THE EFFECTS OF INVOLVEMENT IN DECISION-MAKING
ON THE
PRODUCTIVITY OF THREE-MAN LABORATORY GROUPS

by

Arthur A. Ponder

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF EDUCATION

in the
DEPARTMENT OF EDUCATIONAL ADMINISTRATION

We accept this thesis as conforming to the
required standard

THE UNIVERSITY OF BRITISH COLUMBIA
March, 1973
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Department of Educational Administration

The University of British Columbia
Vancouver 8, Canada

Date 12 April 1973
ABSTRACT

An inquiry was carried out into the effects of involvement in decision-making, related to how to perform a given task, on the productivity of three-man laboratory groups. One of the possible explanations for the wealth of contradictory findings in the literature is that the "motivational" effects of being involved in decision-making and the efficacy of decisions made appear to be two logically separable effects, although both are often treated as one. As a consequence, an attempt was made to control the effectiveness of the strategy used between the two treatment conditions.

The theoretical basis for the experiment was McGregor's (1960) adaptation of need theory for the organizational context and Lowin's (1968) analysis of the potential effects of participative decision-making on productivity. The three hypotheses, derived therefrom, which guided the investigation were: (1) groups involved in decision-making would be more productive than groups which were not; (2) would implement the strategy designed to accomplish the task more faithfully, and; (3) given the choice, subjects in the experiment would choose to perform in a situation in which they were involved in decision-making rather than one in which they were not.
The task involved the assembly of matrices from component pieces. The measure of productivity was time to successful completion.

Results did not agree with predictions. In all three cases the hypotheses were not confirmed. Additionally productivity and choice results were significant in the opposite direction to that predicted by the experimenter. The experimental procedures, assumptions concerning the nature of the test population and the theory itself were re-examined in an attempt to offer possible explanations for these findings.
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The investigator wishes to acknowledge the assistance and support of all members of the Committee, particularly the constructive criticism and advice rendered by Dr. F.L. Brissey, the research director and by Dr. R.J. Hills.
Chapter I

The effects of involvement in organizational decision-making is identified as the general area of interest. A conceptual analysis of decision-making in organizations is offered. Additionally, an analysis of the implementation of decisions is provided through the development of the concepts of resources and organizational plan. Theory and empirical findings dealing with involvement in decision-making and productivity are reviewed. The specific focus of this laboratory study is outlined.

Introduction

One of the topics of interest to writers on administration is the effects of increasing the involvement of an organization's membership, particularly those members at lower levels of the organization, in the decision-making process of that organization. The current focus is on the downward distribution of decision-making responsibility and its potential for improving member and organizational productivity. In the works of management theorists such as Maslow (1965), McGregor (1961), and Likert (1961, 1967), this redistribution plays a central role. Students of administration such as Gross (1964), and Golembiewski (1967), to name only two, describe "post bureaucratic" structures in which members at lower levels of the organization have increasing involvement in the decision-making process.

The justification for this redistribution is generally on one of two grounds. First, it is held to be morally
correct that members have greater involvement in the decision-making of the organization, especially in decisions which directly affect them. There is a trend in our society toward an increasing populism reflected by an educational system which stresses the development of the individual (Kenniston, 1967). Additionally, social scientists appear to have developed a profile of twentieth century man markedly different from that envisaged by Taylor (1947). Etzioni, discussing greater involvement in organizational decision-making for the members at lower levels of organizations concludes

... that it is just, non-arbitrary and concerned with the problems of the workers, not just the work. (Etzioni, 1964, 38)

Secondly, it is asserted that member productivity and consequently organizational productivity, will be improved. The present concern is not directly with the moral issue i.e., the rights of the individual to increased decision-making responsibilities but rather with the effectiveness issue. That is, with the effect on productivity of greater involvement of members, at lower levels of the organization, in the decision-making process.

It should be pointed out that what has been referred to here, as involvement in the decision-making process and the downward distribution of decision-making responsibilities, have a number of apparent synonyms in the literature. These include influence on the decision-making process, decentralization of decision-making, participation in decision-making
and a number of others. Although meanings may vary, all appear to have at least one common element. In the organizational context, this common element concerns the freedom to decide. The central question concerns what happens when employees have the responsibility for making decisions concerning actions to be undertaken when compared to a condition in which these same decisions are made by someone higher in the authority structure.

The classic view of organizations has tended to place responsibility for making certain kinds of decisions in the hands of those located in the upper echelons of the organization. By way of contrast, in organizations where the decision-making locus has been deliberately shifted, decision-making responsibility has tended to be delegated or re-distributed from the upper to lower levels of the organization.

A search of the literature did not reveal an appropriate conceptual model for analyzing the decision-making process within organizations. As a consequence, a new model is offered which may be better suited to the problem under investigation.

Organizational Decision-making

Broadly speaking, organizational decision-making may be thought of as decisions relating to the goals to be achieved and includes decisions about how best to achieve them. A number of more detailed analyses of the decision-making process within organizations have been made. One similar to that
advanced by Rubenstein and Haberstroh (1966) is outlined below (Figure I).

It divides the decision-making process into six stages or sub-processes. It includes decisions related to (1) the identification of the problem; (2) setting of priorities; (3) generation of alternative solutions; (4) selection of a solution; (5) implementation, and; (6) evaluation. Such an analysis appears useful in examining decision-making in organizations because it separates the decision-making process from the content of decisions. This is not to suggest that all organizational decisions involve all these steps or that they need necessarily occur in the above sequence. It appears probable that at least some decisions involve a somewhat different ordering of the steps and that the output of one step may necessitate the return to a previous one.

In a simple organization in which there are only two levels of members, a manager and employees, it is conceivable that organizational decision-making responsibility may be differentially distributed between the two. In general and for purposes of simplification, three possible conditions could occur. First, decision-making may be the sole responsibility of the manager. Alternatively, it may be the sole responsibility of the employees, individually or collectively. Finally, decision-making may be a joint responsibility of the manager and his employees. Obviously this latter condition
Figure I
The Decision-making Process in Organizations

(The process is decomposable into six stages each of which entails a particular type or types of decisions. These are represented schematically below.)
represents a whole range of possibilities from a heavy weighting on the manager's responsibility to a heavy weighting on that of the employees. Figure II represents the possible ranges of decision-making responsibility for the six stages of the decision-making process.

At one end of the continuum, the manager would retain sole decision-making responsibility at all stages of the decision-making process. At the other end, decision-making responsibility is delegated to the employees. In real-world organizations, it appears unlikely that one would encounter either of these extremes. More commonly, at least in certain stages, decision-making responsibility would be distributed between the two extremes and even this would vary from step to step of the decision-making sequence. One can conceive of the responsibility to make the implementation decision (step V) being vested primarily in the manager or at least weighted heavily in his favour, whereas in the generation of alternatives (step III), this need not be the case. These could be jointly determined or even primarily employee determined.

Another consideration in this analysis is the level of importance or the scope of the decision to be made. (Lindblom, 1959) Considering the hierarchy of decision types from everyday, 'ad hoc' decisions of limited scope on up through broad policy decisions, the distribution of decision-
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<td>MANAGER &amp; JOINT</td>
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making responsibility presumably would vary according to the level of the decision to be made. For example, decision-making responsibility related to the overall organizational goal would more likely be manager-determined or at least heavily weighted in that direction in most organizations. On the other hand, responsibility to make 'ad hoc' decisions might rest primarily with the employees, particularly for those which directly affect the employee and his work.

Finally, it appears appropriate to point out that within any level there may be different kinds of decisions. For example, decisions related to working conditions could be considered to be on the same level as decisions related to salary. However they could also be construed as different kinds of decisions and consequently have different decision-making structures.

Figure III has combined the factors of manager-employee responsibility, stages of the decision-making process, levels of decision and kind of decision. This view of an organization's "decision-space" suggests the possibility of depicting the actual distribution of decision-making responsibility across the stages of the process, the levels of decisions to be made and the kinds of decisions for the simple two level organization. For more complex, multi-level organizations the task might be somewhat more difficult, although it appears, in principle, to be possible. For the moment, the conception is a convenient device for examining alternative "profiles"
Figure III
Matrix of Decision-making Responsibility for a
Two Tiered Organization

KINDS OF DECISIONS

KINDS OF DECISIONS

STAGES OF DECISION-MAKING PROCESS

DISTRIBUTION OF
DECISION-MAKING RESPONSIBILITY

MANAGER

JOINT

EMPLOYEES

'ad hoc'

levels of
decision

policy

1 2 3 4 .... N
The Implementation of Decisions by the Organization

The Concept of Plan

It appears reasonable to suggest that most groups engaged in the goal attainment process, are guided by some kind of a plan; but this is not to say that their activities reflect their own planning or that they are all aware of such a plan.

The present use of plan is in no way intended to convey a belief that the behaviour of all persons in any organization is necessarily guided by some logical, calculated, consciously constructed plan. Although the use of the term plan does not preclude this possibility, the term is used in this context to distinguish, among other things, some intended structure, systematization or coordination of group behaviour in pursuit of some goal or goals.

Theoretically an observer would be able to observe an organization in the goal attainment process and identify structure, systematization or coordination in the activities of its members, whether its members could do so or not. Acknowledging the fact that organizations may and often do function in accordance with a consciously constructed plan and that for a variety of reasons their planned actions will not correspond on a one-to-one basis with the structure, etc.,
identified by the observer, it appears appropriate to make a working distinction between the plan (a symbolic device which includes indications of intended behaviour) and its implementa-
tion (including actual behaviour as it might be observed by a hypothetical, ideal observer).

Ordinarily, one would expect observed behaviour to approximate what is contained in the plan. It may not, however, because the plan is incomplete, the plan is not faithfully implemented for some reason or another or because the plan has been changed in the course of action. It is important to recognize that the plan, because it is a symbolic representa-
tion, cannot for practical purposes describe every aspect of every resource regarded as important for goal attainment. It is also important to recognize that decision-making and plan implementation are dynamic processes. Any organization, especially in its stages of early development, may evolve a series of plans which occur as a result of the modification of the initial plan as outcomes may indicate the need. Thus the decision-making process, so far as planning is concerned, may be regarded as a series of assessment (or feedback) loops each with the potential of producing a new plan (Figure IV). It is important to realize that in subsequent discussion, the term plan refers to a specific plan whether it be I, II, III, or IV. Thus the strategy of analyses employed here is based on a momentary state of dynamic process and the experiment to
be discussed later is actually a time-segment of such an on-going process.

Assuming that the goal has been identified (identification of the problem) it appears appropriate to focus on the planning process itself. It may be thought of as the identification of sets of resources which appear to be useful in the attainment of the specific goal (generation of alternative solutions). Generally speaking a goal may be attained in a variety of ways. For example, electric power may be generated by means of hydro, atomic or even thermal power plants. Resources may be broadly
defined as those people, goods and services and the relationships between and among them which could be utilized for the successful attainment of a goal. Obviously the generation of hydro-electricity suggests different mixes of resources than power generated by thermal plants. The term resource is used here in its broadest sense and may include specific machines which could be utilized, the variety of appropriate skills, a range of possible procedures to be followed, even time itself. For purposes of simplification, resources are divided into three discrete categories. These are non-human, human and organizational resources.

The category of non-human resources embraces all resources except human beings (including their properties and characteristics) and the relationships among and between classes of resources. It may include not only a variety of basic raw materials but fabricated machine systems such as bulldozers, computers or typewriters, each with their own unique sets of properties.

Human resources refers to the 'people' component appropriate to attain the goal. It includes not only the range of people themselves but may also embody their specific properties such as age, sex, intelligence and the outcomes of training and education. Further, it is apparent that to specify the range of people skills and abilities with the potential to accomplish the task is one thing, but to secure their services in the attainment of a goal quite another. Sometimes specified,
but on other occasions simply assumed, are the motivational or attitudinal properties which are also viewed as essential aspects of human resources.

Finally, there is a third set of resources referred to here as organizational resources. Broadly speaking these are the set of possible relationships between and among the non-human and human resources. It may include procedures to be followed, division of labour or even the sequencing of tasks. It appears that organizational resources are of a higher order in that they presuppose the existence of resources in one or both of the previous categories.

Once the alternatives have been identified, the planner is then faced with the task of making the specific selections from among the alternatives. The product of this selection process is the organizational plan. Specifically, a plan may contain reference to the three principal divisions of resources mentioned above; again these are non-human, human and organizational resources. Each of these categories may be thought of as embracing a potentially wide variety of entities, properties, characteristics and relations. The planner's task is to select the combination that will lead to the attainment of the goal in accordance with some criteria of utility (selection of a solution).

A practical example may serve to illustrate. Assume as a goal the clearing of a number of acres of land. One the
Figure V
The Plan-Specification of Human, Non-human and Organizational Resources

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<tr>
<td><strong>Human Resources</strong></td>
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<tr>
<td>Selection of human resources with appropriate properties such as sex, training, education, age, etc.</td>
</tr>
<tr>
<td><strong>Non-human Resources</strong></td>
</tr>
<tr>
<td>Selection of non-human resources with appropriate properties such as horsepower, maintenance features, etc.</td>
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<tr>
<td><strong>Organizational Resources</strong></td>
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<tr>
<td>Selection of operations to be performed, relationships man to man, man to machine, machine to machine.</td>
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non-human side there is a considerable variety of earth-moving equipment on the market. The task of the planner is to select the most appropriate, whether it be a bulldozer, grader or front end loader. In the category of human resources he must select, from a variety of alternatives, an operator with the specific properties or characteristics necessary for the accomplishment of the task. Further, he must select a set of organizational resources (a set of relationships between human and non-human resources which will yield the specified goal—in this instance the relationship between the operator and the bulldozer and the operations to be performed).

The planner may have the additional problem of control. One way of describing the problem is simply to state that resources are not stable. This applies primarily to human beings but not exclusively so. It is one thing to select and specify a bulldozer, an operator and the operations to be performed, and quite another to actually have these operations performed. The planner is interested in selecting an operator with not only the specific properties necessary to accomplish the task, but also one with the greatest likelihood of actually performing the task. Further, he is most likely interested, wherever possible, in optimizing that probability. (Figure VI) The degree of "match" between the symbolic plan and its implementation may be called fidelity of implementation.
Figure VI
The Plan-Specifications and Control

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<tr>
<td>Human Resources</td>
<td>Bulldozer Operator</td>
</tr>
<tr>
<td>Non-human Resources</td>
<td>Bulldozer</td>
</tr>
<tr>
<td>Organizational Resources</td>
<td>Operations to be carried out</td>
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Another problem deals with the amount of detail to be displayed in the plan. At one extreme, a plan may be little more than a broad and highly abstract statement of intention -- to harvest fifty Christmas trees. It could remain silent about how, where, details of the operations to be carried out, etc., leaving a great deal of latitude or optionality for individual initiative and interpretation. On the other hand, the plan to harvest fifty Christmas trees could be highly detailed and specific, stating which trees to harvest, how the trees are to be harvested, the exact operations to be performed, as well as the temporal sequence of operational events. The extent of the detail contained in the plan may be called its level of specificity. (Figure VII)

Previously it was suggested that when the plan is treated as a symbolic representation it cannot be complete in any absolute sense of the term. Thus every plan leaves something unspecified and, therefore, some options open to its implementers. That is, they may be and typically are required to make some decisions concerning (exercise options related to) those aspects of the plan which are not described in detail. The manner in which the "blanks" in the plan are filled in may be defined as the exercise of options. However it should be noted that it could apply to any or all of the categories of resources. That is, those who implement the plan may exercise options with respect to human, non-human, organizational
Figure VII
Possible Level of Specificity of a Plan

Level of specificity

- that portion of the operations etc. detailed in the plan
- that portion of the operations etc. about which the plan remains silent
resources (or any combination of these).

Thus far in the discussion the plan has been treated as though it possessed a single level of specificity, uniform across the whole plan. Obviously this need not be the case. In multi-level organizations, working from highly complex plans, it appears likely that the level of specificity may vary according to the task being performed, the level of the organization at which it is performed and a number of other considerations. Even the plan for harvesting fifty Christmas trees could spell out precisely the manner in which trees were to be harvested but remain silent concerning other aspects of the operations, such as the selection of the trees to be cut. Although the concepts of plans and planning are subject to a more penetrating analysis, they are here regarded as heuristic concepts which appear to be useful in the context of the present investigation of involvement in decision-making and the effects on productivity.

Summary of the Concept of Plan

To summarize, the concept of organizational plan contains the following points.

1. It has been proposed that organizations operate from a plan, which may be treated as a symbolic representation of human, non-human and organizational resources. Because it is a symbolic representation, the plan
cannot, for practical purposes, describe every aspect of each resource.

2. As a consequence, the plan may leave some options open to those who implement it. That is, the implementers may be required to exercise options related to those aspects of the plan which are not specifically described. These options may be related to human, non-human or organizational resources or any combination of these.

3. Each plan has what is described as its level of specificity. That is, the degree to which human, non-human and organizational resources are detailed.

4. The planner is faced with the potential problem of control. That is, having designed a plan either general or specific, what is the probability that it will be faithfully implemented? Ordinarily, the planner is interested in maintaining a high probability that the plan will be faithfully implemented and whenever possible doing what he can to insure that this will be the case.

5. The planner is also interested in having whatever options may be provided by the plan exercised in ways which enhance productivity.
The Relationship of the Organization's Plan to its Productivity

In examining this relationship it will be helpful to enlarge on the previous example. Assume two groups are engaged in the attainment of a goal—to harvest fifty Christmas trees. Assume further that one group is clearly more productive than the other. For example, it harvests the required fifty trees in a shorter period of time. How might this difference in productivity be explained? Using the concept of plan it appears possible to advance some plausible alternatives. First, what is the nature of the plans which the two groups are utilizing? For example, if one plan specifies men as opposed to boys, and chainsaws as opposed to axes, then it might be judged that the plan of the more productive group was simply a superior plan, other things being equal.

Next, assuming an effective plan, do both groups implement the plan faithfully? That is, are the human, non-human and organizational resources utilized as they are specified in the plan. (The underlying assumption here is that a plan of known effectiveness which is faithfully implemented is more likely to achieve the goal than one implemented with a lesser degree of fidelity, although this need not always be the case.)

Finally, how does each group exercise the options provided by the plan? For example, does one group work more
vigorously or exercise a greater degree of care? The point here is that questions concerning productivity apply to organizations generally and differences in productivity can be approached analytically, in very general terms, through the use of the concept of plan. Thus organizations interested in increasing productivity may do so by developing more effective plans, having these plans implemented with greater fidelity and having the options provided by the plans exercised in a way which enhances productivity.

How Can Involvement in Decision-making Increase Productivity?

One of the ways in which organizations attempt to develop more effective plans, have the plans implemented with greater fidelity and have the options provided by the plan exercised in a way which enhances productivity is through the involvement of the people who are to implement the plan in the development of that plan.

Why should having the responsibility for making decisions affect the quality of the plan, the fidelity of implementation or the exercise of options? Or in other words, why should it increase productivity? McGregor (1969) offers one explanation based upon his adaptation of a theory of human needs to the organizational context. Man is a wanting animal with a number of needs. Needs are organized in a series of levels—a hierarchy of importance. The five levels, from low to high,
include physiological, safety, social, ego and self-fulfillment needs. (Figure VIII)

Physiological needs are on the lowest level. They include the need for food, shelter, exercise and protection from the elements. It appears reasonable to assume that for most employed persons these needs are satisfied. Thus needs at the next higher level begin to dominate man's behaviour, to motivate him.

Safety needs encompass the need for protection from danger, threat and deprivation. McGregor argues that this is not a need for security. Rather that if man does not feel threatened or dependent he is willing to take risks. But when he feels he may be the recipient of arbitrary action, then his greatest need is for guarantees, for protection and for security.

Once these lower levels of needs are satisfied, then social needs become important motivators of behavior. They include the need for belonging, for association, for acceptance by his fellow man and for the giving and receiving of friendship and love.

Next in the hierarchy are ego needs. These fall into two distinct categories. The first relates to self-esteem. The needs for self-confidence, for independence, for achievement, for competence and for knowledge are part of this group. The second are needs relating to one's reputation.
Figure VIII
McGregor's Hierarchy of Needs

HIGHEST LEVEL

<table>
<thead>
<tr>
<th>SELF-FULFILLMENT NEEDS</th>
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<tbody>
<tr>
<td>EGO NEEDS</td>
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<tr>
<td>(a) self esteem</td>
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<tr>
<td>(b) one's reputation</td>
</tr>
<tr>
<td>SOCIAL NEEDS</td>
</tr>
<tr>
<td>SAFETY NEEDS</td>
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<tr>
<td>PHYSIOLOGICAL NEEDS</td>
</tr>
</tbody>
</table>

LOWEST LEVEL
They include needs for status, for recognition, for appreciation and for the deserved respect of one's fellows.

Finally, at the highest level, are the self-fulfillment needs. There are the needs for realizing one's own potentialities for continued self-development and for being creative in the broadest sense of the word.

McGregor states that a satisfied need is not a motivator. However when the individual is deprived of the opportunity to satisfy some of these needs (frustration) he may behave more independently, appear to lack ambition, express dislike for responsibility and seem to be inherently self-centered and indifferent to organizational needs. It can be hypothesized that having decision-making responsibility provides opportunity to satisfy some of the higher-order needs. But more important, not having it deprives him of that opportunity. Presumably he is less willing either to implement faithfully or to exercise options in a way which enhances productivity. A case can be made that having decision-making responsibility provides more opportunity to satisfy social, ego and self-fulfillment needs than a work situation in which the employee is not involved in the decisions of the organization, at any level.

Group decision-making may provide greater opportunity for more meaningful interaction between group members. It can provide chances for members to advance suggestions, have
their ideas recognized, derive additional status and receive appreciation and recognition. To be involved in the decision-making process can, of itself, be a creative action in the broad sense of the word.

There are a number of other ways in which possessing decision-making responsibility (DMR) might contribute to increased productivity. Lowin (1968), acknowledging the importance of ego need satisfaction, lists a number of these others, some of which obviously involve the satisfaction of needs.

1. **Closure and a sense of participation.** Decision-making responsibility gives the employee a greater awareness of his role in the system and enables him to see how his daily activities fit in the total operation.

2. **Shared goals.** Being involved in the decision-making process leads to internalization of organizational goals.

3. **Pressure to conform to prior commitments.** Having participated in organizational decision-making members are under pressure not to renege on earlier commitments. Thus greater adherence to an organizational "plan" could be expected of individuals who participate in the decision-making process.
4. **Improvements in technical and administrative systems.**

Employees close to the scene can often spot opportunities for improving technical and administrative systems which would be less obvious to remote supervisory personnel.\(^1\)

Although, under certain conditions, having decision-making responsibilities may lead to increased productivity, it can also be affected by a number of other factors quite unrelated to the decision-making process. For example, if wages are too low the possible positive effects of decision-making responsibility may be washed out by resentment of the wage level itself. In terms of need theory, the salary fails to satisfy the employees' needs at a number of possible levels.

\(^1\)Obviously DMR cannot be expected to bring about increased productivity under all circumstances. Lowin further suggests a number of conditions which can contribute to the likelihood that productivity will be increased. The first is that the employees have desire or need to be involved in organizational decision-making. Clearly, by itself, this will not guarantee positive results. Yet to give DMR to employees who clearly do not want it appears to invite failure. Additionally he suggests that the extent, relevance, importance, and visibility of the decision-making activities, the difficulty of the issues settled, the cohesiveness of the group and the clarity of goals all contribute to the likelihood that productivity will be improved.
Similarly, in small face-to-face groups, the potential effects of possessing decision-making responsibility may be obscured by a number of factors peculiar to the groups themselves. For example, if the interaction of the group members is unsatisfactory perhaps because one member dominates the decision-making process, then one might expect the results not to be positive or even negative results.

The same hypothesis could be advanced concerning the quality of the plan itself. If, as a result of decisions made by employees, an inferior plan is generated, a decline in productivity could occur.

It is important to make a distinction between two different types of occurrences. The first is behaviour of the employees which could occur independently of the plan. Given a plan, the degree of fidelity with which they implement it, or the way in which they exercise options provided by the plan, could affect productivity. For example, employees may simply work more vigorously or with greater precision.

The second, is change in the plan itself. A decision to purchase desk calculators to aid members of an accounting department, who formerly did the calculations by hand, improves productivity. In this particular example the employees need not work more vigorously, or more carefully. But for a given expenditure of energy, the amount of work done is greater—or for a given level of care, the work is more accurate. Clearly
increases in productivity are due to the increased efficiency of the calculator method over the manual method. Efficiency is a ratio of energy consumed per unit of output. This is not to suggest that possessing decision-making responsibility may not bring about both sorts of changes at the same time, or that there may not be an interaction between the two.\footnote{The terms decision-making responsibility and involvement in decision-making have been employed interchangeably throughout this discussion. It appears important to remind the reader that both refer, in this particular context, to the decision-making process and not to the outcomes of these same decisions. To be involved or have responsibility for making decisions may flatter, give recognition or be treated as an admission of worth. At the same time responsibility for outcomes may, under certain conditions, thwart these same needs. For example, if meeting needs requires "success," then it may be possible to "fail." Further, it may also be difficult to determine to what extent employees are held accountable for the efficacy of decisions in which they are involved. In a profit-motivated organization where employees are not deemed to be held directly responsible for their decisions, they may be indirectly responsible. In the extreme, too many "bad" decisions and the organization may cease to function. Not to minimize the potential effects of responsibility for outcomes, it is simply outside the scope of the present study.} Given these views it appears that there may be a number of ways in which involvement in decision-making could improve organizational productivity. It now appears appropriate to examine studies in the field to determine how well these views are supported by available evidence.
Related Research

Studies involving the downward distribution of decision-making responsibilities may be divided into two general categories. There are those studies in which decision-making responsibility was the principle independent variable under investigation and those, such as investigations of the Scanlon Plan, in which it was only one of a number of apparently equally important independent variables. Although the present study is concerned primarily with the decision-making responsibility by itself, it should be stated that management systems such as Interaction-Influence and the previously mentioned Scanlon Plan, which incorporate a broader distribution of decision-making responsibility, have been successful in a number of different organizational settings. Likert (1961, 1967), presents some convincing evidence for the success of his management system at the Harwood Manufacturing Co. and in the sales' divisions of various other companies. Lesieur and Puckett (1969), in a study of the effectiveness of the Sanlon Plan, document similar results in three different manufacturing companies.

Studies involving principally decision-making responsibility have produced somewhat mixed results. In some contexts, organizational productivity, or at least some measure of organizational or individual performance, have been improved. In others this has simply not been the case. Lowin (1968) suggests
that studies involving the downward distribution of decision-making responsibility may be divided into three distinct categories. These include experimental non-organizational research, experimental studies in organizations and observational studies in organizational settings. It appears appropriate to review this research one category at a time.

It would be both impractical and unnecessary to review all the related research since much of it appears to bear tangentially on the topic under investigation. Thus the researcher has attempted to review studies which are representative of the field particularly in terms of the hypothesis that increased decision-making responsibility improves organizational productivity.

Experimental Non-Organizational Research

The results produced in this type of research have been mixed. Under certain conditions positive findings have occurred, under others problematic ones. (The description of findings as positive or problematic refers to findings which support the hypothesis that responsibility for decisions improves organizational productivity. For purposes of clarification, it was felt that positive findings would include cases where the occurrence of, or increase in, decision-making responsibility were coupled with increases in productivity or other similar indices of organizational performances.
Problematic findings would include either cases in which occurrence of, or increase in, decision-making responsibility were coupled with either a decline in some other measures of organizational or individual performance or no recorded differences in the above.) Table 1 categorizes some of these experimental studies in terms of the results achieved.

Positive Findings

Early studies by Lewin (1947) demonstrated the value of group discussion and decision over lecture in changing dietary habits. For purposes of this review it was assumed that a parallel could be drawn between "discussion and decision" and responsibility for making decisions, and "lecture" and non-responsibility. Housewives in a mid-western town were involved in discussion leading to a step by step decision to increase milk consumption. No high-pressure salesmanship was used, in fact pressure was carefully avoided. The control group was given a "good" lecture about the value of greater consumption of fresh milk. The amount of time used for each treatment was equal. The change in milk consumption was checked after two weeks and four weeks. Figure IX indicates the superiority of the group decision process.

In a similar study among farm women who had come to the maternity ward of the Iowa State Hospital, the effect of individual treatment was compared with the effect of group decision.
Table 1
Experimental Non-Organizational Research

<table>
<thead>
<tr>
<th>POSITIVE FINDINGS</th>
<th>PROBLEMATIC FINDINGS</th>
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<tbody>
<tr>
<td>Day &amp; Hamblin (1964)</td>
<td>Back (1961)</td>
</tr>
<tr>
<td>Hare (1953)</td>
<td>Bass &amp; Leavitt (1963)</td>
</tr>
<tr>
<td>Levine &amp; Butler (1952)</td>
<td>Bennett (1955)</td>
</tr>
<tr>
<td>Lewin (1947)</td>
<td>Calvin, Hoffman &amp; Harden (1957)</td>
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<tr>
<td>Preston &amp; Heintz (1949)</td>
<td>Haythorn (1956)</td>
</tr>
<tr>
<td>Radke &amp; Klisurich (1947)</td>
<td>McCurdy &amp; Eber (1953)</td>
</tr>
<tr>
<td>Tomekovic (1962)</td>
<td>Misumi (1959)</td>
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<td>Sales (1966)</td>
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<td>Shaw (1955)</td>
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<td>Simmons (1954)</td>
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<td>Torrance &amp; Mason (1958)</td>
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</table>
Again discussion and decision were carried out by a group of mothers concerning the proper formula for feeding babies and the benefits of orange juice and cod liver oil. For the control group each subject was given individual instruction by the nutritionist lasting about twenty-five minutes. An equal amount of time was devoted to discussion and decision in the group setting. Figure X shows the superiority of the group decision procedure after periods of two and four weeks.

Similar positive findings have been recorded in a number of other studies; Radke and Klisurich (1947) in changing food habits of subjects and Levine and Butler (1952), in an industrial setting, document positive results. The second study has been categorized as a laboratory study because of its closely controlled and somewhat artificial manipulations. The study involved attempts to change the rating habits of foremen in an industrial setting. The problem occurred because foremen tended to overrate performance of workers in higher grade jobs and underrate the performance of workers in lower grade jobs on the criteria of accuracy, effective use of working time, cooperation, output and application of job knowledge. Three groups were involved in the experiment, two experimental and a control group. The former were a discussion and decision approach to the methods of rating, and a lecture-approach. The control group received no treatment before foremen's ratings were made. Only the discussion and
Figure IX
Percentage of Mothers Reporting an Increase
in the Consumption of Fresh Milk

(Lewin, K., "Frontiers in group dynamics," Human Relations, 1947, 1, 2-38)

Figure X
Percentage of Mothers Following Completely Group Decision
or Individual Instruction in Giving Orange Juice

(Lewin, K., "Frontiers in Group Dynamics," Human Relations, 1947, 1, 2-38)
decision group showed any significant changes in the ratings of the low and high grade jobs. The authors concluded that performance ratings were significantly affected only after group discussion had transpired and a group decision had been reached.

The effects of discussion and decision on group judgements are also well documented. Hare (1953) conducted an experiment with thirteen year olds at a Boy Scout Camp. The task involved an initial ranking of items of camping equipment to be taken on a trip alone through unknown country. Discussion followed under participatory or supervisory leadership. Each individual then ranked the items again and recorded his reaction to the discussion and the leader. Greater attitude convergence was found in the participative group. In addition, greater influence was shown by the participative leader. Preston and Heinz (1949) had earlier conducted a similar experiment with a population of college students. The task was ranking a list of twelve prominent men according to their desirability as a Presidential possibility. Ranking of subjects under participative leadership were found to correlate higher with group rankings than with their own initial rankings. The final rankings of subjects under supervisory leadership were found to correlate higher with their own initial rankings than with rankings formulated in group discussions.
In an experiment to measure productivity, Tomekovic (1962) used a population of grade six school pupils and a task of adding columns of trinomial numbers. The experimental group received an explanation of its work, discussed the explanation and the instructions and made its own decisions relating to the working pace etc. The control group received only instructions. It was found that the experimental group was significantly more productive than the control group in the number of examples completed. However no significant difference between the groups as to the quality of their work was recorded. Day and Hamblin (1964) in a study conducted with women undergraduates, report similar findings. The task involved the assembling of models of molecules using pegs, springs, and various coloured balls provided in Sargent Kits for chemistry classes. It was found that groups performing under close supervision were less productive than those under general supervision. Once again, close supervision seems to imply constraint whereas general supervision implies freedom.

Problematic Findings

Bennett (1955) found the group discussion and decision technique to be less effective than the lecture method in influencing subjects. The experiment attempted to raise the willingness of psychology students to volunteer as subjects in psychological experiments. Group discussion as an influence technique was not found to be a more effective inducement
to action than a lecture or no inducement at all. Additionally, a decision indicated by public commitment was not found to be more effective in assuring the execution of the decision than one indicated less publicly or anonymously. However, the factor of coming to a decision regarding a future action was found to be effective in raising the probability that such action would be executed. Finally, a high degree of actual or perceived group consensus regarding intention to act was found to raise the probability that individual members of the group would execute the action above the probability of action by members of a group characterized by a low degree of consensus. Misumi (1959) reported one study which supported Bennett's findings and another which found lecture and decision less effective than discussion and decision. Simmons (1954) reporting three studies of attempts to influence overweight subjects to reduce, found no significant differences between lecture and discussion and decision groups. Back (1961) discovered that the relative effectiveness of lecture as opposed to discussion and decision depends upon prior attitudes and experience and on the time lapse between manipulation and measure.

A study of influence techniques by Torrance and Mason (1958) was conducted among four hundred twenty seven air crewmen participating in survival exercises. Crew instructors were requested to conduct survival ration indoctrination according to specific instructions. The success of the methods
was judged through the use of four criteria of acceptance of the ration. Superior results were achieved by making the food indoctrination a regular part of the training. Promising results were also obtained from a "low pressure" technique relying chiefly on objective information. Significant negative results were obtained from conditions relying upon persuasiveness, setting an example and the like.

Shaw (1955) conducted a study of authoritarian and non-authoritarian leadership in various communication nets. He concluded that authoritarian leadership produces better performance but lower morale than does non-authoritarian leadership. Haythorn (1956) studied the effects of varying combinations of authoritarian and egalitarian leaders and followers. The findings suggested that the effectiveness of egalitarian leadership varies with the personality traits of the subordinates and of the leaders.

In studies using measures of productivity, a number of problematic findings have occurred. McCurdy and Eber (1953) used a population of elementary psychology students placed in three-man groups. Four experimental conditions matched democratic and authoritarian leaders with democratic and authoritarian followers. The task was to correctly identify switch settings necessary to turn on a signal lamp. Using four measures of productivity the following results were achieved: When time in minutes was plotted against runs, all groups were
virtually alike. Similarly, on correct switch turnings per unit of time and errors per unit of work, no differences occurred. On the measure errors per unit of time, the combination of democratic leadership and authoritarian followers produced significantly better results. However, on a replication of the same experiment no differences were found. Sales (1966) replicated an industrial assembly line task in a laboratory setting. In this experiment two male supervisors played both democratic and autocratic roles over both female and male workers. Sales reported no differential effectiveness whatever between the two conditions; the productivity means for the two were virtually identical. Calvin, Hoffman & Harden (1957), using subjects drawn from undergraduate psychology classes, compared the performance of bright and dull students in authoritarian and permissive climates. The task was the familiar game of twenty questions. The results suggested an interaction between intelligence and social climate. No significant differences were recorded between permissive-bright and authoritarian-bright for either the number of problems solved or the number of questions asked. However the performance of authoritarian-dull subjects was significantly better than permissive-dull subjects both in terms of the number of problems solved and the number of questions asked. In a replication of the same study modified to take into account problem difficulty, neither of the above relationships were significant.
Additionally, difficulty of problem did not have any significant effect. In a third experiment an attempt was made to secure a "happiness score." No significant differences were found in productivity between the groups. In terms of "happiness," permissive-dull subjects dealing with difficult problems were the most unhappy.

Finally, Bass and Leavitt (1963) conducted three experiments relating planning activities to performance and attitudes. The major focus centered on comparing the performance of trios who planned for themselves with trios who were assigned plans and with trios who spent no time preplanning at all. The experimental tasks included word-sentence production, the common targets game and the numbers game. In all these experiments, differences in productivity between the three groups failed to reach significance.

If one accepts that the sample of laboratory studies presented here is generally representative of the field, then it appears that there are as many problematic findings as there are positive ones. One of the main issues in the use of the laboratory to study organizational phenomena is whether the parameters of real-world organizations can be represented in short-term laboratory experiments. Lowin in criticizing the use of laboratory studies to identify either casual relationships and/or mediating variables affecting organizational performance concluded:
Given these issues, it is hard to justify the common use of laboratory experimentation in exploring organizational PDM (participative decision-making). In the study of PDM, simplistic laboratory models fail to reflect just those issues which form the very heart of the organizational phenomenon. (Lowin, 1968, 87)

When using the laboratory for investigating organizational phenomena, the experimenter compromises. In return for a degree of control which would not ordinarily be possible in field settings some of the reality may be sacrificed. It appears that the two methods are complementary. That what is identified in the laboratory may yield information pertinent to experiments to be carried out in the field. As Weick suggests:

External and internal validity can be achieved if the experimenter moves back and forth between the laboratory and the field. (Weick, 1967, 49)

He further suggests that the laboratory is a good starting point for testing some of the theoretical propositions of the literature.

Since both organizational theory and research are in their early stages, it is reasonable to expect that more attention in the immediate future will be focused on internal validity rather than external validity. (Weick, 1967, 48)

and finally

Experiments have numerous shortcomings but they are also more versatile than existing folklore would suggest. As more of the shortcomings of the laboratory are pinpointed, it should be possible to strengthen their role in organizational research. Furthermore, an increasing number of phenomena can now be created in the laboratory and it seems clear that imaginative investigators will be able to increase the phenomena that can be brought
under laboratory control. Although there is little history of organizations in the laboratory, the promise seems considerable. (Weick, 1967, 49)

To dismiss laboratory experimentation as a valid method of investigating organizational phenomena appears to be a premature action. Each experiment must be judged on its own merits. It appears that laboratory experiments properly conducted, have the potential to provide the same richness of information which they have provided in other fields.

Observational Studies in Organizational Settings

Observational studies have turned up similarly mixed results. A representative sample of these studies is presented in Table 2.

Table 2
Observational Studies in Organizational Settings

<table>
<thead>
<tr>
<th>POSITIVE FINDINGS</th>
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<tr>
<td>Kahn &amp; Tannenbaum (1957)</td>
<td>Argyle, Gardner &amp; Ciofi (1958)</td>
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<tr>
<td>MacKay (1964)</td>
<td>Fleishman &amp; Peters (1962)</td>
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<tr>
<td>Meltzer (1956)</td>
<td>Halpin (1954)</td>
</tr>
<tr>
<td>Tannenbaum &amp; Georgeopoulos (1957)</td>
<td>Stryker (1956)</td>
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<td>Wickert (1951)</td>
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**Positive Findings**

Kahn and Tannenbaum (1957) conducted a study of leadership skills and functions of union stewards and their relationship to member participation and control among the rank and file of four union locals. Member participation and control were measured by attendance at meetings, member activities at these meetings (such as making and recording motions, asking questions, etc.), involvement in committee work and voting in union elections (indices of productivity). The independent variable of leadership skill was measured by indices of the stewards' skill in communicating, joint decision-making, stewards' resourcefulness providing support for the men and the inter-personal relationship between the membership and the steward. Although the relationships of the other indices are somewhat unclear, the rank order of locals, with respect to the stewards' involvement of members in decision-making, corresponded exactly to the relative level of member participation in union affairs in these four locals (productivity).

Mackay (1964) examined the relationship of organizational structure and teacher performance in thirty-one Alberta schools. Organizational structure was measured by teachers' responses on Hall's Organizational Inventory (HOI), specially modified to make it appropriate for educational organizations. Pupil achievement on ninth-grade examinations set by the
Department of Education provided a measure of teacher performance. Academic aptitude of pupils was controlled by SCAT (School and College Ability Test) scores. On the dimension of hierarchical authority and pupil achievement, there was a statistically significant negative relationship. A high degree of hierarchical authority tended to be associated with low achievement of pupils in the ninth grade. Conversely, pupils in schools where authority relationships between principal and teachers were minimized and where some aspects of decision-making were decentralized, performed better on a set of standard external examinations.

Similar findings were recorded by Tannenbaum and Georgopoulos (1957) in a study of control in two manufacturing plants. They found that in the plant in which more control was exercised over employees above the level of the "rank and file" resulted in its performing at a lower level of effectiveness. At the same time, the work force tended to be characterized by lower morale and worker satisfaction. However it should be pointed out that equal control over rank and file employees was recorded in both plants.

Wickert (1951) investigated employee turn-over and morale among several groups of young women employees of the Michigan Bell Telephone. Employees who remained in the employ of the company made some specific observations about their jobs which those who resigned did not. First, they tended to say that
they had a chance to make decisions on the job. Secondly, they reported that they felt that they were making an important contribution to the company.

Meltzer (1956) examined the correlates of productivity among physiologists in the United States. Data came from a questionnaire returned by over seventy-five percent of the nation's physiologists. He found that productivity and freedom were positively correlated. It was also found that the availability of research funds was also an important factor influencing productivity and that productivity of physiologists working in organizations was approximately the same as those working independently.

Problematic Findings

Argyle, Gardner & Ciofi (1958) investigated certain dimensions of supervisory style related to productivity, absenteeism and labour turnover. It was discovered that higher productivity was associated with democratic and general supervision but only where piece rate was not in force. However there was a significant inverse relationship between democratic foremanship and absenteeism. Labour turnover appeared unrelated to supervisory style.

Halpin (1954), in a study of airplane commanders identified two major dimensions of leadership—Consideration and Initiating Structure. A trend toward negative correlations
was found between superiors' ratings and the Consideration scores and a positive correlation between these ratings and Initiating Structure scores. Conversely, the correlations between a Satisfaction Index and the dimension scores showed a trend in the opposite direction. Thus the superiors and subordinates were inclined to evaluate oppositely the contributions of these dimensions to the effectiveness of leadership. Fleishman and Peters (1962) reported a positive correlation between Initiating Structure and productivity but only in production groups. In non-production groups the two were negatively correlated.

In a study of attempts to make the Ansul Chemical Co. of Wisconsin more "participative," Stryker (1956) documented the use of practically all the then new doctrines of "good communications" and "human relations."

The president, Robert C. Hood, had practically run the gamut of group management techniques from "buzz sessions" to "vertical conferences" and "role playing." (Stryker, 1956, 134)

The results of these efforts speak for themselves. In the ten years before Hood took over as president in 1949, sales had increased by one thousand percent. Since 1950 sales had increased only as much as the general level of business volume. (During this period the GNP had gone up 40% and Ansul's sales had increased from $9,100,000 to $12,700,000.) During the same period most of the leading companies in the chemical industry had shown fifty to one hundred percent sales
increases. Ansul's chief competitor in the fire extinguisher business, Kidde & Co., had increased sales roughly one hundred and seventy percent.

The author concludes:

People are important, but so is the matter of making things and selling them. Managers have a limited amount of time to run a business; the more they become preoccupied with "people centered" management and the abstraction of human relations, the less energy they have to expand on the hard necessities of operations. (Stryker, 1956, 136)

Experimental Studies in Organizations

A similarly mixed pattern of results has occurred in experimental studies in the organizational context. A representative sample of these studies is contained in Table 3.

Table 3
Experimental Studies in Organization

<table>
<thead>
<tr>
<th>POSITIVE FINDINGS</th>
<th>PROBLEMATIC FINDINGS</th>
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<tbody>
<tr>
<td>Bavelas &amp; Strauss (1961)</td>
<td>French, Israel &amp; Aas (1960)</td>
</tr>
<tr>
<td>Fleisman (1965)</td>
<td>Morse &amp; Reimer (1951)</td>
</tr>
<tr>
<td>Kuriloff (1963)</td>
<td>Tannenbaum &amp; Allport (1956)</td>
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<td>Lawrence &amp; Smith (1955)</td>
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<tr>
<td>Rice (1953)</td>
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</table>
Positive Findings

Bavelas and Strauss (1961) conducted a study in a toy factory where girls were given more decision-making responsibility. They were allowed to control the speed on a paint line conveyor. They sped it up when they felt like working and slowed it down when they didn't. Productivity and earnings soared, and soared higher by far than that which the engineers had believed to be the normal output. The girls apparently established their own equilibrium. For when the company officials wrested control of the line from the employees once again, they all quit, as did the foreman.

Coch and French (1948) conducted what has become one of the classic experiments in organizational decision-making. The experiment took place in a garment factory where increasing costs and competition had created the need for updating of products and procedures. It involved three experimental groups and a control group. When changing product and procedure, the control group went through the usual routine. The production department modified the job, and a new piece rate was set. A meeting of the workers was held in which they were told why the change was necessary and at what level the new piece rate had been set. Questions were answered and the meeting ended. Experimental group 1 followed a different procedure. A meeting was held at which it was demonstrated, as dramatically as possible, the need for change. Management
then presented a six point plan to set the new job and piece rate.

1. Make a check study of the job as it was being done.
2. Eliminate all unnecessary work.
3. Train several operators in correct methods.
4. Set the piece rate by time studies on specially trained operators.
5. Explain the new job and rate to all the operators.
6. Train all operators in the new method so they can reach a high rate of production within a short time.

The group approved the plan. The special operators were selected to help design the new job, which was then to be studied by the time and motion men so as to train the other operators.

Experimental groups 2 and 3 went through much the same kind of change procedure. However the groups were much smaller. The meeting was held to demonstrate the need for change, only this time all operators were selected as special operators. Thus all operators participated in the design of the new job and were subjects of time study analysis. The results of this experiment are recorded in Figure XI.

As can be seen quite readily, productivity appeared to vary with the degree of participation. As a further test of these results, the control group was put through the fully
participative treatment for another change a few months later. The dramatic effect on productivity is detailed in Figure XII.

Similar findings were obtained by Fleishman (1965) in a study of work group productivity in a dress factory. Participation increased the transfer effect from the one style change to the next i.e. the usual dropoff in production was substantially reduced or eliminated. Of special interest is the author's observation:

It also appears that direct participation of individual workers may not be as important as their group's participation in the work changes. (Fleishman, 1965, 141)

Kuriloff (1963) describes an experimental test of McGregor's Theory Y in an instrument factory. To implement the theory, management made a number of changes in the plant.

1. The minimum salary was raised to $100 per week, $24 higher than prevailing rates in the community. It was felt that this would take care of physiological needs.

2. In attempting to satisfy safety needs hiring policy was changed so that layoffs were avoided during slack time and additional hiring in peak periods. This was accomplished through the stockpiling of major items.

3. In an effort to satisfy social needs the structure of the work force was modified. Assembly lines were changed to seven man work teams. Each team was responsible for planning its work, assignment of tasks, etc.

The results of this experiment are quite remarkable. The absentee rate dropped to less than half of that prevailing in
Figure XI

The Effect of Participation on Production*

![Graph showing the effect of participation on production.](image)


Figure XII

A Comparison of the Effect of the Control Procedure with Total Participation Procedure on the Same Group*

![Graph showing a comparison of control and total participation procedures.](image)


*Number of working days for which observations were recorded, versus average output in units per hour.*
similar businesses in the community. Productivity was increased by thirty percent. Additionally, quality also improved. There were seventy percent fewer complaints from the field than had occurred before the new system came into effect.

Lawrence and Smith (1955) performed an experiment to determine whether industrial employees setting their own group goals attained higher production output than employees participating in group discussion only. When mean experimental production was compared with mean control production on an individual basis, it was found that those groups setting their own goals showed significantly greater increases.

Finally, Rice (1953) investigated changes in productivity brought about by a change in the social organization of the work force. He found that as a result of giving the worker increased responsibility for decision-making, a number of phenomena occurred. First, there was an increase in the mean efficiency of the experimental groups. However this was accompanied by an increase in damage costs and a drop in maintenance below a minimum acceptable level. After an initial period of "settling down," a new higher level of performance was reached in which efficiency was higher and damage lower than before reorganization.
Problematic Findings

French, Israel and Aas (1960) conducted an experiment in participation in a Norwegian footwear factory. Nine four-man groups of employees were to produce new products. Four of the groups were changed in the usual arbitrary manner. The other five were given more participation. All groups met with the foreman and representatives of the planning department to plan which of the five new products should be assigned to each group. Two of the groups held two additional meetings to decide the division of labour, assignment of jobs to groups' members and the training for new jobs. The results showed no differences between experimental and control groups in level of production. All three meeting types produced psychological participation on the part of workers.

French, Kay and Meyer (1966) manipulated participation in decisions related to an appraisal system. Employees were involved in periodic appraisal sessions in which their past performance and future goals were assessed by their superiors. Through a complex system of measures, the experimenters were able to ascertain the usual level of participation of the subjects and the state of an employee's relations with his manager.

The major findings of the study showed that "goodness" of man-manager relations varied directly as the usual level of participation. Although increases in participation
generally produced improvements in relations, decreases in participation did not have the expected effect. Under conditions of high threat and low usual participation, experimental participation has strong negative effects on subsequent performance improvement. Finally, if subjects perceived a high general level of participation, performance was better on their own goals, but if they perceived a low level of participation, their performance was better on goals induced by the manager.

The deceptive effect of increased supervisory pressure was made clear in a large study by Morse and Reimer (1951). The experiment took place among clerical employees in four parallel divisions of a large corporation. Productivity in all divisions depended on the number of clerks involved. At any one time there was a given volume of work which had to be done. Thus the only way productivity could be increased was to reduce the number of clerks performing the work, i.e. increase the average output per man. The four divisions were assigned to two experimental conditions. In one an attempt was made to push down the levels at which decisions were made by altering the supervisory structure. In the second, the level of supervision was increased and the level at which decisions were made moved up. The results, after a period of twelve months, are displayed in Figure XIII. As can be seen the hierarchical programme increased productivity
Figure XIII
Change in Productivity

by twenty-five percent. A significant increase in productivity of twenty percent was also achieved in the participative programme, but this was not so great an increase as in the other programme. However on measures of employee satisfaction, such as satisfaction with supervisors as representatives, the participative programme came out ahead.

Tannenbaum and Allport (1956) used an event-structure hypothesis to study the relationship of personality and group structure among female clerical workers. Subjects predisposed to participation were placed in a participative work structure. Authoritarian subjects were placed in a similar work structure. Additionally two mismatch experimental conditions were created. It was found that groups in which there was proper matching of personality and work structure were significantly more productive than those in which mismatch occurred. However there was no difference in productivity between participative and authoritarian groups.

Conclusions

What conclusions can be drawn from the results of studies reviewed here? Some of the problems of laboratory research have been mentioned earlier. The field studies cited here have been carried out in ongoing organizations and consequently experimenters were confronted by the problems of this type of study, primarily control, which are detailed by Barnes.
(1969). But of even greater significance is the lack of any semblance of uniformity on which the studies could somehow be equated. What this points to is the obvious complexity of the relationships of the variables. It appears that even at the conceptual level it is often difficult to determine exactly what levels, kinds, stages, etc. of decision-making were actually involved, and where they would fit into any general analysis of studies conducted in the area. For example, each study seems to have included different levels or kinds of decisions. In the Morse and Reimer study decisions were concerned with manufacturing procedures and piece rates, in the Allport and Tannenbaum study decisions were related primarily to working conditions, such as release time and work load, and in the Mackay study decisions appeared to be of a much broader range of kinds and levels. The same observation could be made concerning the levels of the organization to which decision-making responsibility was delegated. In the Stryker study this included only executives, whereas in the French et al. study only assembly line employees were involved.

Similarly, any hypothesized effects may be quite different according to the task performed by the decision-makers. The question raised by Leavitt (1962), that of the importance of human performance to the overall success of the operation, might well apply here. Thus the effects of acquiring
decision-making responsibility related to a task whose performance is dependent to a great extent on human effort may differ from those in which the human effort is more incidental. The effects of redistributing decision-making responsibility may be very different for physiologists (Meltzer, 1956) than for weavers (Rice, 1953).

Finally, it appears appropriate to ask to what extent measures of productivity in, for example, a manufacturing organization can be equated to measures of productivity in any other kind of organization. In view of the difference in structure, goals, employee populations, levels and kinds of decisions, levels of the organization involved, task and end result variables, attempting to compare the results of one study with another may be a highly presumptive undertaking. To expect to find some generalizable effect across a variety of studies may be somewhat naive.

Statement of the Problem

Putting aside for the moment the difficulties of trying to generalize from the research findings cited above, another problem may be identified which has been touched upon earlier. Recalling the earlier discussion of the concepts of plans and resources, the downward distribution of decision-making responsibility in the organization includes the possibility that decisions reached by members may create change,
i.e., as a result of decisions they have made, they are no longer operating from the same plan. Suppose that the responsibility for the decision to order a new machine accrues to the employees. The machine is ordered, placed on line and productivity increases. How could one account for this increase?

First, the new machine is superior to the one it replaces i.e., with the amount of energy and care expended held constant, its utilization yields greater productivity than the machine it replaces. That is, they are operating from a superior plan.

Secondly, employees implement this particular plan more faithfully than they had implemented previous plans.

Finally, the options provided by the plan are exercised in such a way as to enhance productivity. For example, where the plan is highly specific and detailed it may be that they simply worked more energetically/carefully.

Thus, involvement in organizational decision-making may yield a superior plan. But it could also produce a plan of comparable quality or even an inferior plan. Similarly, involvement in decision-making may lead to implementing a plan with greater fidelity, but it could also bring about comparable or even lower fidelity of implementation. Options provided by the plan may be exercised in a way which enhances productivity or they may not.
In any given set of circumstances, responsibility for making decisions may effect three areas in which productivity is determined—the quality of plan, fidelity of implementation and the exercise of options. It appears logical that the factors which affect the quality of a given plan may not necessarily be the same as those affecting fidelity of implementation or the exercise of options. For example, as Lowin (1968) suggests, to assign decision-making responsibility to those who clearly do not want it or, owing to the nature of their particular training or skills, do not possess the necessary insights, may result in the development of an inferior plan. At the same time, fidelity of plan implementation may be high and options provided by the plan may be exercised in ways which enhance productivity. The point here is that a basic, analytic separation may be made between the quality of the plan (i.e., its effectiveness for achieving the goal) and the way in which the plan is implemented which includes fidelity of implementation and the exercise of options provided by the plan. In studies cited here no attempt has been made to separate the effects of these two factors. Thus the results reflect not only the effects of increased decision-making responsibility on the way a plan is implemented but on the quality of the decisions made as well. One can only speculate to what extent each has contributed to the plethora of contradictory findings. But it
appears to be another potentially valid and important explanation for the differences which appear in the results of a variety of studies.

**Purposes of the Study**

The purpose of the study was to determine the effects on productivity of extending certain decision-making responsibilities to the members of laboratory groups. However, interests in this experiment centred on the effects on fidelity of plan implementation and the exercise of options provided by the plan. Consequently the experimenter attempted to control the qualities of plans between decision-making and non-decision-making groups. It would, at best, have been impractical, and, at worst, impossible to have attempted to investigate all possible distributions of manager-employee decision-making responsibility, all levels and kinds of decisions and all stages of the decision-making process. Thus the experimenter was faced with the need to select from this very large set of alternatives. A specific kind of decision was selected--how to perform a particular task. In terms of the schema of organizational decision-making presented earlier, this was a "medium" level decision, above the level of 'ad hoc' decisions but certainly below the level of policy. Additionally, because it was proposed to present organization members with a single problem, the first two stages of the
decision-making process—identification of the problem and setting of priorities were effectively eliminated. Finally, with respect to the distribution of decision-making responsibilities, the researcher selected one in which decisions were self or group determined, the second in which these were determined outside the group.

Expected Outcomes

The expectations of the experimenter, based on the work of Lowin (1968) and McGregor (1961) were that:

1. Groups involved in decision-making will be more productive than groups which are not involved in decision-making.

2. Groups involved in decision-making will implement their plans with greater fidelity than groups which are not involved in decision-making.

3. The preference of subjects in the experiment will be to perform in groups which are involved in decision-making rather than in groups which are not involved in decision-making.
Chapter II

Following is an outline of the procedures followed in the experiment itself. These include descriptions of the problems solved, treatment procedures for both the experimental and control groups and post-experimental interviews. Both the independent and dependent variables are identified. The types of hypotheses tested, data generated, statistical tests employed and computer programmes utilized are also detailed.

The Experiment

Population

Participants in the experiment were obtained from among students enrolled in the second year of the engineering technologies at the British Columbia Institute of Technology, (B.C.I.T.), where the experimenter was an instructor. Subjects were male and under thirty years of age. They were recruited on a voluntary basis and no payment was involved. Because of the considerable numbers of foreign language students at the Institute, students who had not completed their high school education in Canada were excluded from the experiment on the grounds that they might not be fluent in the language or could possess different cultural backgrounds which might confound the research. Assignment to the two treatment conditions was made on a random basis. Each laboratory group consisted of three persons, also assigned on a random basis. Since the unit of analysis was the group, the
The experiment consisted of thirty groups; fifteen within each treatment condition.

The Problems

The task required each group to engage in problem-solving. The problems involved the assembly of 12 x 12 matrices (Brissey, Fossmire & Hills, 1969) (Figure XV and XVI) from component pieces. These displays were used for a purpose differing from that for which they were originally designed. In the present work they were employed as patterns which could be cut up into component pieces and later reassembled. The task presented to groups was divisible into two distinct sub-tasks, gathering the information necessary to reconstruct the matrix and the reconstruction itself. It was the view of the experimenter, substantiated by a number of trials, that once the necessary information had been gathered at a central location the construction of the matrix would be a fairly straightforward procedure and the number of strategies for accomplishing it appeared limited. The information gathering sub-task was designed so that it could be accomplished in a variety of different ways. To insure a choice of possible solutions certain restrictions and rules were applied to the task.

1. The pieces were located at five "stations" which were separated and removed from the assembly area. (Figure XIV)
2. In addition to the pieces necessary to construct the matrix, there were certain extraneous pieces (ones which did not fit anywhere) and other pieces which did fit into the matrix but which appeared in duplicate. (Complete task sets including duplicate and extraneous pieces are contained in Appendix A.)

3. Subjects were required to move the necessary information from the stations to the assembly area. However they were not permitted to remove the pieces themselves, rather they were provided with blank matrices and marking pens so that duplicates could be made. The duplication included not only the correct shape of the pieces but the correct
placement of the black and white circles as well. Additionally, the pieces of the stations could not be seen from other stations or the assembly area. Nor could the assembly area be seen from the stations. Scissors were provided at the assembly area to cut out and shape duplicate pieces.

4. To aid in the development of, but also to channel methodologies used in, the assembly sub-task, subjects were provided with a wall diagram containing twenty similar matrices. The matrix which they were to assemble exactly matched one of these. A copy of the wall diagram is contained in Appendix E.

The information gathering sub-task essentially involved the sorting and selection of information and the return of this information to a central location. The construction sub-task called for solutions similar to complex jigsaw puzzle assembly.

This task was developed over a period of approximately one year using subjects drawn from the Faculty of Education at the University of British Columbia. It was necessary that the task have several unique properties which were not readily available in existing small group tasks. Naturally it had to have a number of possible approaches to its solution and be reasonably challenging. But equally important, it
Figure XV
Problem 1
Figure XVI
Problem 2
had to offer the possibility of specialization among group members. Additionally, the task had to provide the opportunity for the development of a fairly specific plan which could be followed not only by its developers but also by other groups which had some familiarity with the task. Further, it had to allow for the development of a plan which could be judged by observers to have been implemented by groups either completely faithfully or with lesser degrees of fidelity. Tryouts and modifications of the task were carried out until the experimenter, after consultation with groups of subjects and observers, was reasonably satisfied that these requirements had been fulfilled.

Experimental Procedures

The procedures for both decision-making and non-decision making groups, although parallel, differed in some respects. Decision-making groups were acquainted with the rules of the task and then given a preliminary trial. They were permitted to develop and implement whatever strategy they chose and to amend it as they saw fit. At the conclusion of this preliminary trial, they were then asked to design a plan for gathering the information which would be more efficient than that used in the previous attempt, could be easily followed by another similar group and which they themselves could apply to a similar but slightly different task. The group
was then asked to implement its plan. Productivity was measured by the time required to successfully complete the task.

For decision-making groups no productivity measures were taken until the second attempt at the task. This occurred for two reasons. First, it was felt that subjects required some experience with the task to be able to make meaningful judgements concerning its solution. Secondly, one of the advantages of delegating decision-making responsibility is the flexibility it provides. In order for this potential to be more fully realized, it appeared necessary that each group have a chance to select and amend procedures sufficiently before being locked-in to a plan.

Non-decision-making groups were also given a preliminary attempt at the task. In this trial virtually all decisions concerning the procedures to be used rested with the experimenter. The purpose of this phase was to acquaint subjects with the difficulties of the task, but also to put them in a position that they could have made some meaningful decisions concerning how to approach the task, had they been called upon to do so. Additionally, it was designed to help set up an "organizational climate" distinctly different from that experienced by the decision-making groups. As in the other treatment conditions, no productivity measures were taken until the second attempt at the task.

At the conclusion of the preliminary trial, non-decision-
making groups were then asked to implement another plan for accomplishing the task which the experimenter felt was more efficient. The plan which the group actually implemented was that developed by a corresponding group of decision-makers. Once again productivity was measured by the time required to successfully solve the problem.

Tryouts have demonstrated that the gathering and sorting of information required the bulk of the time required to solve the problem. Thus a plan which made provision for attempting to identify redundancies or extraneous pieces, or both, before the information was transferred, had the potential of reducing the time. The word potential is used here in recognition of the fact that any plan may specify an initial attempt to identify redundancies, but it will only reduce the time if the redundancies can actually be identified. (It should be emphasized that any plan employed during the experiment contained only statements concerning what procedures to follow in organizing to solve the problem and not substantive information on how to solve the problem itself. Thus if the plan contained, for example, a directive for one member of the group to visit all stations to attempt to identify extraneous pieces but not specifically how to identify them i.e., they are cut differently.)

When each group had completed the experimental operations, a brief post-experimental information gathering session was
held. Its purpose was to obtain some additional data which might extend the productivity data derived from the experiment itself. In this part of the procedures subjects in both treatment conditions were made aware of the other treatment condition. In the case of decision-making groups, subjects were told that other groups were working with plans provided by the experimenter. They were then shown a videotape of the experimenter outlining a plan to a group. Following the tape, they were asked to choose which condition they would prefer to work under for a second test session. In addition, they were asked the reasons behind their choice and whether they would prefer a similar condition in a job they might occupy upon graduation from B.C.I.T.

For non-decision-making groups the procedure was identical except that subjects were shown a videotape of a group designing its own plan. Once again they were asked to choose their preferred condition for a second test session, the reasons for their choice and a preferred condition for a job they might occupy upon graduation.

Once these data were collected, subjects were informed that there would be no second test session. Subjects were then apprised of the purposes of the study and were asked not to discuss the study with their fellow students. Additionally, it was promised that once the results had been analysed, subjects would be welcome to a copy of the report.
By following this procedure, it was assured that both groups in a matching pair would have identical plans to implement. Whether or not one or both implemented their plans with fidelity was, of course, quite another question.

Control Procedures

It was important to the success of this experiment to be as certain as possible that both decision-making and non-decision-making groups had an equal understanding of both the problem and the plan to be implemented.

With respect to knowledge and understanding of the plan, an attempt was made to have the treatments as closely parallel as was possible. Thus while decision-making groups were able to design a plan for the preliminary trial, non-decision-makers followed a plan of comparable quality. Pre-testing showed that decision-making groups could invariably improve their performance times on the second task. To make the two treatment conditions parallel, the initial plan provided for non-decision-making groups had to be of sufficiently low quality that the plans used by these groups for the second task would also lead to improved performance times. Hence, the initial plan for the non-decision-making groups specifically provided that all pieces be duplicated and brought to the assembly area before the assembly sub-task was commenced.

Also critical to the success of this experiment was a
reasonable degree of confidence that both decision-makers and non-decision-makers had an equal knowledge and understanding of the plan itself. To facilitate this, careful review procedures were developed so that both the experimenter and the subjects were aware of what steps were involved in the plan. Once a decision-making group had developed its plan, the members were required to outline the steps involved to the experimenter, who then recorded them. As a double check, the experimenter would then read back the steps. He would then ask "Is that correct?" If any modifications were required, they were made at this point. Each group was permitted to retain a copy of the plan.

Non-decision-making groups were given a careful outline of the steps of the plan, developed by the matching decision-making group, which they were to follow. Any problematic steps were clarified by discussion between the subjects and the experimenter. As a final check, the group members were then asked to outline the plan they were to follow, as they understood it. Any modifications or corrections were made at this point. Once again, each group was permitted to retain a copy of the plan.

To control for understanding of the task each group was allowed two attempts at similar tasks. As mentioned previously, the first trial was designed to acquaint subjects with the difficulties associated with task solution. Even though
the treatments differed, it was felt that one trial was sufficient to provide subjects in either treatment condition with a reasonably thorough knowledge of the difficulties involved. This assessment was based on the information provided by subjects in the pre-testing sessions.

Finally, the evaluation of the degree of fidelity of implementation proved a somewhat more difficult assessment to make. Because each plan developed by decision-making groups was unique, the steps tended to differ from one plan to the next. Additionally, some steps were obviously more critical to the success of an individual plan than others. Thus observers were required to make a somewhat subjective evaluation, "as objectively as possible," as to how faithfully each group had implemented its plan. This was accomplished through the use of two independent observers. The observers were brought in, once the plan had been either developed by or delivered to the group and given copies of the plan to be implemented. It was their task to judge, on a ten point scale, how faithfully the plan had been implemented. The observers were unaware whether they were observing decision-making or non-decision-making groups, in fact observers were unaware of the experiment's hypotheses. A complete outline of procedures used by the observers is contained in Appendix C.
The independent variable was the distribution of decision-making responsibility. It was dichotomized into decision-makers, in which groups were permitted to design their own plans and non-decision-makers, in which a plan was provided for each group. Certain aspects of the independent variable proved impossible to control. To delegate decision-making responsibility is one thing, to have group members participate equally in all decisions is quite another. Additionally, it appears that a broad distinction can be made between decisions about how to perform the task and "housekeeping" decisions or decisions about the decision-making process itself. Thus once decision-making responsibility was delegated to a group, the way in which it became structured was outside the control of the experimenter. Pilot study tryouts showed that in certain instances, the "ideal" condition of all three members participating equally in the decisions occurred. In others, one member or possibly two appeared to dominate. It was originally intended that some measures of this process would be kept but it proved too difficult to carry out. As suggested earlier, it may be that having the opportunity to participate without actually doing so has as profound an effect as actually participating in the making of decisions. Thus the evaluation of this aspect of the decision-making process was necessarily abandoned.
The Dependent Variable

The dependent variable was that of group performance. It was measured by the time required to successfully complete the problem. Obviously this was only one possible measure of performance. It could be argued that for certain tasks this measure is not the most appropriate. For example, in the manufacture of expensive electronic equipment, performance time may be secondary to freedom from error. Time to successful completion reflects the time necessary to correct errors but because of the many different types of possible errors and the different locations at which they could be committed it was deemed impractical to keep an accurate error count.

A subsidiary interest of the experimenter was choice of condition for a proposed second test session. This information was gathered during the post-experiment interview sessions.

Questions to be Answered and Hypotheses to be Tested

The experimenter sought evidence to support the contention that the downward distribution of decision-making responsibility improves group productivity. Assuming that the quality of plans was effectively controlled, any hypothesized difference could have occurred in two ways. There were fidelity of plan implementation and/or the exercise of options provided by the plan. The basic question of the whole study
remained "Are decision-making groups more productive than non-decision-making groups?" The argument developed by this writer, based on the works of Lowin (1968) and McGregor (1961), was that they would be. Therefore the following substantive hypothesis was tested.

Hypothesis 1: Decision-making groups will be more productive than non-decision-making groups.

To have rejected or failed to reject this hypothesis would have added information over and above what has been provided by a variety of studies discussed earlier. By controlling one possible source of difference, the quality of the plan, it was possible to ascertain whether having decision-making responsibility affected fidelity of plan implementation and/or the exercise of options provided by the plan. Since a matched decision-making group and a non-decision-making group possessed the same plan, it became possible to test empirically the hypothesis, advanced by Lowin, that involvement in decision-making puts pressure on members to conform to prior commitments. Thus the second substantive hypothesis was:

Hypothesis 2: Decision-making groups will implement their plans with greater fidelity than non-decision-making groups.
Whether or not this hypothesis was rejected, it would have provided additional information concerning the effects of decision-making responsibility. If there were no differences in fidelity of implementation, it would be necessary to look elsewhere for factors differentially influencing productivity. If there were differences, this alone might account for differences in productivity. However differences would have been just that, and there would be little point in going on to subsequent questions.

In the event that both groups implemented with not only equal but a high degree of fidelity, it would have been possible to attribute differences in productivity to factors other than fidelity, namely, performance characteristics not specified in the plan—the area referred to earlier as optionality. Further, it would have been possible to make some guesses about the way these options were exercised.

Finally, if membership in decision-making groups was capable of satisfying higher order needs (and each subject recognized this) then one would expect that, given the choice, subjects would select membership in decision-making groups rather than non-decision-making groups for a second test session. The third substantive hypothesis then was:

Hypothesis 3: More subjects will choose to work in decision-making groups than non-decision-making groups for a second test session.
Pretesting

Twelve groups were put through the final form of the problem during the 1971 summer session at the University of British Columbia. These included ten groups of decision-makers and two groups of non-decision-makers. Owing to the difficulty of obtaining subjects, considerable departure was made from the strict population control which was used in the actual experiment. Subjects reported the task to be challenging. The time for complete test sessions ran between forty-five and sixty-five minutes.

For the decision-makers times ranged from 10 to 21 minutes, with a mean of 14 and a standard deviation of 2.91. With a more homogeneous population it was expected that this range of performances would be somewhat reduced.

Pretesting demonstrated the feasibility of transferring the plan developed by the decision-makers to non-decision-makers and of evaluating, with reasonable accuracy, the degree of fidelity of plan implementation.

Scripting

To standardize treatments as much as possible, scripts were employed wherever possible. This included scripting not only during the experiment itself but for the soliciting of subjects and post-experiment data gathering as well. A complete set of scripts for both decision-makers and non-decision-
Post-experiment Data Gathering

Brief interviews were held with subjects individually following each test session. These interviews were carried out by the observers as it was felt that the presence of the experimenter might inhibit the comments which subjects might make. The interviewers sought to obtain three kinds of information.

1. The choice of condition (decision-making or non-decision-making) which the subject preferred for a second test session.
2. The reasons behind the choice.
3. A choice of condition which subjects would prefer in a position which they might occupy upon graduation from B.C.I.T.

Analysis of the Data

The data provided was of four distinct types. These included productivity data, two kinds of choice data and interview data relating to reasons for choice.

Productivity data were to be analyzed through the use of the t-ratio for matched observations. Since each pair of groups used the same plan, times recorded by non-decision-making groups were not independent of times recorded by
decision-making groups (Senter, 1969)

Although the experimenter tested directional hypothesis, it was not felt that the use of one-tailed tests could be justified either on a theoretical basis or as a result of the empirical findings of other studies. Additionally it was felt that a one-tailed test greatly enhanced the chances of an Alpha error.

The level of confidence selected for rejection of the null hypothesis was (.05). Since only a single variable distribution of decision-making responsibility was being examined, other sources of variance were hopefully randomized. However it was felt that the higher (.01) level of confidence, too greatly increased the chances of missing real differences between the groups. A $t$ value for paired comparisons was computed by the University of British Columbia Pair C programme. This programme also provided means and standard deviations for each treatment condition.

Fidelity of Implementation Data were analyzed by means of the Sign Test. (Siegal, 1956) The rating used in this study was at best a partially ordered scale, thus the information contained in the ratings were expressed by a sign. It was possible to rank with respect to each other the fidelity of implementation of the two groups in each pair. For the same reasons as those expressed in the previous section, the experimenter selected a two-tailed test and a level of confidence
Choice Data. The Analysis of these data required a two-step operation. Although one of the hypotheses guiding the study concerned the choice of subjects for a second test session, it should be pointed out that selection of one or the other experimental condition could have been influenced by at least two factors (a) a generalized preference for one or the other condition; or (b) their particular experience in the condition to which they were assigned. It seemed unlikely that a one-hour laboratory experience would significantly influence generalized preference. Consequently it was decided to test for independence between treatment and choice for a second test session, and treatment and choice for a possible position to be occupied upon graduation from B.C.I.T. If these were independent it would have been possible to combine choice data for both treatment conditions. Combined choice data could then have been analyzed in a two-cell table. Tests for independence utilized the Chi-square technique, casting treatment against the two choices. Additionally, Guttman's Lambda was computed to measure the strength of association. (Freeman, 1965)

These measures of predictive association form a useful adjunct to the tests given by X² method. When the value of X² turns out to be significant one can say with confidence that A and B are not independent. Nevertheless, the significance level alone tells almost nothing about the strength of the relationship. Usually we want to say something about the predictive strength of the relation as well. (Hays, 1965, 610)
If possible, it was planned to analyze the combined choice data by means of the Chi-square technique, for a simple two-cell table. Levels of confidence for rejection of the null hypothesis were once again (.05). Both Chi-square and Guttman's Lambda were computed by means of the University of British Columbia--MVTAB.

Interview Data Related to Choices. Realizing the shortcomings of introspective data related to choice, it was not planned to submit these data to rigorous statistical analysis. Rather, it was assumed that the data would suggest some aspects of the experimental or real life situations which appeared to condition choice.
Chapter III

The results of the experiment are reported. Non-decision-making groups were significantly more productive than decision-making groups. There was no difference in the fidelity of implementation between the two groups. With respect to choice of condition for a second test session, both groups chose significantly in favour of the non-decision-making condition. None of the three experimental hypotheses were confirmed.

Results

Productivity

The performance times of both decision-making and non-decision-making groups are listed in Table 4. For the decision-makers, mean performance time was 13.84 minutes and with a $\sigma$ of 2.99. For non-decision-makers, mean performance time was 12.84 minutes with a $\sigma$ 2.53.

Hypothesis 1: Decision-making groups ($P$) will be more productive than non-decision-making groups ($\bar{P}$).

The calculated $t$ value for paired comparisons was 2.73 (degrees of freedom = 14). A value of 2.15 is required for significance at the .05 level for a two-tailed test. This permitted rejection of the null hypothesis, the actual level of confidence being .02. However differences were not in the direction predicted by the experimenter.

Fidelity of Plan Implementation

Hypothesis 2: Decision-making groups will implement their plans
Table 4
Performance Times of Matched Groups Under Decision-Making and Non-Decision-Making Treatment Conditions

<table>
<thead>
<tr>
<th>Decision-Makers</th>
<th>Non-Decision-Makers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group No.</td>
<td>Performance Time (Minutes)</td>
</tr>
<tr>
<td>01-1</td>
<td>13.68</td>
</tr>
<tr>
<td>02-1</td>
<td>15.18</td>
</tr>
<tr>
<td>03-1</td>
<td>11.18+</td>
</tr>
<tr>
<td>04-1</td>
<td>16.67</td>
</tr>
<tr>
<td>05-1</td>
<td>9.58+</td>
</tr>
<tr>
<td>06-1</td>
<td>15.97</td>
</tr>
<tr>
<td>07-1</td>
<td>14.37+</td>
</tr>
<tr>
<td>08-1</td>
<td>16.73</td>
</tr>
<tr>
<td>09-1</td>
<td>11.95</td>
</tr>
<tr>
<td>10-1</td>
<td>13.55</td>
</tr>
<tr>
<td>11-1</td>
<td>18.30</td>
</tr>
<tr>
<td>12-1</td>
<td>10.97</td>
</tr>
<tr>
<td>13-1</td>
<td>8.92+</td>
</tr>
<tr>
<td>14-1</td>
<td>18.13+</td>
</tr>
<tr>
<td>15-1</td>
<td>12.37+</td>
</tr>
</tbody>
</table>

+ indicates superior productivity in matched pair.
with greater fidelity than non-decision-making groups.

The fidelity of implementation was to be compared through the use of the Sign Test. Two observers' ratings of fidelity of implementation produced only one difference in rating. Observers gave all decision-making groups a perfect score of ten. For the non-decision-makers, observers gave all groups a similar score with one exception. In this instance, one observer gave a perfect rating of ten but the other gave a fidelity rating of only nine. Thus for the sixty ratings, only one produced a signed difference. Calculation of a probability value in the sign test requires a minimum of five signed differences. (Hays, 1965) Thus the calculation was meaningless and the null hypotheses could not be rejected.

Of considerable importance was the finding that all groups had implemented their plans with not only equal, but with a high degree of fidelity. Although the rating scale was only a partially ordered scale, observers gave all groups a rating of perfect fidelity with the one exception discussed above.

Choice

Hypothesis 3: More subjects will choose to work in decision-making groups ($P_1$) than non-decision-making groups ($\overline{P}_1$) for a second test session.
As discussed in the previous chapter, the experimenter was interested in discovering whether choice for a second test session was conditioned by (a) a generalized preference for one or the other structure (b) their experience in the treatment which they had undergone (c) or both.

Two measures of independence were computed between treatment and choice of condition for a second test session. These were a Chi-square, with Yates correction, and a Guttman Correlation of Predictability. (Freeman, 1965 and Hayes, 1965) Treatment and Choice for a second test session are cast in Table 5. The vertical and horizontal percentages are expressed in Tables 6 and 7.

Table 5
Treatment Conditions and Choice of Condition
For a Proposed Second Test Session

<table>
<thead>
<tr>
<th>CHOICE</th>
<th>$P_1$</th>
<th>$P_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P$</td>
<td>16</td>
<td>29</td>
</tr>
<tr>
<td>$P_2$</td>
<td>12</td>
<td>33</td>
</tr>
</tbody>
</table>

28 62 90
Table 6
Treatment Conditions and Choice of Condition for a Proposed Second Test Session Expressed as Horizontal Percentages

<table>
<thead>
<tr>
<th>CHOICE</th>
<th>$P_1$</th>
<th>$\bar{P}_1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P$</td>
<td>35.56%</td>
<td>64.44%</td>
</tr>
<tr>
<td>$\bar{P}$</td>
<td>26.67%</td>
<td>73.33%</td>
</tr>
</tbody>
</table>

|         | 31.11% | 68.89% | 90 |

Table 7
Treatment Conditions and Choice of Condition for a Proposed Second Test Session Expressed as Vertical Percentages

<table>
<thead>
<tr>
<th>CHOICE</th>
<th>$P_1$</th>
<th>$\bar{P}_1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P$</td>
<td>57.14%</td>
<td>46.77%</td>
</tr>
<tr>
<td>$\bar{P}$</td>
<td>42.86%</td>
<td>53.23%</td>
</tr>
</tbody>
</table>

|         | 28.00  | 62.00   | 90  |
A Chi-square value of .47 (df = 1) was calculated. A value of 3.84 is required for significance at the .05 level of confidence. Thus the null hypothesis could not be rejected. The probability of such a value is actually .50. Guttman's Lambda was calculated as .05 and had a probability of .94. Thus it appeared that treatment and choice of structure for a second hypothesized test session were unrelated.

It was then possible to combine choice data for both treatment conditions. Choice data for a proposed second test session are contained in Table 8. Expected frequencies were calculated on the basis of equal probability.

<table>
<thead>
<tr>
<th>Table 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choice of Treatment Condition for a</td>
</tr>
<tr>
<td>Second Proposed Test Session</td>
</tr>
<tr>
<td>$P$</td>
</tr>
<tr>
<td>28</td>
</tr>
<tr>
<td>(45)</td>
</tr>
</tbody>
</table>

A Chi-square value of 12.84 (df = 1) was computed. A value of 3.84 is required for significance at the (.05) level of confidence. This permitted rejection of the null hypothesis $P < .001$. However inspection shows that choice was not in the direction predicted by the experimenter.
Although no hypothesis testing was involved, choice data for a position which subjects might hold upon graduation from B.C.I.T. were subjected to similar analyses. Two measures of independence were computed between treatment and choice of condition for a position after graduation. These were a Chi-square and a Guttman Correlation of Predictability. Both Treatment and Choice are cast in Table 9. The vertical and horizontal percentages are expressed in Tables 10 and 11.

Table 9
Treatment Conditions and Choice of Condition for a Position After Graduation

<table>
<thead>
<tr>
<th>CHOICE</th>
<th>( P_2 )</th>
<th>( \bar{P}_2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P )</td>
<td>21</td>
<td>24</td>
</tr>
<tr>
<td>( \bar{P} )</td>
<td>14</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>55</td>
</tr>
</tbody>
</table>
Table 10
Treatment Conditions and Choice of Condition for a Position after Graduation Expressed Horizontal Percentages

<table>
<thead>
<tr>
<th>CHOICE</th>
<th>$P_2$</th>
<th>$\bar{P}_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P$</td>
<td>46.67%</td>
<td>53.33%</td>
</tr>
<tr>
<td>$\bar{P}$</td>
<td>31.11%</td>
<td>68.89%</td>
</tr>
<tr>
<td></td>
<td>38.89%</td>
<td>61.11%</td>
</tr>
</tbody>
</table>

Table 11
Treatment Conditions and Choice of Condition for a Position after Graduation Expressed Vertical Percentages

<table>
<thead>
<tr>
<th>CHOICE</th>
<th>$P_2$</th>
<th>$\bar{P}_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P$</td>
<td>60.00%</td>
<td>43.44%</td>
</tr>
<tr>
<td>$\bar{P}$</td>
<td>40.00%</td>
<td>56.36%</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>55</td>
</tr>
</tbody>
</table>
A Chi-square value of 1.68 (df = 1) was calculated. A value of 3.84 is required for significance at the (.05) level of confidence. The null hypothesis could not be rejected. The probability of such a value is actually .19. Guttman's Lambda calculated as .09 with a probability of .94. Thus it appeared that treatment and choice of condition for a position after graduation were unrelated.

It was then possible to combine choice data for both treatment conditions. Choice data cast in Table 12. Expected frequencies were calculated on the basis of equal probability.

Table 12
Choice of Condition for a Position which Subjects Might Hold Upon Graduation from B.C.I.T.

<table>
<thead>
<tr>
<th>CHOICE</th>
<th>P</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>35</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>(45)</td>
<td>(45)</td>
</tr>
</tbody>
</table>

A Chi-square value of 4.44 (df = 1) was computed. A value of 3.84 is required for significance at the (.05) level of confidence. This permitted rejection of the null hypothesis P < .05. However inspection shows that choice was in favour of a non-decision-making condition.
Chapter IV

The difference in productivity between treatment conditions is attributed to the differential exercise of options provided by the plan. Some speculation is carried on for possible reasons why this occurred. The experiment and some of the auxiliary assumptions are re-examined. Implications for both theory and for further research are reviewed.

Discussion of the Results

The difference in the productivity of decision-making and non-decision-making groups, although significant at the (.02) level, did not support the hypothesis that involvement in decision-making would improve productivity. The mean difference of 1.00 minutes, not large in absolute terms, represented a mean percentage difference of some 7.78%.

In the opinion of observers, there was no significant difference in the fidelity of plan implementation between the two groups. Once again, the hypothesis of the experimenter, that decision-making groups would implement their plan with greater fidelity than non-decision-making groups, was not confirmed. Additionally, observers rated both groups as achieving near perfect fidelity, an unexpected finding given the hypothesis.

To sum up, the experimenter conducted a study in which neither of the substantive hypotheses related to productivity were confirmed.
The most obvious source of difference in productivity may have been sampling differences. Assuming that this was not the case it is then possible to identify where these differences occurred, using the concept of plan developed in the first chapter. It may be recalled that productivity was viewed as a function of the quality of the plan, the fidelity with which it is implemented and the manner in which options permitted by the plan are exercised. In this particular experiment, the qualities of the plans appeared to be effectively controlled. Further, groups were judged to have implemented their own plans or the plans given to them with near perfect fidelity. Presumably therefore, differences in productivity must have occurred as a result of the way decision-making and non-decision-making groups differentially exercised the options provided by the plan. That is, non-decision-making groups may have either devised more efficient procedures e.g., for detecting extraneous items, for cutting patterns, or simply worked faster or committed fewer errors.

It may also be recalled that options provided by the plan may be exercised with respect to human, non-human or organizational resources. However in this particular experiment, where the range of available non-human and organizational resources was constrained, it can be concluded that the major contributor to productivity differences lay in the area of human resources e.g., the decision-makers worked
more slowly or committed a greater number of errors. The term "major contributor" is used here in recognition of the fact that some "slippage" is bound to occur because no plan is completely specific. The plans generated by decision-making groups were sufficiently abstract not to preclude the possibility of some differences in either non-human or organizational resources.¹

With respect to the measure of productivity, time to successful completion, the mean performance time of non-decision-making groups was 1.00 minutes less than for decision-making groups, not a large difference in absolute terms. Neither the experimenter nor the observers could detect anything consistent in the behaviour of groups in either treatment condition which could account for this difference.

For example, one group may have moved more quickly from station to station gathering information than their matched counterparts. Other things being equal, one could expect the

¹An example of a plan used by one matching pair of groups is listed below.

**Plan**

1. To proceed one station at a time—all members begin at station #1.
2. As one station is completed move onto next.
3. Try to identify duplicate pieces as we move along or possible "no fits."
4. When the last station is in progress whoever is free first can start cutting out the pieces.
5. All work to put the puzzle together.
faster moving group to be more productive. Similarly, one group may have worked in a relatively error-free fashion while their matched counterparts did not. The time required to correct errors must increase the time to successful completion, other things being equal.

Had it been practical to videotape each of the test sessions and apply event analysis to the tapes, a behaviour pattern or patterns may have been identifiable. Conversely, differences may have been so subtle or interactions so subtle that such an analysis would also fail to reveal clear differences. Thus the experimenter is left to conclude that the exercise of options need not be restricted to a single behaviour, but rather a range of possible behaviours such as those suggested above, some or all of which may be operative at the same time.

The question then is—"Why were non-decision-making groups more productive?" It would appear that explanations fall into two or possibly three general categories. The first is related to the experimental procedures themselves and the possibility that some bias was unintentionally introduced into the experiment which would account for the difference. (Campbell and Stanley, 1966)

The second deals with the correctness of the theory itself, or the hypotheses and auxiliary hypotheses derived therefrom. Here the most obvious explanation would be that the theory is
simply incorrect. That involvement in decision-making does not satisfy a greater number of higher order needs and, as a consequence, does not lead to greater productivity. Obviously it would be difficult to discount the theory on the basis of a single experiment, with so much experimental evidence to the contrary. However it does appear useful to examine some of the auxiliary hypotheses. As Hemphill suggests

If a particular way of testing a hypothesis H presupposes auxiliary assumptions $A_1, A_2, \ldots A_N$--i.e., if these are used as additional premises in deriving from $H$ the relevant test implication $I$--then as we saw earlier, a negative test result, which shows $I$ to be false, tells us only that $H$ or one of the auxiliary hypotheses must be false and that a change must be made somewhere in this set of sentences if the test result is to be accommodated. A suitable adjustment might be made by modifying or completely abandoning $H$ or by making changes in the system of auxiliary hypotheses. (Hempel, 1966, 28)

Finally, there exists the possibility of factors in both areas intruding into the relationship between involvement in decision-making and productivity. It is therefore proposed to discuss factors surrounding the experiment which could have contributed to the result and then to discuss in subsequent sections alterations which might be made in either experimental procedures and/or the theory itself.

Some Possible Causes of Difference in Productivity

One such source of difference may lie in the charges given subjects in each of the treatment conditions. It will be recalled that non-decision-making groups were required to
implement, to the best of their ability, a plan supposedly developed by the experimenter. Their responsibility entailed solving the problem using a pre-designed method. Productivity is determined by the effectiveness of the plan, the fidelity of plan implementation and behaviour not specified in the plan. On the one hand, subjects in non-decision-making groups had control over how faithfully they implemented the plan and other behaviours not specified in the plan. However responsibility for the quality of the plan lay elsewhere. On the other hand, decision-making groups were required to design a plan and then implement it to the best of their ability. In these cases, productivity was determined not only by their fidelity of implementation and the exercise of options, but by the quality of the plan which they had developed. In the former case, subjects may have perceived themselves as being evaluated in terms of productivity only. In the latter case, they may have perceived themselves as being evaluated both in terms of productivity and the effectiveness of the plan which they had developed, as well as their own ability to carry it out.

What effect could this have on productivity? Decision-making groups appeared to have a double responsibility first in terms of the development of a plan and second its implementation. Thus it may be that having responsibility for both processes brings about a "trade-off," deliberate or
unconscious, between speed and what might be described as deliberateness. That the implementation of their own plan induces subjects to hesitate, to be more deliberate, to "make sure" that the quality of their plan is not obscured by error—that they can, as a matter of fact, make their plan work. Since the mean difference being discussed here is only 1.00 minutes, even small hesitations on the part of subjects could account for differences in productivity.

Decision-making groups were clearly charged with developing a product, in this case a plan. It could be considered a group product whether or not all group members participated actively in its design. By agreeing to the plan, either explicitly or tacitly, by not attempting to modify or block the plan group members may be considered to have been involved in its development. This differs from non-decision-making groups where the plan appeared clearly to be the product of the experimenter.

How could this account for differences in the exercise of options? As a result of involvement in the development of the plan, it may be that the subjects in decision-making groups would have a propensity to monitor other member's activities. To compare what they are doing with what other group members are doing and to verify that it is in accordance with the plan itself. Additionally, when presented with the opportunity to pursue a range of possible behaviours, unspecified
in the plan, they may even in this instance have a tendency to "check back" with other members of the group. This need not be specific approval seeking but merely a tendency to continue the practice established earlier to stop and consider alternatives.

In non-decision-making groups, where interaction was primarily between the experimenter and the individual subjects, interest in what others are doing may be less likely to develop. Additionally, members of the group have only one person with whom to "check back," the developer of the plan, in this case, the experimenter. Although no one in either treatment condition specifically asked "Is this what I do next?", it does not mean that the more subtle forms of hesitation, suggested above, did not take place.

A third possibility is that members of decision-making groups were more uncertain concerning the performance of the task and, as a consequence, tended to proceed more slowly, i.e., work more deliberately. Although groups in both treatment conditions were placed in novel situations it could be argued that non-decision-making groups were provided with more direction i.e., placed in a more "structured" situation. If a greater degree of structure serves to reduce uncertainty, increase confidence, etc., then it appears possible that this could explain greater productivity on the part of non-decision-making groups.
What have been offered here are three alternative explanations of what might have happened. Obviously they are highly speculative in nature. However it now appears appropriate to re-examine the experiment to determine whether certain factors can be identified which would serve to support any or all of these explanations or even to suggest other possible alternatives.

The Experiment Re-examined

Soliciting Subjects

It was suggested earlier that by soliciting subjects on a voluntary rather than compulsory basis, the test population would more likely be composed of subjects who possessed a "need for independence." That is, they would want to be involved in decision-making. Terms such as "need for independence," direction seeking" and "authoritarian" are used here in a very restricted sense. They apply to the need either to be relatively free from or subject to the dictates of higher authority or conversely perhaps to exercise responsibility. That is, freedom to determine strategies related to their work by themselves or in concert with their peers, or to have these determined by their "superiors." In view of the expressed preference for the non-decision-making condition, it is possible that just the opposite was true. Since the
experimenter was an instructor of B.C.I.T., many of the subjects were students in his classes and for those who were not, the fact that he was an instructor was well-known. Thus it may be that subjects who agreed to participate had an orientation toward dependent behaviour, at least compared to the population as a whole, from which subjects were drawn. They may have experienced difficulty saying "No" to an authority figure.

Vroom (1960) found that involvement in decision-making was related both to attitudes toward the job and to performance. Additionally, he discovered that those who were more authoritarian responded less favourably to involvement than those who had a greater "need for independence." Vroom discusses performance as an attitudinal or motivational matter but it could also be affected in another way. It might reasonably be expected that if soliciting procedures had selected subjects who preferred to be directed, then the double charge given to the decision-making groups might make subjects more cautious and, as a consequence more deliberate, than the single charge given to non-decision-making groups. If subjects in the decision-making condition were inclined to be more hesitant, then this could account, at least in part, for the difference.

In the same vein, if subjects were inclined to be "direction seeking," then the decision-making condition may have
forced them to do what they would rather not--make decisions. Although this "mismatch" condition need not necessarily have a "de-motivating" effect (Katz, et al., 1950) there is abundant evidence to show that it might (Ronan, 1970).

The Experimenter as an Expert

The fact that the experimenter was a doctoral student at the University of British Columbia was well-known among subjects. Thus he may have been viewed as an "expert" in the solution of the type of problem used here. In fact, ten subjects revealed this in post-experiment interviews. Consequently it may be that members of decision-making groups saw their plans as being evaluated against what the "expert" might generate. Once again one might expect more deliberate behaviour on the part of members of decision-making groups. Furthermore non-decision-making groups might well have assumed that they had a good plan and focussed their attention on speed and accuracy of implementing the plan, particularly when, for them, those would be the most obvious (perhaps only) grounds for being evaluated by the experimenter. Thus, while the decision-making groups may or may not have been more deliberate, the non-decision groups may have had more reason to work rapidly.
Task and Situational Novelty

The selection of a task for laboratory research poses an interesting and difficult problem. Choosing between novel tasks and tasks more familiar to the subjects may be critical. In this experiment subjects were drawn from several areas of study within the engineering field, making it extremely difficult to select a task which would have been equally unfamiliar to all. This procedure runs the risk of inadvertently introducing another variable to the study. Weick suggests

A person who is in an experiment, like the newcomer on the job, often has low confidence in his judgments, is easily influenced, misunderstands instruction, is uninformed, finds the job novel or interesting, is cautious and tolerates many demands that would anger him in more familiar settings. Many of these behaviours dissipate as he comes more accustomed to the assignment. (Weick, 1967, 47)

In this study, pains were taken to insure both that the task was novel and that all groups had an equal opportunity to become familiar with it. How much time would be required to make subjects confident, comfortable and familiar with the task remains an unknown. However, in response to the question concerning preferences for a position which might be held upon graduation from B.C.I.T., subjects significantly preferred the non-decision-making condition. Closer questioning by the interviewers revealed that a dozen subjects put a time limit and qualifications upon their choice. That is, some subjects preferred to be directed initially, but once they were
familiar with what was to be done, would prefer some decision-making responsibility. This raises the question of whether subjects were generally confident, etc., in this particular laboratory situation. If they were not they may have been more inclined to seek direction from someone else, in this case, the experimenter and to feel more comfortable when this direction was provided. Thus one might expect more uncertainty, lack of confidence, deliberateness, etc., in decision-making groups possibly manifest in the sort of behavior which could account for the differences in the time required to complete the task (productivity).

Assumptions Concerning the Nature of the Test Population Re-examined.

In addition to some of the possible determinants of differences discussed above, some of the assumptions made concerning the nature of the test population should be re-examined in the light of evidence from the experiment itself and from an outside source. It was assumed that a young, professional group would be more likely to want to be involved in the decision-making process. (Kornhauser, 1962) The choice made by subjects for a second test session was significantly in favour of membership in non-decision-making groups. If this were the sole piece of evidence available, it could be argued that this occurred because of something unique in the experiment itself. However in response to a question about preferred
Some additional evidence, taken from a study by Dennison, et al. (1972), appears to be consistent with this point of view. In a study of the impact of community colleges, the authors sampled seven-thousand students from B.C.I.T., ten community colleges and the four subgroupings of Vancouver City College including Langara Special Programmes, Art School and the Vocational School. Contained in the questionnaire were three questions which appear to bear on the idea of preference for or against involvement in decision-making.

The first question posed to students was "Do you prefer assignments which are definite or ones in which things are left largely or completely to your own initiative?" Of the B.C.I.T. students 61.3% prefer definite assignments, tying for the highest percentage among the populations sampled. Additionally, the percentage of 38.6% who preferred that it be left to students, ranked second lowest among responding groups. If this can be accepted as a measure of desire for decision-making responsibility related to one's work, then it would appear that B.C.I.T. students may be more inclined to seek direction compared to other populations sampled and in the context of their roles as students in educational organizations.

A similar question, concerning control, was also posed. "Should students participate in the control and organization
of courses, academic policy decisions and matters of this sort?" The B.C.I.T. students, who responded affirmatively, represented 42.9% of that population. In this they ranked second lowest or fourteenth out of a possible fifteen. The percentage of B.C.I.T. students who responded negatively composed 22% of that population, the highest percentage among all the groups of students sampled.

Even more revealing were the responses to a third question. "Which of the following statements comes closest to your own view?" (a) Students should be given very great freedom in choosing their subjects of study and in choosing their own areas of interest within those subjects; (b) There is a body of knowledge to be learned and the faculty is more competent than the student to direct the student's course of study through required courses, prerequisites, and the like." The percentage of B.C.I.T. students who selected the statement that students should have freedom was 30.5%, by far the lowest of any of the populations sampled. Reciprocally, the percentage who selected the statement that the faculty should direct was 69.5%, the highest of any of the population groups.

This is not to suggest that there is a one-to-one correspondence between the questionnaire responses and the degree to which subjects wished to be involved in decision-making. However, if these responses can be taken as an indication of what degree of involvement B.C.I.T. students generally prefer
and/or feel is appropriate, then it seems that this experiment may have dealt with subjects who tended more to be authoritarian, at least with respect to educational institutions and the role of students in decision-making, and relative to some of the other populations sampled by Dennison, et al. It seems quite possible that the experiment was viewed as an extension of the educational context and expectations regarding the preferred role for students would therefore have been a factor in this study. It may be that inadvertently, the experimenter has identified the same phenomenon as Tannenbaum and Allport (1957). That subjects, who in the main prefer the non-decision-making condition, function best in that condition.

It may be reasonable to suggest that if subjects were more inclined to seek direction, then to thrust them into a situation in which, at least in the planning phase, little or no direction was provided may have caused them to behave a little more cautiously, and somewhat more slowly, than would be the case in non-decision-making-groups. Similarly membership in non-decision-making-groups may have provided more of a "match" between the predisposition of the subjects and the greater degree of direction provided in this treatment condition, thereby reducing the inclination to proceed "slowly but surely."
Possible Reasons for the Lack of Difference in Fidelity of Plan Implementation

There appear to be a number of possible contributors to the fact that groups in both treatment conditions implemented their plans with not only equal but high fidelity. At the risk of being somewhat repetitive, it appears appropriate to deal with these in a separate section.

Possible Nature of the Test Population

First, the evidence from the Dennison, et al. (1972) study suggests that the test population may have been one which tended to seek direction. Since this possible factor has been dealt with at length in the previous section, it appears appropriate merely to note its relevancy to the question of fidelity of plan implementation.

Explicitness of Directions Given to Subjects

It may be recalled that directions given to subjects concerning implementation of the plan were rather explicit (i.e., "Whatever plan you devise I would like you to stick closely to it throughout the exercise," or "Once again I would like you to follow the plan closely"). It appears possible that such specific directions for the plan implementation phase of the experiment may have outweighed any effects induced by differences in the plan development phases of the treatments.
themselves. It may also be recalled that it was hypothesized that decision-making groups would, as a result of involvement in decision-making, more faithfully implement their plans. However, with a population which may have sought direction and where some explicit direction was provided for the implementation phase, it may be that this effect could have overridden any effects generated by treatment differences. It could be that with a population of this nature that subjects would have chosen to follow directions closely regardless of the prior treatment.

Task and Situational Novelty

Finally, as Weick (1967) suggests, subjects may be more likely to follow directives in novel situations than they would be in more familiar ones. If, as was proposed earlier, subjects were not sufficiently familiar with either the task or the experimental situation, then one might expect greater adherence to the plan than if this were not the case.

To summarize, it appears that potentially three factors, the nature of the test population, the explicitness of directions in the implementation phase of the experiment and the novelty of the experimental task or the experimental situation may have combined in some way to produce this result. However it should be pointed out that in these instances plans appeared to be sufficiently unambiguous and simple, and
apparently subjects possessed the skills and abilities necessary to implement them. It could be that had the plans been more complex or required higher levels of skills and abilities on the part of subjects, that this result would not necessarily have occurred.

Some General Conclusions Concerning Productivity

In the first chapter it was suggested that when employees are involved in organizational decision-making several possibilities may occur. The first concerns the effectiveness of the plan itself. Obviously a plan may have a positive (+), negative (-), or null (0) effect on productivity. The assumption here is that there exists a prior plan or at least some yardstick against which the effectiveness of this particular plan may be measured. Thus a plan which, for example, may be said to have null effect on productivity would simply be no more or less effective than a prior plan.

The second possibility, though not unique to situations in which group members participate in decision-making, is concerned with the fidelity of plan implementation and the exercise of options provided by the plan both of which may have a positive (+), negative (-), or null (0) effect on productivity. Once again the judgements that a group implemented a plan more faithfully implies that some scale of fidelity of implementation exists or at least some comparative
judgement can be made to some other group, real or hypothetical.

Allowing that productivity is determined by the quality of the plan, the fidelity of plan implementation and the exercise of options provided by the plan, some rather obvious conclusions can be drawn. Ignoring for the moment the question of the magnitude it appears the content or nature of plans, plan implementation and the exercise of options may well determine the results in a given experiment. For example, the effects of a superior plan may be masked by less than adequate implementation of that plan. Similarly, as happened in this experiment, there may be no difference in fidelity of plan implementation but a clear difference in the exercise of options allowed by the plan. There appear to be nine sign combinations, suggesting one possible explanation for the plethora of contradictory findings in the literature.

If one can consider productivity as being determined by four sets of variables, situational, personality, interaction of the actors and cultural, then the mix which produces the most effective plans is not necessarily the same mix which produces the most faithful implementation of a plan or the most effective exercise of options provided by the plan, which will lead to higher productivity. In this particular experiment it was not possible to determine how effective the mix had been in producing effective plans. But given this mix of variables and holding the qualities of plans constant,
it was possible to show the effects of involvement in decision-making on productivity.

To summarize, in attempting to advance explanations for the results, a number of possibly important mediating variables have been identified and discussed. As a result, several avenues for further research became apparent. These will be discussed, in depth, in a subsequent section of the chapter. Keeping in mind the limitations which have had to be placed on the results of this study, it was demonstrated that when the quality of the plan was held constant, that fidelity of implementation was both equal and high and with respect to time as a criterion, non-decision-makers were significantly more productive than decision-makers.

Choice

Choices of subjects for a second test session significantly favoured membership in non-decision-making groups. Again this was contrary to the hypothesis that subjects would opt for membership in non-decision-making groups. Although no hypothesis testing was involved, subjects significantly favoured the non-decision-making condition for a position which they might hold upon graduation from B.C.I.T. ²

²One problem arose for the experimenter from the wording of the question about preference of structure for a position which subjects might occupy upon graduation from B.C.I.T. Unfortunately the question was tied to the treatment which the
Possible Factors Influencing Choice

Possible Nature of the Test Population

Turning to the question of subjects' choice of condition for a second test session and for a position which might be occupied upon graduation from B.C.I.T., several possible explanations can be advanced for the results. However it should be pointed out that choice and productivity are probably not unrelated. Thus it could be hypothesized that many of the same variables influencing productivity would also influence choice.

The most obvious explanation is the nature of the test population itself. It was suggested earlier in the chapter that this study may have been carried out with subjects who preferred to be directed. The Dennison, et al. (1972) study raises serious doubts about whether B.C.I.T. students want to be involved in decisions related to their work. If this is, subjects had just undergone. Thus they could indicate a preference for a condition similar to that which they had just experienced or a preference for some other. Since both treatments were at extremes of the continuum, a preference for other than a decision-making condition, indicated only a preference for something different from what the subject experienced in the experimental treatment. This could have included anything from slightly less decision-making responsibility to no decision-making responsibility at all. Similarly, a preference for something other than the non-decision-making condition could have included anything from very little decision-making responsibility to more or less complete decision-making responsibility. As a consequence, data provided by responses to these questions, have to be carefully qualified.
in fact, correct then it appears logical that subjects would select a treatment condition in which the greatest amount of direction was provided. In non-decision-making groups a greater amount of direction was provided in the plan development phase of the treatment. In decision-making groups, the development of the plan was left more or less unconstrained. This applied not only to the substantive content of the plan itself but to the way in which the group organized to develop the plan. For example, the group was free to develop as a leaderless one, with all members participating equally in all decisions or, at the other extreme, one member could make all decisions for the group. Thus it does not appear unreasonable to assume that subjects who preferred direction would select membership in non-decision-making groups for a second test session rather than decision-making groups, where less direction was provided.

Lack of Information Concerning Performance

A second possible explanation of choice lies in the information subjects were given concerning their groups' performance relative to other groups or some yardstick of performance. It will be recalled that the experiment was designed so that subjects had an opportunity to perform two problem solving exercises. After the first trial, subjects were provided with only very limited and non-specific information concerning their
performance, (i.e., "You have now had one attempt at a problem and no doubt have noticed errors that you have made and ways in which you could improve your performance," or "You have now had one attempt at a problem and I have noticed errors that you have made and ways in which you could improve your performance"). At the end of the second trial, no information was provided concerning performance because it was felt it would serve little purpose as no further tasks were to be performed by subjects.

In retrospect, it appears that by not providing some information concerning performance, the experimenter may have eliminated one of the necessary ingredients for successful involvement in decision-making, at least so far as it affects choice. Even the early analysts of administrative systems, such as Barnard (1958), recognized the value of what might be described as "payoffs." Advocates of the Scanlon plan, such as Lesieur and Puckett (1969), were aware of the importance of monetary payoffs. However Barnard also recognized that there were other important payoffs besides money, such as prestige or status, sense of accomplishment and a number of others.

In this particular experiment subjects had scant information, other than what might be termed 'intuitive,' to judge their groups' performances. There were no statements by the experimenter ("You did better/worse than groups A, B or C) or
displays of performance times for their and other groups. Since there was no monetary payoff involved, it was assumed that subjects in decision-making groups would receive their "reward" in other ways i.e., a chance to have their ideas recognized, derive additional status and receive appreciation. It may be that these sorts of payoffs are tied closely to having information concerning the groups' performance. For example, the recognition for an idea may stem in part from the effectiveness of that idea when it is put to work. If subjects have no idea of how their group performed relative to others, then the recognition may not be readily forthcoming.

One might hypothesize that choices might differ according to whether the group performed well or poorly compared to other referent groups. This gives rise to another possible avenue for research which will be discussed later in the chapter. However it occurs to this writer that the need to know, regardless of whether they have fared well or poorly relative to other groups, may be a very important variable. That is, if no information concerning performance is provided then what purpose is there in being involved in decisions. If one of the sources of payoff is removed, then why not take the easier approach where the responsibility for the plan lies elsewhere.
Implications for Theory

On the one hand, the very theory described in chapter one may be used to explain these results. The experimental conditions may actually have frustrated the higher order needs e.g., the lack of information on performance. This represents (or could represent) a frustrating factor to having needs for competence met.

Moreover, a number of other factors such as the possibilities of being evaluated negatively in the instructional setting and the lack of any obvious "payoff" may have represented exactly the opposite of what would be required to meet the higher order needs.

In other words the theory may be all right, but the experiment may not have possessed the test implications it demands. Adding to this the short time span and the absence of long range working relationships, one must be cautious in any critical appraisal of the theory. The fault may be less with the theory and more with its exposition.

On the other hand, earlier in the chapter it was suggested that the relationship between involvement in decision-making and productivity was influenced by situation, personality, interaction of the actors and cultural variables. At the same time it appears probable that the relationship is not a simple linear one. From the point of view of needs, there appears to
be not a single need hierarchy for people in organizations but rather a variety of possible need hierarchies and a number of possible ways in which each of these could be satisfied. (Fiedler, 1965) Similarly, although each may be capable of satisfaction within the organizational context, the situational and interaction variables most likely to satisfy them presumably depends upon personality and/or cultural background. This is not to suggest that all human behaviour is idiosyncratic, but it is to suggest that there will always exist individual variability. A number of variables have been identified in this particular study, which could have mediated the relationship.

Both task and situational novelty appear to be possible mediating variables. If subjects felt strange, either with the task or the experimental situation, then they may have behaved very differently than if this had not been the case. Civil and Structural technologists, one of the fields of engineering studies from which subjects were drawn, may have behaved very differently performing an engineering related task, such as a design problem, than they did performing this rather abstract task. Similarly, if the conditions of work, i.e., three-man peer groups, were unfamiliar to the subjects, then behaviour might also have been affected.

Likert (1961) documents the difference in behaviour of employees according to how they perceived their superiors. For this particular experiment it has been suggested that the
experimenter may have been perceived as an expert in this particular area of problem-solving. At the same time, the relationship of the experimenter who may also be perceived to have power over subjects in terms of course grades, may also have affected behaviour. Had the experimenter been perceived as possessing no more expertise than the subjects themselves or had the experimenter not been an instructor at the Institute, would this have affected behaviour?

Would knowing the nature of the test population itself change the hypotheses? It has been suggested that this particular population may have been one which sought direction. Had a population been used, which clearly sought more involvement in decision-making have behaved differently?

Finally, had the experiment provided information concerning the groups' performance relative to other groups, have altered choice patterns for a second test session?

What is suggested here are a number of possible variables which may bear on the relationship between decision-making and productivity. Although the general proposition that involvement in decision-making leads to greater need satisfaction and increased productivity may hold in principle, it appears to require considerable refinement. Even the limited aspects of human behaviour dealt with in the present study appear too complex to be explained by such a general statement. But the view does provide a point of departure, permitting the
experimenter to determine the refinements that may be necessary. A theory is needed which takes into account some of the variables suggested above. For example, Kenniston (1965) cites a number of studies of campus unrest in which different populations such as artsmen, engineers and theology students were involved differentially in various campus protests. This suggests that different populations have different characteristics, needs, etc. and may therefore behave very differently in similar situations e.g., involvement in decision-making. A theory which fails to take into account such factors as population differences, appears to have limited predictive value.

Factors Which Could Contribute to the Development of a More Comprehensive Theory

For a more complete theory to evolve it appears that at least two things are necessary. First, some sort of taxonomic framework needs to be developed into which the various empirical studies done to date can somehow be placed. (Maguire, 1971) Such a framework, besides bringing some order to research findings in the area, might well force researchers to be more explicit concerning just what it is they are investigating. As was suggested earlier, it is often difficult to tell, in other than the most general terms, what was being investigated (e.g., the kinds, levels, stages, etc. of decisions).
Secondly, as suggested above, there is a need to continue the development of theoretical and conceptual systems that will systematically incorporate the plethora of variables which appear to condition the causal relationship. A number of possibly important variables have been identified in this study, not to mention those identified in other studies. Perhaps of even greater value would be the drawing together, in a unified body, the thinking which currently exists in the field. Obviously what has been suggested is an ideal and it may be too early to attempt this. However, this particular study has raised a number of questions for further research which will be outlined in detail in the next section.

**Implications for Further Research**

From the preceding discussion, a number of questions for further research may be suggested.

1. Were the results of this study attributable to the nature of the test population itself or would the same results have been achieved regardless of the test population utilized?

   It has been suggested in a number of places that the test population of B.C.I.T. students may have been one which sought direction. At the same time there is the possibility that the same result would have been achieved regardless of the test population; that something situational in the experiment itself
would produce the same results, over time, with different groups. One way of approaching this would be to replicate the experiment with different test populations, such as those identified by Dennison, et al. Since the B.C.I.T. population might reasonably be considered to be on the direction-seeking end of the continuum, then replications with groups with an apparently greater "need for independence" might determine whether this was a population or a situational phenomenon. If the results were different for different groups, one might reasonably assume that it was a population phenomenon. If, however, results tended to be consistent over various test populations, one might conclude that it was a situational phenomenon.

2. What effects would providing information concerning groups' performance have on choice of treatment condition for a subsequent test session?

It appears that this is actually a two-part question. The first part relates to whether providing information would have any effect on choice. The second, deals with the possible differential effects of providing this information, depending on whether the group was "successful" or "unsuccessful" relative to other groups or to group norms. In the decision-making condition, one might expect successful groups to opt for the decision-making condition a second time. However it could be hypothesized that unsuccessful groups might choose
the non-decision-making condition. In non-decision-making groups, it could be expected that unsuccessful groups might choose membership in decision-making groups. Successful groups would more likely be inclined to remain in the same treatment condition. Additionally, it would be easy to determine whether providing information on performance influenced choice in any general way.

Certainly a number of other possible avenues of research have been identified. The relationship of the experimenter to the subjects requires some further investigation. Clearly an experimental comparison in which the experimenter was perceived as possessing expertise and one in which he did not, would not be difficult to design. Additionally, experiments dealing with such aspects as task novelty versus familiarity, situational novelty versus situational familiarity, and time to successful completion versus other possible measures of productivity all appear worthwhile.
Chapter V

Presented here is a brief overview of the whole study. Included is a summary of what is contained in Chapters I through IV.

Summary

The Problem

This experiment investigated the effects of involvement in decision-making on the productivity of three-man laboratory groups. In terms of the hypothesis that involvement in decision-making will improve productivity, a review of the literature revealed that similar investigations had produced as many problematic findings as positive ones. One possible explanation for this plethora of contradictory findings may be that the hypothesized relationship involves two logically separable sets of forces which tend to be treated as a single one. The first is the effectiveness of a particular strategy for accomplishing a goal; the second is the way which the strategy, once developed, is implemented. For example, involvement in decision-making may motivate employees to work harder, but the strategy which they develop to achieve the goal may not be as effective as was formerly used. Obviously a number of combinations of more, less or equally effective strategies and employees who implement this strategy more, less or equally effectively are possible.
Conceptual Framework

An analysis of the decision-making process was presented which divided decision-making into six discrete steps. These included decisions related to (1) the identification of the problem; (2) setting of priorities; (3) generation of alternative solutions; (4) selection of a solution; (5) decision to implement; and, (6) evaluation.

At the same time a continuum for the involvement in decision-making was proposed in which decisions could be manager determined, employee determined or jointly determined. This latter category suggests a number of possible weightings from responsibility for a decision lying primarily in the hands of the manager to lying primarily in the hands of the employees.

It was also proposed decisions could be of different levels from, at the lowest level, "ad hoc" decisions on up to policy decisions, at the highest level. Within any level of decisions there could also be different kinds of decisions. For example, decisions relating to working conditions could be considered to be on the same level as decisions related to salary, but be construed as different kinds of decisions.

By combining these criteria, it would be possible to plot the distribution of decision-making responsibility for all stages of the process, for all levels of decisions to be made and for all kinds of decisions for a simple two level
organization. For more complex, multi-level organizations the task might be somewhat more difficult, although it appears, in principle to be possible.

Additionally, an analysis of the implementation of decisions by the organization was developed through the use of the concept of organizational plan. It appears probable that groups in the goal-attainment process are guided by a plan, which may be treated as a symbolic representation of particular resources and their intended employment. Once developed, the plan may be implemented faithfully or with lesser degrees of fidelity. Similarly, when the plan is a symbolic representation of intended activities and outcomes, it cannot, for practical purposes, be complete in every detail. Thus it will provide some opportunity for those who implement it to exercise options related to non-human, human or organizational resources.

One of the ways in which organizations attempt to develop more effective plans, have the plans implemented with greater fidelity and have the options provided by the plan exercised in a way which enhances productivity is through the involvement of those who are to implement the plan in its development.

Theoretical Base

It was hypothesized that groups which were involved in the development of a plan would be more productive than groups
which had the plan developed for them. The rational for this was based on McGregor's adaptation of need theory. It was proposed that involvement in decision-making would provide an opportunity for more meaningful interaction between group members. It could provide chances for group members to advance suggestions, have their ideas recognized, derive additional status and receive appreciation and recognition. It was also suggested that involvement in the decision-making process could have appealed to needs associated with creativity. To summarize, a greater number of needs at various levels would be met.

Additionally, following Lowin (1968) it was proposed that involvement in decision-making could lead to increased productivity in a number of other ways. These included (1) closure and a sense of participation; (2) shared goals; (3) pressure to conform to prior commitments; and, (4) improvement in technical and administrative systems.

The satisfaction of needs and the effects proposed by Lowin were looked upon as motivators which would cause employees to work more effectively and hence, be more productive.

The Specific Focus of the Research

In any given set of circumstances, responsibility for making decisions may affect three areas in which productivity
The quality of the plan, fidelity of plan implementation and the exercise of options provided by the plan. However, a basic logical separation appears to exist between the quality of the plan (i.e., its effectiveness for achieving the goal) and the way in which it is implemented (fidelity of plan implementation and the exercise of options provided by the plan). The purpose of this study was to control the quality of the plan and to determine the effects on fidelity of implementation and the exercise of options of involvement in decision-making.

The Experiment

Subjects, in groups of three, were involved in solving problems similar to jigsaw puzzles. In the experimental condition, groups developed their own plans for solving the problem and implemented them. In the control condition, groups implemented the plans developed by other groups. Productivity was defined as time to successful completion of the experimental task.

Hypotheses

The investigation was guided by three hypotheses: (1) groups in the decision-making condition would be more productive; (2) would implement their plans more faithfully; and (3) subjects generally would select membership in decision-
making groups for a second test session.

Results

Groups which had the plan developed for them were more productive than decision-making groups although the mean difference was only 1.00 minutes, it was statistically significant. There was no significant difference in how faithfully groups implemented the plans. Groups in both treatment conditions were judged to have implemented their plans with near perfect fidelity. Subjects' choice for a second test session was significantly in favour of membership in non-decision-making groups.

Possible Causes of Differences in Productivity, Fidelity of Implementation and Choice

It was suggested that the lower productivity of decision-making groups might be accounted for in three ways. First, because decision-making groups were required to design and implement a plan as opposed to simply implementing one, they may have perceived themselves as being evaluated both in terms of productivity and the effectiveness of the plan which they had developed and their own implementation. Thus it may have been that having responsibility for both process brings about a "trade-off" between speed and deliberateness. That the implementation of their own plan induced subjects to hesitate, to be more deliberate and to "make sure."
Secondly, it was suggested that because the plan was a group product, it may be that subjects in decision-making groups had a propensity to monitor other member's activities, leading to the sort of hesitation or deliberateness which could reduce productivity.

Finally, it was suggested that the lack of familiarity with the experimental situation or the problem, judged to be possibly more unfamiliar to decision-making groups, would have made subjects more uncertain and, as a consequence, to work more slowly or more carefully.

The experiment was re-examined in an attempt to identify variables which might account for the performance of decision-making groups. Potentially contributing factors were the way in which subjects were solicited, the experimenter possibly being viewed as an expert, the novelty of both the task and situation and the nature of the test population itself.

In addition three possible contributors to the lack of difference in fidelity of plan implementation between treatment conditions were advanced. These included the nature of the test population, task and situational novelty and the explicitness of directions in the plan implementation phase of the experiment.

Finally, two factors which could have influenced choice were also identified. These were the nature of the test population and the fact that the experiment provided subjects
with no information concerning the "success" or "failure" of their performance.

Implications for Theory

The possibility was raised that the theory was correct but that the experimental conditions may have been exactly the opposite of what would have been required to satisfy higher order needs. It was also proposed that although the general proposition that involvement in decision-making leads to greater need satisfaction and increased productivity, may hold in principle, it is simply too general to hold in all cases. A number of variables have been identified, in this and other studies, which may mediate the relationship. A theory is called for which takes into account these and other variables e.g., the nature of the population, task, degree of involvement, etc.

Implications for Research

Two avenues for further research have been detailed. The first included replications with other populations to determine whether the results were a situational phenomenon. The second suggested a modification of the experiment providing subjects with information concerning their groups' performance to determine its possible effects on choice.
APPENDIX A

Task Set Nos. 1 & 2
Problem I
Station 1
Problem II
Station 1
Problem II
Station 2
APPENDIX B

Scripts for Decision-making and Non-decision-making Groups
APPENDIX B

Scripts

Soliciting Subjects

I am engaged in some problem solving research at the University of British Columbia. At present I am trying to get some persons who would be willing to go through some problem solving exercises and be observed in the process. It will require about 3 hours of your time broken into two $1^{1/2}$ hour sessions. Your task will be to work on some fairly simple problems with some of your schoolmates and our job will be to observe your group's work. Obviously I cannot give you much information about the nature of the problems or the purpose of the study in advance without the possibility of prejudicing the results. However, if you sign up for this project the nature of the problems will be explained to you at the first testing session. Once the project is completed the purpose will be fully explained to you and the results made available to you. I hope you understand the necessity of being rather vague at this time.

If you are interested in taking part in this project just sign up on the list and you will be informed shortly of both the time and the place.

If you have any questions I would be glad to answer them
but of course I must remain silent as to the purposes of the study and the nature of the problems themselves.

Directions to Subjects Arriving at First Test Session

Thank you for volunteering to take part in this exercise. You will notice that there are just three of you here. This is because you will be working as a three-man team in these problem-solving exercises.

1) The problem-solving task is somewhat similar to building jigsaw puzzles.

2) On the wall in front of you are a number of 12 x 12 matrices each with its own unique pattern of black and white dots. One of these has been cut up into a number of pieces.

3) Five stations have been set up in the room. At each of these stations you will find some of the pieces of the matrix. However the pieces are glued onto sheets of paper and cannot be removed from the station.

4) On the table in front are a number of blank matrices, some marking pencils and a pair of scissors. It will be part of your task to visit the various location, make duplicates of the pieces and bring them to the assembly area. Your task will also include reconstructing the matrix from the duplicate pieces. A word of warning, there may be more pieces than you need to construct the matrix. Just remember that the pieces properly assembled form a matrix 12 x 12 of dots.
which exactly matches one of the matrices in the wall display.

Are there any questions so far?

This is a timed exercise. The less time required to gather the information and construct the matrix, the more successful has been your performance.

(The treatments for either the decision-makers or non-decision makers are then administered.)

To the Decision-makers

Now that the three of you are aware of the nature of the problem and the rules of the exercise, I am going to ask you to design a plan which you feel will be effective in bringing about a speedy solution. During this first problem you may change or amend your strategy as you go along. I will give you some time to consider what you are going to do. When you are ready to begin the first problem just let me know. Remember the less time you take to gather the information and construct the matrix the more successful you have been.

Are there any questions?

(The decision-makers are then permitted to discuss their strategy and come up with a preliminary plan.)

Are you ready to begin? Very well, Go!

(At the conclusion of the first trial.)

You have now had one attempt at a problem and I doubt have noticed errors that you have made and ways in which you
could improve your performance. The second problem will be similar to but not identical to the one you have just completed. I would like you to design a new plan for the problem which is more efficient than that used in the previous attempt, could easily be followed by another similar group and which you yourselves will be asked to use on the second problem. There is one difference from the first problem. Whatever plan you devise I would like you to stick to the plan closely throughout the exercise. You should not deviate from the plan or change it as you go along as you could in the first attempt.

Are there any questions?

Very well, you may now commence your planning.

(Once the group has designed its plan and indicated that it is ready.)

Would you please outline the plan for me?

(The members of the group then outline their plan and the experimenter writes it down on a piece of paper.)

As I understand it your plan involves the following operations:

(The experimenter then reads back the plan. Any errors or omissions can then be corrected.)

Are you ready to attempt the second problem? I am going to bring two observers into the room to watch you while you attempt the second problem. Their purpose is simply to observe you at
work, so please try not to let their presence bother you.

(The observers are brought in and given copies of the prospectus.)

Are you ready to begin? Remember the less time you require the better your performance. Alright, Go!

OR

To the Non-Decision-makers

Now that you are aware of the nature of the problem and the rules of the exercise, I am going to outline a plan for you which I feel will be effective in bringing about a speedy solution. I would like you to follow this plan.

1) Each of you will visit one of the first three stations and make duplicates of the pieces then return to the assembly area.

2) The first person returning to the assembly area will become the cutter. His job will be to cut out all the pieces while the others return to do stations 4 and 5.

3) When these are finished all may work on the assembly task. Are there any questions about the strategy to be used? Remember the less time you take to gather the information and construct the matrix the more successful you have been.

Are you ready? Go!
(At the conclusion of the first trial.)

You have now had one attempt at a problem and I have noticed errors that you have made and ways in which you could improve your performance. The second problem will be similar but not identical to the one you have just completed. I have figured out a plan which I feel should definitely improve your performance. Once again I would like you to follow the plan closely.

(The experimenter then outlines the plan devised earlier by the corresponding group of decision-makers.)

It is quite clear what the plan involves? Maybe you could outline the strategy for me.

(The subjects then repeat back the steps of the plan.)

Are you ready to attempt the second problem? I am going to bring two observers into the room to watch you while you attempt the second problem. Their purpose is simply to observe you at work, so please try not to let their presence bother you.

(The observers are brought in and given copies of the prospectus.)

Are you ready to begin? Remember the less time you require the better the performance. Alright, Go!
(Once the test session has been completed subjects will then be asked to answer a few questions about the exercise. This post test procedure is outlined in the section—Post Test Procedures.)
APPENDIX C

Procedures Followed by Observers
APPENDIX C

Observers were required to judge to what extent subjects had faithfully implemented their own plan or the plan which had been given to them. At the conclusion of the first trial observers were brought into the room and given copies of the plan to be implemented. Since the plan contained a number of steps to be performed in sequence, the task of judging how faithfully it was carried out was not inordinately difficult. However in deciding exactly what constituted a departure from the plan, the experimenter was required to be somewhat arbitrary.

Error correction was not considered to be a deviation from the plan. Thus if a subject was required to perform a prior step again or in some other way correct an error it was not judged a departure from the plan. Similarly as the exercise of options is, in fact, behaviour not contained in the plan, it became important for observers to be able to differentiate between behaviour in addition to the plan and behaviour which was a departure from the plan.

Thus subjects, once they had completed their specific role in a given step, could engage in other behaviours, such as aiding other members of the group. This would not be considered a departure from the plan so long as it did not interfere with their or other members of the groups' performance
of the next step of the plan. For example, a subject who had
drawn his replications of the pieces and taken them to the
assembly area, could aid another slower member. If he was
not ready to perform his role in the subsequent step then
this would be considered a departure.

Observers were required to judge on a ten point scale
how faithfully a group had implemented its plan. Perfect
fidelity would receive a perfect score of ten. A minor viola-
tion, such as was possible in the previous example, would
reduce this score by one, and each similar violation would
reduce the score by similar amounts. More serious departures
would reduce the score by two or even three. Thus observers
were required to make some rather subjective judgements.

1) Whether there had been a departure from the plan.
2) How serious was the departure (i.e., major or minor)?

At the conclusion of the exercise, they were to rate the
group on fidelity of plan implementation. What was hopefully
achieved was a partially ordered scale, which although quite
subjective in nature was more accurate than no rating at all.
APPENDIX D

Post-experimental Interview Questions
APPENDIX D

Interview Questionnaire for Decision-making Groups

I am sure that you realize that the director of the project has been asking you to solve the problems using solutions designed by your group. Your task has simply been to design solutions and to put them into effect to the best of your abilities.

Although you may not be aware of it, other groups have been solving problems using solutions designed by the project director. I would like to show you a video tape of the director outlining a solution to the group.

Assume for the next test session that you would be working with different group members on a similar but different problem. Given the limited information that you possess, would you prefer to work in a group which implements solutions designed by the project director or would you prefer to continue working in a group which designs its own solutions and puts them into effect?

1. same □ other □

2. Can you give any reasons for your choice?

3. In a job which you might occupy upon graduation from B.C.I.T. would you want to have a similar involvement in the design of solutions to the problems related to your work?
Interview Questionnaire for Non-decision-making Groups

I am sure that you realize that the director of the project has been asking you to solve problems using solutions designed by him. Your task has simply been to put these solutions into effect to the best of your abilities.

Although you may not be aware of it, other groups have been given the freedom to design their own solutions to the problems and to put them into effect to the best of their abilities. I would now like to show you a video tape of such a planning session.

Assume for the next test session that you would be working with different group members on a similar but different problem. Given the limited information that you possess, would you prefer to work in a group which designs its own solutions and puts them into effect or would you prefer to continue to work in a group which implements solutions designed by the project director?

1. same ☐ other ☐

2. Can you give any reasons for your choice?

3. In a job which you might occupy upon graduation from B.C.I.T. would you want to have a similar lack of involvement in the design of solutions to the problem related to your work?
These questions were used as a guide for the interviewer. Interviewers were encouraged to ask as many additional questions as were necessary to obtain the basic information.
APPENDIX E

Wall Chart Containing Twenty Twelve-grain Matrices
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