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A TECHNIQUE FOR ASSESSING PERCEPTIONS OF ORGANIZATIONAL STRUCTURE

ABSTRACT

This study explores the use of a multidimensional scaling technique in understanding members' perceptions of organizational structure and investigates the relationship between formal and informal (or social) structure. Social structure, as defined, is derived from members' similarity-dissimilarity judgments, compared to sociometric data, and presented in INDSCAL configurations after the work of Carroll and Chang [4].

The INDSCAL configurations are for two bureaus in a state highway department, a design bureau and a construction bureau. Within and between the bureaus, the configurations suggest several visual and statistical differences. Some of the differences can be explained by the patterns of work relationships and duties. There are, for example, notable differences in intragroup social interaction, group formation, and dimension weighting. Members' weightings of the dimensions are examined to discover meaningful patterns. Finally, the potential of the INDSCAL technique for organizational analysis and development is discussed.

INTRODUCTION

Individual behavior in an organization is influenced by factors both inside and outside the organization. Certainly, within the organization, a major factor affecting individual behavior is organizational structure. The structure of an organization is defined by Leavitt [18] as "an established pattern of relationships among the various parts, components, or departments of an organization." Emphasis on structure is not new to organizational thought; any investigation of organization--or of behavior in organization--must by definition include the concept of structure or how the organization is put together.

In spite of the obvious importance of structure to organizational behavior, there have been few studies which examined the effects of structure on behavior. One possible reason for this is the difficulty in determining the structure of an organization. Reality for an individual is what he perceives reality to be; to investigate the structure of an organization requires knowledge concerning members' perceptions of structure. In order to investigate the perceptions of structure, it is necessary to know the dimensions used to define structure. As Golembiewski [10] has noted, "Many serious students of the small group are all too prepared to indulge in verbally involved theories without having investigated the first essential fundament . . . the dimensions along which the attributes of any group are to be quantified."

The present study explores a new technique for investigating a facet of organizational structure, the perceived interpersonal (or social) structure of organization, and the potential usefulness of the results obtained by this technique for management. A few previous studies have

used this technique, but only with academic organizations [3], [17]. This study, therefore, is a test of the generalizability of the technique and its applicability to other types of organizations. In many respects, it is exploratory in nature, and, as such, is more interested in methodology than testing specific hypotheses.

ORGANIZATIONAL STRUCTURE

There are many possible approaches to the study of organizational structure. Typically, the analysis begins with the premise that the organization is a total system--a whole. The parts or components of the organization are then identified and the relationships between them examined. This is necessary because the parts and the relationships between them are, in reality, the organization. The identification of the elements depends upon the level of analysis chosen. Occasionally, the entire organization is chosen as the unit of analysis, while at other times the department or the work group is used. None of these approaches is necessarily right or wrong, but, depending upon the information sought, one approach has comparative advantages over another. From this standpoint, it would be misleading to refer to the structure of any organization, since there are many possible structures.

Classical organizational theory dealt extensively with the anatomy of the formal organization. Most of the work done by the pioneers in organization theory was concerned with the relationships that existed between the various activities performed in an organization. In turn, the purpose of structure was to provide an orderly arrangement among the functions of the organization; ideally the arrangement which optimized

efficiency [8], [20], [35]. In a somewhat similar vein, a number of sociologists wrote about the effects of structure on organization [11], [19], [29], [36]. They were more concerned, however, with the effects of structure as it related to the organization's interactions with other segments of society--clients, government, other organizations--and not with the internal effects on the organization and individual behavior.

Research on formal organization structure has sought to develop measures of a variety of structural characteristics and to relate these to each other and to a number of organizational and environmental factors. Starting with Durkheim's [7] work on the division of labor, research in this area was focused primarily on extending our understanding of the Weberian bureaucratic form of organization. In this regard, the recent series of studies conducted by Pugh and his associates at Aston represent a major effort [16], [23], [24].

Cartwright and Zander [5] indicated that in many cases an organization will have a formal structure that has within it, or parallel to it, an informal or social structure which is quite different. This can create conflict for individuals when they are expected to do one thing for the formal organization, but are influenced to behave differently by the social structure. Although formal and informal organization are discussed at length as independent of each other, it should be noted that from a practical standpoint it is very difficult to separate the two. As noted by Blau and Scott [1], there is only an analytical distinction between the formal and informal aspects of organizational life--there is only one actual organization.

Perhaps the best known study of the effects of organizational structure on individual attitudes and behavior is that of Porter and Lawler [22].

More recently, Rice and Mitchell [25] have suggested that behavior in organization is largely a function of the individual's hierarchical position. According to them, an individual-in-organization approach is more conducive to understanding structural influences on behavior, because it reflects factors which the individual himself is "likely to perceive about his place in the organization." Rice and Mitchell also present evidence to indicate that formal organization has a far greater influence over informal organization than previously thought.

Complicating the problem of understanding the effects of hierarchical position and similar structural characteristics on individual attitudes and behavior has been the existence of small groups in organization. Jones and Young [17] have postulated that intragroup behavior, particularly in on-going, real groups, can best be understood by specifying the social field in which it occurs. To the extent that both the mutually shared social field of a group and the private social fields of its members can be specified, prediction of interpersonal behavior should be enhanced. Scott and Mitchell [28] have reported that most subdivisions or subunits of a large organization are composed of many small groups, which are composed of a relatively restricted number of people, usually fewer than seven, who maintain personal interaction over a relatively long span of time. As some researchers have pointed out, however, although group behavior has been the subject of much attention by behavioral scientists, less research has been conducted with on-going groups in permanent organizations than with college students in short-term and artificially contrived settings [9].

Following this line of reasoning, it is our contention that the best description of organizational structure is one in which both the formal

and informal components of structure refer to relationships between people. Formal relations are more visible in that they are planned, have normative legitimacy, and have historical basis in the concerns of modern organizational life. Informal relations are less accessible, more emergent, and more personal. Neither are really different types of organizational structure, but are descriptions of aspects of that structure.

METHODS FOR ASSESSING SOCIAL STRUCTURE

Sociometric Choice. Following the early work of Moreno [21], this method for assessing social structure involves asking group members with whom they most or least like to engage in a social or task activity. From the data, a sociogram is constructed. There are shortcomings with this method as the dimensions of group structure are predetermined and the visual representation of structure is limited to a two-dimensional figure. Even with the subsequent use of mathematical tools associated with matrix theory and graph theory, the end result with this method is still a structural description based on interpersonal choice, only one of four possible types of interpersonal relations cited by Cartwright and Zander [5].

Sociometric networks are assumed to possess face validity, and to represent the "true" network of interpersonal relations within groups. However, this notion was attacked by Holland and Leinhardt [13]. They point out that in traditional statistical conception all data are composed of a true structure plus noise (error); thus it must be true that any noise (error) introduced by the sociometric procedure may be safely ignored. If this is not true then, obviously, whenever an error is made in sociometric

measurement--for whatever reason--the resulting sociogram does not agree with the actual structure. Holland and Leinhardt suggest improving the collection of sociometric data by obtaining rankings of preference data from individual members of the group.

Multidimensional Scaling. Research on the psychological assessment of structure has focused primarily on two approaches to data analysis. The more traditional approach, as exemplified by sociometric choice, is oriented toward the detection and statistical evaluation of patterns of a predetermined form. As with sociometric choice, the patterns are presumed by the questions asked. The other orientation is toward the discovery or recognition of new patterns. The aim is to uncover structure within the data. Shepard [32, 33] has suggested that data analyses of this sort should be matched to the human abilities needed to comprehend them, and has argued that a visual representation of the results would be most effective.

The class of techniques generally used in the latter approach includes cluster analysis, factor analysis, and scaling. Factor analysis has seen considerable use already in the investigation of organizational structure, notably that patterned after the work of Pugh and his associates [16], [23], [24]. Recent developments in multidimensional scaling (MDS) offer the possibility of revealing underlying social structure in a visual mode. The basic premise of MDS is that similarity judgments are useful indices of perceptual structure, and from perceptual structure one can understand the relevant dimensionality of the criteria used. This is precisely what MDS is presumed to do, namely, spatial representation of perceptions in minimum dimensional space so that the inner stimulus

distances in this space are monotonically related to the similarity judgments.

Although the earliest work on MDS was done over thirty years ago, MDS did not generate much interest until a major breakthrough came with the work of Shepard [30], [31]. He developed a nonmetric MDS method which summarizes nonmetric input and provides metric output. His program was proposed as a tool for deductively analyzing similarity data by making explicit the multidimensional structure underlying the data. The simplest explanation of MDS may be that given by Green and Carmone [12]. As the number of stimuli, n, increases, the number of rank order constraints increases almost with the square of n. However, to portray any set of points in r dimensions, only rn numbers are needed. As the number of inequalities (rank orderings) increases relative to the number of rn numbers needed to satisfy a configuration, the inequalities serve to restrict the movement of the n points so that with "enough" inequalities it is possible to obtain a unique configuration.

In general, as one increases the dimensionality of the space under consideration, the chance of finding a unique configuration increases. The more dimensions used to specify the configuration, the less error in representation; however, the configuration becomes more difficult to interpret. Typically, some error is traded off for lower dimensionality and easier interpretation. Shepard [34] has noted that all MDS techniques share two purposes: (1) to obtain whatever pattern or structure may otherwise lie hidden in a matrix of empirical data, and (2) to represent that structure in a form that is much more accessible to the human eye--a geometrical model or picture.

Individual differences multidimensional scaling (INDSCAL) was developed recently by Carroll and Chang [4]. It is an analytic method which yields three kinds of representations: (1) group structure as perceived by all subjects, (2) group structure as perceived by each individual in the group, and (3) differences in the way individuals perceive the group. Each representation is imbedded in a truly metric space with the representations having specified mathematical relationships. In this model, subjects need only make judgments about the similarity of individuals in the field. INDSCAL then empirically determines the configuration of the representation and the weighting of the dimensions for each individual after the researcher assigns the number of dimensions to be considered. The names and nature of these dimensions are not given directly by the model; other information and procedures are needed to identify the dimensions. INDSCAL assumes that different individuals perceive the stimuli in terms of a common set of dimensions, but that these dimensions are differentially important or salient for each individual.

A complete description of INDSCAL can be found in Carroll and Chang [4]. The model assumes a set of r dimensions or factors underlying the perception of the n stimuli. In this study, the stimuli correspond to stimulus persons, and the dimensions correspond to attributes determining interpersonal perceptions. The dimensions are assumed to be common to all the judges in the study; however, the weighting of the dimensions are expected, and allowed, to vary. The model also assumes that the similarity judgments are linearly related to a modified Euclidean distance in space. The space is modified in the sense that distances in the configuration can expand or contract differentially for each judge along the coordinate axes.

METHODOLOGY

Sample. The sample used here to explore the use of the INDSCAL technique consisted of sixteen representative employees of the construction bureau and twenty-one employees of the design bureau in a state highway department. The employees were managers, engineers, and technicians; all had been with their respective bureaus for at least one year and were acquainted with each other. Nearly all of the managers were registered engineers and had come up through the ranks.

Some of the task and structural features of a construction bureau, as discussed by Hunt and Liebscher [14], are summarized briefly here to provide perspective: (1) the bureau is responsible for maintaining a liaison relationship between the highway department and road construction contractors in a variety of geographical locations, (2) bureau field supervisors, engineers, and technicians are rotated frequently, and (3) superior-subordinate interactions in the field are brief and, therefore, evaluations of subordinate work performance are often based on limited information. The formal structure of this bureau is shown in Figure 1, with letters denoting subjects in the sample. In the design bureau, by contrast, (1) the bureau is responsible for conducting new highway location studies, designing highways, and producing plans and specifications for the construction phase, (2) a subordinate keeps the same supervisor for long periods of time, and (3) superior-subordinate interactions occur in a large office permitting close supervision, and evaluations of subordinate performance are based on observed performance. The formal structure of the design bureau is shown in Figure 2, with letters denoting subjects in the sample.

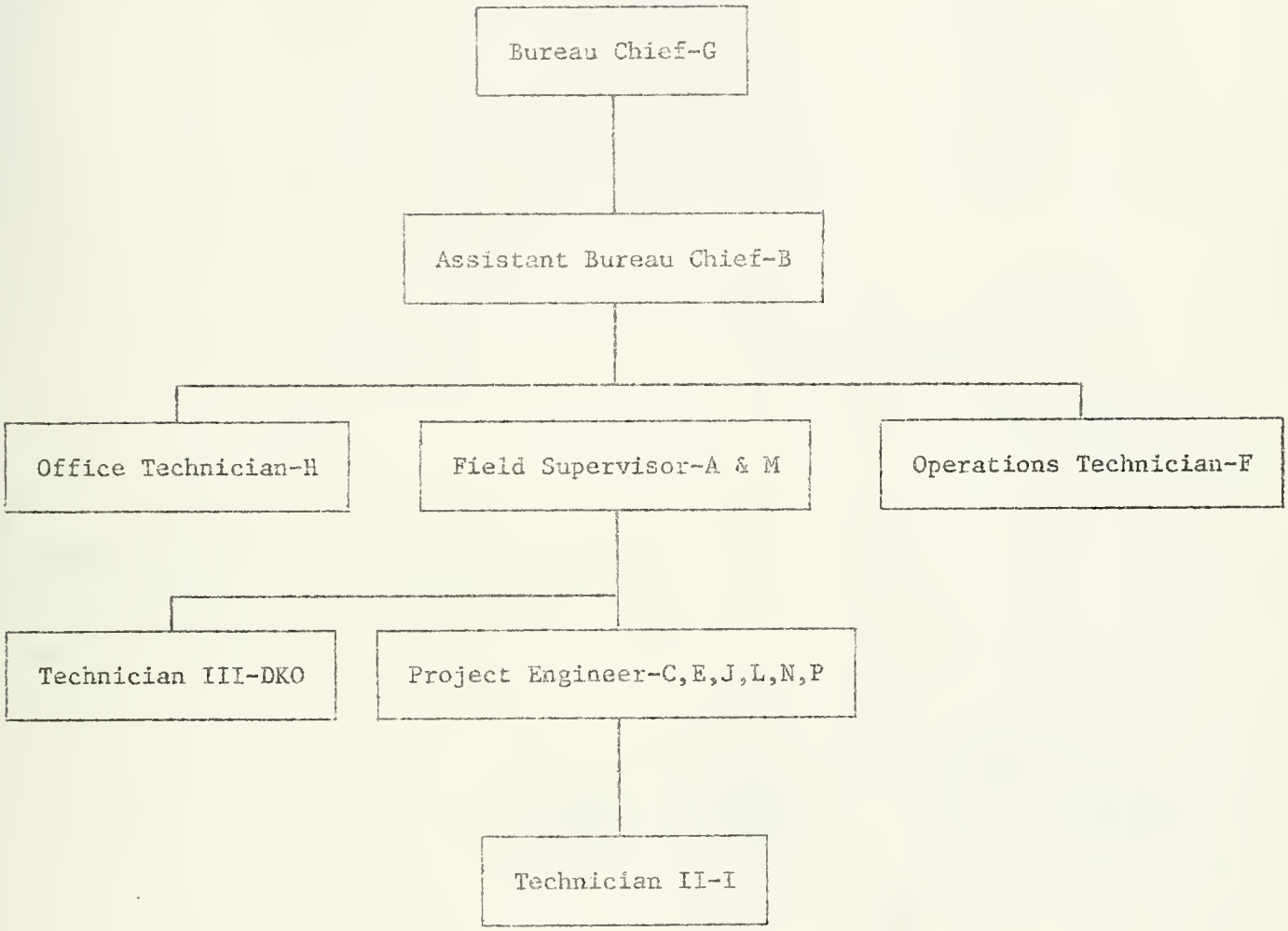

Figure 1.

Formal structure of construction bureau.[1]

[1]Letters denote bureau members included as subjects and stimuli.

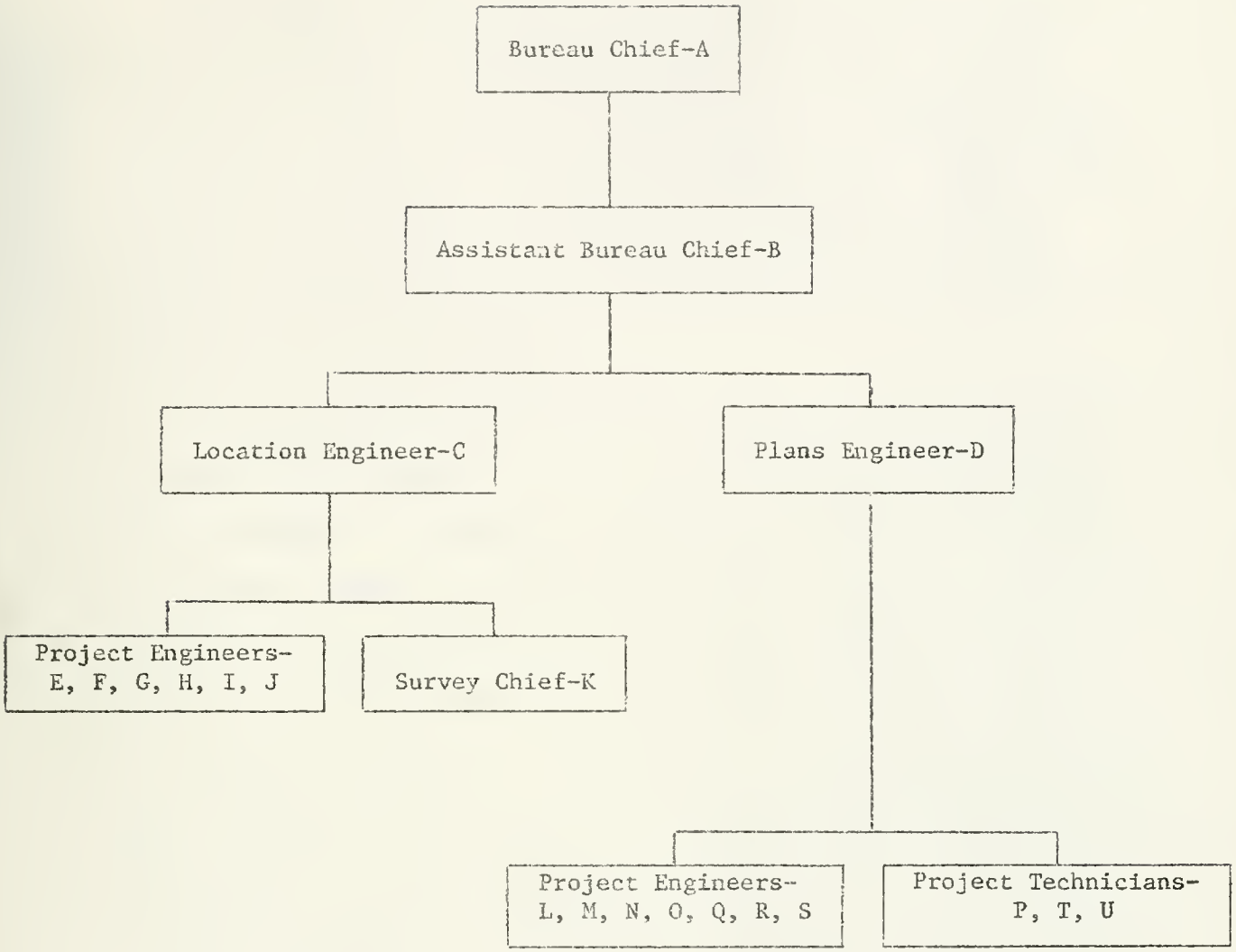

Figure 2

Formal structure of design bureau.[1]

[1]Letters denote bureau members included as subjects and stimuli.

Instruments. Each subject in the study was given three items: a deck of IBM cards and two questionnaires. Each card in the deck contained the names of two of all possible pairs of stimulus subjects in the subject's bureau. The cards were generated by a computer program [2], which arranged them according to a scheme developed for minimizing systematic repetitions and maximizing the space between pairs having the same names [26].

All subjects were then instructed to rank order the pairs of names in terms of their similarity. Care was taken not to give a very specific definition of the meaning of similarity other than "they seem to go together." When the subjects had finished sorting their decks, they were given the questionnaires. The first questionnaire required the subject to rate each stimulus person on a scale of 0 to 7 on a number of attributes or properties. These rated attributes or properties were used to interpret the MDS results. The second questionnaire was placed in a sociometric choice format and included such questions as, "Which of these people would you be the most (least) likely to ask for help on a work problem?" The questions were concerned with two major areas--work problems and social contacts--and were tailored for a task-oriented organization.

Research Focus. As suggested earlier, this study was undertaken for the purpose of exploring the use of a multidimensional scaling technique in understanding the social structure of an organization. In addition, several related research questions were posed; for example:

1. Will the task demands of an organization (in this case, bureaus of a state highway department) impact on employees' perceptions of social structure?

2. To what extent will perceived social structure be congruent or incongruent with formal structure? What implications exist for the management of an organization when social and formal structure are congruent or incongruent?
3. Will the bureaus use comparable dimensions in making their judgments concerning social structure? Will role or function in an organization play an important part in determining the weight each individual places on a given dimension?
4. What is the potential of the multidimensional scaling technique used in this study (and other related techniques) for organizational design and development?

RESULTS--CONSTRUCTION

The first problem encountered was that of determining the appropriate dimensionality of structure. Normally, the number of dimensions is plotted against stress and the point at which there is a sharp break or elbow, indicating an optimal point, is chosen. However, for the data obtained, there was no apparent elbow. It was decided, therefore, to use the most dimensions that could be visually represented--three. The correlation between the data and the subsequent configuration was .44. While not an especially strong correlation, correlations of similar magnitude are reported in other studies using the INDSCAL technique, for example, Wish et al. [37]. For four dimensions, the correlation was .47. As a result, not much interpretive richness in understanding social structure was lost with the three-dimensional representation.

As suggested in Figure 3, the configuration of the construction bureau is fairly simple. That is, individuals are dispersed over the entire stimulus space with very little clustering; the mean interpoint

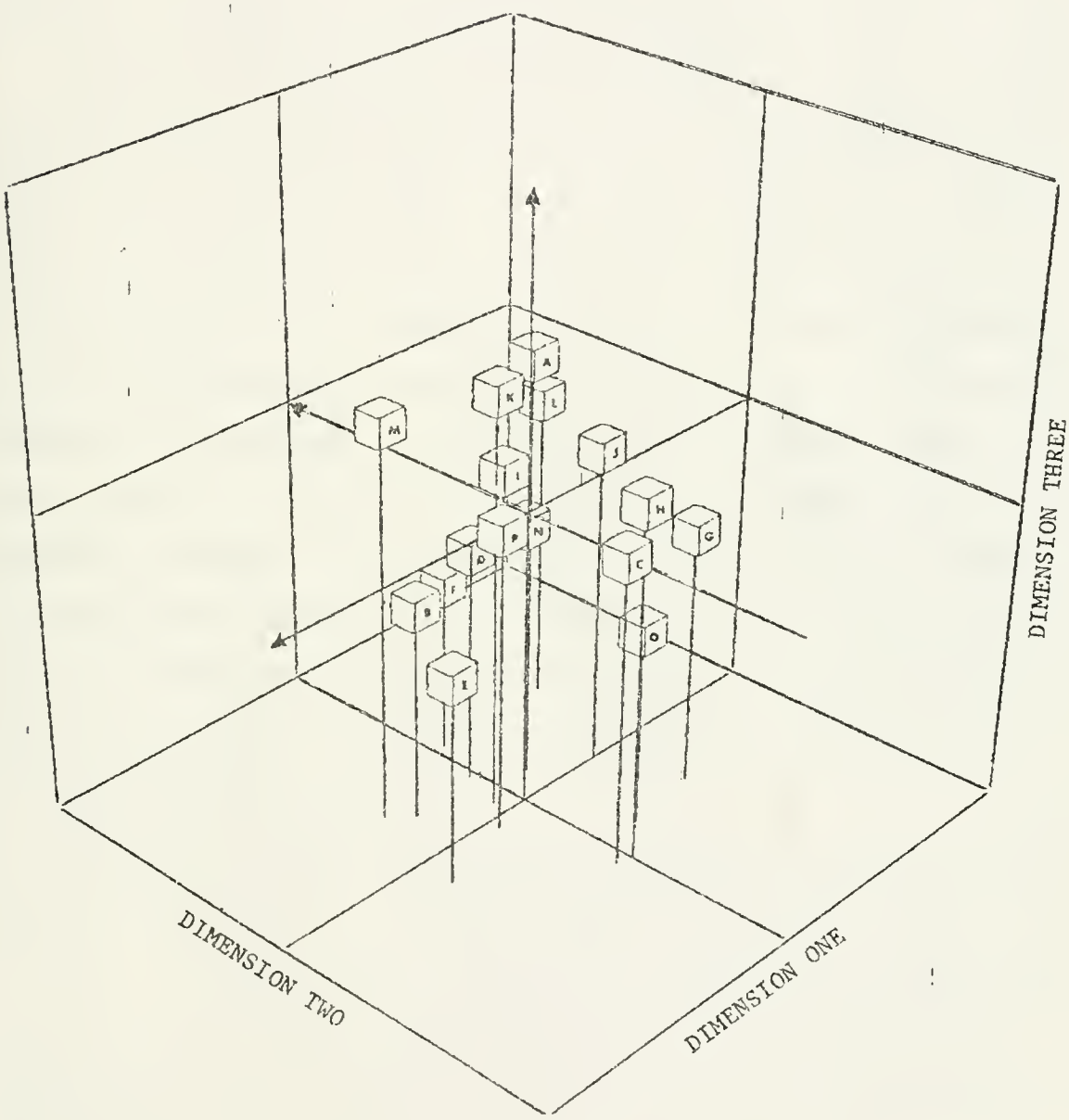

Figure 3. INDSCAL Configuration--Construction Bureau (16 subjects)

distance between subjects is 59.3 with a standard deviation of 20.2. Using an operational definition of an isolate as a person who is more than one standard deviation away from another person, there are eight isolates (B, E, F, G, J, L, M, and O). Two of these so-called isolates (F and O) are managers. There are four two-man groups, CH, DN, AK, and IP.

To assist in the interpretation of the dimensions, a linear regression analysis procedure known as PROFIT [6] was applied to the combined dimensional data and the data obtained from the first questionnaire. This procedure provided cosines of fitted vectors (or unidimensional scales) associated with the three dimensions. The results are shown in Table 1. The three dimensions were then identified in terms of the fitted vectors. Dimension I, for example, was named "Social In-Group" because cosines ranging from .61 to .90 were obtained in association with the vectors Familiarity, Influence, Oral Communication, Social Contact, and Likeable. All subjects gave importance to this dimension with values ranging from .39 to .14. There were no observable associations between dimension importance and position in the INDSCAL configuration, physical proximity at work, or bureaucratic rank.

Although more difficult to interpret, Dimension II was named "Task Ability" due to cosines of -.83 with Interest in Job and .59 with Advancement. It appears in this case that job interest and advancement are not perceived as the same thing and somehow oppose each other. It is interesting to note, in comparison to formal structure, that the bureau chief and one field supervisor (G and A) are located at one end of the distribution on this dimension, while the assistant bureau chief and the other field supervisor (B and M) are located at the other. Subjects'

TABLE 1

DIRECTION COSINES OF FITTED VECTORS
IN STIMULUS SPACE--CONSTRUCTION

Vector		Dimension		
		I	II	III
1.	Familiarity	.90*	-.21	.37
2.	Professional Status	-.17	.08	.98*
3.	Position Power	.40	-.16	.90*
4.	Influence	.66*	-.24	.71
5.	Oral Communication	.66*	.49	.57
6.	Interest in Job	-.32	-.83*	.44
7.	Social Contact	.90*	-.18	.39
8.	Orthodox Life Style	-.39	-.60	.69
9.	Conservative-Liberal	.84*	.30	-.45
10.	Likeable	.61	.33	.72
11.	Advancement	.20	.59*	.78*

*Large values--used in naming dimensions.

importance values on this dimension were generally lower than for Dimension I and ranged from .38 to .09.

Cosines ranging from .79 to .98 for the vectors Advancement, Position Power, and Professional Status suggested the name of "Professional Standing" for Dimension III. Individual importance rankings on this dimension ranged from .40 to .00. The subject with the highest importance ranking on this dimension, G, is rated near the median by the rest of the group. The distribution on this dimension is different from that for Dimension II. On this dimension, by contrast to Dimension II, the bureau chief and his assistant (G and B) are ranked at one end of the continuum, while the two field supervisors (A and M) are ranked near the other.

For each of the three dimensions, the mean importance weights for the engineers were compared with those for the technicians. On Dimension I (Social In-Group), the engineers had a mean value of 28.0, while the technicians had a mean value of 22.9. The technicians had four of the lowest six scores on this dimension. On Dimension II (Task Ability), on the other hand, the engineers had a mean value of 22.7, while the technicians had a mean value of 25.9. More variance, however, was noted for the technicians, who provided the two highest and two lowest importance scores on this dimension. The results for Dimension III (Professional Standing) were similar to those for Dimension I; the technicians had a mean value of 21.4, and the engineers, a mean value of 25.8. In general, the results reported here tend to support the names chosen for the dimensions on the basis of the earlier regression analysis, especially Dimensions I and III.

When the sociometric data from the second questionnaire were compared with the INDSCAL configuration, only in four of the possible forty-eight instances did the three closest individuals to a particular subject match those of the subject's sociometric choice on overall similarity. However, when each of the dimensions was compared with specific questions from the data, the matching improved: Dimension I correctly predicted nine of the possible forty-eight choices on socialization, and Dimension II and Dimension III correctly predicted eleven and eight choices, respectively, on work problem consultation. Yet these results are less than impressive; and not surprisingly so, since the data collection procedures for each method were quite different. We have argued, of course, for the use of an approach which seeks to discover patterns within the data rather than an approach which presumes some prior knowledge concerning those patterns.

RESULTS--DESIGN

For the design bureau, the correlation between the data and the subsequent configuration was .37. For four dimensions, the correlation was .42; therefore, for the design bureau, the fourth dimension would be slightly more meaningful than for the construction bureau. While the correlation for the design bureau was smaller than for the construction bureau (.37 versus .44), there were more subjects in the design bureau (19 versus 16).

As suggested in Figure 4, the configuration of the design bureau is more complicated than that of the construction bureau. This would appear

logical in light of the descriptions of the work patterns for both bureaus, as noted earlier. There seems to be more grouping in the design bureau and less dispersion over the entire space. The mean interpoint distance is 50.0 with a standard deviation of 20.9. Compared with the mean for the construction bureau (59.3), there is a significant difference ($t_{30,.1} = 1.310$). The importance of this difference is that it confirms the visual impression of two different structures. Using the same operational definition of an isolate, there are eight isolates (A, C, J, L, O, Q, S, and T); of these, one (T) is a technician, two (A and C) are managers, and five (J, L, O, Q, and S) are engineers. There are five group clusters, with several individuals (K, N, E, and F) included in more than one group. These groups are HBUK, PEF, NRM, KNFG, and DIFG. Thus, the general structure of the bureau is about 38% (8/21) isolates; of the remainder, about 62% are members of at least one group. Compared with the construction bureau, this bureau has a more complicated and interactive structure. This result was not surprising considering the close physical proximity and interdependency of the work.

To assist in the interpretation of the dimensions, PROFIT was also applied to the dimensional data for the design bureau. The results are shown in Table 2. The three dimensions were then interpreted in terms of the fitted vectors. Dimension I was named "Advancement," because of cosines of -.80 with the Advancement vector and -.80 with Life-Style; the range of importance given to this dimension ranged from .39 to .09. The association between Life-Style and Advancement may be partially explained by the geographical location of the design bureau. It is located in a largely rural and politically conservative area of the

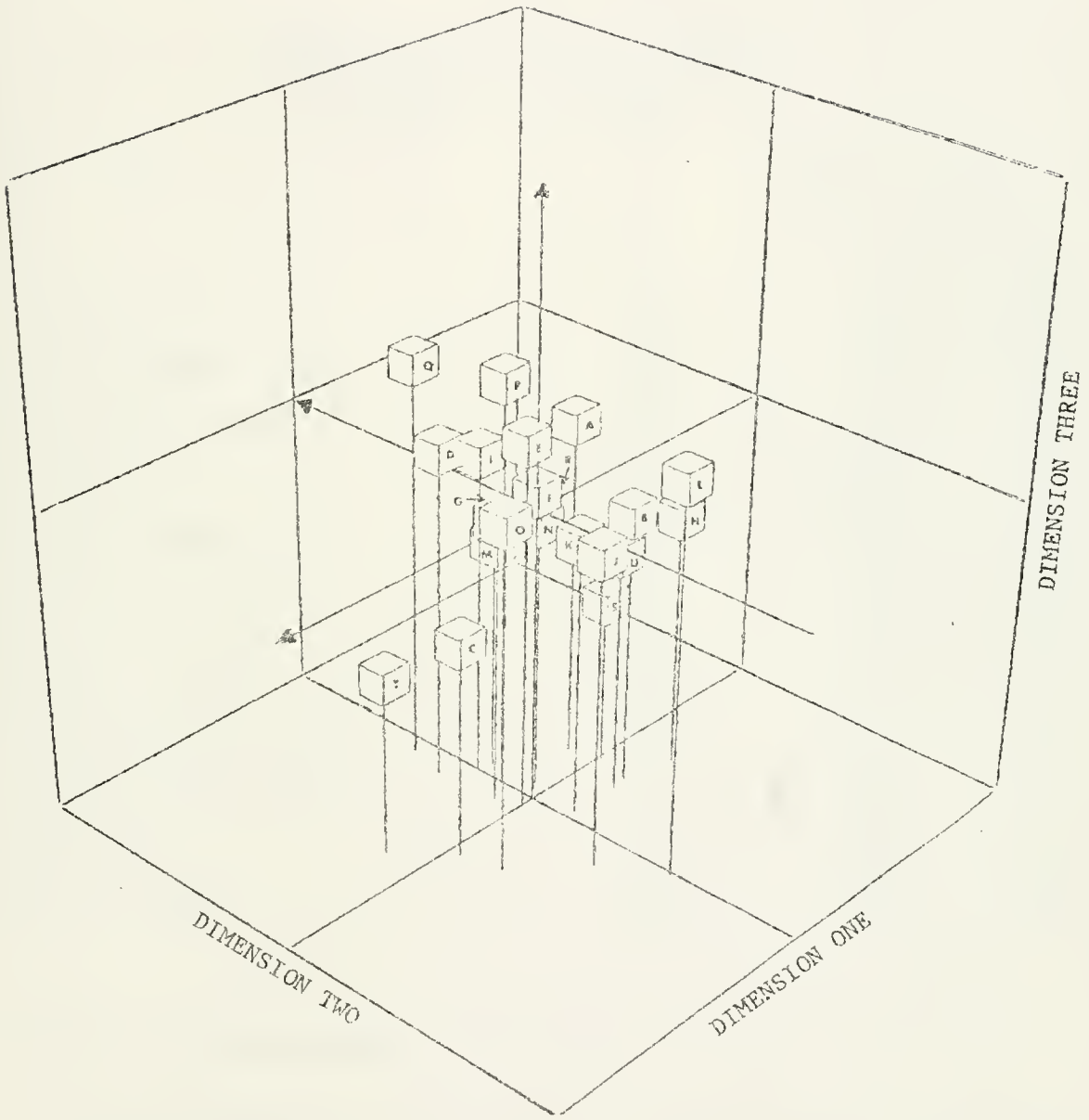

Figure 4. INDSCAL Configuration--Design Bureau (19 subjects)

Midwest. It is interesting that of the seven subjects at the upper end of this dimension, six were in the Plans division of the bureau. The implications of this are not clear, but it may indicate something about the leadership or promotional opportunities in the bureau.

Table 2

DIRECTION COSINES OF FITTED VECTORS
IN STIMULUS SPACE--DESIGN

Vector	Dimension		
	I	II	III
1. Familiarity	-.52	-.50	-.69
2. Professional Status	.50	-.87*	-.07
3. Position Power	-.24	-.66	.72
4. Influence	-.26	-.34	.91*
5. Oral Communication	-.71	-.45	.55
6. Interest in Job	.25	-.49	-.83*
7. Social Contact	-.60	-.80*	-.05
8. Orthodox Life Style	-.89*	-.14	-.43
9. Conservative-Liberal	.42	-.85*	-.32
10. Likeable	-.45	-.80*	.40
11. Advancement	-.80*	-.05	-.60

*Large values--used in naming dimensions.

Again, Dimension II is difficult to interpret, but was named "Social-Professional" due to cosine values of -.87 with the Professional Status vector, -.85 with Conservative-Liberal, and -.80 with both Social and

Likeable. This dimension appears to include both strong social and professional components. The association of Professional Status and Conservative-Liberal would appear to be caused by the same phenomena as Dimension I (Life Style and Advancement) and reflects the intrusion of environmental variables into the organization. The association of Social and Likeable vectors is obvious and requires little additional explanation; however, the association between the two major aspects of the dimension, Professional and Social, is not obvious, but may indicate something about the types of interactions within the bureau. Perhaps socialization is done in accordance with recognized professional standing. The importance scores on this dimension ranged from .30 to .09, again with no apparent association between job, physical location, or bureaucratic rank. Interestingly, the bureau chief and his assistant (A and B) are ranked at one end of the dimension, while the area supervisors (C and D) are at the other end. This suggests again a "balancing" operation, similar to that found in the construction bureau and brings these questions to mind: Was it deliberate? How did it evolve? Is it necessary?

Dimension III shows large cosine values with the vectors Influence (.91) and Interest in Job (-.83). It appears that influence and job interest differ in polarity and those perceived as being interested in their jobs are not very influential. Why this would be so is not known, but would bear further investigation. The seven subjects at the upper end of this dimension have jobs with the ability to approve or veto portions of the projects; for example, L reviews the work of engineering consultants, Q has final approval of all bridge designs, and P does the computer calculations for the bureau. Those at the other end of the dimension

appear to have little perceived influence, but are interested in the job; four of the five at the end (M, R, S, and T) have responsibility for the completion of plans for the various sections of the highway. Thus, they are the ones actually concerned with the details of getting the job completed. Importance scores on this dimension ranged from .39 to .11.

The mean subject importance weights for the engineers, managers, and technicians mean values were 15.0 for Dimension I, 19.5 for II, and 20.5 for III. It appears, therefore, that they put considerably less importance on the advancement aspects of the job, perhaps because of the difficulty of advancing in the bureau without an engineering degree. On the other hand, both managers and engineers gave all three dimensions about the same importance. The managers' scores were 20.7, 19.0, and 18.3, while the engineers' scores were 22.3, 22.0, and 20.4.

When the sociometric data from the questionnaires were compared with the INDSCAL configuration, only in two of the 54 possible times, about 4%, did the three closest individuals to a particular subject match that of the subject's sociometric choice. Comparing the choices with the individual dimensions did not substantially improve the predictions; the best being six out of 54, about 11%, between Dimension I and a question on Work Problems. Although the results were somewhat disappointing, it must be remembered that the individual selections were being predicted by a group perception configuration, and, if individual configuration had been used, the match might have been better. This would not, on the other hand, necessarily mean a better procedure, since a visual inspection of the choices detected a definite "upward" selection.

DISCUSSION

In Hunt and Liebscher's [14] discussion of the differences between the two types of bureaus on a state-wide basis, they noted that because of the differences in interaction potential, the design bureau would have stronger leadership relations than construction and that structure would be more important in design. It appears that both of these conclusions are confirmed by the INDSCAL configurations and supporting data. The design bureau does have a more complicated structure and the supervisors do appear to have larger interaction patterns. This would give an independent confirmation of the validity of this methodology in detecting structure and, if so, could then be used as a basis to predict behavior of individuals and groups in the bureaus.

It appears from the results that the investigation of perceived social structure in organizations, through the use of a multidimensional scaling approach, is both feasible and potentially useful. Although this study was primarily concerned with the adequacy of a methodological procedure, several interesting findings were obtained.

First, the correlations between the data and the INDSCAL configurations were not large, ranging from about .44 to .37. However, considering the complexity of the stimuli and the ambiguity of the instructions, the small correlations were understandable. Of course, what is of importance is not the size of the correlation, but whether or not the configuration helps to explain and predict behavior. An examination of the psychological literature suggests that a number of studies with correlations in this range have proven of considerable value. So, while the correlations were

not as large as those in many of the earlier MDS studies [15], they are not small enough to discourage further use of this research technique. It is possible, of course, that our employee sample did not truly reflect the nature of the organization or the employees in it. Perhaps a different sample, selected without regard to formal structure, would have improved the correlation between the data and the configuration by providing employee-subjects with a more meaningful set of stimuli. In any event, the results indicate the problem of relying entirely on the formal aspects of organization in organization analysis.

Second, and perhaps most important, the configurations of the two bureaus were different. They differed on a number of statistical properties and they differed visually. Not only did the structure of the two configurations differ, but the dimensions used by members of each bureau also differed. Weightings of the most important three dimensions differed both within and between bureaus. For example, the mean weight of the social dimension for construction engineers was 28.0, while for design engineers it was 22.0. It should be noted that the naming of the dimensions was done with some reluctance and was intended only for descriptive purposes and should not be given any normative connotations. Differences in the two bureaus were noted in personal conversations with the bureau chiefs; conceptually, then, it was necessary for the methodology to display some differences, and it did.

Third, although we are not sure how the representation of formal structure would look in an INDSCAL configuration, there is little apparent relationship in this organization between formal and social structure. That is, there are very few similarities between Figures 1 and 3 or

between Figures 2 and 4. For example, four employees with positions at the top of the hierarchy in the construction bureau are found at different locations in the INDSCAL configuration; they are alternately paired together at opposite ends of Dimensions II and III. Yet Dimension III (Professional Standing) may suggest a reasonably good meld of formal and social structure. It would be interesting to explore this matter in further detail. Are the managers in this bureau fulfilling important facilitative roles, or are we obtaining informal assessments of managerial effectiveness? Although it has been common knowledge for years that the formal organizational chart did not depict the real organization, there was no viable alternative. This study, however, did demonstrate a method for understanding the perceived "real" organization. The implications of this result for management are considerable.

The apparent lack of congruency between formal and social structure can be related in part, it seems, to the different missions of the two bureaus and the relative nature of the work assignments of many employees. For example, in the construction bureau, employees apparently perceived themselves as being rather independent in their work and social relationships. Superior-subordinate relationships appeared to be superficial; perhaps some relationships outside the organization (e.g., with road construction contractors) were as meaningful as relationships inside the organization. These contextual factors could be expected to impact on employees' perceptions of social structure. One might ask, How incongruent can the structural components of organization become before the accomplishment of mission is adversely affected? Repeated measures in the same organization or comparisons across organizations with different

mission/technology arrangements might provide some insight on this question. Some explanation may also be provided here regarding the low correlations found by Hunt and Liebscher between measures of leadership and satisfaction in the state-wide organization.

Fourth, in both bureaus there appeared to be some "balancing" of managers in organizational space. While this may make sense from an intuitive standpoint, and, in fact, may be confirmed by aspects of contingency theory, there is little agreement or even mention of this point in the personnel or organizational design literature. Perhaps this raises more questions than any of the other findings: Is this a stable condition or necessary condition? Will this be present in most organizations or only in certain situations? Is this accomplished by conscious manipulation of individuals, the personnel department, or top management? What happens after a change in managers?

The availability of an unbiased, multidimensional, here-and-now view of the organization can be useful to management. The visual representation of structure can serve as a point of reference for a variety of management decisions. New or modified work assignments might be made to strengthen ties between managers, engineers, and technicians. Feedback to, and discussions with, employees concerning their perceptions of the organization could be implemented as an OD-type intervention.

Additional research into the understanding of perceived social structure in organization through the use of multidimensional scaling techniques is needed. An early probe with a related POLYCON technique was undertaken recently [3]. The results of a study which investigates the effects of social structure on leadership, as a component of social structure, are reported in Salancik *et al.* [27].

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