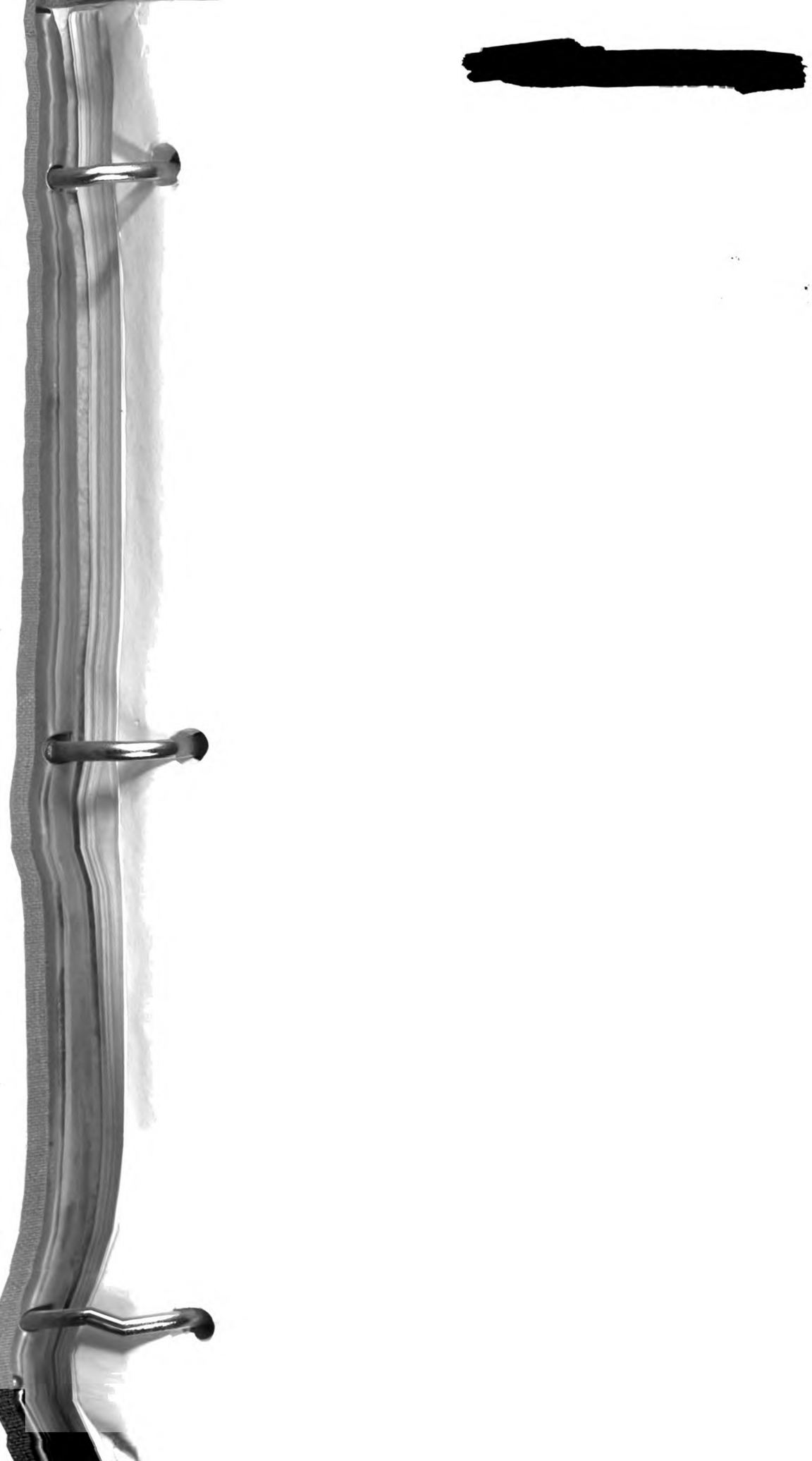

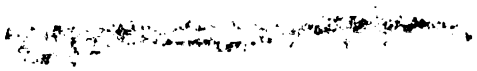

ABSTRACT

JOB CONTENT AND WORKER RESPONSES

by Michael R. Clowe

The paper investigates the application of the principles of psychology and its related disciplines to the functions of Industrial Engineering, with reference to both the validity of these theories and difficulties in implementation. The published materials relating to the behavioralist theories contain both valid and directly applicable principles; but also many generalizations, the validity of which are severely limited. Survey results are also presented which support the conclusion that many of the basic behavioralist principles are considered valid by people in various industrial capacities; yet most of these same people do not use these principles in practice because of both real and perceived difficulties in implementation.

JOB CONTENT AND WORKER RESPONSES

By

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A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for a degree of

MASTERS OF BUSINESS ADMINISTRATION

Department of Management

1969

ACKNOWLEDGMENTS

I would like to express my sincere appreciation to Dr. John Walter Bonge, Assistant Professor of Management, for his continuing support and guidance in the completion of this thesis. I would also like to thank the survey participants for their time and consideration, and the participating companies, which will not be identified in this paper, for their interest and willingness to cooperate on this project.

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I. INTRODUCTION

In the first decade of this century F. W. Taylor developed the methodologies for studying work that are still being used, with greater elaboration, in contemporary industry. The conceptual framework behind Taylor's techniques involves a method of securing organizational change through the use of technological approaches. This same conceptual framework is the basis of other, more contemporary disciplines like Industrial Engineering and Operations Research. Also, the recently developed methods of simulation and heuristics were borne out of this same technological framework. However, behavioralists have attacked these methods on the basis that they ignore the principle assets of an organization -- the people within the organization. The participative management concepts of Likert (1) and McGregor (2) are the most popular of the people-oriented approaches to organization operation, although their ideas are yet to be widely accepted operationally. The development of the Scanlon Plan (a participative profit-sharing system) and T-Group approaches to group training are also a result of concentration on the people-oriented approaches to organizational change. The

purpose of this study is to look at this controversy on a micro-level; specifically, an integration of the viewpoints of both the behavioralist and the traditionalist schools of thought as applied to job content. (Job content refers to the work elements incorporated into an individual's job assignment.)

Two motives can be cited for interest in the effects of job content. The first is from the viewpoint of the overall organization; every organization has certain basic reasons for its existence, and since human beings are a prime component in every organization, the organization should be interested in securing the greatest possible contribution from its human components. Secondly, social conscience has motivated many people to take interest in industrial operation, and most of this interest has led to criticism of industry's use of its human components. The effects of specialization, either real or imagined, are the forms of this criticism that are usually directed at the existing approaches to job design.

This report represents the accumulation of research into the problem of developing an orientation toward job design which takes into consideration both the technical constraints introduced by industrial procedures and facilities,

and also the less precise concepts of the behavioral sciences.

This report will first discuss some of the more important theories relating to job content and also the research that has been done in this area.

A model which facilitates conceptualization of the interaction of the various job design variables will be presented. The model considers the following factors to be the output or dependent variables: quantity and quality output, learning time, worker flexibility, and worker morale. The input variables, which are the "givens", will include both the workers involved and the organizational environment. The job content alternatives, which will be treated as independent variables, include job enlargement, job rotation, authority delegation, and work group operations. However, one important consideration should be kept in mind while evaluating the model, that is the danger of generalizing the results to the point that individual differences are ignored. This is the principal fault inherent in much behavioral research that has been performed in the area of job content. Also, the model will not explicitly include human factor considerations, i.e. the physical construction of systems to match human physical capabilities and limitations. Human Factors Engineering could be thought of as a part of methods design, rather than

content design; the latter being the factor under study in this model. Four propositions based on the model will also be presented to illustrate its operational significance.

Often the concepts of the behavioral sciences are considered to be too vague and inconsistent to justify significant operational changes in industry. Therefore, this report will also discuss the results of a survey of people in both methods - engineering functions and personnel functions taken to determine the degree of credibility given to the behavioralist concepts by people in different industrial environments. Following this, some of the problems involved in conducting valid research in the area of job design will be discussed, and suggestions will be offered as to potentially worthwhile directions for future research efforts.

II. REVIEW OF JOB CONTENT RESEARCH

In the past, very little research, especially empirical research, has been done which is specifically related to job content. However, much research has been done in areas which are partially related to job content. Much of the research done in these peripheral areas has been used in the development of the model to be presented in the next section. Of that research dealing with job content, much is centered around the extent to which job specialization is beneficial in industrial applications. The division of labor is an important part of the classical management theory. Classical management theory, which is identified with the work of F. W. Taylor and The Gilbreths, supported the use of rigid organization of work with performance standards for control. At present, most of the methods of performance evaluation have been designed with the concepts of scientific management in mind. For this reason supervisors will tend to use those methods of job design that will produce the best results in terms of the methods of evaluation used. Likert (1) has recognized this problem of organizational self-rationalization and has emphasized the

importance of recognizing the existence of such intervening variables as employee morale and commitment to organizational objectives. However, the ideas of Likert are not wholly the same as those commonly recognized as part of the second major era of management thought, the Neo-Classical (or Human Relations) theory of organization. This school of thought looked at human variables in the light of motivational responses and interpersonal relations. The Human Relations theory of management looked at organizations from a more micro-viewpoint than did the Classical Theory. However, the latest school of organizational theory, which might be called Modern Organizational Theory, again reverts to the macro-viewpoint by looking at organizations as a group of integrated sub-systems. In this context, people would be considered as components with specific role requirements acting within a larger system. Nadler (3) has attacked traditional methods of job design and its emphasis on job fragmentation from the viewpoint that these techniques fail to look at the overall organization's task requirements. It is interesting to note that although Nadler criticizes present industrial techniques, he does not do so for the same reasons as the behavioralists. As most of the disagreement concerning job content boils down to the extent to which specialization is

justifiable, this topic will be discussed in detail.

Case For Job Specialization

Thompson (4) has summarized much of the support for rigid specialization in what he refers to as "long-linked" technologies, i.e. sequentially interdependent functions such as exhibited on an assembly line.

> "Jobs in 'long-linked' technologies...are highly standardized and repetitive, in part because such technologies can operate only when instrumental knowledge is highly developed, in part because organizational structure relates these jobs in relatively fixed patterns. Such jobs tend to be fully determined to the point where discretion, if exercised, is an unwelcome influence that can only result in reduction of efficiency or instrumental rationality."

Proponents of job specialization feel that job fragmentation leads to (1) the need for fewer work stations, (2) increased efficiency, (3) improved quality, (4) reduced indirect labor (supervisory and inspection), (5) the ability of people to specialize in difficult tasks with a minimum of prior training, and (6) the ability of people to reach full efficiency sooner. Proponents also feel that rigid specialization is a natural outgrowth of mass production techniques which are responsible to our present high standard of living.

Case Against Continued Specialization

Opponents of continued specialization feel that fragmentation is not a natural outgrowth of mass production, but only due to the techniques that are commonly but not necessarily employed. In general, the opponents of continued specialization are not against it in its entirety; but feel a point exists beyond which continued specialization is damaging both to the worker and to the organization. Friedmann (5) sees three consequences resulting from the overuse of fragmentation, (1) fragmentation of labor, or reducing it to specific movements, increases fatigue and possibly leads to physiological and neurological damage, (2) confining a worker to the pace of the slowest man on the line, thus not allowing him to work at his personal rhythm, again results in fatigue and irritability, and (3) the worker who never completes a whole job which he can identify as his own personal product suffers from a lack of interest and a sense of frustration. Again, Friedmann does not condemn mass production methods but only their excessive application toward people. Friedmann suggests the following methods of job enlargement: (1) addition of more task elements, (2) troubleshooting equipment and routine maintenance, (3) inclusion of own

inspection work, and (4) addition of own set-up work.

Smith (6) identified three elements which he felt should be included in job design, the degree to which would depend on the particular circumstances: (1) autonomy, (2) challenge, and (3) task identity. Opponents of continued specialization feel that inclusion of these factors would result in employees feeling increased responsibility, more interesting jobs, improved time utilization, and reduced scrappage and rework.

Significant Studies of Job Content Variables

Just as disagreement exists as to how far specialization should be employed, various attitudinal studies have also arrived at contradictory results. This again points out the danger in making generalizations when the attitudes and perceptions of people are involved. Kennedy and O'Neill (7) reported the following based on a survey conducted in an automotive assembly plant: "If job content is a factor in determining how favorable workers rate their supervisors and the work situation, the difference in job content apparently must be along more fundamental dimensions than those observed in the study." In support of this view, Sexton (8) stated the following with respect to job satisfaction and specialization: "It does not seem likely that the job

structure has a devastating effect on the workers satisfaction of his egoistic needs as Argyris and McGregor contend." Sexton also commented that part of the disagreement concerning the effects of specialization was the result of confusing monotony and habit. That is, a task may not be monotonous, no matter how simple it is, unless the individual is forced to concentrate on it.

In a study which emphasized the effects of mechanical pacing and repetition, Walker and Guest (9) arrived at results which disagree with the above. Of the workers who were surveyed that had jobs paced by some variety of moving line, the majority felt that the pacing was clearly an undesirable feature of the job. The minority who did not mind the pacing appeared to sense excitement in the moving line. With respect to repetition, Walker and Guest reported the following: "We were able to correlate the number of operations a man performed (which served as a rough measure of repetitiveness) with expressions of interest or lack of interest in his job." Table 1, below shows the responses by classes indicative of the number of operations in the individual's job assignment. In summary, Walker and Guest detailed several features that are generally regarded as favorable from the viewpoint of the worker: (1) social interaction, (2) enough task elements to

TABLE 1

ON-THE-JOB INTEREST FOR DIFFERENT DEGREES OF REPETITIVENESS

Operations Performed	Very or fairly interesting	Not very or not at all interesting
1	19	38
2-5	28	36
5 or more	41	18

Source: C. R. Walker and R. H. Guest, "The Man on the Assembly Line", Harvard Business Review (Vol. 30, No. 3), 1952, p. 71.

provide some variety, (3) opportunity to work back up the line or to build up a bank, in order to get a breather, (4) ability to alternate methods of operation (5) ability to alternate jobs with other workers in the same area (job rotation), and (6) a longer cycle encompassing a large number of task elements (job enlargement).

Frequently, the use of such techniques as job rotation and enlargement is criticized on the grounds that all workers do not favor its implementation and some prefer jobs that are as simplified as possible. There is no doubt that there is a degree of truth in this statement. However, an experimental program of implementation can always be initiated which gives the workers the alternative of reverting

back to the use of fragmented assignments if they desire. Potential productivity increases should also provide some stimulus toward the initiation of a program of job enlargement.

Marks (10) conducted a study in a manufacturing department of a unionized company which produced hospital appliances. The purposes of the study was to test the hypothesis that higher economic productivity (output in terms of quantity and quality with attention also given to attitudes and satisfaction) could be achieved by:

> "1. Increasing the number of tasks in a job.
> "2. Combining tasks that (a) have similar technological content and skill requirements; (b) are sequentially related in the technical process, (c) include final activities in the process or subprocess; (d) increase worker responsibility by enlarging the area of decision-making concerning the job; and (e) increase the opportunity for the worker to perceive how his contribution is related to the completion of the work process."

The experiment was carried out in four phases, each characteristic of a different layout and assembly procedure. The original method used a mechanically paced assembly line on which 29 people were stationed. This method had been used for four years and its average daily output was used as the standard. The second phase of the experiment retained the line configuration but eliminated the mechanical pacing.

The result was that daily productivity fell because of the removal of mechanical pacing. However, from the experiment, it can not be concluded that the reduced productivity would be a static situation. As in any change in productive methods, initially output can be expected to be reduced until the workers reach full efficiency. In this experiment only two days were allowed with this assembly method, thus the results are by no means conclusive. The third phase used individual work stations. The workers performed all assembly operations, plus workpiece inspection and procurement of all supplies. Again only two days of operation were observed. The fourth phase again used individual work stations but these stations were placed in the plant's main assembly area rather than all stations being located in one room, as was the case in phase three. Productive output for six days was recorded using the configuration of phase four. Although both of the latter two layouts did not match the original in average daily output, a significant rising trend was noted in the phase four layout. On the sixth day, output rose above the standard based on the original layout. Also, defective assembly for the six day period fell to one-quarter of the average of the mechanically paced configuration. Since only six days were allowed for workers to develop

assembly methods and adjust to the arrangement, the results from the use of individual work stations are significant. Marks also concluded that besides the improvement in productive output and quality, the use of individual work stations had:

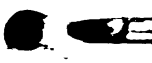
> "1. Increased the flexibility of the production process.
> "2. Permitted identification of individual deficiencies in productivity and quality.
> "3. Reduced the service functions of the department such as materials delivery and inspection.
> "4. Developed a more favorable attitude toward individual responsibility and effort."

An interesting study of the effects of automation and job enlargement in a large electric power plant has been reviewed by Mann and Hoffman (11). The simultaneous application of automation and job enlargement caused the workers to find both increased satisfaction and interest in their job assignments. This study points out the importance of proper training of employees. A two-part training program had been initiated prior to the assignment of the workers to their new jobs. The first part of the training program had workers assigned to work with fellow employees in other areas of the plant. The workers, however, felt that such a program had little effectiveness because of the "look but don't touch" attitude held by many of the fellow employees who were supposed to teach the other employees. The second part of the

training program consisted of formalized education through the use of lectures. Again, most of the employees felt that this approach to training was not as effective as on-the-job experience. Unfortunately, on-the-job training led to significant tension and anxiety for most of the workers, especially when crisis conditions developed during the early periods in which the new equipment became operational.

Job enlargement studies based on white-collar job assignments also support the findings of the above studies. Sears-Roebuck and IBM have made extensive use of the concept of job enlargement. In general, their findings indicate that benefits to the company include a more satisfied work force, increased productivity, and higher quality work. The employees have also incurred benefits in the form of higher pay and increased personal satisfaction. Detroit Edison has also used job enlargement in many of its clerical assignments. The aims of these changes include: (1) reduction of job related monotony, (2) reduction of specialization where it has created duplication and increased costs, and (3) fuller utilization of the intellectual abilities of each worker.

Paul, Robertson, and Herzberg (12) have reported on job enlargement studies involving laboratory technicians, sales representatives, design engineers, and factory



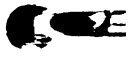
supervisors. In all cases, control groups were used along with experimental groups. Guides for enlargement were based on what are referred to as "satisfiers" in Herzberg's "Motivation-Maintenance" Theory (13,14,15). In each case, the following points were substantiated: (1) performance improvements were seen within a short period of time and the general level of satisfaction appeared to be rising but at a slower rate, (2) job enlargement can be applied to all employees within a particular job classification being studied, and (3) employees' performance relative to other employees in same classification is not a valid indicator of his potential performance relative to other employees following application of job enlargement.

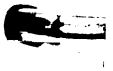
This section has examined the advantages and disadvantages commonly credited to the use of job specialization and experiments which have been performed to analyze the effects of changes in job content. The evidence which presently exists as to the effects of changes in job content is not conclusive because of: (1) generalizations which are based on the assumption of uniform behavior, (2) difficulties in the comparison of experimental situations due to the lack of a suitable method of expressing different degrees of job fragmentation, and (3) difficulties in allowing for time lags

in the responses to changes in job content. Yet, the interrelationships between the variables which collectively define a worker's job have at least been considered, although not thoroughly understood. The next section will present a model illustrating the relationships between those variables which must be considered in the analysis of job content.

III. DEVELOPMENT OF MODEL

If one is to be able to develop a statement of association, it is necessary to first define the dependent and independent variables as well as the intervening conditions. Beyond this, if the operational statement is to be tested, indicators and measuring instruments must be designed for each of these variables. In order to facilitate the identification of the variables, an input-output model of some variety can be constructed. In this case, the descriptive model shown in Figure 4, page 40, will be used. The input variables include both the worker and the organizational environment and the output variable is referred to as total economic productivity. Total economic productivity includes all those factors which have a significant impact on a worker's value to the organization. The intervening variables include the predominant job content alternatives. The function of the model can be expressed as follows: given a particular set of input variables (worker and organization), what will be the effects on the output variables that result from changes in job content? Many problems are encountered in the interpretation of such a model, and this paper will





examine some of them. First of all, the properties involved are dynamic as time lags are associated with the results. Measurement of the state of these variables is also difficult if not impossible in many cases. Thus, the results obtained from analysis are almost stochastic in nature due to these deficiencies. Thus, one might ask why a model should be attempted at all. However, the advantages to be gained from development of such a model include analysis of the relationships between the variables and the classification of those variables which are controlable in the development of work routines. This section of the report will discuss the factors involved with each of the components of the model.

Input Variables

The input variables specify the "givens" in any particular situation. In most cases, the input variables include the worker(s) and the organization, including task requirements and technological constraints.

Work Force

Industry as long been criticized for failing to appreciate the importance of human variables. The famous Hawthorne studies of the 1930's started a new era of management thought which is commonly referred to as Human Relations.

Initially the Human Relations concepts indicated a causal relationship between employee attitudes and productivity. However, this simplified thesis has not been supported in actual practice. Even since this time, much of the social science work done in areas of motivation and interpersonal relations has continued to be plagued by the desire to find simple answers to very complex questions. Commonly, this problem is felt to have led to disillusionment in industry with some of the work of behavioralists. The concepts of Maslow (16) are commonly used to justify the logic associated with the participative managements theories of Likert (1) and McGregor (2). The heart of these concepts is based on a study of effective motivation. The proponents of participative management feel that traditional management has attempted to motivate employees through an appeal to previously satisfied needs. Thus, they feel that such motivation is very ineffective. They urge that management appeal to the worker's egoistic and self-actualization desires in order to improve the lot of both the organization and the worker. However, two major obstacles are preventing the widespread acceptance of these views: (1) lack of objective evidence indicating the validity of these concepts, and (2) tremendous difficulty in properly applying these concepts in an

organization with traditions based in the older school of management thought.

In all of this confusion regarding the status of the individual, one concept is of obvious importance - the worker's group affiliations. A work group as a whole may have goals and attitudes which are different than those of many of its individual members; work group effectiveness is the measure of the groups potential affect on the attitudes and goals of the individual members. Zaleznik (17) identified four conditions which determine a work group's effectiveness: (1) mutual attraction among the members, (2) prior achievement of group purpose, (3) size of the group, and (4) reactions of supervision. The effect of the work group on the individual worker's value to the overall organization is dependent on the group's norms and its effectiveness. The importance of group attitudes in determining job design will be discussed in the section dealing with the application of team operations in methods design. The work of Allen (15), also discusses the effects of such factors as age, seniority, sex, and education.

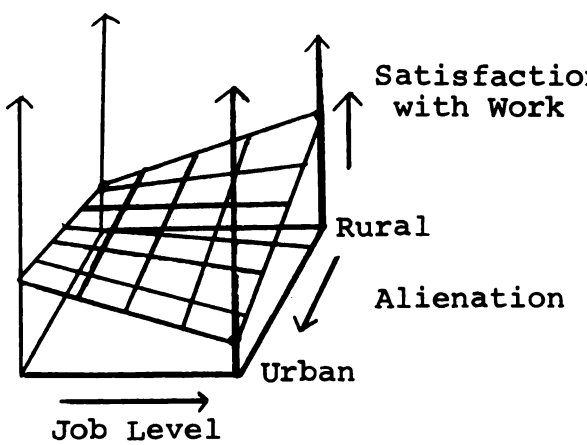
One frequently ignored variable in studies of the effects of job content is the predominant set of class norms exhibited by the work force. Hulin and Blood (18) have

attempted to reconstruct many of the experimental studies previously made to include the work force class norms as an independent variable. The ideas of Hulin and Blood stemmed from a study which appeared to indicate that the generalizations developed from behavioral research held for small town workers but not for workers from major urban areas. The hypothesis under investigation in the original study supported the view that large city workers were much more anomic (normless) because of the great heterogeneity in the worker population of urban areas, and that this accounted for the different responses of the workers to changes in job content. However, Hulin and Blood disagreed with the hypothesis that anomie was the crucial variable and felt that large city workers could be considered alienated from the work norms of the white middle class (norms based on the doctrines of the Protestant Ethic and Calvinism). Thus, Hulin and Blood's revised thesis was as follows: "The predictions were made that blue-collar workers in communities where one could expect integration with and acceptance of middle-class work-norms (small communities, low standard of living, few slums, etc.) would respond as the human relations theory or the striving type of motivational theory (Maslow 1943) would expect. However, workers in communities where

we would expect alienation from middle-class work norms (large, industrialized communities with large slum areas, etc.) would not respond as expected and, in some cases, would respond in the opposite manner from their counterparts in the 'integrated' communities." After reconstructing the data from previous research projects to classify the work forces involved, Hulin and Blood made the following conclusion: ". . .the argument for larger jobs as a means of motivating workers, decreasing boredom and dissatisfaction, and increasing attendance and productivity is valid only when applied to certain segments of the work force -- white collar and supervisory workers and non-alienated blue-collar workers."

The following diagram was used by Hulin and Blood to summarize their findings.

Figure 1 - Effects of Work Force Norms



Source: C. L. Hulin and M. R. Blood, "Job Enlargement, Individual Differences, and Worker Responses", Psychological Bulletin (Vol. 69, No. 1), 1968, p. 53.

However, since this model is based on a urban/rural dichotomy, one could still conclude that the model contains an inherent generalization that may not always be justified. Just specifying the location of the plant does not say very much about the cultural backgrounds of many of the workers. Yet, Hulin and Blood's work does supply at least an introduction to a variable which is significant even if it can not be properly categorized in many instances. Beyond this, the concept of work force alienation is crucial to the analysis of the problem of reducing "hard-core" unemployment. The failure of many "hire-the-unemployable" programs can possibly be traced to ramifications of structural alienation.

Organization

In general, three basic organizational factors are important in predicting the results of various forms of job design; these include the rewards system, supervisory style and controls, and the technological characteristics of the process and available equipment.

Porter and Lawler (19) have presented an excellent format for analyzing the effectiveness of industrial rewards systems (including base rate or salary). Their methodology is based on the significance of three job-related attitudes: satisfaction, perceived value of possible rewards, and the

effort-rewards expectation (i.e. how the worker perceives the relationship between increased effort and receipt of additional rewards). They reason that if a company varies rewards with performance, then satisfaction and performance are likely to be positively related. However, if a company can't relate individual levels of performance to levels of satisfaction, the reason may be that the company fails to differentiate rewards on a basis of superior or inferior performance. If a positive relationship does exist between performance and satisfaction, then the interplay between the perceived value of the potential rewards and the effort-rewards expectations will govern the effort an employee will put into his job assignment. On the other hand, if company policies do not allow rewards to vary with the level of performance, the employee will likely develop the following attitudes: (1) perception that effort and satisfaction are not related, and (2) weak belief that increased effort will lead to increased rewards. The ultimate effect is that the individual worker will exert less effort in his job assignment.

The second major organizational factor to be considered is supervisory style and control systems. As this area is only part of the overall management scheme used by the entire organization, the same criticisms that have been directed at

high level management philosophy have also been directed at immediate supervisory practices. In general, the foreman in industry has almost approached the position of having responsibility without authority. Patten (20) has studied the plight of the foreman and has been unable to arrive at a good solution to this problem. While arguments rage over the relative merits of democratic and authoritarian supervisory styles, Patten summarized much of his feelings by quoting Emery (21):

> "The central hypothesis offered here is that regardless of organizational level or type of work, men will work hardest, gain most personal satisfaction, and contribute most to the organization as a whole if they regard contributing to the work objectives of the component as the best means to fulfill their own values now and in the foreseeable future. In this frame of mind people are more likely to be motivated toward high productivity, creativity, and self-discipline by forces within themselves, instead of just meeting the minimum required by 'external' pressure."

Likert (1) has also attacked the common methods used in industry to evaluate supervisory performance. As most of the measures used are only sensitive to productivity and cost data and almost totally ignore the utilization of human resources, supervisors tend to use those techniques that yield the best short-run cost and productivity results. The unfortunate thing is that these same methods might very well be more damaging to the long-run welfare of the organization

than is justifiable for short-run performance.

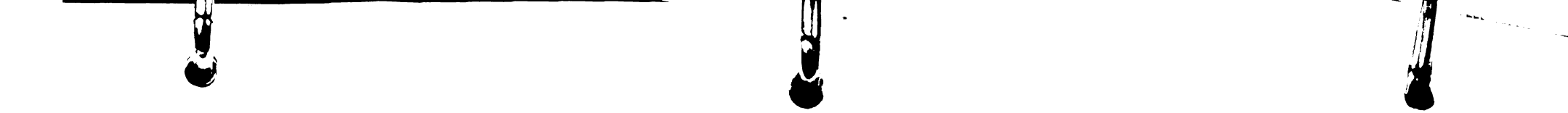
A final point that should be made is a warning against confusing the concepts of employee-centered leadership and personality-centered leadership. Supervision should be careful to relate to the objective requirements of the job rather than to the employees personally. Supervisors should be responsive to the needs of employees but the use of interpersonal influence can be very dangerous in many cases as it tends to be more manipulative than participative.

The last organizational variable to be discussed is technical constraints resulting from process or facility limitations. For example, the use of individual work stations could be prevented by lack of floor space or assembly fixtures. Also, union work rules can often interfere with the implementation of process changes, especially when enlarged jobs may cut across previously established labor classifications. However, in many cases these problems are not insurmountable and efforts taken to overcome these difficulties may be very productive.

Output Variables

What is referred to as total economic productivity in Figure 4 includes such factors as quantity and quality output, learning time requirements, work force flexibility,

employee commitment, turnover, absences, grievance rate, and supporting service requirements. All of these factors should be important to the overall organization. However, only a few of them are periodically monitored for evaluation purposes in most organizations. The early Human Relations concepts indicated a relationship between productivity and job attitudes. However, more recent investigations indicate little or no correlation between the two, especially in case of repetitions or highly fragmented job assignments. In these types of jobs, standards have usually been set to establish narrow limits of performance acceptable to both the union and management. While the use of such methods usually keeps production relatively high, the attitudes of employees may be relatively unfavorable. Almost a complete lack of commitment to the job is the ultimate result when such procedures are followed religiously. The workers motivational appeal and personal satisfaction are also almost totally neglected. Many of the studies discussed earlier show how these results can be avoided if the person is designed into the job rather than out of it. The inclusion of work elements that provide a sense of purpose often shows increased output but more importantly, an increased personal commitment on the part of the worker toward the objectives of the organization. These

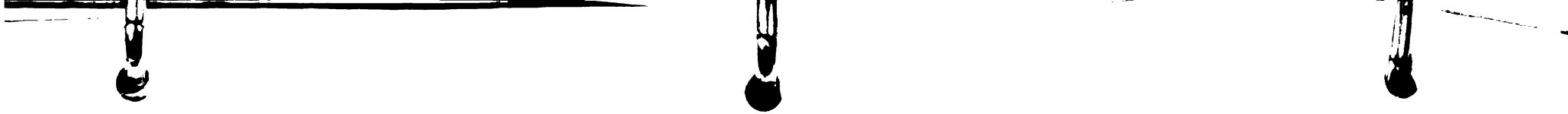


results may not always be achieved but very seldom has the economic value of the person and his performance been reduced below that which was formerly experienced. Attitudinal improvements can also be seen through the reduction of turnover and absences. However, such attitudinal changes are very slow to develop, and results may not become apparent for several years.

Training time can be expected to be greater with the application of job enlargement techniques. However, this may more than be made up for if successive process changes are anticipated. As workers begin to understand more of the productive processes, minor changes can be implemented more easily than if workers have only gained experience in limited portions of the process.

Job Content Alternatives

The five job content alternatives listed in Figure 4 include job enlargement, rotation, authority delegation, use of team operations, and continued fragmentation. These alternatives described the ways in which existing jobs can be redesigned. It is important to remember that these alternatives do not reflect on the process alternatives open to selection. Each of these alternatives will be discussed in turn and their major features will be highlighted. For the sake of



brevity, much of the information offered in earlier sections will not be repeated at this time.

Job Enlargement

It first should be noted, that enlargement is not anti-simplification. Enlargement only refers to the integration of operations wherever technically possible and psychologically desirable, that were formerly dispersed among several employees or work stations.

Several qualifications should be met before job enlargement should be attempted: (1) the program must be consistent with the worker's ability and desires, (2) the organization must have a position for the "enlarged" person, and (3) the program should make the person more enthusiastic, or else it may not lead to increased economic productivity. The methods by which job enlargement can be implemented include combining tasks that: (1) have similar technological content and skill requirements, (2) are sequentially related in the production process, (3) include final activities in the process or sub-process, (4) increase workers responsibility by enlarging the area of decision making, and (5) increase worker's opportunity to perceive how his contribution is related to the completion of the work process.

In successful applications, the results could include

one or more of the following advantages: (1) more favorable attitudes toward individual responsibility and effort, (2) increased process flexibility, (3) permit identification of individual differences in output and quality, (4) reduce department service requirements, (5) reduced worker fatigue, (6) development of greater job-related aptitudes, and (7) reduced training time required for subsequent process changes. In all cases, however, these advantages may not be realized. The initiation of a job enlargement program also requires more effort in view of the extra considerations that must be made that presently are often ignored. Also, increased costs may result from increased equipment needed when such methods as individual assembly stations are used.

Job Rotation

The use of job rotation is basically a partial application of job enlargement. Instead of enlarging individual assignments, workers are merely rotated among existing work stations. In general, the application of job rotation will likely lead to slightly reduced individual output, especially if the number of assignments that the worker may work on is large. However, in most cases turnover and absences have been seen to decrease.

One variety of job rotation that has proven successful

is to incorporate the use of work teams within a department. This method of operation makes use of the powerful motivating force of group affiliation. However, if a group's norms are directed as restricting production, this method can not be expected to prove successful. The desirability of job rotation from the viewpoint of the worker will be discussed in more detail in the next section of this paper.

Authority Delegation

Authority delegation refers to the lowering of decision levels within an organization. This can be typified by giving a worker authority to make decisions that effect him and his job, but do not have a great influence on other employees. Several restrictions must be placed on the use of lowered decision levels: (1) it is not useful in highly structured jobs as such a job has been designed to eliminate the human variable; thus reintroduction of human elements would result in reduction of efficiency or instrumental rationality, (2) the worker must perceive that management is serious in its delegation attempts, (3) value of authority delegation must be positive from viewpoint of higher management, (i.e. do not suboptimize), and (4) frequent contact must be maintained between supervisor and subordinate. In situations where the above conditions are satisfied and

management has faith in the ability of the worker to make satisfactory decisions, several advantages may result. The employee will likely feel increased responsibility to get the work done and his attitude toward his supervisor will likely become more favorable. Also, long-run productivity can be expected to increase as the worker's commitment to the job increases; however, short-run productivity probably will not change noticeably.

Team Operations

The use of work groups was briefly mentioned with respect to job rotation. In general, the use of work groups can be expected to increase the total contribution of the workers involved if the group's norms are aligned with the company's objectives and immediate supervision does not behave in a manner opposed to the groups purposes and values. Also, the effectiveness of the work group will be greater if the member's jobs are related sequentially in the process, rather than all the members of the group performing the same function. Even in cases where work group operations do not result in increased productivity, turnover and absences can be expected to decrease because of the employee's attraction to the work group.

This section only briefly presented the model and

the factors associated with it. Many questions arise in the analysis of the model, the answers to which may well be only subject to hypothesis. The following section will offer some sample propositions that have been derived from the model.

Sample Propositions

This section will now present four propositions or operational statements that have been developed from the information formerly presented. The dependent and independent variables will be identified as well as some indicators that would be useful in measuring the state of these variables. For specific applications, the measurement instruments to be used would have to be determined, although they will not be identified in this report as they would be unique in almost all situations. The distinction between indicators and measurement instruments will be made more clear after an example based on the first proposition is presented.

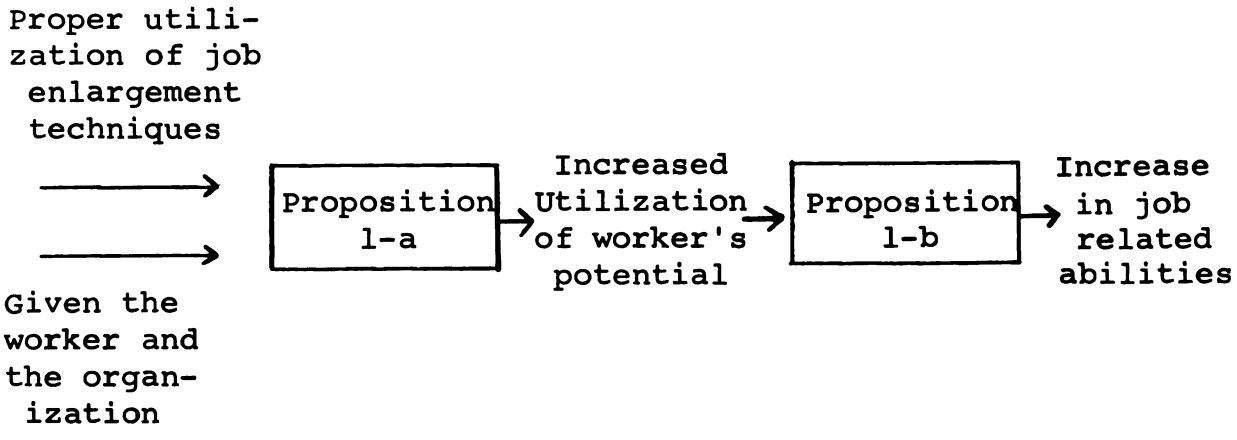
The first proposition involves one of the effects of job enlargement on the worker. This proposition will be presented in two parts.

1-a. Proper job enlargement will result in greater utilization of a worker's physical and mental potential.

1-b. Greater utilization of existing potential will result in increased abilities, such as (1) understanding of the productive process, (2) ability to handle assignment under crisis conditions, and (3) flexibility, or ability to handle various assignments with varying degrees of external services.

The independent variable in the first statement is the proper application of job enlargement techniques and the dependent variable is the utilization of the worker's existing potentials. The latter variable then becomes the independent variable in the second statement and the dependent variable is the increase in the worker's job-related aptitudes. Figure 2, below, may be useful in further illustrating these relationships.

Figure 2 - Aptitude Increase as a Function of Utilization of Abilities



Once the relevant variables have been identified, indicators must be devised to detect the state of the variables. For example, if a variable of interest were the internal energy of a substance, then temperature would be one possible indicator. Beyond this, a measurement instrument would be required to detect the state of the indicator, just as a thermometer is a measurement instrument for temperature. In the case of the first proposition indicators can be identified for the variables, however particular measurement instruments can not be detailed as they would be unique in almost all situations. The indicators that would be required to test the first proposition include: (1) worker's ability to aid fellow employees in different production areas, (2) understanding of technical requirements (specifications) that a worker's output must meet, (3) ability to produce acceptable output when input materials are not within customary limits, and (4) ability to efficiently operate a new assignment without extensive training.

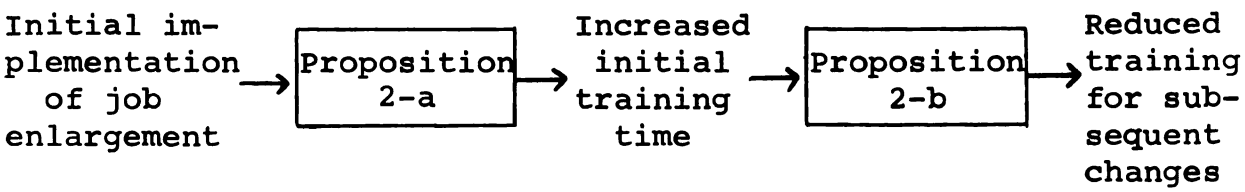
The second proposition involves the effects of job enlargement and training time requirements. Again, the proposition will be presented in two parts.

2-a. Implementation of job enlargement will result in increased initial training time.

2-b. Given initial application of job enlargement that has been successful, training requirements for successive job alterations will be reduced.

The independent variable in the first statement is the initial implementation of job enlargement and the dependent variable is the initial training time. In the second statement, the independent variable is the extent of previous job enlargement and the dependent variable is the degree of reduction of successive training time requirements. Figure 3, below, may be useful in further illustrating the relationships between these variables.

Figure 3 - Training Time Effects Due to Application of Job Enlargement



An indicator that could be used to measure extent of job enlargement applications is the rate at which functionally related operations have been combined into individual work-stations neglecting effects of automation. The indicators for training time would relate to time required, i.e. length of time required for the worker to reach near ultimate

efficiency; and resources required, i.e. formal and informal consultation required.

The third proposition involves work group operation.

3. Work group operations will realize increased total economic productivity if operations handled by the group are related sequentially, rather than all group members performing the same function.

The independent variable would be the functional (process) relationships between work group members. The dependent variable would be total economic productivity. Indicators for the independent variable would be the degree of dependence on the whole work group that each group member is subject to. The indicators for total economic productivity would include: quantity, quality, scrappage, rework, turnover, grievance rate, etc.

The final proposition to be presented involves the effects of different varieties of job enlargement applications. This proposition is related to the third proposition except that it applies to individuals rather than work groups.

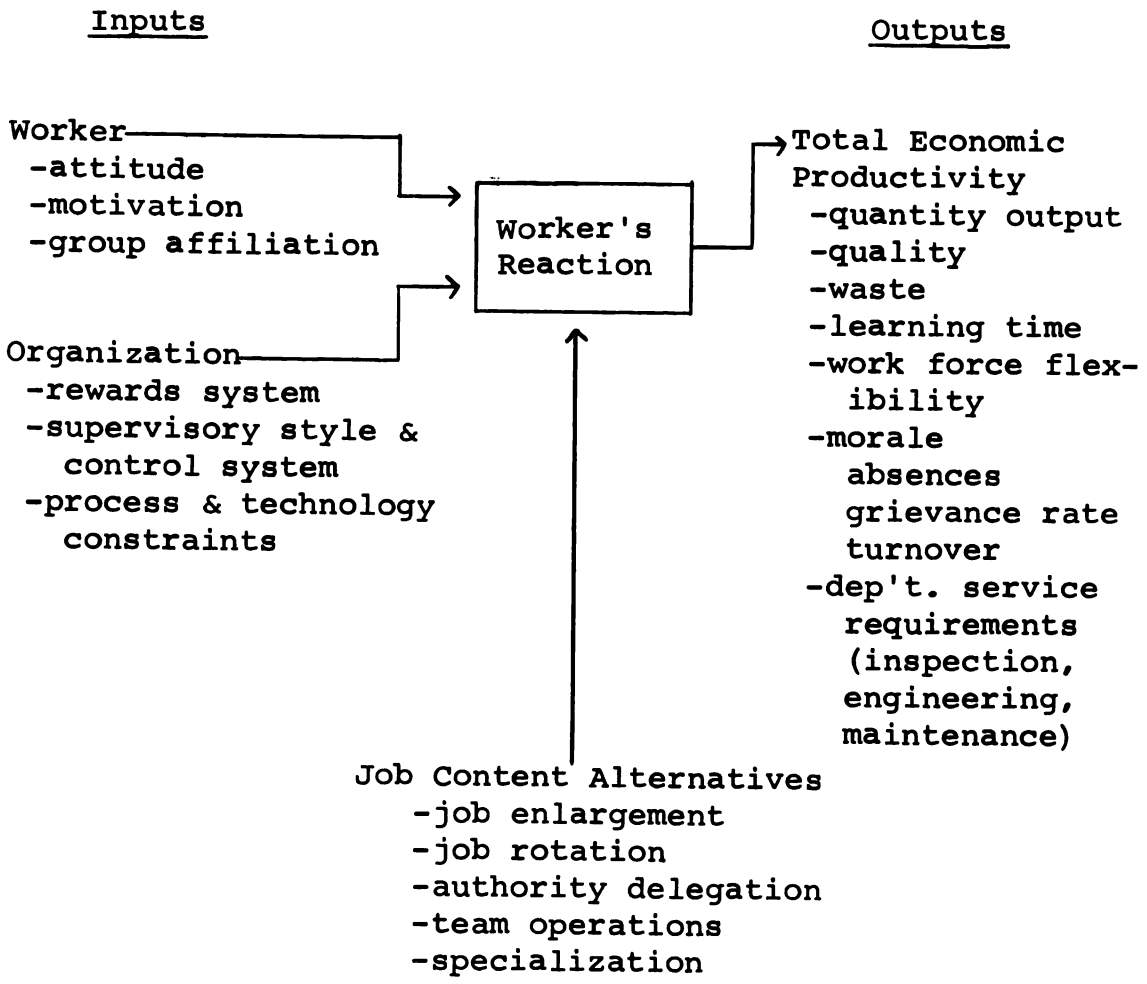
4. Job Enlargement through integration of vertically (sequentially) related process function will increase individual total economic productivity more than integration of horizontally related process functions.

The independent variable would be the functional relationship between the combined functions. The dependent variable

would be the increase in total economic productivity under various schemes of job enlargement. The indicators for the latter variable have already been covered in the discussion of the third proposition. The indicator for the independent variable would depend on whether the enlargement involved added sequential process functions or just more task elements involving the same detailed operations.

These propositions have been presented in an elementary form; however, testing them would still be very difficult. As many of the variables involved have significantly long time lags, ex post facto research would probably be required rather than experimental research. Ex post factor research is research in which the independent variables have already occurred, thus they are not subject to control. This report has only presented the problems facing job content researchers. It is hoped that continued research will find the answers to some of these questions and that the job content model can be made operationally useful.

Figure 4 - Job Content Model



IV. PURPOSE OF THE SURVEY AND ANALYSIS OF RESULTS

Thus far this paper has attempted to examine the behavioralist concepts dealing with job content. Also a model has been presented to aid conceptualization of the interaction of the technical and psychological variables involved in job design. However, in actual industrial situations it must be noted that the number of applications of the behavioralist theories has been very limited. In part this is due to the failure of many attempts that have previously been made and in part due to the lack of the degree of knowledge of the social science concepts required for successful implementation. However, it must be noted that the second of these two factors has often reinforced the first.

Purpose of the Survey

Schoderbek (22) has recently concluded a survey designed to determine the number of companies which have initiated job enlargement programs. A total of 210 useable questionnaires were returned from the participating companies, all of which are included in Fortune's list of the 500 largest companies in the United States. Schoderbek found that approximately 80% of the responding companies

were not using job enlargement. In general, there were no trends toward either usage or nonusage in any particular industry; however, there appeared to be slightly more usage in the insurance industry. Probably this is a result of the large number of clerical jobs associated with this industry. Of those companies that used job enlargement programs, cost reduction motives were more common than paternalistic motives. The advantages of job enlargement utilization most frequently cited by these companies were reduced costs and increased worker satisfaction; however, increased quantity and quality of work were also common responses. As questions often arise as to what measurements of success should be used in judging job enlargement programs, Schoderbek also asked the companies to indicate what criteria they felt were most important. The results were as follows: (1) profits, (2) improved employee attitudes and morale, (3) quality of work, and (4) quantity of work. However, it should be noted that the above criteria are not mutually exclusive.

Thus it can be concluded from the results of this survey, as well as from data included in publications relating to methods - engineering or behavioral research, that job enlargement and its related theories are not used in industry to any great degree. A crucial question is

therefore why the concepts of job enlargement are so infrequently used. Two possible answers can be forwarded even though the specific reasons for disuse will vary from location to location. The first is a low degree of credibility given to the behavioralist concepts by people in industrial environments; and the second is the difficulty in properly applying these concepts, given that they are generally accepted. In order to further investigate this problem, a survey was taken to determine which of the two above answers is more accurate.

Location of Survey and People Interviewed

The survey was designed to determine the degree of credibility given to the behavioralist concepts by people in industry. Several different companies were used as survey sites, each with different manufacturing and procedural characteristics. The following table identifies the general characteristics of the survey sites used and the number and positions of those people interviewed at each location.

TABLE 2

SURVEY SITES

Site No.	Plant Employment	Production*	Piece Work or Day Rate	People Interviewed: Methods-Engineering	People Interviewed: Personnel
1	2200	C	Day Rate	3	0
2	3000	A	Day Rate	2	2
3	450	B	Both	1	2
4	600	C	Day Rate	2	0
5	2800	A	Piece Rate	2	2
				Total=10	Total=6

*Code: "A" refers to high volume producer of relatively standardized products. Symbol "B" refers to "job shop" operating characteristics and "C" refers to a combination of the two.

At each site, the number of people interviewed from any one department was limited to three in order to reduce the possibility of biasing the results. This was necessary because it can be expected that in each location a "departmental philosophy" is likely to develop as the viewpoints of individual employees are likely to be a result of many of the same influences and experiences.

A wide variety of internal operating conditions was desired in the selection of the survey sites. Due to product design characteristics and process constraints, some manufacturers have many more opportunities to apply the social science concepts to job design then others. A company

operating with a job shop configuration is not likely to have very many highly routine job assignments. However, high volume, continuous production manufacturers will tend to apply mass production methods to a much greater degree, hence leading to the probability of many routine, short cycle-time job assignments, although this is not inevitable. The participating companies were also identified as to whether they used piece-work plans or day-rate payment schedules or both. People working in both methods-engineering and personnel functions were interviewed in order to determine if any significant differences exist between the attitudes in these groups. Within the category of personnel functions were included people working in personnel services, employment, and labor relations. The following section will relate the interview format used and will discuss the responses received.

Interview Format and Interviewee Responses

Each question was stated in an identical manner to each survey subject. As such the questions are rather broad in meaning in order to be flexible enough to relate to each of the various companies operating characteristics and the positions of the interviewees within the companies. The questions were designed to avoid giving the interviewee any

cues as to what might be desired answers. Both open and closed questions were used in order to provide crosschecks between responses to different questions which might indicate any misunderstanding on the part of either the interviewer or the interviewee. Several of the questions required that the responses be coded with the use of a rating scale, i.e. rater places the person being rated at some point along a continuum or in one of an ordered series of categories. The responses were all coded by the writer as each interview progressed in order to insure the consistency required for comparison. Each question will now be given as it was stated in each interview.

1. What criteria would you use in deciding whether or not the job design employed at any given work station is good?

2A & 2B. From the viewpoint of the average worker, how important is the degree of (Q2A - autonomy) (Q2B - challenge) inherent in a particular job design?

3. Do you feel that job specialization has a limit in the degree to which it should be applied?

4. Would you agree or disagree that job specialization could <u>ultimately</u> lead to:

   A. Increased worker fatigue?
   B. Increased worker irritability due to the fact that the worker can no longer work at his own rhythm?
   C. Lack of worker interest and commitment because of failure to be able to identify with a finished product?

5. From the viewpoint of the average employee, to what degree do you feel the following are important:

   A. Social interaction on the job?
   B. Enough task elements to provide some variety?
   C. Opportunity to work back up the line or build up a bank in order to get a breather?
   D. Ability to alternate jobs with other workers in the same area (Job Rotation)?

6. What design criteria do you normally use when redesigning a job or designing a new job? (Question asked only to people in methods-engineering functions.)

7. Do you feel that employee satisfaction and productivity are positively related in this company? And, does this company differentiate rewards to employees on the basis of performance?

8. Do you think that such concepts as job enlargement and job rotation are more applicable to white collar workers than blue-collar workers?

These questions relate to the discussion of the behavioralist theories applicable to job design which were detailed in Section II of this report. The responses given by the interviewees to each question will now be summarized.

Question 1 - What criteria would you use in deciding whether or not the job design employed at any given work station was good?

This question was designed to determine the criteria that a person uses when judging the value of a particular job design. For example, some people may look at a job purely from a technical viewpoint and rely on such criteria

as motion efficiency, productivity, or skill level requirements. However, other people will be more concerned with the job as seen by the operator and will consider such things as the degree of worker autonomy, challenge, and the degree of task identity potential in the job. As this is an open question, a wide variety of responses were received but all can be placed in one of the following categories as shown below. A total of four people gave responses that overlapped between two categories, thus a total of 20 responses were recorded.

TABLE 3

COMMON JOB DESIGN ANALYSIS CRITERIA

Category	Number Responses		% of Total
	M-E[1]	Personnel[2]	
1. Configuration of work elements	5	2	35%
2. Productivity & cost data	3	2	25%
3. Physical environment surrounding the job & level of safety	0	4	20%
4. Effort required	1	2	15%
5. Skill level required	1	0	5%
Total	10	10	100%

[1]refers to methods-engineering.

[2]includes labor relations, employment, and personnel services.

Although the number of interviews conducted limits the significance which can be credited to an analysis of these responses, the answers do show that the basic viewpoint used by industrial personnel in judging work stations designs is limited to technical considerations and is not based on analysis of the work experience of the operator. Although 20% of the people interviewed consider the physical environment surrounding the job as being of primary importance, this still refers to such things as lighting and cleanliness rather than the intrinsic and extrinsic task desirability. The data shows that the commonly used tools of Industrial Engineering (activity charting, time study, line balancing, predetermined method-time systems, etc.) still form the basis of outlook of the interviewees, rather than the other criteria deemed important by the behavioralists.

Question 2A & 2B - From the viewpoint of the average worker, how important is the degree of (Q2A - autonomy) (Q2B - challenge) inherent in a particular job design?

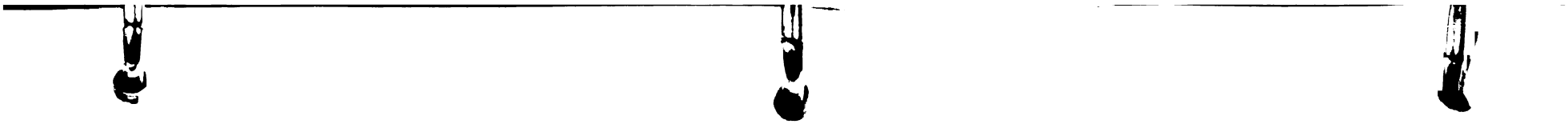
This two part, open question requires the interviewee to relate his impression of the attitudes held by a hypothetical average worker. Although the concept of an average worker is only philosophical, the phrasing of the question is relevant as most jobs are designed to allow for a large

degree of shifting job assignments within a given work force. Thus the concept of an average worker is vital to the person who must develop a work station design or is involved in assignment of worker on jobs. The responses to both questions were coded on a continuum ranging from "very important" to "of no importance". The responses are summarized below.

TABLE 4

IMPORTANCE OF AUTONOMY AND CHALLENGE

	Q1A - Autonomy				Q2B - Challenge			
Response	M-E	Pers.	Total	%	M-E	Pers.	Total	%
Very important	1	1	2	12.5%	0	1	1	6%
Fairly important	4	1	5	31.5%	4	1	5	31%
Somewhat concerned	5	4	9	56%	4	3	7	44%
Of little importance	0	0	0	0%	2	1	3	19%
Of no importance	0	0	0	0%	0	0	0	0%
Total	10	6	16	100%	10	6	16	100%



Job autonomy is the measure of control over work methods, pace, sequence of operations, and freedom to call for assistance when the worker feels that he needs it. Although the interviewees recognized that the importance of autonomy varies greatly with the individual, it was felt that the vast majority of workers desire some autonomy in their work situations. This may appear to be an elementary observation, yet when one considers the practices that are used in designing jobs and evaluating existing work stations, it must be concluded that although it may be generally accepted that autonomy is important, it is still not considered in the design of work stations in most cases.

Similar conclusions can be reached concerning the importance of challenge; although the interviewees, as a whole, did not consider this to be quite as important to the worker as autonomy. In general, the survey subjects felt that both autonomy and challenge are important to most workers, yet they felt uncomfortable when attempting to incorporate these ideas in practice.

Question 3 - Do you feel that job specialization has a limit in the degree to which it should be applied?

In all cases this question was prefaced with a definition of job specialization. 87.5% of the interviewees

responded positively and one person out of the 16 or about 6%, responded negatively and the remaining one person was uncertain. Two reasons were generally given for the positive answers; first the limitations resulting from technical constraints and secondly, limitations resulting from adverse effects on employees (e.g. boredom, loss of commitment, decreased satisfaction, etc.). Each of these reasons was cited an equal number of times. These responses indicate that a point of decreasing returns in the progressive application of job specialization has been sensed. Also, many of the respondents felt that the point of decreasing returns has been passed in many industrial situations. Several respondents also credited automation with helping to move the point of decreasing returns back toward job synthesis.

Question 4 - Would you agree or disagree that job specialization could ultimately lead to:

A. Increased worker fatigue?
B. Increased worker irritability due to the fact that the worker can no longer work at his own rhythm?
C. Lack of worker interest and commitment because of the failure to be able to identify with a finished product?

The responses to this question are summarized in the following table:

TABLE 5

EFFECTS OF JOB SPECIALIZATION

	Q4A				Q4B				Q4C			
Response	M-E	Pers.	Total	%	M-E	Pers.	Total	%	M-E	Pers.	Total	%
Agree	10	5	15	93.75%	7	6	13	81%	9	6	15	93.75%
Disagree	0	1	1	6.25%	3	0	3	19%	1	0	1	6.25%
Uncertain	0	0	0	0%	0	0	0	0%	0	0	0	0%
Total	10	6	16	100%	10	6	16	100%	10	6	16	100%

The degree of unanimity of these responses might lead one to conclude that the interviewees had begun to answer the questions in a way they thought may be desired and not in light of their own feelings. Therefore, on several occasions the writer followed the initial answers with further questions designed to see if this was the case. However, the respondents appeared to have what they considered to be valid reasons on which to base their answers. In answer to the first question concerning whether or not job specialization could ultimately lead to increased worker fatigue; all but one respondent felt that this was possible. Generally, the respondents felt that even if restriction of bodily movements did not necessarily lead to fatigue, that fatigue would still be mentally induced. This realization has probably been strengthened by the study of Human Factors Engineering, a field receiving increasing attention by professional societies and publications catering to methods-engineering personnel.

In answer to the second question, three people expressed disagreement on the grounds that a person's rhythm, when applied to a work situation, could be altered over time. However, the time required to do so also was used as an argument against job rotation, as will be discussed

later. Only one person expressed disagreement with the third question. The grounds for this negative answer was that many nonskilled or even semi-skilled workers resist personal commitment, largely a result of the impersonality of many large, bureaucratic industrial organizations. However, the remaining respondents felt that task fragmentation does lead to a lack of interest and that workers will not resist personal commitment as long as other organizational factors don't alienate them. The most commonly cited methods of attempting to give workers a sense of purpose included displays of finished products and various suggestion soliciting schemes.

Question 5 - From the viewpoint of the average employee, to what degree do you feel the following are important:

A. Social interaction on the job?
B. Enough task elements to provide some variety?
C. Opportunity to work back up the line, or build up a bank in order to get a breather?
D. Ability to alternate jobs with other workers in the same area (Job Rotation)?

Again this question requires the respondent to put himself in the position of an unskilled or semi-skilled worker. The responses to this question are summarized below.

TABLE 6

IMPORTANCE OF JOB CONTENT VARIABLES

	Q4A				Q4B				Q4C				Q4D			
Response	M-E	Pers.	Total	%	M-E	Pers.	Total	%	M-E	Pers.	Total	%	M-E	Pers.	Total	%
Very important	3	2	5	31%	1	2	3	19%	2	2	4	25%	0	0	0	0%
Fairly important	6	2	8	50%	4	3	7	44%	6	3	9	57%	3	3	6	38%
Somewhat concerned	1	2	3	19%	4	1	5	31%	0	1	1	6%	2	2	4	25%
Of little importance	0	0	0	0%	0	0	0	0%	1	0	1	6%	4	1	5	31%
Of no importance	0	0	0	0%	1	0	1	6%	1	0	1	6%	1	0	1	6%
Total	10	6	16	100%	10	6	16	100%	10	6	16	100%	16	6	16	100%

The importance of social interaction on the job was perceived by all the respondents, although the degree of importance is dependent upon the individual involved. Generally, the respondents felt that social interaction was more likely to be a detriment to a person's performance rather than a benefit. This may well be true in some manufacturing situations, yet the power of peer group identity can be used to increase employee performance if such devices a work teams are effectively used. The use of team operations was discussed in Section III and hence will not be detailed here.

The importance of variety in a person's job assignment was somewhat less significant than the importance of social interaction in the viewpoint of the interviewees. Again, individual differences must be allowed for in this case. Several of the respondents felt that there was a trend toward reduction in the importance of variety as seen by the workers. The reasoning behind this belief was based on the ability of people to adapt to a changing job environment. However, this view may not give sufficient weight to the rapid employee turnover in the work forces of many industries.

With respect to the third question, almost all of

the respondents felt that the opportunity to secure a work break that is not allowed for in the job routine is important to the average worker.

An example of the lengths that many workers will go to in order to secure an unscheduled break occurred in a plant of a large manufacturer of heavy-duty trucks. The assembly line for these trucks moves very slowly compared to the pace of most vehicle assembly lines because of the great variety of options and models that are assembled on the same line. Various parts and subassemblies are delivered to the line in advance of the vehicles to be assembled but due to floor space limitations only a very limited number of parts can be stored adjacent to the line. However, workers will often call for parts in advance of the vehicles arrival by their work station so that they can carry the parts down the line to the truck in order to get ahead in their work. Large fender assemblies weighing in excess of 70 pounds are often carried distances of greater than 50 feet. This type of behavior is common as people will often increase their work load in order to make unscheduled breaks possible. This time is then used for socializing or just to break the monotony of the work routine.

The area of greatest disagreement seen between the

ideas of the interviewees and the literature of the social sciences was with reference to the use of job rotation. None of the respondents felt that job rotation was "very important" and five felt it was "of little importance" from the viewpoint of the average worker. Several observations can probably explain this reaction by methods-engineering and personnel people. Many people take a lot of pride in their work and often they like to feel that they are the only ones who can perform satisfactorily on a given job. In many cases this is true, yet often this is due to their refusal to relay their knowledge of a given job to other people. Earlier in this paper, reference was made to the results of a training program for workers in a new powerhouse of an electrical utility. Part of the training program was to assign workers who would ultimately be placed in positions in the new powerhouse to work with other employees in order to get a feel for other functions which they would later be expected to perform. Most workers felt that this approach was very ineffective because of the hesitance of fellow workers to relay all of the crucial aspects of their jobs to the trainees. This is just one example, of many possible, to show that often industrial workers will try to build up their own specialties, no

matter how meager they are in comparison to the total operations of the plant. This does not mean that such workers would not want to learn other jobs but that their desires to protect their areas of specialized knowledge or ability will often overcome the desire to work on other assignments. One interviewee offered an example of one worker who arrived at work several hours late. When he discovered that another man had been assigned the job he normally ran, he insisted that the other operator be reassigned. When the employee's supervisor refused to reassign the man, the worker who had been late walked off the job and his employment was terminated. This is, of course, an extreme example, yet similar experiences are fairly common, only without such a dramatic end.

Work rules will often limited the degree to which job rotation can be applied. Also shops which use piece work wage schedules have added problems in using job rotation because of worker's desires to keep the same job, either because of the rate it has or merely because a move would decrease the worker's proficiency in the very short run.

Question 6 - What design criteria do you normally use when redesigning a job or designing a new job? (Question asked only to people in methods-engineering functions.)

The purpose of this question was to detect the degree to which the worker is considered in the development of a method. The point was to see if the worker was the nexus of the methods engineer's consideration, or whether it was the process routings, or similar technical considerations. Of course, it is not possible to design a job without paying close attention to the technical constraints; however, the point of the question was to see if the methods personnel considered the workers as more than as source of motive power subject to certain generalized limitations.

This question was an open question, therefore it is difficult to categorize the responses. However, in general, the responses were in accordance with standard Industrial Engineering techniques. Although the respondents expressed their answers differently, most of them boiled-down to relying upon an analysis of the process routings, material flow, worker movements, and elemental breakdown for similar parts. None of the interviewees gave an answer that would be acceptable to a firm believer in the theories which grew out of psychology or the related social sciences. Thus from this and the earlier questions, it can be hypothesized that most methods-engineering people give a large degree of credibility to the behavioralist concepts, yet still do not

use them in practice.

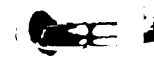
Question 7 - Do you feel that employee satisfaction and productivity are positively related in this company? And, does this company differentiate rewards to employees on the basis of performance?

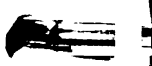
This question relates to the discussion of the ideas of Porter and Lawler (19) which began on page 24 of this report. As no objective means of measuring levels of satisfaction was available to the respondents, this question required them to make a judgmental estimate of the levels of satisfaction exhibited by the workforce in their particular company. Also, the lack of adequate measurement instruments is commonly true for productivity as many companies do not have accurate records reflecting productivity of particular employees, or even groups of employees. All of the respondents felt that productivity and satisfaction were positively related, except for one who was uncertain. Five of the respondents were from locations which employed piece-work plans on at least some of their operations. Yet in those locations where piece work systems were used, several respondents noted that workers appear to produce up to a particular dollar amount each day and then reduce their efforts drastically. Outside of those locations that use piece-work plans, no differentiation of rewards was made to

employees on the basis of performance. In these locations, the belief that productivity and satisfaction are positively related might be a result of several factors: acknowledgment of the results of the very early behavioral studies, such as the Hawthorne studies (work done by Mayo, et. al, 1927-1934); failure to look objectively at the worker's organizational status and responding with reference to personal values and perception which are partly a function of the respondent's position in the company and attitudes toward work; and belief that workers do gain some degree of added satisfaction from producing more, even though extrinsic rewards are constant.

Question 8 - Do you think that such concepts as job enlargement and job rotation are more applicable to white collar workers than blue collar workers?

This question refers to the ideas of Hulin and Blood (18). The survey sites used were all in either of two midwestern cities, both with populations well in excess of 100,000. Because of the size of these cities and the general characteristics of these cities (low unemployment, few if any slums, mixture of ethnic groups, etc.), it would not be expected that the work forces would fit Hulin and Blood's concept of structural alienation. The responses of the interviewees seemed to bear this out. Although many of the





respondents felt that the behavioralist concepts were more applicable to white-collar positions, these opinions were not strongly based. In addition, five of the respondents felt that no differences existed between the two groups, at least as far as that this question was concerned.

Conclusions from the interviews

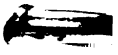
Even though not all of the responses are quantifiable, at least to the point that statistical test of significance would be appropriate, some interesting conclusions can be drawn. First, it appears that both categories of respondents (methods-engineering and personnel) agree with many of the basic concepts that have come out of the behavioral sciences. Except for the question relating to job rotation, the interviewees were both aware of the ramifications of the behavioralist concepts and also gave a large degree of credibility to these concepts. This disagrees with the feelings of many people that the failures of some applications of the social science theories to actual work situations has led to a degree of disillusionment among people in industry with the behavioralist theories. It is important to note that no significant differences in the answers of the methods-engineering and personnel people were found. Often Industrial Engineers are criticized for failing

to give adequate attention to human responses in practice. Yet this was not apparent from the responses given and the failure to change methods and procedures appears to be more a function of the general organizational environment common to many industries. Thus there is reason to believe that given feasible methods of application of these concepts in industrial situations, people will use these concepts and have faith in them. However, nearly all of the people interviewed indicated that they presently do not use any of the behavioralist theories in their day-to-day practice. Most felt that it was not inappropriate to do so but felt that the environmental situation, i.e. traditional work rules, uncooperative production supervisors, etc., made it extremely impractical to apply these concepts in their work. What becomes increasingly obvious is that worthwhile applications of most of the behavioralist theories will have to follow a very widespread commitment within the organization to make the drastic changes, both attitudinal and procedural, necessary to effectively apply these concepts operationally. Operating procedures, manufacturing and assembly methods, and supervisory practices will have to be voluntarily remolded if a successful program of work systems redesign is to be initiated and successfully completed.

V. PROBLEMS ASSOCIATED WITH THE STUDY OF JOB CONTENT PARAMETERS AND SUGGESTIONS FOR FUTURE RESEARCH

Thus far, this paper has discussed the significant concepts that have grown out of psychology and other related social sciences. Also a model was presented to facilitate conceptualization of the interaction of all the job content parameters, including both technical and behavioral variables. The previous section then reported on a study taken to investigate the degree of credibility given to some of the basic behavioralist concepts by people in various capacities in industry. Of course, there are many directions this research effort could have taken, each with a different probability of successful completion and level of significance obtainable. In reality, however, the number of directions which could have been taken are severaly limited in view of the time and resources available. The first direction of research which was attempted will now be described and the resulting problems will be discussed.

The original research proposal was to investigate the validity of the following proposition: "Inclusion of more task elements in a job design will increase the worker's



total economic productivity." Total economic productivity is used here in the same sense as was discussed in Section III. This proposition, however, must be limited to situations where the workers involved either desire or are indifferent to larger jobs. The dependent variable in this case is total economic productivity and the independent variable is the inclusion of more task elements. The initial research proposal was based on an attempt to locate a survey site where the independent variable would be defined by the structure of existing jobs. That is, to find two sites both of which had people working under similar technical constraints, i.e. similar equipment, processes, and skill levels, but where the number of task elements in the job assignments of the workers were much different. For example, one group might assemble a given part using an assembly line configuration with very fragmented jobs, yet another group would assemble a similar part using individual work stations. Through the use of two such work groups, the independent variables would be identified. The state of the dependent variables could then be detected through the use of a questionnaire that would indicate a worker's attitudes toward quality and quantity of his productive output, level of job satisfaction, and commitment to the organization's

welfare. The responses to the questions from each group could then be tabulated and quantified. Through the use of either parametric or non-parametric statistical tests (the method used would depend on the distribution of the tabulated data), the significances of any differences between the two groups could be tested.

This type of research is generally called a field study or an ex post facto study (to be differentiated from field experiments where manipulative control over the independent variables exists). Field studies are strong in realism and significance; however, statements of causal relationships are much weaker than in field experiments or laboratory experiments because of the ex post facto nature and the difficulty in identifying the relationships between the independent variables. Also reliance on questionnaire data to determine attitudes is not ideal in that it requires complete honesty on the part of the respondents for its realism.

However, this research proposal had to be discarded, even though a set of work groups had been found that approximated the situation described earlier. The reason was that several of the questions, if answered honestly, would have tended to incriminate the workers

from the viewpoint of the shop rules of the company involved. Beyond this, the companies labor relations department was not desirous of any activities which would disturb the normal work routine of the employees, although the manufacturing departments involved were in no way opposed to such a study. As a result of these difficulties, the alternative research approach, discussed in Section IV, was adopted.

The experiences encountered in doing the research for this paper support the more widespread concerns over the difficulty of getting valuable research data on the effects of changes in job content. The factors which contribute to this difficulty include: locating appropriate research sites or designing realistic laboratory experiments, securing cooperation from those companies with potential sites, developing valid indicators of the state of the dependent and independent variables, and accounting for time lags inherent in the effects of many of the independent variables.

In general, the problems associated with research programs investigating the effects of job content parallel many of the problems associated with applying most of the behavioralist concept in industrial environments. Four requirements which must be met if any successful applications

of job enlargement or its related concepts are to be made: (1) the entire organization must support the effort, (2) a long-term commitment to change must be made, (3) the personnel within the organization must accept the aims of the program and must not resist involvement, and, (4) a commitment to change both procedural and manufacturing methods must exist. This is certainly a large order, yet if any program is to be successful, these criteria must be met. But also, care must be taken not to leap into a program until all the potential problems have been analyzed and contingency measures planned. Beyond this, as many of the behavioralist concepts are still in the theorization stages, extreme care must be exercised in order to avoid implementation of a program which ultimately could be very unsuccessful, particularly if the personnel involved do not have adequate understanding of the principles being used.

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