly articulated on multiple levels by Bales et al. (1979). However, several serious inconsistencies in the SYMLOG space have been reported (Polley, 1987b), and revised sets of dimensions and measures have been used with good result. These new dimensions appear in Table 1.

GFD provides forms for the measurement of both behavior and values. With either form, each group member rates other members on the 26 vectors of the three-dimensional space. For example, in the English value-level version, "active teamwork toward common goals, organizational unity" combines group-centered, conforming, and powerful, whereas "admission of failure, withdrawal of effort from the task" combines self-centered, nonconforming, and passive. Because of the unusual structure of the questionnaire, it is necessary to complete

TABLE 1
GFD Dimensions for the Behavior and Value Levels

Behavior	Value
Friendly–Unfriendly	Group-Centered–Self-Centered
Conventional–Unconventional	Conforming–Nonconforming
Dominant–Submissive	Powerful–Passive

rather thorough and iterative validation procedures. A discussion of the rationale for the item structure and a procedure for the improvement and validation and rating scales appear in Polley (1987b). All data for the present study were collected by using a fully validated Norwegian version of the value questionnaire (Polley, 1988b; 1989a; Polley & Eid, 1990).

The primary result of a GFD analysis is a field diagram in which group members are plotted as circles in the two-dimensional (self-centered/group-centered by conforming/nonconforming) space. The third dimension (powerful–passive) is shown by circle size, with more powerful members shown as larger circles. The polarization model seeks clusters of members in the two-dimensional space and provides descriptions of subgroups and hypothesized conflicts between subgroups (Polley, 1988a). It has been demonstrated that members who lie outside of both subgroups tend to play pivotal roles in the group. Those who are outside both subgroups and off to the group-centered (or friendly) side of the space tend to be accepted by both subgroups and thus have the potential to serve as mediators, whereas those to the self-centered (or unfriendly) side of the space tend to be rejected by both subgroups and thus have the potential to serve as scapegoats (Bales et al., 1979). Figure 1 illustrates these basic interpersonal dynamics. The smaller circles in this figure represent individuals and would ordinarily be labeled with their names. The larger circles that encompass these individual images define subgroups, and the arrows between their centers define polarizations and identify scapegoats and mediators. The major polarization shown in Figure 1 is between a group of five authoritarians and four creative and unconventional members. One member lies toward collaboration and so may serve as a mediator, and another lies toward rebellion and so may serve as scapegoat. The two members who lie in the area of overlap between the two opposing subgroups may play a variety of roles. The arrows represent vectors of attraction and repulsion. The two subgroup centers repel one another, and both are repelled from the scapegoat and attracted to the mediator.

A field diagram is a snapshot taken of a dynamic group process. The vectors, based on Lewin's (1948; 1951) physical science metaphor, suggest that the next snapshot may well show a group beginning to unify around the mediator in opposition to the scapegoat. Each resolution, however, contains the seeds of the next polarization. Some of the members who lie closest to the scapegoat may actually be drawn toward that location rather than toward the mediator location. In addition, some of the more extreme members of each subgroup may stay where they are. If this happens, a new polarization will be established between a collaborative subgroup and a rebellious subgroup, as shown in Figure 2.

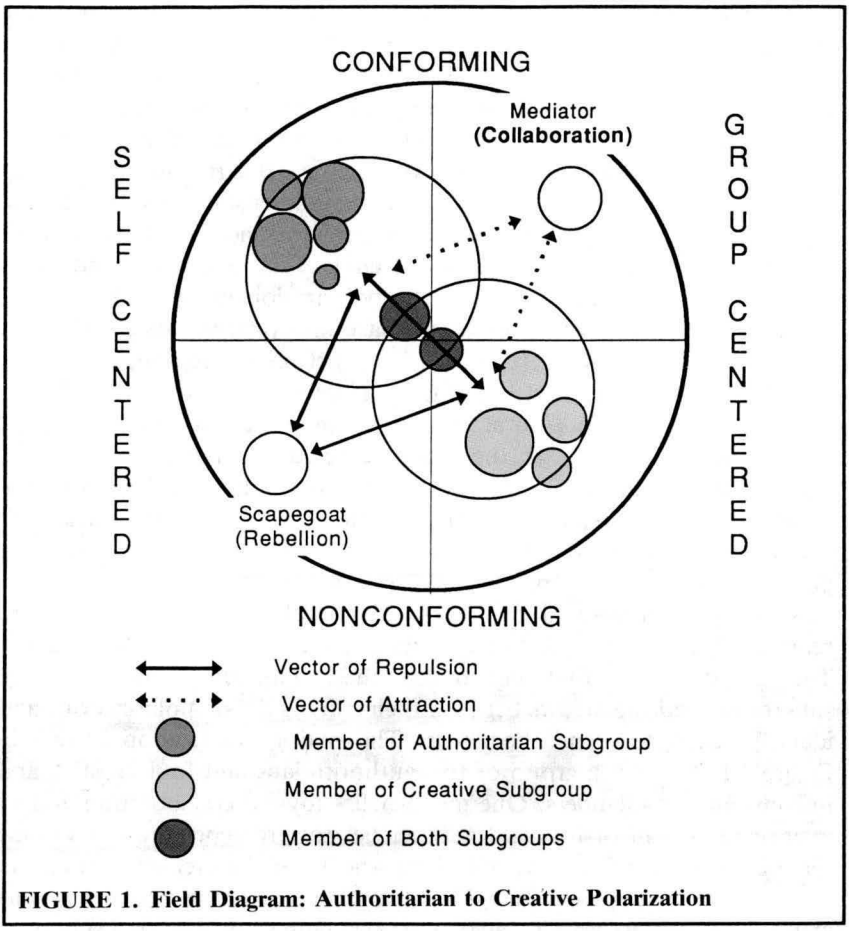


FIGURE 1. Field Diagram: Authoritarian to Creative Polarization

Social Atoms and Molecules

Moreno (1953; 1960), like Lewin, sought to understand social reality through physical science metaphors. He argued that society's basic building block is the social atom, an indivisible unit that consists of the individual with all actual and potential social relationships. He stressed that, although physicists could continue to discover smaller and smaller subatomic particles, the social atom could not be further reduced. The structure of the social atom is shown in Figure 3. The inner nucleus is made up of all actual relationships that the focal person experiences. In sociometric terms, these relationships consist of mutual choices, on some

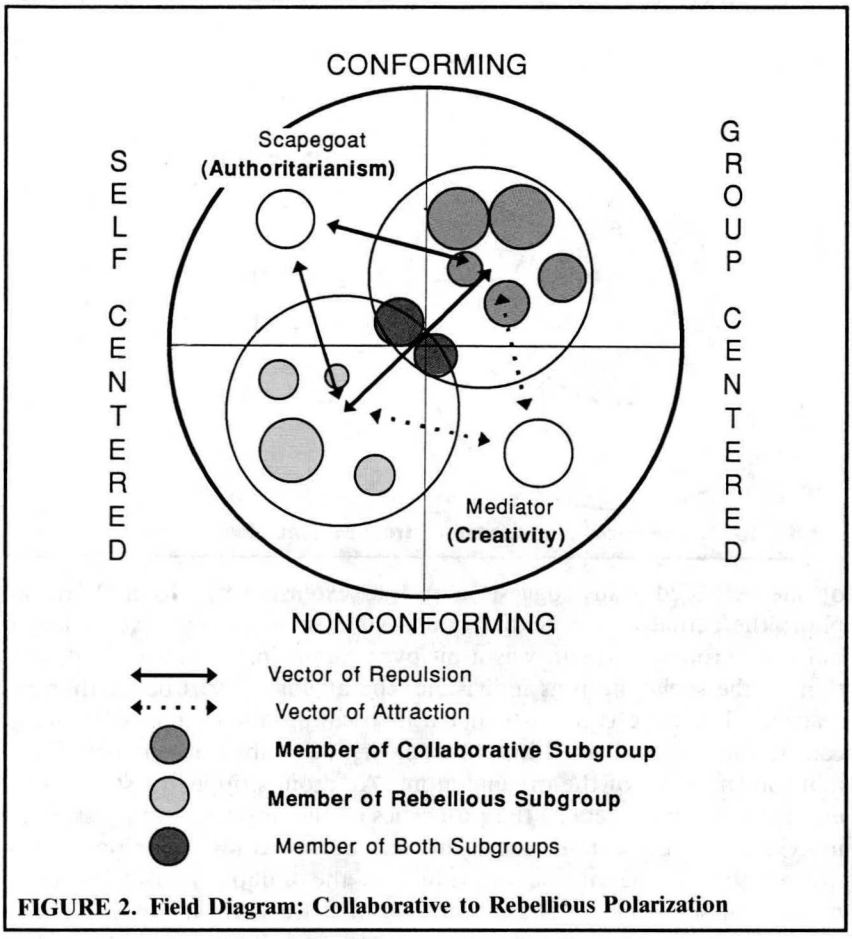


FIGURE 2. Field Diagram: Collaborative to Rebellious Polarization

sociometric question, for some social domain. The outer nucleus extends to encompass potential and wished-for relationships; these might appear as unreciprocated choices in sociometric tests. Finally, the acquaintance volume includes all interpersonal contacts, whether or not they represent either desired or possible reciprocal relationships. Although Moreno did not extend the metaphor to describe chemical bonds, the analogy fits. To understand the nature of a physical atom, one must understand the electron shells that make bonding with other atoms possible.

The concept of the social atom is congruent with Simmel's (1955) notion of "intersecting social circles." Simmel suggested that we could describe an individual as the unique intersection of all groups to which he

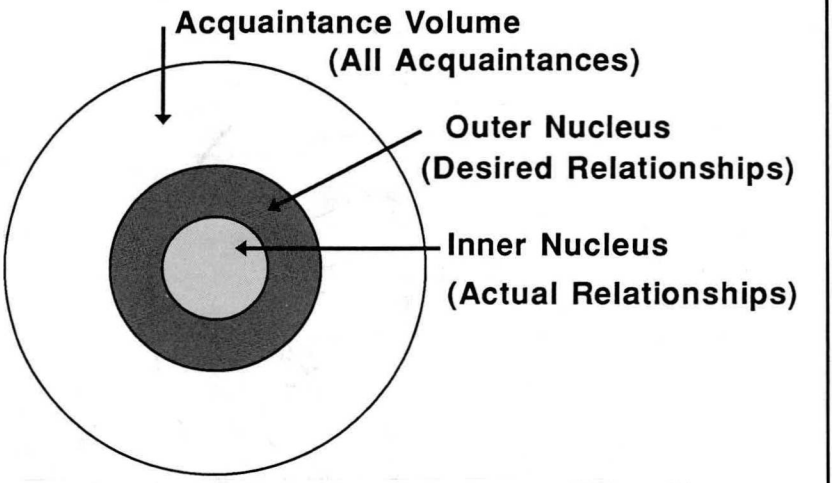


FIGURE 3. The Social Atom (adapted from Moreno (1960, p. 57)

or she belonged. This suggests a further extension of Moreno's metaphor; the actual and potential bonds all exist in the context of larger units, or groups. Moreno was a bit overzealous in defending his definition of the social atom as indivisible; the analogy works better than he realized. The issue is not whether a physical atom—or a social atom—can be further subdivided but whether or not "subatomic particles" retain the character of the original atom. An atom stripped of some of its electrons no longer retains the properties of the original atom, just as an individual viewed without social linkages begins to lose definition. Simmel's (1955) image of the individual as the unique intersection of a number of social circles is a compelling one. Each group, or subgroup, membership that we discover tells us something about the nature of the individual under consideration. To extend the physical science analogy a bit further, the unique position of the carbon atom as the fundamental building block of life cannot be understood on the basis of the atom alone; by itself, it appears unremarkable. Its true character lies in the extraordinary number of combinations that it can form when brought into contact with oxygen and hydrogen. Similarly, the charismatic leader without the group is just another person. It is the ability to draw others and to forge enduring bonds among the group of followers that is the key to the character of the leader.

Before we leave the physical science metaphor, let us make one more point. A molecule is not just an aggregation of atoms. The properties of the molecule are dependent on the pattern of bonds that link its atoms

together. The combination of two carbons, one oxygen, and six hydrogens can produce either ethyl alcohol or methyl ether, depending on the pattern of bonds (Figure 4). The characteristics of these two structural isomers differ dramatically. Similarly, Figures 1 and 2 could be thought of as structural isomers of the same set of social atoms. The two "social molecules" may include the same individuals, but the network of bonds has changed.

Configurations of a given set of individuals vary for a number of reasons. All interpersonal relationships are dynamic; people come

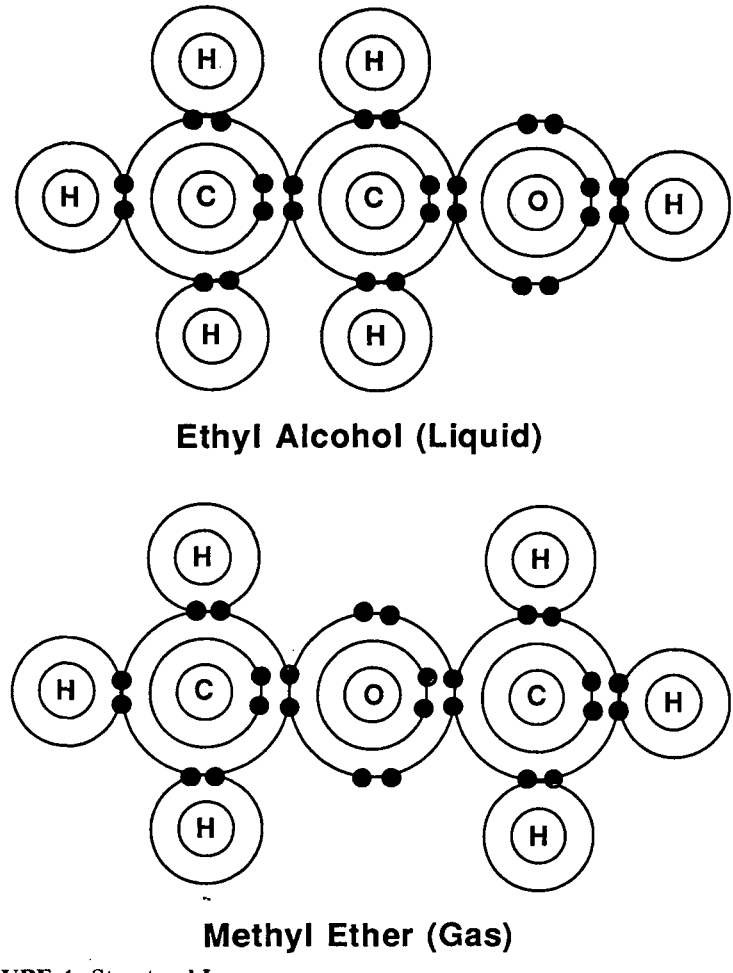


FIGURE 4. Structural Isomers

together, drift apart, age, shift their interests, and establish new relationships. Major events in the life of a group may result in fundamental shifts. In addition, some groups meet in a variety of settings; the roles and relationships that are appropriate in the office are probably not appropriate at the company picnic.

The metaphor also illuminates the often unexpected effects of adding or removing an individual from a group. The removal of the oxygen atom from either ethyl alcohol or methyl ether results in the flammable gas ethane. The addition or removal of a leader, mediator, or scapegoat can have profound impacts on the relationships among the remaining members. When a person is added to a group, it does not become the group plus one, it becomes a new group. Pre-existing relationships and choices shift in response to the new individual. To pursue one final extension of the metaphor, these shifts in relationships can occur even when the new individual does not have obvious ties to the existing members. Some members have the ability to act as catalysts, bringing about changes in the interpersonal relationships among others without establishing direct bonds with any of the members involved.

Measuring Social Relationships

The sociometric test is a simple idea that has often been misunderstood and misapplied. A great many sociometric studies have been conducted by asking group members whom they "like," "dislike," and see themselves as "similar" to. Although these questions make for clean sociological theory, they make for poor sociometry. The concepts of liking and disliking are far too vague. Moreno insisted that sociometric questions be firmly rooted in social reality, that they refer explicitly to the relationship of interest. The concept of "similarity" is the most problematic of the three. Moreno would argue that this concept may have meaning for the sociometrist, but it is almost certainly meaningless to the person who is expected to answer the question about similarity. Whereas a person's motivation for choosing co-workers, roommates, or leaders is clear, the motivation for making judgments about similarity is not.

The Setting

The subjects for the study reported here were cadets at the Norwegian Naval Academy (Sjoekrigsskolen). Each had spent at least 3 years in training and 1 year as a junior officer. During the previous year, each had been part of a six-to-eight member team. Preliminary interviews suggested that there had been few conflicts in these teams. Members at-

tributed the smooth functioning largely to the fact that they had not been in any crisis situations that would test them. Putting them in such a situation was one of the reasons for conducting the outdoor training exercise (Bank, 1983; Radcliff & Keslake, 1981). These exercises were viewed as action research. Although outdoor training has become quite popular—with corporations as well as military groups—there has been relatively little systematic research into the effects of such training (Beeby & Rathbone, 1983).

Detailed descriptions of the outdoor training exercises appear in Eid (1987) and Polley and Eid (1990). Although the exact format varied somewhat from year to year, each exercise began with a goal-setting session back at the Naval Academy in Bergen. An instructor was assigned to each group to help the members work through the goal-setting session and to follow them through the field exercise. At the end of the session, the cadets were taken to the naval base at Haakonsvern, where they boarded fast patrol boats. At this point, one cadet was appointed to lead each team, with the understanding that leadership would rotate approximately every 12 hours. Various crises were manufactured on board the boats in order to keep the cadets busy while heading to a relatively remote section of the Bergen Fjord. A few hours into the cruise the "abandon ship" signal was sounded, and the cadets were given 5 minutes to leave the boats in rubber rafts. Over the course of the next few days, the cadets were faced with various challenges—long hikes, clearing mine fields, planning and executing an attack on a naval fortress, crossing a mined stream, and so forth. At the end of each member's turn as leader, a field evaluation was completed. Before the new leader assumed command, the previous leader was rated by the other team members, and the ratings were discussed in detail. These feedback sessions typically lasted for about an hour. At the end of the exercise, the cadets boarded buses and were returned to the Naval Academy. The following day was devoted to debriefing.

Data Collection and Analysis

Both GFD ratings and sociometric data were collected shortly before the exercise began and again approximately a week after the exercise had ended. GFD data were collected using the Norwegian version of the value form. Sociometric data were collected by asking members to rank one another as both leader and peer or co-worker. A translation of a sample sociometric questionnaire appears as Figure 5.

The data base for this study included 4 teams each from 1986 and 1987 and 10 teams from 1988. Ninety-six of the 112 cadets completed all forms

Please list the names of your teammates, excluding yourself, in the top row of spaces. Under each name, indicate your ranking of the team members from (1) for your first choice as leader to (5) for your last choice as leader. Then indicate your ranking of the team members as co-workers from (1) for your first choice as co-worker to (5) for your last choice as co-worker.

Name	____	____	____	____	____
Leader (Rank 1 to 5)	____	____	____	____	____
Co-Worker (Rank 1 to 5)	____	____	____	____	____

FIGURE 5. Sample Sociometric Questionnaire (English Translation)

for both rounds. Cadets who failed to complete all forms were excluded as raters but were included as the objects of others' ratings. Thus, the following analyses are based on the perceptions and sociometric choices of 96 cadets who rated a total of 112 of their fellow cadets.

For each rater, two field diagrams were produced: one from the pretest perceptions, and one for the posttest perceptions. A polarization analysis was run on each field diagram, and the direction of polarization was recorded. In addition, the perceived locations of team members on each of the three GFD dimensions were converted to ranks and recorded. The basic data structure was as follows:

LE1 and LE2	Sociometric Leader rank, before and after.
PE1 and PE2	Sociometric Peer rank, before and after.
C1 and C2	GFD Conforming rank, before and after.
G1 and G2	GFD Group-Centered rank, before and after.
P1 and P2	GFD Powerful rank, before and after.
T1 and T2	GFD Direction (Type) of Polarization, before and after.

All of the variables except T1 and T2 refer to perceptions of individuals. T1 and T2 refer to the rater's perception of the polarization in the group. These two variables thus remain constant across a rater's perception of all team members at a given time.

The initial data analysis consisted of creating a correlation matrix for the variables LE1 through P2. The relevant results of this analysis appear in Figure 6. These correlations were based on 514 sets of ratings, provided by 96 subjects. First, the test-retest correlations for the five measured indicated moderate stability, with the greatest stability being in measures of leader choices and interpersonal dominance. These test-

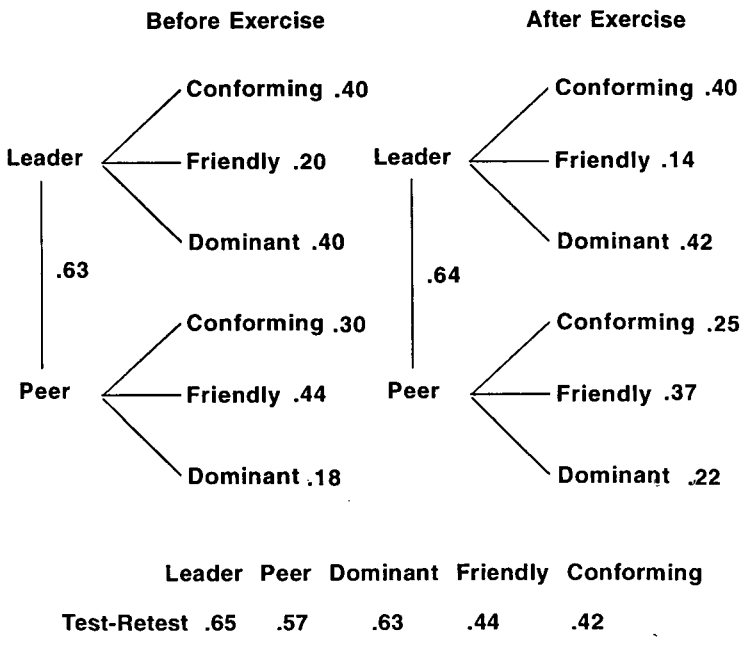


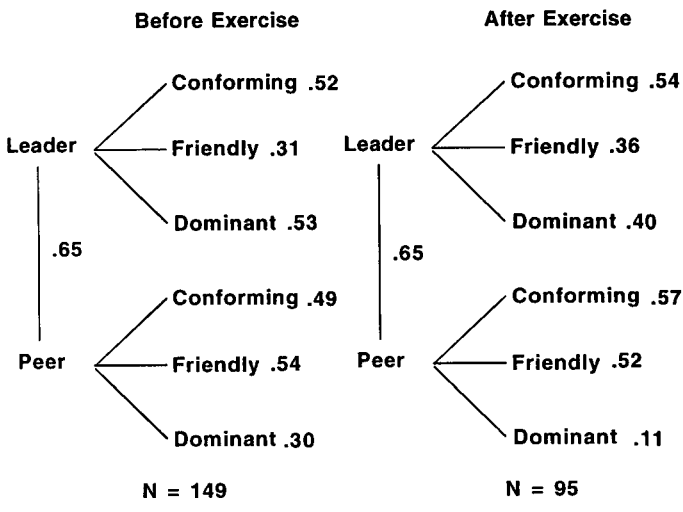
FIGURE 6. Correlations among GFD and Sociometric Ratings: 96 Raters, 514 Sets of Perceptions

retest correlations were about what we would expect given that a major event in the lives of the groups occurred between measures. Second, the moderately high correlations between leader and peer rankings suggest that the two are related but distinct. Leader choices were best predicted by a combination of dominance and conformity, with friendliness a weak third factor. In contrast, peer choices were best predicted by friendliness, with conformity a relatively weak second factor and dominance a very weak third factor. Multiple regressions were also run on these data. All three GFD dimensions were significant ($p < .001$) predictors of both leader and peer choice. (Given the sample size, all correlations were significant at $p < .001$.) The observed patterns seem logical; members of a highly structured organization have indicated that they look for dominance and acceptance of the established norms in their leaders. Given a choice, they also prefer that their leaders be more collaborative then authoritarian. In choosing peers or co-workers, they look first for friendliness and second for an acceptance of the norms.

anything, slightly stronger after group members had the chance to observe each member in the role of leader. The observed pattern for peer or co-worker choices seems to have diminished somewhat. It is possible that the experience of working with teams in crisis situations caused some members to begin to place a higher value on dominance in their peers and a lower value on friendliness. These changes were, however, too small to interpret with any confidence.

The first two research questions and their answers were relatively straightforward; there was a difference between leader and co-worker choices, and the criteria seem not to have changed much as a result of the exercise. The third question, regarding sensitivity to group context, is a bit more complicated. We were concerned with whether or not group members take into consideration their perception of conflict and polarization within the group. To answer this question, we divided the observations according to the direction of the group polarization perceived by the individual rater. Because these perceived polarizations often change over the course of the exercise, we expected the number of cases for each polarization to vary. Figure 7a presents the correlations based on those raters who perceived a "collaborative versus rebellious" polarization in the group. This is the polarization shown in Figure 2. For leader choices, the correlations followed the basic pattern seen in the full sample, only more strongly. When this polarization occurred, the bulk of the group tended to be in the collaborative (conforming and friendly) quadrant, with one or two members in the rebellious or alienated quadrants. It is not surprising that the leader would be chosen from the collaborative quadrant. The pattern for peer choices was also very strong and again reflected the fact that the "in-group" combines conformity with friendliness. Members who perceived this polarization in the group chose their co-workers on the basis of acceptance of the group norms as well as friendliness. The rebellious and alienated were rejected as both leaders and peers.

Figure 7b presents the correlations for those raters who perceived a friendly versus unfriendly polarization in the group. The pattern for leader choices was weak, but this could have been an artifact; there was, by definition, less variation on conformity in these groups, and so the small differences on the dimension represented by rank order are probably meaningless. This does not explain, however, why these group members were less concerned about selecting dominant leaders. When this polarization occurs, it generally indicates that there is a very cohesive and friendly group united in opposition to one unfriendly and individualistic member. Adherence to the norm of friendliness thus becomes more central than either dominance or more general patterns of conformity.



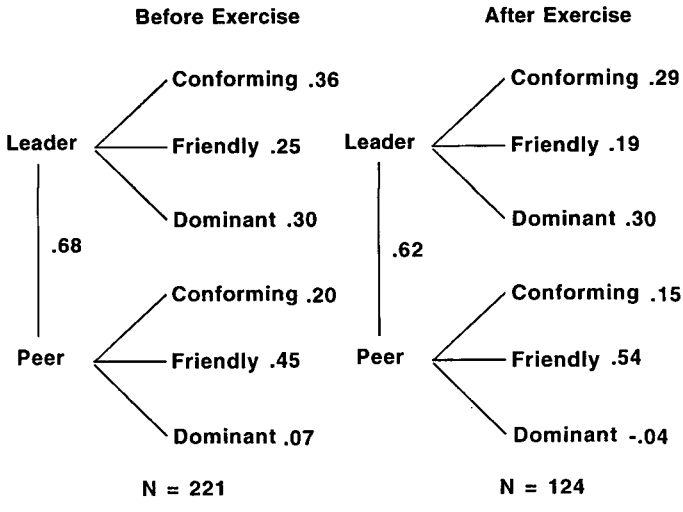
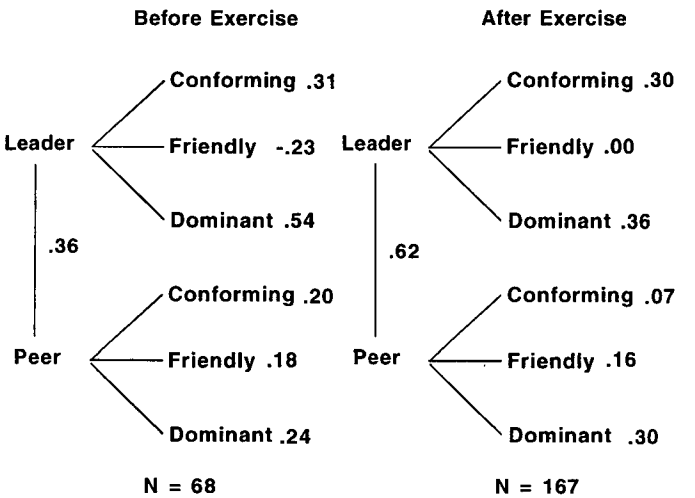
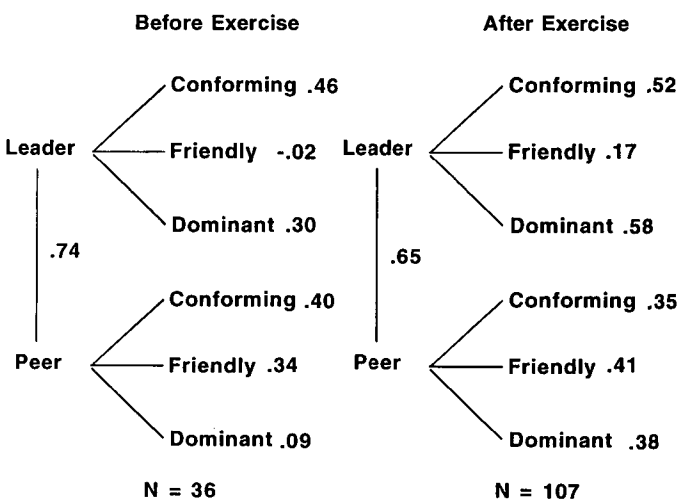


FIGURE 7. Correlations among GFD and Sociometric Ratings: By Direction of Polarization

Figure 7 Continued



Conforming versus Nonconforming Polarizations



Collaborative versus Rebellious Polarizations

The pattern of correlations in the data collected after the exercise suggest that the criteria for selecting leaders seemed stable and were, if This interpretation is confirmed by the pattern for peer choices. Peers were chosen almost entirely on the basis of friendliness.

Correlations for members who perceived an "authoritarian versus creative" polarization are shown in Figure 7c. This is the polarization shown in Figure 1, and it creates a unique pattern of leader choices. Before the exercise, members who perceived this polarization actually preferred leaders who were unfriendly. In context, this makes some sense. If the majority of the group members lie in the authoritarian quadrant and are opposed by a weaker group of creative and nonconforming members, they are likely to choose a strong representative of the authoritarian perspective as leader. The results from after the exercise suggest that they may have discovered that this is a bad strategy. Although they did not select the most friendly members (because this would likely mean selecting a nonconformist), they chose a less extreme representative of the conforming side. The correlation with friendliness rose from -.23 to 0. Peer choices for these raters were unpredictable. Because, on the one hand, many of them probably identified with the authoritarian subgroup, they were unlikely to choose peers from the creative and nonconforming subgroup. On the other hand, authoritarians were not likely to be nominated as preferred co-workers.

The final polarization type is conforming versus nonconforming (Figure 7d). Both before and after the exercise, these raters were likely to choose the most conforming members as leaders. After the exercise, however, they were also more concerned about selecting dominant leaders and, all things being equal, they preferred collaborative to authoritarian leaders. Their peers were chosen from among the more conforming members, but the balance shifted toward friendliness after the exercise.

Concluding Comments

A close relationship exists between sociometric choice and perceptions of interpersonal behavior. In general, group members tend to choose leaders who are interpersonally dominant and who accept the group norms. All things being equal, they prefer that those conforming leaders be collaborative rather than authoritarian. When choosing peers or co-workers, group members focus mainly on friendliness, with conformity coming in a weak second. These patterns seem to be relatively stable over time. In answer to the first two questions posed at the beginning of this

article, we suggest that there is a difference between those chosen as leaders and those chosen as co-workers, and (overall) the criteria for these choices seem not to change much as a result of having the opportunity to observe the candidates under difficult circumstances.

The answer to the third question is complicated. Team members *do* seem to be sensitive to the group context; in our study, the pattern of correlations varied according to the perceived polarization within the team. The pattern of choices, however, may not indicate very wise criteria for leadership selection. Almost invariably, the patterns indicate that members are choosing as leaders the most extreme members of the more dominant subgroup. This is likely to exacerbate the existing conflict (Polley, 1988b). Previous research has suggested that mediators must lie outside the two subgroups and to the friendly side of the space (Polley, 1988a; 1988b). The changes in the correlation patterns from the first to second round were, however, encouraging. At least in the cases of "authoritarian versus creative" and "conforming versus nonconforming" polarizations, team members seem to have learned to prefer leaders who take a less extreme position. The observation of rigid and autocratic leaders under trying circumstances seems to have taught team members that a softer approach would be better.

In the minds of some, the generalizability of this research will be limited by the fact that it comes from a military setting. Clearly, the results need to be replicated in other contexts, but a few words should be said in defense of this subject population. The Norwegian Naval Academy is an unusually open and creative environment. Military formality and protocol are at a minimum, and there is an egalitarian norm that is striking to the outsider. It is not uncommon to see casual conversations spring up between senior officers and recent conscripts; it *is* uncommon to see salutes and ritualized deference. Such anecdotal observations are confirmed by the data. As part of a larger project, data were collected on group norms. All of the cadets in this sample rated a hypothetical "ideal leader." The readings for this ideal closely matched those for a broad and diverse U.S. sample. The results indicate that high values are placed on friendliness, collaboration, and creativity. In fact, the values placed on the positive aspects of nonconformity are somewhat greater than those for the general U.S. population (Polley, 1989a). Cross-cultural data suggest that some patterns of polarization are more common in one culture than in another (Polley, 1989a), but the results presented here separated out the four directions of polarization and so should be independent of the variations in distribution. Although a wider sample from a more general population will be needed to confirm these results, there is reason to expect that similar patterns will emerge.

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Multidimensional Scaling: High-Tech Sociometry for the 21st Century

GEORGE M. GAZDA
JERRY A. MOBLEY

ABSTRACT. Multidimensional scaling (MDS) has been available since the 1950s, but it has not received widespread recognition in sociometry. In this article, the authors briefly trace the history of MDS and explain why MDS has been used infrequently in sociometry; they then illustrate how it can be used effectively as a diagnostic intervention for management consulting. A case is made for greater application of MDS as a diagnostic and intervention strategy with small groups. The authors predict that MDS will be the high-tech sociometry for the 21st century.

ALMOST EVERYONE WHO DEFINES multidimensional scaling (MDS) applies a slightly different emphasis. We have selected three definitions from the literature that represent numerous variations. With reference to MDS's application to counseling research, Davison, Richards, and Rounds (1986) used the following definition: "Multidimensional scaling (MDS) is a statistical technique that can be used in mapping the structure of objects as they are perceived by clients and counselors" (p. 178). Leblebici, Marlow, and Rowland (1983) define MDS as follows: "In very general terms, multidimensional scaling (MDS) can be described as a family of geometric models for multidimensional representation of data, and a corresponding set of methods for fitting such models to actual observations" (p. 167). And, finally, Young and Hamer (1987) state:

> The term *multidimensional scaling* refers to a family of data analysis methods, all of which portray the data's structure in a spatial fashion easily assimilated by the relatively untrained human eye. That is, they construct a geometric representation of the data, usually in a Euclidean space of fairly low dimensionality. Some multidimensional scaling methods display the data structure in non-Euclidean spaces, and some methods provide additional information about how the structure varies over time, individuals, or experimental condi-

> tions. The essential ingredient defining all multidimensional scaling methods is the spacial representation of data structure. (p. 3)

Young and Hamer (1987) divide the history of MDS into four stages, roughly equated in decades.

1. The first decade was heralded by the seminal work of Torgerson (1952), who defined the multidimensional scaling problem and provided the first metric solution.
2. The second decade of work was ushered in by the path-breaking work of Shepard (1962) and Kruskal (1964) on nonmetric multidimensional scaling and saw the highly illuminating work of Coombs (1964) on data theory.
3. The third decade opened with the trend-setting work of Carroll and Chang (1970) on individual difference multidimensional scaling and saw the consolidation of the preceding 25 years of developments by Takane, Young, and de Leeuw (1977) and by de Leeuw and Heiser (1980).
4. The decade of the 1980s witnessed the development of maximum likelihood multidimensional scaling, as exemplified by Ramsey (1982) and Takane (1980a, 1980b). (p. 15)

Young and Hamer (1987) view MDS as appearing to reach full maturity in the "family" of scaling methods. They project future growth through computer analysis and nonlinear scaling methods, and perhaps as important as new methods is the potential of high-resolution three-dimensional color graphics displays that allow interaction in real time and that are based on quantitative analysis of qualitative data (scaling).

MDS Applications to Sociometry

Noma and Smith (1985) refer to Moreno's (1934) sociograms as "ad hoc placement of individuals in space" (p. 180). Collins (1987) refers to sociometry as "the study of interpersonal relations within groups" (p. 179). She contends that usually the social interaction network is summarized in a sociogram, but she argues that, because the sociogram is not entirely empirically derived, objectivity and formality are lacking. Although Collins (1987) agrees that the sociogram has great descriptive power, she also believes that it "may in some cases fall short as a valid representation of the interaction pattern of the data" (p. 180).

To alleviate some of the subjectivity surrounding the sociogram and traditional sociometric practices, Collins suggests using a more formal technique for spatially representing a set of stimuli—MDS. Collins reports, however, that there have been few attempts to apply MDS to sociometric data. She cites Laumann and Guttman (1966) as perhaps the first to use

MDS with sociometric data, but even then it was not applied to typical sociometric problems. Laumann and Guttman's study sampled city-dwellers continuity among occupations rather than among persons. A pioneering study by Jones and Young (1972), according to Collins, was much closer to the mainstream of sociometric research. They used the individual scaling model (INDSCAL) to study the similarity of all possible pairs of members of an academic department. Even though the Jones and Young study was similar to more traditional sociometric analyses, it did not generate many related applications. Collins reasoned that research studies did not follow because many sociometric studies are done in classrooms, especially with young children, and even in a small classroom of 15 the children would be required to rate 105 stimulus pairs, an effort that would fatigue them. The complexity of the task, that is, judging similarity among all classmates, would also present a significant challenge to young children. Although there have been few applications of MDS to sociometry for reasons suggested by Collins, many opportunities exist that are virtually untapped. We will refer to some of these later in this article.

Advantages and Disadvantages of MDS

No attempt is made here to include a comprehensive listing and analysis of advantages and disadvantages of MDS. We include only the more relevant issues and those that pertain to the case examples that follow.

Perhaps the most intriguing and advantageous aspect of MDS for assessment purposes is its innocuousness, or noninvasiveness. When a person is asked to compare other persons (paired-group members) simply on the basis of their similarity/dissimilarity to each other, the rater can use any and all dimensions/characteristics that he or she chooses. Therefore, there is no bias introduced by the person (external evaluator/consultant) doing the assessment. Following the use of their own criteria for comparing each other, the raters are then presented with a picture/map generated by the MDS computer program showing how the ratings/comparisons of everyone positions individuals in two-dimensional space. Based on the groupings alone, the subjects can be asked to interpret what the groupings represent to them. In other words, the subjects can be totally involved in determining the nature of the input and interpreting the output. To assist in the interpretation of the groupings/dimensions of the MDS configurations or maps, researchers can give unidimensional measures such as adjective checklists to subjects concurrent with their MDS-paired ratings.

The process begins with a very subjective subject rating followed by an objective statistical analysis and usually concludes with a subjective analysis by participants. The subjective analysis, however, can be corroborated

by correlational analyses, the use of participant weights, and fit measures (Davison, Richards, & Rounds, 1986).

MDS programs can quantify both metric and nonmetric data, unlike factor analysis, which requires metric data. MDS solutions usually require fewer dimensions than factors from factor analysis; therefore, graphic representations are simpler (Davison, 1985).

The advantages of MDS also frequently can pose disadvantages. For example, because the subject rater uses his or her own dimensions for rating, typically some type of unidimensional scale is often administered to aid the subject raters in interpreting the maps that are generated.

Another major disadvantage of MDS is related to the size of the sample. Fewer than 9 or 10 participants for two-dimensional solutions and fewer than 14 or 15 for three-dimensional algorithms such as INDSCAL are general rules of thumb to follow (Shoben, 1983). As cited earlier, children develop rating fatigue with large numbers (15 class members generate 105 paired comparisons) and are confused by the complexity of rating each other on similarities/dissimilarities. Adults also become bored and fatigued when groups become larger than 10 or 12. Generalization of research results depends upon randomness of sampling, and, because groups must be small, generalization of results may be restricted.

A disadvantage of having subjects interpret their own maps is that if some subjects are shown to be isolates/rejects, it may be difficult to conceal the fact, and unhealthy emotional responses may be generated. Care must be taken by the leader to protect isolated group subjects.

Application of MDS to Management Consulting

MDS has numerous and varied applications. Our purpose in this article is not to review these applications but rather to single out its unique application to management consulting and to illustrate this application with two case reports. Other applications and references can be found, for example: vocational, family, and group counseling (Buser, 1989; Davison, Richards, & Rounds, 1986); stereotype research (Funk, Horowitz, Lipshitz, & Young, 1976); vocational psychology (Rounds & Zevon, 1983); leadership behavior (Jones, 1983); supervisor roles (Ellis & Dell, 1986); organizational structure (Leblebici, Marlow, & Rowland, 1983); counseling psychology (Fitzgerald & Hubert, 1987); marriage counseling (Diekhoff, Holder, & Burks, 1988); small groups (Gazda & Mobley, 1981; Stanton & Morris, 1987); family counseling (Bisio, 1987; Mobley & Gazda, 1981).

Several textbooks are also available: The *User's Guide to Multidimensional Scaling* (Coxton, 1982), *Multidimensional Scaling* (Davison,

1983), *Multidimensional Scaling* (Kruskal & Wish, 1978), *Introduction to Multidimensional Scaling* (Schiffman, Reynolds, & Young, 1981), and *Multidimensional Scaling: History, Theory, and Applications* (Young & Hamer, 1987).

Company A

As a community-oriented manufacturing company, the changes and decisions made at Company A frequently had repercussions in their city. Their parent company strongly encouraged companies to be involved in their respective regions and allocated for diversity at all levels of the company. Because of the demands of its product, the staff of about 500 in this operation were probably better educated than those at most other state plants. At this location, the president has a vice-president with two directors and a general manager with seven directors. Together these 12 managers formed the executive committee of that company.

At Company A, we were invited to provide some feedback, team building, and direction because the organization had experienced the loss of its general manager (GM), the number two person in the organization, to whom most of the staff reported. Although the GM had made some bold changes and was responsible for four people being in the positions they were in as managers, the GM had also created a culture in which fear led to memo writing to protect oneself. The president of the organization had numerous responsibilities that took him out of the facility on a regular basis, leaving the GM to manage the day-to-day operations. The president relied on the GM for his information regarding almost all aspects of the organization. Without the GM in the strategic position between the president and the managers, the entire culture was now ill-defined. Our mission was to bring definition to the re-ordered structure, which would have the managers reporting to the president, and to encourage behaviors from the president that would reverse any negative tendencies that the organization had developed. With the numerous uncertainties that the situation manifested, the MDS evaluation seemed to be ideal because of its noninvasive quality.

All members of the executive committee (manager or higher management) were included in the MDS evaluation; their names were listed on the evaluation form, and they were given a form to complete. When these 12 people had returned their rating sheets, the *SAS* ALSCAL program for individual differences multidimensional scaling (see chapter 9 in Schiffman, Reynolds, & Young, 1981) was used to provide a two-dimensional graphic of the *perceived* relationship among these upper level managers. The human resources director worked with the consultant

to name the two dimensions, with an opportunity for the president and vice-president individually and the group as a whole to confirm or adjust these dimensions (see Figure 1).

The *X* axis (Dimension I) seemed to indicate a paradigm of goal-oriented, hard-driving people on the left-hand side and more detail-oriented people on the right side. The president and the vice-president were on the left, whereas some support staff people were on the right, including management information systems, accounting, and marketing. Human resources and sales managers were in the middle on these two dimensions. Although the group was not perfectly satisfied with the placements, there seemed to be consensus that they could at least understand this placement. The second dimension seemed to express the group perception of the personality

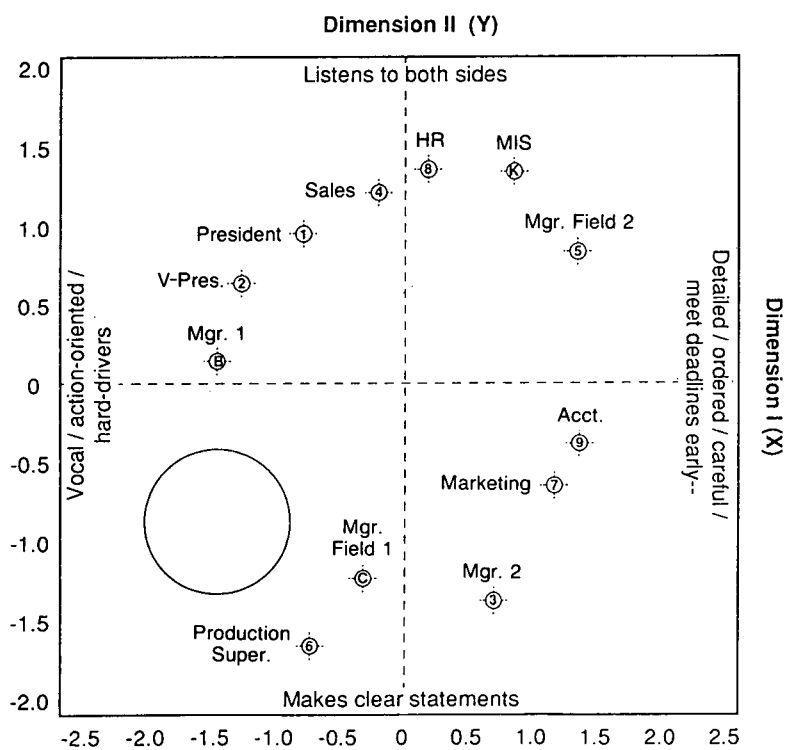

FIGURE 1. Company A initial MDS group solution with all managers

of the individual manager. The upper part of the *Y* axis reflected perceptions about whether or not the manager would listen to both sides; the bottom part of the graphic reflected perceptions concerning the manager's propensity to state a clear position. It was noted that the human resources person scored the highest in listening to both sides—a favorable place to be for that person and function. Although not extreme, both the president and vice-president were perceived as being in a listening posture during this period of getting reconnected to the managers. This style was supported by the consultant. The strongest disagreement with this axis came from one of the managers (production supervisor) who paradoxically took a strong stand. He said that maybe other people did not recognize it, but he spent a lot of time listening. This opportunity was used to explain again the difference between perceptions by group members and "reality."

This MDS assessment had an interesting feature that was discussed in both the individual and group sessions for confirmation. The managers were positioned on these two dimensions in a rough circle around the origin. However, note the lower left quadrant. For the consultant, it seemed that a person was missing between number 6 and B. In each of the two sessions, the consultant posed the question: "Would you be comfortable describing your former general manager as an action-oriented person who tended to take clear stands?" In each case, the response was in the affirmative. At that point, the 12 members could not consider themselves without including the GM, who was no longer part of the group. The former structure was still in place even though one of the members had been removed. The premise for the consultation, redefining the organization without the powerful GM, seemed to be strongly supported from the MDS sociometric.

Once the group solution had been established, each of the group members who completed rating sheets (in Company A, all managers were included) could then be assessed by the ALSCAL program for their individual correlation with Dimension I and Dimension II. How well those gestalt issues fit them individually could be explained by this analysis (see Figures 2 and 4). The higher the correlation of the individual with the group dimensions, the better the individual could understand and function in that environment, and vice versa.

The correlations from individual differences analyses for this two-axis solution were not as high as the consultant would have liked. Only one of the correlations between the individual's perception of the members and the composite picture was over .5 (see Figure 2). Fortunately for the consultant, the person who scored highest on both dimensions was the human resources director, with whom the consultant was working most closely. This low correlation of the individuals with the group model suggested that some of the managers were experiencing a different culture from their col-

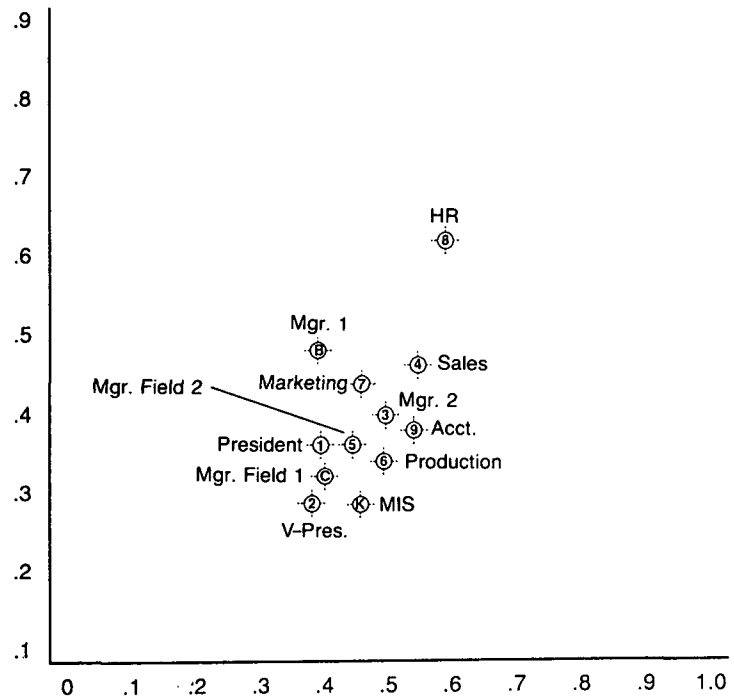

FIGURE 2. Individual correlations: Company A managers with initial MDS group solutions.

leagues. All of the managers except two had reported to the GM. Those two managers reported to the vice-president, who reported directly to the president. It seemed plausible that the experiences of those two managers could have been quite different from the other eight and therefore were not as critical to accomplishing the mission of this consultation as were those who were directly affected by the GM.

We re-assessed the data, omitting both the perceptions of the vice-president and his two reporting managers and all of the ratings that had to do with them. In the new solution (Figure 3), six of the nine managers had individual differences correlations over .5 on at least one of the dimensions. Something significant had happened to move the president out of his position of being clustered with the other managers in the first assess-

ment (Figure 2) to the position of being totally isolated from the other managers in the second assessment (Figure 4).

The president's correlation to the *X* axis was .8, very high, but his correlation to the *Y* axis was .2, very low. The second assessment (listens *vs.* takes stands) indicated that the president had a clear picture of what the first dimension represented but no picture at all of what the other managers were dealing with on the second dimension (yet to be determined).

The information reflected in Figure 4 is very different from that of the first solution. Placement of the managers along Dimension I in this second solution looks a lot like their placement along Dimension II in the first solution. The production supervisor who did not like his role as a person who takes stands rather than listens is still on the extreme. The president is

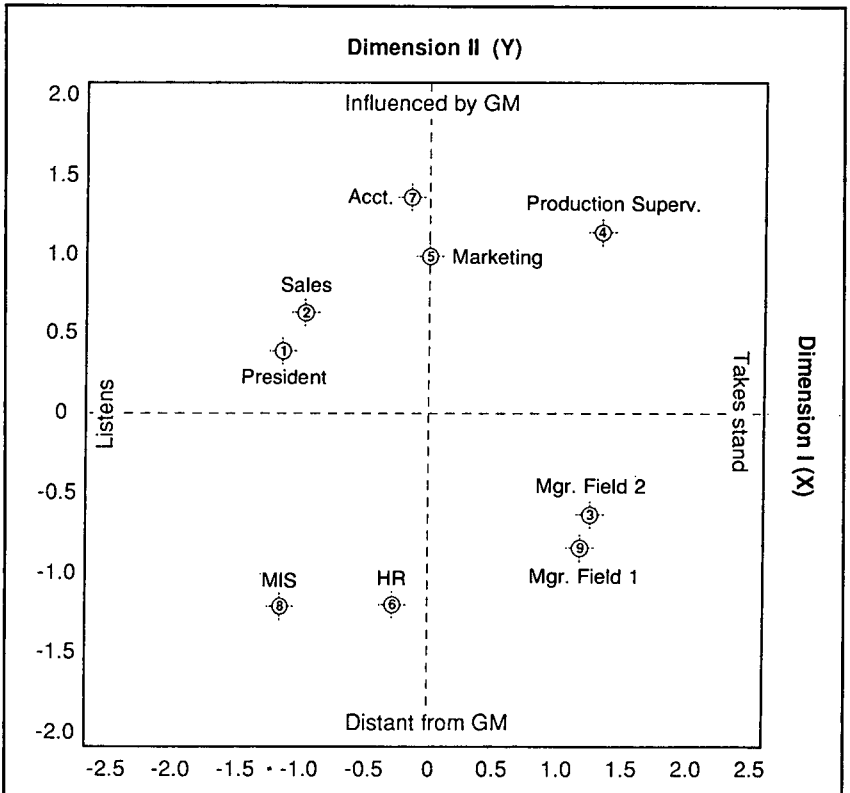

FIGURE 3. Company A MDS group solution (omitting the managers who did not report to the general manager)

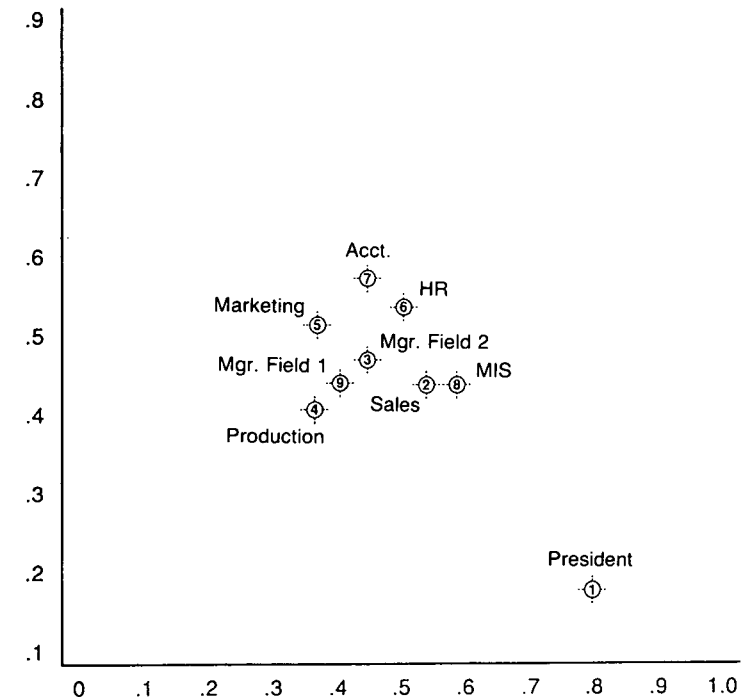

FIGURE 4. Individual correlations: Company managers with Company A reassessment

approximately where he was before. The human resources (HR) manager is in a more moderated position, according to this composite, than in the first one that included people who were outside the immediate functioning of this group of managers. As the president's low correlation suggests, Dimension II in Figure 4 bears no resemblance to either of the dimensions in the first solution.

The second most important thing underlying the perceptions of this group of people who reported to the GM is different from any dimension determined thus far. Being a hard driver or being conscientious with details is not as important as some other issue. In individual sessions with the HR manager, the president, and the vice-president and finally in sessions with the full group, the label that emerged on the new *Y* axis was people

who were influenced by the GM (top) versus people who were distant from the GM (bottom). In other words, this dimension was about how the managers negotiated their relationship with the GM. The president had been unable to perceive this dimension because of his unique relationship with the GM and his insulation from the managers. If the president is to make sense of where the organization is now without the GM, then he is going to have to understand this dimension and develop individual relationships with the GM's former managers.

Creating an environment in which it would be safe to provide feedback and one in which the managers' feedback could be used to bring the president up to speed on the reality within the organization became the focus of the consultation. In three group sessions and as many individual sessions with the president, the organization was coached toward a new culture, a culture that addressed those potential conflicts openly and directly. After a year, the vignettes of successful applications among these managers have continued to be reported and are trickling down through the organization. MDS had powerfully focused the consultation on the organization's and leadership's challenge in a nonobtrusive manner.

Company B

Company B was a subsidiary of a multinational manufacturing company. Through a series of operations, it moved raw materials to customers for retail sales. The senior managers included in the weekly staff meetings involved three different levels: president (senior officer at that location); three vice-presidents (development, procurement, production/sales); and area managers (two plant managers; a sales manager; management information systems manager; accounting manager; and human resources manager).

As a follow-up to their continuous improvement (CI) efforts, Company B brought us in as consultants to understand the underlying issues that were shaping their interactions. The MDS analysis was elected as an evaluation procedure. All of the upper level managers at this particular location were included in the assessment, both as evaluatees and evaluators. Everybody participated in the study. (If, for some reason, a person or several persons did not complete the rating sheets, the composite picture still could have been created, and the group solution could still have been created; however, the individual assessment for those nonparticipants would not have been possible. Obviously, the more group members who participate, the more who complete the solution.)

When the MDS sociometric was reviewed with the president (Figure 5), the recognition of the dimensions and the relationships among the man-

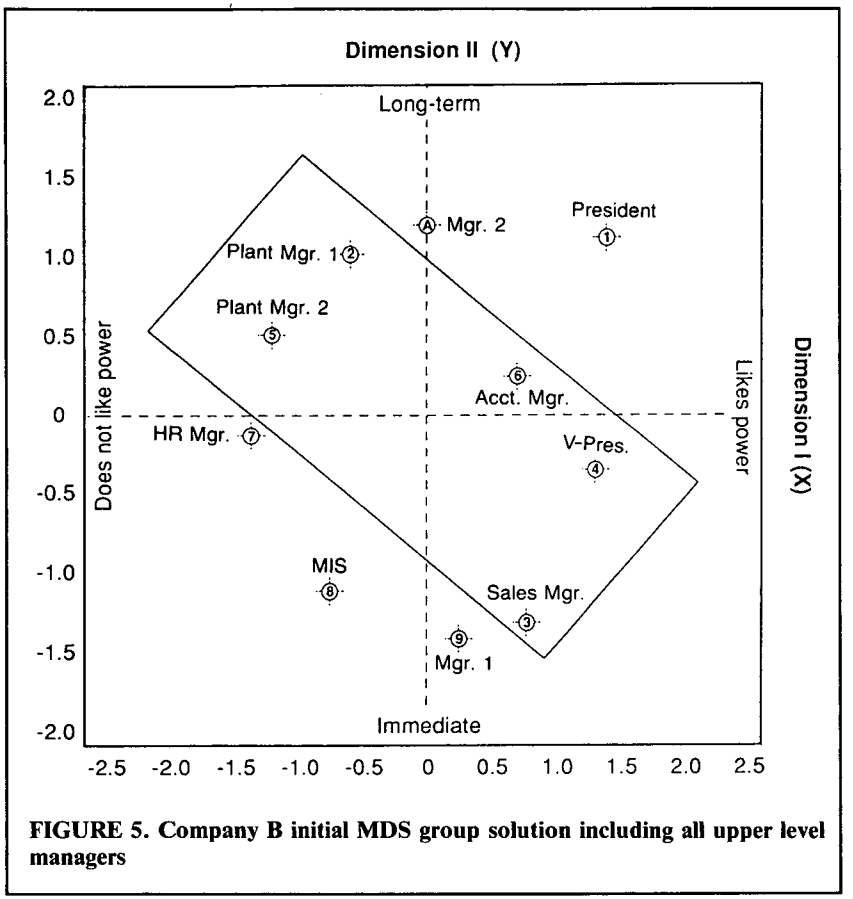

FIGURE 5. Company B initial MDS group solution including all upper level managers

agers was mixed. The *X* axis seemed to be about power: Those on the left did not like power and those on the right did. The *Y* axis seemed to be about vision: Those toward the top had a long-term view, whereas those on the bottom were more immediate in their perspectives. On both of the axes, however, there were discrepancies. What was the accountant (#6) doing over on the power side? Hence, the label was changed from "has power" to "likes power." The two plant managers, who were located in the "does not like power" of the *X* axis, did not seem well placed at that extreme. On Dimension II, the sales manager, who does long-term forecasting, was identified more with the extreme of functioning on a short-term perspective, as was the raw materials manager (#9), whose perspective often had to span decades. The picture was clear enough for one of

the plant managers to name the four quadrants: the upper left he called "operators," the upper right—"decision makers," the lower right—"people runners," and the lower left—"support staff." At the same time, there was enough ambiguity about the dimensions that one of the support staff (#8), a number cruncher, questioned the validity of the MDS process. (Rule: Business people do not like ambiguity. They want answers/solutions. They are not interested in the process.)

As was the case with Company A, the limitation of this solution and the progress of their CI program might have been indicated by the individual manager's correlations to the group analysis. The correlations between the individual managers and the group solution (see Figure 6) ranged from .2 to a high of .6, with .4+ occurring at the highest frequen-

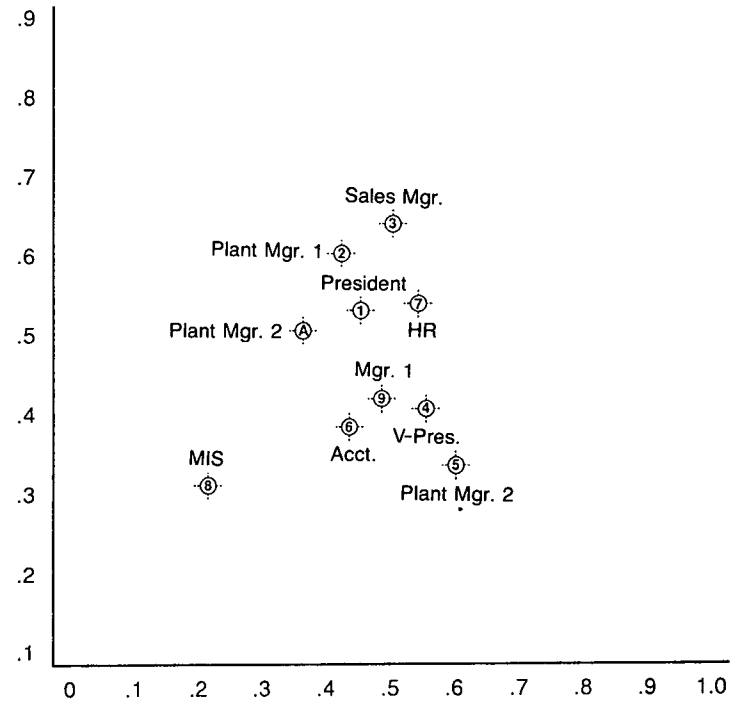

FIGURE 6. Individual manager correlations with the initial MDS group solution in Company B

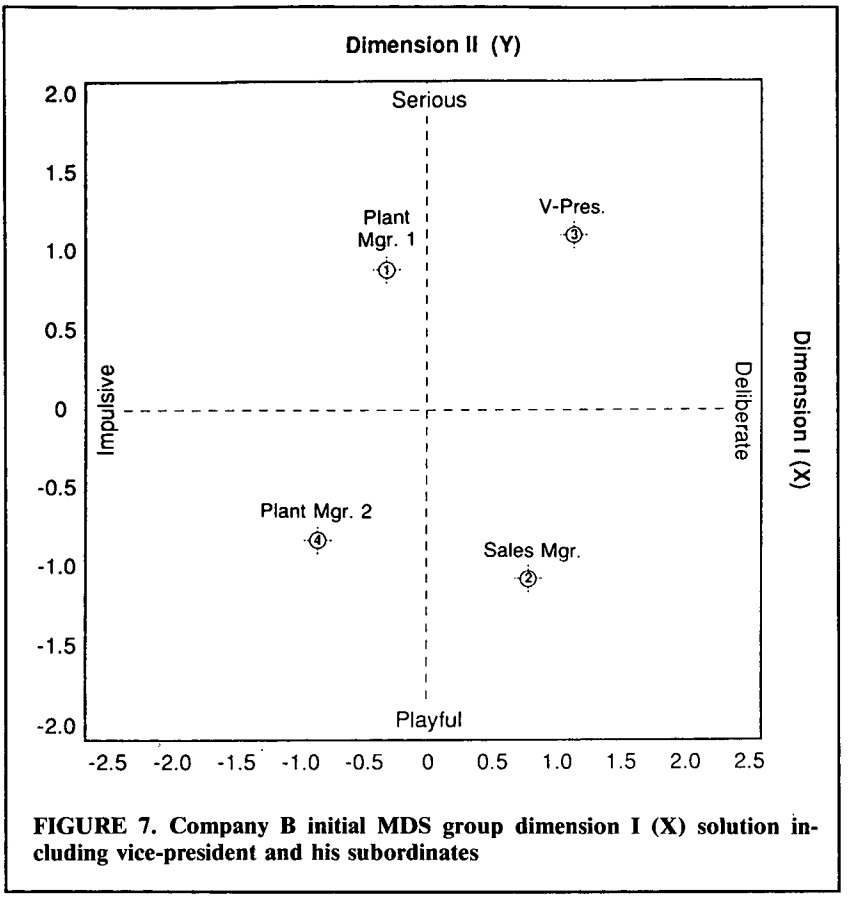

FIGURE 7. Company B initial MDS group dimension I (X) solution including vice-president and his subordinates

cy (six times). The diversity of the functions of these upper-level managers could have been causing the lack of unity in the underlying important issues. Because of their differences in roles, the overall group picture was not consensual. Maybe their subgrouping and diverse functions caused them to perceive the larger group differently while sharing a unified perception within their specialty. A clear perspective on meshing their diverse functions into a common mission was suggested as a reason for this lack of unified perception. Some exploration into subgrouping was thought to be clarifying.

Upon closer scrutiny, it did appear that the president's team was really three subteams. The president had three people directly reporting to him: two vice-presidents over raw materials managers and a vice-president

over production and sales. The plant managers and sales manager were part of the vice-president's team. The support staff for human resources and accounting had a dual report structure that included responsibility not only to the president on location but also to the head of their specific staff function at corporate headquarters. The production/sales vice-president's (VP's) staff, who complained the most about the consultation and this evaluation, seemed to be the most different from those managers who reported directly to the president.

To achieve a more focused picture of this organization, we assessed the VP's team separately from the rest of the president's team. Then, personnel reporting directly to the president were analyzed together. Please note that this reassessment did not involve more time and effort by the company or these managers: The consultants reorganized the existing data.

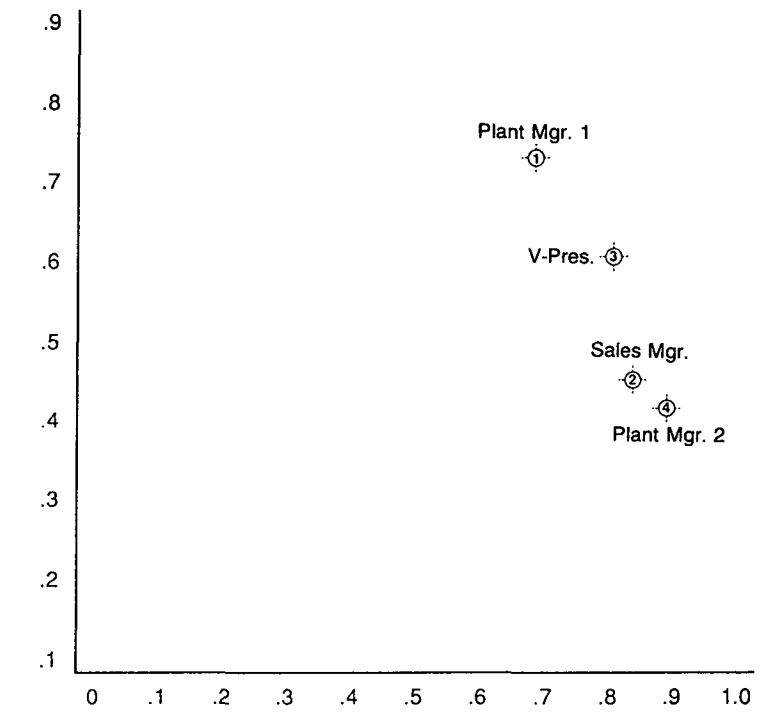

FIGURE 8. Correlation of Company B managers in vice-president subgroup with their group solution

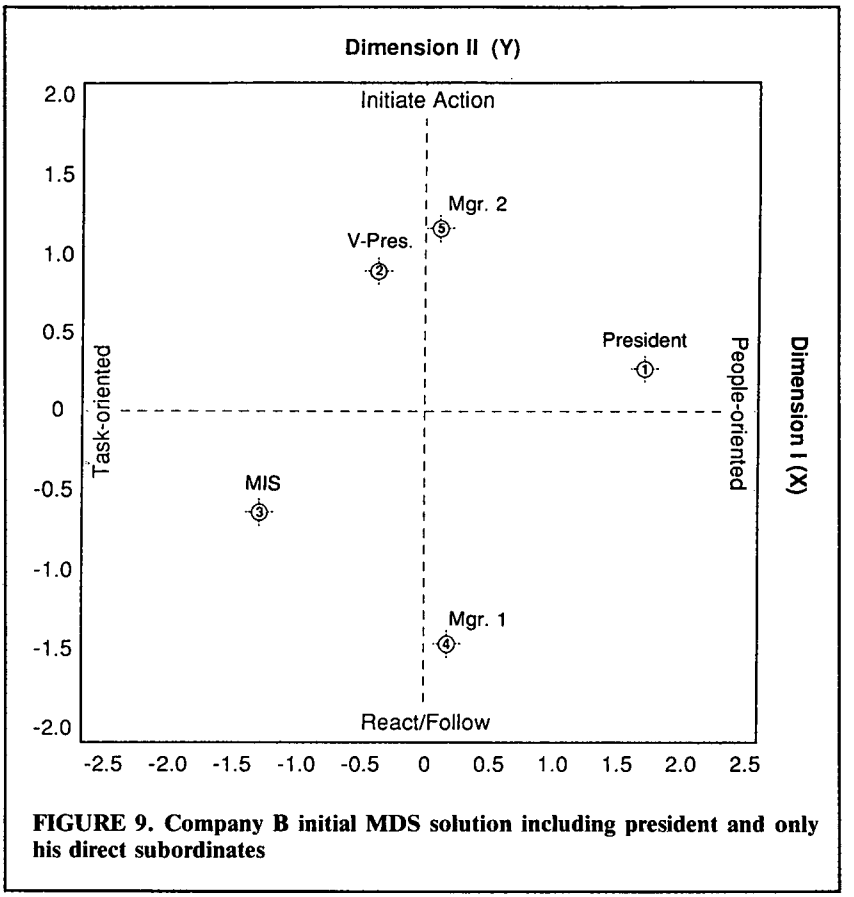

FIGURE 9. Company B initial MDS solution including president and only his direct subordinates

The production/sales VP and the three persons reporting to him formed a quadrilateral (see Figure 7) that mirrored their relationships in Figure 5. They had solidarity on their two-dimensional solution (see Figure 8 and note the high individual correlations to these dimensions). The VP was not on the extreme in the individual differences solution, suggesting that he was able to understand his managers, who emphasized either extreme—a good position to be in.

When this VP's rectangular subgroup was removed from the president's team, another unified subgroup was revealed. The existence of this subgroup was further emphasized when the dual reporting support staff was omitted (see Figures 9 and 10). With the exception of the MIS manager, everyone was committed to Dimension I, people-oriented versus task-ori-

ented. Although the president and vice-president understood this dimension (Figure 10, individual differences assessment), they were perceived as opposites in their management styles on this dimension (Figure 9): the people-oriented president versus the task-oriented VP.

Based upon this MDS assessment, the president had at least two teams to whom he related: the managers who report directly to him and the managers who report to his VP. Another subgroup of support staff could also be described. The cultures and underlying issues were different among these groups. A similarity between the president's group Dimension II, initiate/act versus react/follow, and the VP's group Dimension I, impulsive versus deliberate, may exist but cannot be assumed. The same could be true for people- versus task-oriented and playful versus serious for the re-

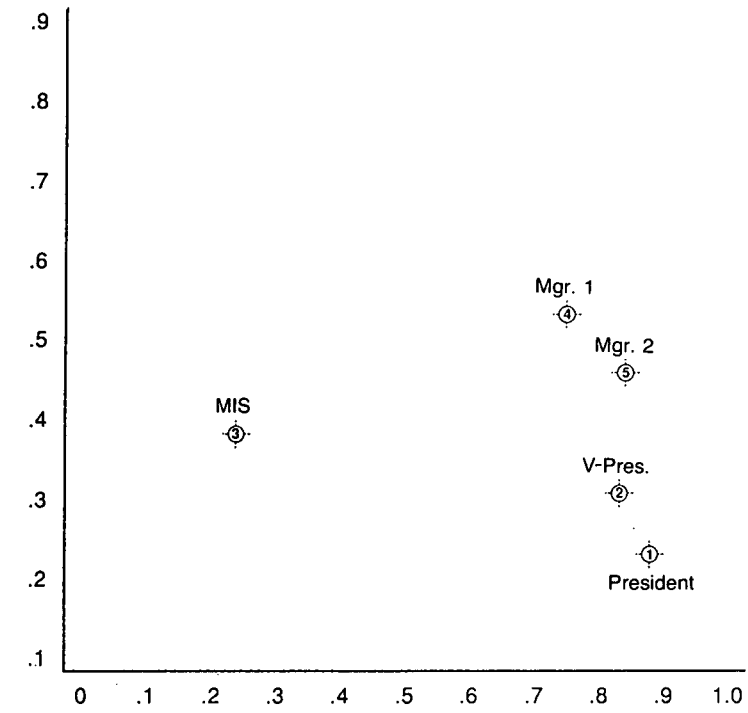

FIGURE 10. Individual correlations: Managers, president, and his subordinates with their MDS group solution

spective groups. But the overall solution (Figure 5) suggested that a meaningful difference was occurring between subgroups. The president and anyone else operating in both groups needed to respect the differences among these groups and not expect the same response from them.

The task of the consultation became that of having the president clarify his mission in a way that could bring together the diverse interests/perspectives of his subgroups, thereby enhancing his CI project. His relationship and boundaries with the VP were critical in affecting the VP's subgroup. By coaching the president individually over 2 months, a meaningful alignment of the subgroups was begun.

Conclusions

From the foregoing presentation, a couple of generalizations may be warranted. First, because of the high technology of computers and the subsequent development of scaling models, a more sophisticated form of sociometry became available that seems to have great promise for expanding sociometric applications. The original enthusiasm for MDS in sociometry abated when it was discovered that many, if not most, sociometric applications were done with children in school classrooms, neither of which lend themselves well to MDS. First, children have difficulty understanding how to rate one another on a metric scale regarding perceived similarities and differences between and among each other. Second, unless random sampling is done, classrooms of 25–30 are too large, because the system of comparing every student with every other student would lead to several hundred ratings, with subsequent student-rating fatigue.

Although MDS has its limitations when applied to young children and large groups (over 15), there are numerous applications of a sociometric nature that lend themselves well to MDS. The authors have used MDS quite successfully with families, group counseling and psychotherapy, and management consultation and conflict resolution. We have described the latter in this article. We believe that MDS holds great promise for use in studying small-group processes, for diagnosis of small-group dynamics that are either facilitative or debilitating, and for providing a "road map" for change. These advantages of MDS were illustrated in the case examples of Companies A and B described in this article.

It is premature for reasons already cited to assume that MDS will replace traditional sociometry, but it is certainly replete with opportunities to expand upon and provide greater objectivity to sociometry. We predict that MDS will be the basis for application of sociometry in the 21st century.

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