TASK CONCEPTIONS AND WORK ARRANGEMENTS

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For well over half a century sociologists have been engaged in the study of organizations. But until the last few years, there has been relatively little systematic attention devoted to describing and attempting to explain the formal structure of organizations. Many sociologists took the structure of organizations as given, viewing it only as a context within which behavior occurred. Others devoted more attention to structure but neglected the formal structure to concentrate attention on the informal structure. As a result there was a systematic neglect of formal organizational structure by sociologists, and the analysis of formal structure remained the province of the industrial engineer and other intellectual descendants of Frederick Taylor and Henri Fayol.

This situation began to change in the late 1950's and early 1960's as a number of sociologists began to take seriously Weber's model of bureaucracy as a set of interrelated variables and to go beyond Weber to examine empirically the extent and nature of these interrelations. Research of this type by Udy (1959), Hall (1963), Pugh, et al. (1968, 1969), and others has revealed that there are sizeable variations in formal structure among organizations. Such variations, in addition to serving as independent variables helping to account for differences in the behavior of participants, have increasingly been viewed as dependent

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variables--as phenomena to be explained.

A number of explanatory variables have been suggested to account for variations in the structure of organizations, but none has received as much attention in the past few years from sociologists as the variable "technology." A central premise underlying much recent work on organizations is that organizational structure depends fundamentally on the nature or type of technology employed.

It is generally recognized that the concepts "technology" and "organizational structure" each incorporates a whole cluster of variables. But, at the present time, there is little consensus on which variables should be emphasized. In the case of technology, Hickson, et al. (1969) suggest that at least three different facets of this cluster have been identified and operationalized. (1) Operations technology focuses on techniques used in carrying on workflow activities. Variables or dimensions which have been employed to characterize one or another aspect of these techniques include: types of production systems--unit and small batch, large batch and mass, and process production (Woodward, 1965); diffuseness (vs. specificity)--the degree to which a firm utilizes a number of technical processes to yield a wide range of products (Harvey, 1968); and routinization--the extent to which work processes entail highly similar, repetitive activities over time (Hage and Aiken, 1969). (2) Materials technology emphasizes the characteristics of the task objects--the materials being processed. Variables proposed as useful in characterizing task objects include variability--the uniformity and stability of the raw materials (Perrow, 1970); activity (vs. inertness)--the extent to which the resistance encountered in the performance of a task is unpredictable (Scott, et al., 1967); and the relative hardness

of materials processed (Rushing, 1968). (3) Knowledge technology focuses attention on the characterisitcs of the knowledge employed in the work-flow. Thus, Perrow (1967) emphasizes how systematic and analytical is the nature of the search process that is undertaken when unusual or exceptional cases are encountered; and Thompson (1967) proposes to classify tasks by the extent to which knowledge of cause-effect relations is complete.

Turning to organizational structure among the components or dimensions which have been investigated are: the extensiveness of the division of labor, the degree of formalization, the ratio of managers and supervisors to total personnel, supervisory ratio, relative power of departments or work groups, the degree of work group interdependence, and the extensiveness and types of coordination mechanisms. Again, it appears that there is little consensus as to which components are to be examined or precisely which variables are to be utilized.

Since this type of research is in its infancy, it is certainly premature to draw any firm conclusions about the relation between technology and structure. On the one hand, several empirical studies have reported fairly consistent results to the effect that uniform inputs and routinized workflows tend to be associated with "tighter"--more centralized, formalized and specialized--structures (cf. Hage and Aiken, 1969; Harvey, 1968; Woodward, 1965). On the other hand, Hickson and his colleagues (1969), focusing exclusively on operations technology, conclude that technological variables are not nearly as decisive as others (such as size and dependence on other organizations) in determining the nature of organizational structure. Hickson's results, while not strictly inconsistent with previous findings, do cast somewhat of a pall over earlier,

more optimistic assertions. Thus, the time would appear ripe for a more careful analysis of the arguments relating technology to structure. That task cannot be completed here, but it can be commenced. We will point to three questionable assumptions made in previous studies of this relation and make some modest suggestions for dealing with them.

Assumptions Made in Relating Technology to Structure

1. The Assumption of Homogeneity. Previous analysts have assumed that the technology employed by an organization is essentially similar across tasks and occupational groups and that the social structure of the organization is uniform in its characteristics across work units. Technologies--whether defined in terms of materials, operations, or knowledge--vary greatly within as well as between organizations. As Hickson and colleagues note in commenting upon Woodward's typology of production systems:

> To describe the general technology of a factory as "mass," when this characterizes only some departments and other departments are engaged in small batch and process operation, is an oversimilification. (Hickson, et al., 1969, p. 395)

Other more complex organizations, such as hospitals or research and development firms, have technologies which vary not only across departments but also across occupational groups within departments and across types of task performed within occupations. Consider, for example, the many types of occupational groups in a hospital: doctors, nurses, social workers, aides, laboratory workers, office personnel, etc. Each group is engaged in the performance of very different sorts of tasks. Even for a given occupational group (e.g., physicians), there may be significant differences among the various specialty groups in the activities

they perform, the methodology and techniques they employ, the uniformity or predictability of problems encountered and the extent to which their knowledge is adequate to cope with these problems. Further, when we examine the work practices of a single physician, we discover that he carries out not one but many types of tasks with which are associated quite diverse technologies. Which of the many technologies performed by individual workers, by occupational groups and by departments determines the nature of the organization's structure?

It may be that there is indeed one technology which predominates over all others. Hughes (1958, pp. 121-122) has suggested that there exists a "core" set of tasks which come to define the "symbolic work" of an occupational group. Perhaps these tasks determine the nature of the organizational structure. On the other hand, perhaps it is only the assumption that one can meaningfully speak of the organizational structure which forces us to search for a single technology. If we admit the possibility of multiple structures with varying characteristics within a single organization (after all, organizations are supposed to be highly differentiated), we can more easily allow for multiple technologies of differing types.

2. The Assumption of Rationality. In attempting to explain the relation between technology and structure, one could posit a kind of technological determinism: the technical requirements of the tasks to be performed force certain kinds of regularities upon the behavior of participants. However, few if any sociologists are willing to embrace a deterministic framework; indeed, one leading advocate of the technology approach, Joan Woodward, has explicitly rejected it as inappropriate (1970). Instead, most analysts in this tradition prefer to assume that

arguments relating technology to structure hold under the assumption of rationality. We are asked to assume that participants in organizations will be motivated to devise and establish the most effective and efficient arrangements for task performance. Thus, in the midst of developing his arguments relating technology to structure, Perrow (1970, p. 80) reminds us:

> We must asuume here that, in the interest of efficiency, organizations wittingly or unwittingly attempt to maximize the congruence between their technology and their structure.

And Thompson (1967) prefaces all of his specific propositions linking technological and structural variables with the illusive phrase "Under norms of rationality...."

However, we have known since the work of Roethlisberger and Dickson, if not long before, that the "logic of efficiency" is not the only logic utilized by organizational participants. Constraints on rationality are pervasive themes in the work of analysts like Selznick (1943, 1948, 1949) and Dalton (1959), who emphasize such motivational factors as self-interest, identification with sub-units, and commitments which bind actors to a particilar set of skills or work arrangements. Even a "neo-classicist" like Herbert Simon (1957) reminds us that the rationality which is exercised in organizations is also "bounded" by cognitive constraints, including selective routing of information and selective attention to information received. In sum, it should not be necessary to persuade sociologists that assumptions about the rationality of human action should be reluctantly embraced and, whenever possible, relaxed or discarded.

3. The Assumption of Consensus. Past research relating technology and social structure assumes that organizational participants agree on

the characteristics of the technology--on the basic nature of the materials processed, the techniques to be employed, and the utility of the available technical knowledge. Presumably such consensus exists because these technological traits are "real, solid, and substantial"--that is, objective characteristics are much less solid than they at first appear--that they are to an important degree subjective and hence liable to disputation and dissensus. Given the same set of task objects, it is possible for participants to emphasize either their similarities or their differences. For example, Perrow's (1965) historical survey of the treatment of the mentally ill demonstrates that conceptions of the raw material--in this case, mental patients--have varied enormously over time. Such variations in conception are particularly apt to occur when the materials being processed are human subjects, but disagreements may also occur over the perceived characteristics of inanimate objects. Similarly, participants may disagree on the characteristics of the techniques employed: where one sees repetitive activities another may see ingenuity and artful adaptation. In recognition of the fact that participants may not agree on the nature of the technology being employed, we propose to speak not of technology per se but of "conceptions" or social definitions of technology. Such an approach, in our view, is not only more accurate but should make the study of technology of even greater interest to social scientists: in positing a relation between technology and work arrangements, it is not only the dependent but also the independent variable which requires sociological formulation.

An Alternative Approach

Three assumptions currently supporting much of the research relating technology to social structure have been identified and challenged. What is advanced as an alternative?

We propose first that the Assumption of Homogeneity can best be circumvented by shifting the level of analysis from technology in general to the technology associated with a particular task or cluster of related tasks. This approach would allow us to examine the relation between particular technologies (rather than technology in general) and particular work arrangements (rather than the social structure of the entire organization). It also allows for the possibility that a given worker employing several differing technologies may be operating within several kinds of work arrangements. This approach is consistent with the empirical findings of Hickson, et al. (1969) that technological variables were not strongly related to characteristics of the wider administrative or hierarchical structure (except possibly in small firms), but were related to structural variables centered on the workflow, such as the subordinate-supervisor ratio and job counts of employees on production-linked activities.

Those wishing to characterize the technology of the organization as a whole would, in our view, be better advised to assume that there are many technologies and attempt to develop measures that will summarize across them in some meaningful way-- e.g., the proportion of technologies employed which are of a given type. Similarly, the overall structure of the organization might be viewed as a collection of sub-structures, or perhaps better as that overarching structure which links the various differentiated units into an integrated system.

In attacking the Assumption of Consensus, we suggested that, because technology is in part socially defined, we did not expect organizational participants to invariably agree on the characteristics of the technology employed. Such disagreements may occur among various sets of organizational participants, but our preliminary thinking indicates that two groups are of critical importance. First, we must be concerned about those higher level participants whose responsibility it is to devise and establish work arrangements within the organization. Such administrators must have some conception of the technology to be used in order to design appropriate structures. And here, if anywhere, one should find some concern for developing the most effective and efficient arrangements. Perhaps these administrative decisions "under norms of rationality" are the implicit mechanisms involved in the conventional arguments linking technology with structure.

A second important group is comprised of those who carry out the tasks. Performers may surely be expected to hold conceptions of the materials, operations, and knowledge technologies with which they work. Whether or not the conceptions held by any given set of administrators and performers converge is a matter to be empirically determined, although it appears that there are important systematic factors at work which help us to predict the outcome.

We begin with the premise that there is always some tendency for dissensus between task performers and administrators on their views of the technology employed by the performers. It appears from some initial empirical studies that the closer one is to the task performance itself, the more impressed he will be with the variability of the raw material, the imperfections of the standard operating procedures, and the inadequacy

of technical knowledge in the work area. As one moves from the work location to administrative levels, perceived variability diminishes and the work process appears to be more predictable. In addition to distance from the task, performers and administrators often differ in their view of both the level and scope of the task definition. Performers are more apt to concentrate on individual cases, while administrators will be more concerned with the fate of the set or cohort of task objects. For example, a classroom teacher may view the task of "teaching" as reacting appropriately to the differing needs and problems of individual students. School administrators, however, are more likely to be concerned that all students perform sufficiently well to enable them to move from class to class and from school to school (Bidwell, 1965). Again, the tendency is for the performer to focus on variability--on factors which differentiate among task objects--while the administrator focuses on uniformity--the factors which task objects share as a class.

Variations in task conceptions are of interest because they should be associated with variations in preferred work arrangements. Most of the previous research relating technology and structure suggests that performers, emphasizing variability and lack of predictability, will prefer structures allowing them to exercise maximum discretion. By contrast, administrators, seeing performers working with fairly uniform and predictable tasks, will prefer more centralized and formalized structures. Assuming that most individuals prefer to make decisions, it appears that these differing task conceptions are not disinterested but work to the advantage of the perceiver. Performers hold task conceptions which are consistent with their desire for greater freedom to exercise discretion. Administrators hold differing task conceptions which are consistent with their own desire for greater decision-making control.

The view that task conceptions are often biased due to motives of self-interest suggests that the third and final Assumption of Rationality is under attack. Not only do we wish to argue that task conceptions have irrational components. In addition, we would argue that, given dissensus on task conception, not "right" but "might" will prevail: the conceptions of the group with the greater power will win out. Thus, should organizational administrators enjoy the greater power, their conceptions of the tasks performed will determine the nature of the work arrangements established. If the task conceptions of performers differ from those of administrators we would expect performers to express preference for a different set of arrangements that is more consistent with their conceptions of their tasks. The greater the discrepancy between preferred and actual work arrangements, the more we would expect performers to express dissatisfaction with these arrangements. Results from empirical studies of public school teachers are consistent with these predictions (see Magnani, 1970). On the other hand, should the performers enjoy the greater power, their conceptions of the task performed would be expected to determine the nature of the work arrangements. In such a case, administrators would be forced to take the preferences of performers into account when designing work arrangements and might be expected to express considerable dissatisfaction concerning the "uncontrolled" and "inefficient" nature of work arrangements.

We believe that such processes operate in all types of organizations. However, they are particularly visible, and, hence, more easily studied in organizations employing professional or semi-professional employees. This is the case because such occupational groups are particularly likely to develop divergent task conceptions, these conceptions being transmitted

by external socializing organizations, and reinforced by peer group pressures. Because specific alternative task conceptions are collectively held by performing groups, these shared conceptions and expectations concerning appropriate work arrangements become important unifying forces for occupational groups across varying settings. Finally, a more or less tight monopoly over the performance of certain tasks, plus, in some cases, the ability to regulate the supply of performers, assures that professional groups will be in a relatively powerful position vis a vis organizational administrators.

Full-fledged professional groups currently enjoy the power to assure that they will have a large say in the devising of work arrangements. Semi-professional and professionalizing groups are in the process of attempting to acquire such power and its attendant privileges. As groups professionalize they challenge both administrative task conceptions and administrator-designed work arrangements. Such challenges, we believe, are among the most powerful sources of change in organizations.

Conclusion

In exposing and questioning the three assumptions of homogeneity, rationality, and consensus which underlie much current writing and research relating technology to social structure, it is not our purpose to deny the importance of technological factors in the design of organizational structure. Rather, it is our view that such factors are both more complex and subtle in their operation than previous views suggest. Specifically, we argue that (1) not one but many technologies associated with many structures may be present in an organization, (2) organizational participants may hold differing conceptions as to the nature of the technology employed, and that such conceptions vary systematically by such

factors as distance from the task and, in the case of professionals, views advanced by socializing agencies and supported by occupational associations; (3) associated with these differing task conceptions will be a set of preferences for work arrangements, their realization depending on the distribution of power within the organization; and (4) that non-rational as well as rational factors enter into the formation of task conceptions (e.g., self-interest) and into the establishment of work arrangements (e.g., power).

If an organization modifies important portions of its technology, it would be expected to change associated social structures. Similarly, we believe that changes in social structures may follow from changes in task conceptions, which may in turn be a product of changes in the distribution of power among participants within the organization.

References

Bidwell, Charles E., "The school as a formal organization," in James G. March (ed.), HANDBOOK OF ORGANIZATIONS, Chicago: Rand-McNally, 1965, pp. 972-1022.

Dalton, Melville, MEN WHO MANAGE, New York: John Wiley and Sons, 1959.

Hage, Jerald and Michael Aiken, "Routine technology, social structure, and organizational goals," ADMINISTRATIVE SCIENCE QUARTERLY, 14 (September, 1969), pp. 366-377.

Hall, Richard H., "The concept of bureaucracy: an empirical assessment," AMERICAN JOURNAL OF SOCIOLOGY 69 (July, 1963), pp. 32-40.

Harvey, Edward, "Technology and the structure of organizations," AMERICAN SOCIOLOGICAL REVIEW 32 (April, 1968), pp. 247-259.

Hickson, David J., D. S. Pugh, and Diana C. Pheysey, "Operations technology and organization structure: an empirical appraisal," ADMINISTRATIVE SCIENCE QUARTERLY 14 (September, 1969), pp. 378-397.

Hughes, Everett C., MEN AND THEIR WORK, Glencoe, Ill.: Free Press, 1958.

Magnani, Leonard, "Task conception and the propriety of autonomy," unpublished Ph. D. dissertation, Stanford University, August, 1970.

Perrow, Charles, "Hospitals: technology, structure, and goals," in James G. March (ed.), HANDBOOK OF ORGANIZATIONS, Chicago: Rand-McNally, 1965, pp. 910-971.

Perrow, Charles, "A framework for the comparative analysis of organizations," AMERICAN SOCIOLOGICAL REVIEW 32 (April, 1967), pp. 194-208.

Perrow, Charles, ORGANIZATIONAL ANALYSIS: A SOCIOLOGICAL VIEW, Belmont, California: Wadsworth, 1970.

Pugh, D. S., David J. Hickson, D. R. Hinings, and C. Turner, "Dimensions of organization structure," ADMINISTRATIVE SCIENCE QUARTERLY 13 (June, 1968), pp. 65-105.

Pugh, D. S., David J. Hickson, and D. R. Hinings, "An empirical taxonomy of work organization structures," ADMINISTRATIVE SCIENCE QUARTERLY 14 (March, 1969), pp. 115-126.

Rushing, W. A., "Hardness of material as an external constraint on the division of labor in manufacturing industries," ADMINISTRATIVE SCIENCE QUARTERLY 13 (September, 1968), pp. 229-245.

Scott, W. Richard, Sanford M. Dornbusch, Bruce C. Busching, and James D. Laing, "Organizational evaluation and authority," ADMINISTRATIVE SCIENCE QUARTERLY 12 (June, 1967), pp. 93-117.

Selznick, Philip, "An approach to a theory of bureaucracy," AMERICAN SOCIOLOGICAL REVIEW 8 (February, 1943), pp. 47-54.

Selznick, Philip, "Foundations of a theory of organization," AMERICAN SOCIOLOGICAL REVIEW 13 (February, 1948), pp. 25-35.

Selznick, Philip, TVA AND THE GRASS ROOTS, Berkeley and Los Angeles: University of California Press, 1949.

Simon, Herbert A., ADMINISTRATIVE BEHAVIOR, New York: Macmillan, 1957.

Thompson, James D., ORGANIZATIONS IN ACTION, New York: McGraw-Hill, 1967.

Udy, Stanley, ORGANIZATION OF WORK, New Haven, Conn.: HRAF Press, 1959.

Woodward, Joan, INDUSTRIAL ORGANIZATION: THEORY AND PRACTICE, London: Oxford University Press, 1965.

Woodward, Joan, "Technology, material control, and organizational behavior," in Anant R. Negandhi and Joseph P. Schwitter (eds.), ORGANIZATIONAL BEHAVIOR MODELS, Kent, Ohio: Comparative Administration Research Institute, Kent State University, 1970.