Effect of mode of control on subordinate satisfaction, productivity and leader behavior descriptions

Jay Donald Munson
Iowa State University

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Effect of mode of control
on subordinate satisfaction, productivity
and leader behavior descriptions

by

Jay Donald Munson

A Thesis Submitted to the
Graduate Faculty in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE

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Signatures have been redacted for privacy

Iowa State University
Ames, Iowa

1980

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I. INTRODUCTION

Formal leadership in a purposeful organization exists to further organizational goals. These goals are accomplished by tasks performed by the led. But a task is a process. It is a series of actions that has some outcome. The task's two facets, actions and outcomes, give leadership two foci -- subordinate task behavior and task outcomes.

Organizational theorists have developed several behavioral models of leadership. A survey of recent introductory organizational behavior and management texts (Donnelly, Gibson and Ivancevich, 1978; Koontz, O'Donnell and Weinrich, 1980; Hellriegel and Slocum, 1979; Luthans, 1977) shows that popular management instruction, when presenting behavioral models of leadership, follows the lead of the Ohio State studies (Stogdill and Coons, 1957). The Ohio State studies attempt to reduce leader behavior to two dimensions: initiating structure and consideration. In the words of Luthans (1977; p. 437): "In simple terms, the Ohio State factors are task or goal orientation (initiating structure) and recognition of individual needs (consideration). The two dimensions are separate and distinct from one another." (Emphasis added.)

An analysis of leadership, therefore, must center on the task and the result of the task. Classical theory and popular pedagogical treatment of leadership conceptualize leadership as directed toward the task, either its operation or result, and toward the individual who attempts the task. The classic approach dichotomizes leadership with respect to the task and the individual attempting the task, making little recognition of the difference between the action and the result.
The purpose of this study is to establish a difference, both conceptually and empirically, of leadership orientation directed at the task and the result of the task.

In the following sections, the literature on behavioral models of leadership will be examined. With the help of some macro-organizational literature, leadership will be reconceptualized to make specific recognition of the difference between the task and the result of the task. An experiment designed to test this new conceptualization will be described and the results reported. Finally, some conclusions will be drawn, some implications will be made, and avenues for further study will be charted.
Leadership is a social influence phenomenon. As Pfeffer (1977, p. 105) notes, leadership implies some congruence between the objectives of the leader and the led. The objectives of a purposeful organization -- particularly one with an economic rationale -- are accepted fundamentally by the leader and the led in the social contract of the job. Further, the social influence exhibited by the formal leader in a firm has two dimensions. First, the leader must interpret general objectives in the context of the specific situation. Second, the leader must communicate the general objectives of the organization, the specific implementations, and any gradations of intermediate goals to the led. This communication is a dynamic process. The specific situation, the intermediate goals, and even, perhaps the fundamental objectives may change over time.

These two dimensions of social influence that constitute leadership can be considered the minimum necessary to place the worker in the "zone of indifference" (Barnard, 1938). Barnard held that there were things that a worker would unquestionably not do and there were things that the worker would unquestionably do. Between the two extremes is an area where the cost of accepting authority is approximately congruent to the perceived benefit. The portion where the perceived benefit exceeds the cost includes a zone of indifference where a worker would accept the leader's authority. According to Barnard, the requisite for worker acceptance of leadership is clear communication of the practicality and net benefit to the worker of the specific exercise of authority.
A. The Concept of Leadership

Three of the popular approaches to leadership are generally identified as: trait, behavioral, and situational. The three provide explanatory sources of social influence and identify manipulatable mechanisms of goal interpretation and communication of objectives.

1. Trait theory

The trait school grew out of historical observation and ascribed leadership to characteristics, or traits, inherent in the leader. According to this school, the appropriate method for manipulating leadership is to select the appropriate leader for a given situation. While this "great man" approach has intuitive appeal, it denies that a particular leader's behavior may change or be manipulated to adjust to a changing situation. This assumption negates any value of the teaching of leadership and has been found inadequate (Hill and Hughes, 1974; p. 83).

2. Behavioral leadership theory

The behavioral school holds that leadership is a result of the behavior or behaviors of the leader and that these behaviors can be manipulated, i.e., taught and selected from. A prime motive of the behavioral school is to reduce the set of behaviors to a minimal number of conceptual dimensions.

The pioneering work was done at the University of Iowa (Lewin, Lippitt and White, 1939). The Iowa study directly manipulated leader behavior by specifying three preconceived leadership styles -- authoritarian, democratic, and laissez faire. This study applied these alternate
leadership styles to hobby clubs for ten-year-old boys while controlling for the characteristics of the led, characteristics of the leader, activities performed, and the physical setting. The intent of the study was to identify causes of aggressive behavior. No productivity measure was taken, and it is not clear, in this situation, if organizational goals were specified.

During the period 1945 to 1956, an interdisciplinary group at Ohio State studied many different leadership situations in the field and emerged with two fundamental dimensions of leader behavior: initiating structure and consideration (Stogdill and Coons, 1957). A popular description of the two dimensions is given by Fleishman and Peters (1962; pp. 43-44):

"Consideration reflects the extent to which an individual is likely to have job relationships characterized by mutual trust, respect for subordinates' ideas, and consideration of their feelings.

Initiating structure reflects the extent to which an individual is likely to define and structure his role and those of his subordinates toward goal attainment. A high score on this dimension characterized individuals who play a more active role in directing group activities through planning, communicating, information, scheduling, trying out new ideas, etc."

The Leader Behavior Description Questionnaire (LBDQ) was developed to measure these dimensions by tapping the perceptions about the leader held by subordinates.

Contemporaneous with the Ohio State studies, the Institute for Social Research at the University of Michigan surveyed a number of work situations, dividing them into "high performing" and "low performing".
The results of these studies showed, as measured by the reported perceptions of workers and supervisors, that supervisors of higher performing groups were more likely to:

1. Receive general, rather than close, supervision;
2. Like the amount of authority and responsibility they have in their jobs;
3. Spend more time in supervision;
4. Give general, rather than close, supervision to their employees; and

Likert (1961; p. 6) defines production orientation as:

"... it is management's responsibility to:

1. Break the total operation in simple, component parts or tasks;
2. Develop the best way to carry out each of the component parts;
3. Hire people with appropriate aptitudes and skills to perform each of these tasks;
4. Train these people to do their respective tasks in the specified best way;
5. Provide supervision to see that they perform their designated tasks, using the specified procedure and at an acceptable rate as determined by such procedures as timing the job; and
6. Where feasible, use incentive in the form of individual or group piece rates."

Employee-centered supervisors are described by Likert as those who "focus their primary attention on the human aspects of their subordinates' problems and on endeavoring to build effective work groups with high performance goals." (Likert, p. 7).

Likert (p. 9) illustrates the difference between close and general supervision by citing Estes: "the difference between getting a janitor to agree to keep the floors clean, as contrasted with sweeping routinely every half hour with a 20-inch broom 10 strokes a minute."
The Michigan studies used productivity measures wherever possible to differentiate between these perceived measures. However, workers' and supervisors' perceptions were still used as dependent variables. The Michigan studies did, however, include authority-responsibility congruence and supervision received as critical dimensions of leadership -- even though they are not part of leader behavior.

The next step was the populist approach of the self-administered Managerial Grid (Blake and Mouton, 1966; p. 31). The Grid questionnaire placed those occupying positions of leadership on a ten unit Cartesian plane, with axes labeled "concern for people" and "concern for production." This grid was used as a tool for conceptualizing and illustrating managerial styles.

In summary, classical behavioral leadership theory evolved from "democratic, participative or authoritarian" leader style in the Iowa study. "Initiating structure" and "consideration" were identified at Ohio State. The Michigan studies expended these concepts to "employee-centered" and "job-centered" with "close" or "general" supervision. Finally, this was reduced to "concern for people" and "concern for production" by Blake and Mouton.

3. Contingency (situational) theories

The next school of thought on leadership has as its foundation the work of Fiedler (1967). Fiedler utilized the perspective created by the Ohio State studies in developing his own instruments, the Least Preferred Co-Worker and the Assumed Similarity between Opposites scales. Although these scales have been criticized (e.g., Ashour, 1973), Fiedler's
instruments are designed to generate measures of leadership style along the dimensions of "task-directed" and "human relations". As he gained experience with his instruments, Fiedler found an increasing dependence between leader behavior and situational variables. Stated differently, the effectiveness of a particular leader style was contingent on the situation. Fiedler specified the situation as consisting of leader-led relations, task structure, and the leader's position of power in the organization. Although recognition of situational variables is significant, it contains the seeds of its own destruction, as everything is a contingency. To reduce the number of contingencies to a practical and empirically assessable number is purely a matter of opinion -- the contingency theory has wide explanatory powers, but offers no improvement on "old" (i.e., non-contingency) empiricism. Fiedler himself regressed to a trait position of engineering the job to fit the man, not training the man to adapt to the job (Fiedler and Chemers, 1974; pp. 140-141). Of Fiedler's three contingencies, leader-led relationship and leader position power appear too individual and too variable to be of practical use. Task structure, however, can be measured on at least an ordinal level by common assessment.

A second contingency theory of leadership, the Path-goal model, is based on the expectancy theory of motivation and was developed separately by Evans (1970) and House (1971). Expectancy theory holds that motivation is a function of the perceived probability that effort will result in either intrinsic or extrinsic rewards and the value (valence) of the rewards. The perceived probability is further decomposed into the prob-
ability that the effort will result in performance and probability that the performance will result in the reward. The Path-goal approach to leadership holds that leadership affects the expectancies and the valences that form the path toward the motivational goal. (A complete and cogent discussion is given by House (1971, pp. 321-323).)

Path-goal theory gives specific recognition to situational variables by recognizing the contingencies of the leader's ability to manipulate extrinsic rewards (both monetary and non-monetary) and the clarity of the path-goal. These give rise to the two dimensions of leader behavior, instrumental -- varying the clarity of the path-goal, and supportive -- manipulation of rewards.

Contingency theories, while recognizing the important influence of situational variables on the leadership process, are built on old conceptualizations that do not distinguish between the performance of the task and the result of the task.

Research on leadership can be divided into two categories. The first is definitional studies -- usually done in the field. For example: the Michigan studies separated groups under observation into high-performing and low-performing and then identified differences. Fiedler and the Ohio State studies took survey instruments with major inherent preconceptions into the field -- a procedure not without its critics (Evans, 1979, p. 216).

In the second category, the perceived leader behavior rating is used as a control variable and/or a dependent measure when other elements of the work situation are varied. Since the definitional works, this category
of researchers have accepted the basic 'people-production' conceptual dichotomy of leader behavior and measure leader behavior with an instrument featuring others' perceptions and the 'people-production' dichotomy. This approach -- acceptance of the perceptual instrument -- is used in both controlled and uncontrolled experimental environments.

B. The Leadership Process Reconceptualized

It has been earlier suggested that leadership is the interpretation of organizational goals to fit the specific situation (recognizing that these goals may generate objectives, policies, procedures, methods, and rules as they perculate down the organizational hierarchy) and the communication of this interpretation to the led. The leadership process can perhaps best be understood as the combination of two managerial functions -- direction and control. Direction is the communication of the organizational goal(s) down the organizational hierarchy. In the leadership context, "down the organizational hierarchy", means one step down, from superior to subordinate. Further, leadership implies that the organizational goal will be interpreted appropriately for that particular level in the hierarchy. Objectives set at the particular level in question become the means by which goals at higher levels in the hierarchy are accomplished. Leadership at a particular level, therefore, involves the interpretation of the means for accomplishing higher level goals and the translation of these means into operational objectives.

Direction is communication; both parties -- superiors and subordinates -- exchange information. Direction is a priority; it occurs before task execution.
The control process has two elements. The first is the reception and evaluation of task related information. The second is the return of this evaluation to the acting agent -- feedback. The distinction between control and direction is: direction occurs before the action, control is the product of information generated by the action. A superior receives and evaluates information generated by the actions of his subordinates and returns it to them suitably modified in the form of suggestions, orders, discussions, etc. (Oldham, 1976; p. 70).

The leadership process is illustrated diagrammatically in Figure 1. Note that information from the action is received by the supervisor, while feedback is given to the subordinate. Further, the action is the ultimate source of all information about the action, even though it may be channeled through other parts and levels of the hierarchy. The subordinate, however, is not dependent on the leader for information; the information is generated at hand and various interpretations of it can reach him without being channeled through the supervisor.

It is best to keep in mind that a job is comprised of tasks. The subordinate's job may be made up of just one task, or it may be comprised of a variety of tasks. This fact, coupled with the dynamic nature of the work situation, blurs the distinction between direction and feedback. For example, direction to initiate a new task may be feedback from an old task. Additionally, just as feedback can return to the worker from a variety of sources, direction can also arise from sources other than the supervisor. Technology is the prime non-supervisory source of direction -- a machine calls for specified tasks to be done at specified times and in
Figure 1. Superior, Subordinate, and Task
a specified manner.

The information resulting from the action falls into two general classes: that which arises from how the action (task) is performed; and that which is generated by the results of that performance. Considering the task as a process, this is the difference between how the process is performed (or even which process is performed) and the result of the process; the means and the ends. These are two very different types of information, and create two potentially different modes of control. Direction, too, can be phrased in terms of the type of information expected. To return to Likert's citation of Estes (as above): "the difference between getting a janitor to agree to keep the floors clean, as contrasted with sweeping routinely every half hour with a 20-inch broom 10 strokes a minute", demonstrates the difference between directing the janitor toward an end -- "keep the floors clean" and toward a means -- "sweep routinely every half hour...."

C. Leadership and Control

William G. Ouchi has established this difference in use of the two sources of information in several papers (Ouchi and Maguire, 1975; Ouchi, 1977 and 1978) within the macro-organizational literature. He terms the differing use of this information either "behavioral control" (means) or "output control" (ends). This taxonomy will be used for consistency and convenience for the remainder of this paper. "Mode of control" as used by Ouchi, includes direction as well as feedback.

Behavioral control and output control modes are independent. Their
Substitutability is dependent on what Ouchi and Maguire (1975) term instrumentality; the relation of the ends to the means. Instrumentality is analogous to task structure (the more structured the task, in general, the more predictable the outcome). Thompson (1967; p. 86) states that such a substitution can take place only where goals are stated specifically and where means-ends relationships are known.

According to Ouchi, the choice between control modes is further confounded by the level of role ambiguity created by the task. If the task is instrumental (i.e., the means-end relationship is known), the behaviors required by the task are clear. If not, the task will generate role ambiguity, which can be ameliorated by efforts of the leader to structure the task. Also, the task can be structured a priori and by other influences such as technology.

Since the leader performs essentially a controlling function for the organization, Ouchi’s conceptualization is applicable to leadership. However, the micro-organizational literature, as noted above, makes no distinction between behavioral control and output control. This may be due to the dependence on perceived measures. Typically, a worker whose supervisor uses the behavioral mode of control will report "he tells me what to do" (initiating structure), while a worker whose supervisor establishes goals (output control) will report "my supervisor is considerate, he lets me do what I want."

Contributors to the macro-organizational literature recognize that the task and the result of the task are different end points of control. The leadership literature likens initiating structure and consideration
to two channels for leader behavior. It makes no clear, thoughtful state-
ment about what is at the ends of these channels. The micro-organiza-
tional literature confounds means and ends within the initiating structure
dimension of leader behavior.

At the micro-organizational leadership level, interpersonal relations
are important -- giving a third locus for leader behavior. Concern for
interpersonal relationships is embodied, in the leadership literature, as
consideration. However, consideration, as used by the micro literature,
is contaminated by goal setting. For example, Likert (1961; p. 7)
reports the view of an "employee-centered" manager:

"One way in which we accomplish a high level of production
is by letting people do the job the way they want so long as they
accomplish the objectives..."

To summarize, the major differences between these micro-organiza-
tional and macro-organizational conceptualizations of leadership are
illustrated in Figure 2. The micro view is not clear as to what leader
behaviors are directed toward, while the macro literature discounts
individual relations.

A synthesis has been presented here, examining the approach of the
micro-organizational literature in the light of the behavioral and output
control concepts based on the macro-organizational literature.
Figure 2. Micro and Macro Approaches
The Micro View

- Initiating Structure
- Consideration

The Macro View

- Behavioral Control
- Output Control

1. Leader
2. Behavior
3. Recipient

The Leader's Behavior and the Result of the Task

- "production" (Recipient)
- "people" (Recipient)

The Leader's Impact on the Individual

- (consideration)
III. THE EXPERIMENT

A laboratory experiment was designed to test this conceptualization of leadership by examining the effects of mode of control on productivity, subordinate perceptions of leader behavior, and subordinate satisfaction. Groups, under the supervision of a leader (confederate) utilizing either behavior or output control, were given a job to perform for a specified time. Construction of a unique paper airplane\(^1\) (Appendix A) was chosen for several reasons. While folding a paper airplane is a familiar task, this particular design would be equally new to all subjects. In addition, the job could conveniently be broken down into several distinct tasks and the material and other physical requirements were not exacting. Finally, little learning time would be required of subordinates and the uniqueness of the job fostered a high degree of subject involvement.

A. Objectives

The foregoing conceptualization of leadership was tested by a laboratory experiment. The objective of the experiment was to establish whether the use of behavioral control or output control by a leader affected productivity, perceptions of leader behavior, and subordinate satisfaction.

Specific questions to be examined by this experiment were:

Will a group under a leader using output controls be more productive than a group under a leader using behavioral controls?

\(^1\)This is a heavily modified version of "The Acquisition Game" (Kolb, Rubin, and McIntyre; 1971, p. 309).
Will leaders using behavioral controls be perceived by subordinates as higher in initiating structure than leaders using output controls?

Will leaders utilizing output controls be perceived as having higher consideration than leaders using behavioral controls?

Will the use of output controls result in higher satisfaction for subordinates than the use of behavioral controls?

Subsidiarily, the effect of feedback on mode of control will be investigated along with the breadth of the control mode. Specifically, what effect will the addition of feedback, within a given mode of control have on group productivity, subordinate perceptions of leader behavior, and subordinate satisfaction?

B. Plan of the Experiment

1. Treatments

Treatments for this experiment were centered around the control mode utilized by the leader in directing subordinates and on the absence or presence of feedback within the control mode.

The behavior control mode was operationalized by instructing the leader several days in advance on a system of decomposing the job into tasks. Each task was assigned to one member of the work group, and that member received training for that task only. Thus, leader direction focused on task methods rather than task results.

Output control was operationalized by having the leader show all members of the work group the total job and allowing group members to determine task allocation.
Feedback was operationalized as mode dependent. Feedback present under the behavioral control mode concerned the tasks and worker effort on the tasks, not the result. The reverse held for the output mode. That is, output feedback was concerned only with the result, not with how group members performed their individual tasks. The two manipulations resulted in the following treatment combinations:

- $B_o$ -- behavioral control, no feedback
- $B_1$ -- behavioral control, feedback
- $O_o$ -- output control, no feedback
- $O_1$ -- output control, feedback.

2. Blocks

Various nuisance parameters were present. Prime among them was the individual leader. The manipulation of interest in this experiment is leader -- human -- behavior. But human behavior cannot be completely controlled. Five confederates who acted as leaders were trained to act in a specified manner. The training could not, however, obliterate habits of a lifetime, personal quirks, etc. Therefore, the experimental treatments were allocated across blocks that consisted of a leader and his individual actions. Five separate, different rooms were used. It was assumed that effect of the physical setting was small and each leader stayed in a particular room for all four sessions. Thus, any room-to-room differences would, regrettably, be confounded with leader differences.

The leaders were five student volunteers whose actions comprised the independent manipulations. Several days in advance of the experiment,
the leaders were given scenarios (see Appendix B) describing their role for each treatment combination. The written instructions were followed by a verbal briefing.

The leaders were assigned (randomly within the constraints of a balanced design) one of the specific scenarios for each of the four groups, representing the four treatment combinations. In the behavioral mode the leader randomly assigned the comprisant tasks to individuals and taught them those tasks only. Under the output mode the leader showed the whole group how to do the complete job.

When the leader was satisfied with the group's ability to perform the job, the group produced for fifteen minutes. During the production period under either mode, the leader was required to write an identification code on each airplane produced. This was the sole duty of the leader during the production period when no feedback was required. When feedback was required, the leader returned information relevant to the control mode (how the tasks were being done in the behavioral mode, information about the final product under the output mode).

Leaders were instructed to give both positive and negative feedback systematically in order to minimize the impact of the nature of feedback on self-report measures.

The second nuisance parameter was the time period in which the group worked. Five groups worked in each of four time periods. The time periods, approximately forty-five minutes including training, were at 11:00 a.m., 11:45 a.m., 2:30 p.m., and 3:15 p.m. of the same day.

It was assumed that the time period in which a particular group
worked did not significantly affect the total variation since the total time elapsed, from start to finish, was short -- under five hours. This short time period allowed no time for maturation of the subjects, contamination of subjects in later groups by earlier groups, etc. Further, the order in which each leader performed each treatment was randomized (within the balance constraint), thus spreading any experience effects over the treatments.

Eighty subjects were drawn from class sessions of two different sections of the same course. Thus, the first two time periods only used subjects from the first section, the third and fourth time periods, from the other section. Forty subjects from each section were randomly assigned either the first or second time period during their class session. Since the subjects were enrolled in two of five possible sections, it was assumed that students were randomly assigned to the two sections. The analysis is accordingly based on the assumption that no systematic bias existed between the classes and between the first pair and the second pair of time periods -- that the subjects were assigned completely randomly.

3. Procedure

Students were randomly assigned to four-person groups and the groups were randomly assigned to previously recruited leaders (confederates). The leaders, using the appropriate mode of control, trained the group in folding the airplane. The fifteen minute production period was then initiated. During the production period, the leader supplied the appropriate level of feedback within the control mode.
Following the production period, the leader behavior and satisfaction instruments were administered to the subjects. After completing the survey, the subjects were debriefed on the intentions of the experiment as a classroom exercise. The airplanes were counted and rated for quality.

4. Dependent Variables

Performance was operationalized in terms of quantity and quality. Quantity was established by a simple physical count of airplanes produced. For simplicity, quality was measured using a ratio consisting of the number of acceptable units divided by the gross number of units produced. The ratio numerator, the number of acceptable units, was the average number of units accepted by two different raters (inter-rater reliability was 0.69). The acceptability ratings were dichotomous -- acceptable/not acceptable. Thus, the quality ratio could range between zero and one.

Individual perceptions of leader behavior were measured by the Leader Behavior Description Questionnaire (LBDQ), Form XII (Stogdill, 1963). The LBDQ was chosen for its popularity and relative reliability (Schriesheim and Kerr, 1974). The LBDQ generates leader ratings on two scales: initiating structure and consideration (described earlier, p. 5). The instrument is included in Appendix C.

Subordinate satisfaction was measured using three scales from the Job Descriptive Index (JDI) (Smith, Kendall, and Hulin, 1969). The scales used pertained to satisfaction with the leader, satisfaction with work, and satisfaction with coworkers. The instrument is included in Appendix C.
C. Design

There were five leaders. On each of the four time periods, a group of four randomly chosen subjects was allocated to each of the leaders. The group constituted the experimental unit. Each of the five groups for each time period was allocated, at random, to one of four treatments. The experimental design\textsuperscript{2} is:

\[
\begin{array}{cccccc}
\text{Leader} & A & B & C & D & E \\
1 & B_0 & B_1 & 0_0 & 0_1 & B_0 \\
2 & B_1 & 0_1 & B_0 & 0_0 & 0_0 \\
3 & 0_0 & B_0 & 0_1 & B_1 & 0_1 \\
4 & 0_1 & 0_0 & B_1 & B_0 & B_1 \\
\end{array}
\]

where:

\begin{itemize}
  \item $B_0$ -- behavioral control, no feedback
  \item $B_1$ -- behavioral control, feedback
  \item $0_0$ -- output control, no feedback
  \item $0_1$ -- output control, feedback.
\end{itemize}

D. The Model

In this experiment, the manipulation (independent variable) was variation of leader behavior along two dimensions. Therefore, the exper-

\textsuperscript{2} The complete layout of the experiment appears in Appendix D.
imental unit was the group receiving some combination of leader behaviors. The dependent variable was a group measure (production, subordinate perception of leader, subordinate satisfaction).

The basic model for this experiment was:

\[ Y_{ij} = \mu + \beta_i \theta_j + \epsilon_{ij} \]

\[ i = 1, \ldots, 5; \ j = 1, \ldots, 4; \ \text{and} \]

\[ \sum_{i=1}^{5} \beta_i = \sum_{j=1}^{4} \theta_j = 0 \]

where

\[ Y_{ij} = \text{the variate under consideration}; \]

\[ \mu = \text{the mean effect}; \]

\[ \beta_i = \text{the effect of the } i\text{th leader}; \]

\[ \theta_j = \text{the effect of the } j\text{th treatment}; \]

\[ \epsilon_{ij} = \text{the experimental error of the } ij\text{th group}; \]

This model contains two assumptions:

1. the effects are additive
2. the errors are normally and independently distributed with a zero mean and a common variance (Snedecor & Cochran, 1967, p. 303). These assumptions (plus the assumption of homogeneity of variance) are fairly robust (Kirk, 1968, p. 60).
IV. ANALYSIS

A. Manipulation Checks

Since leader (confederate) behavior constituted the manipulation, it was deemed necessary to determine whether the subjects' perception of leader behavior corresponded to the intended manipulation. Four questions asking subjects to respond on a 9-point Likert-type scale ranging from "not at all" (1) to "to a great extent" (9) were designed as manipulation checks (see Appendix C).

One pair of questions (A2 and A4) was intended to check leader direction. Question A2 asked "To what degree was your job highly structured?". Analysis of variance of the mean group responses to Question A2 appears in Table 2. This analysis shows no significant effects.

Question A4 asked subjects to indicate the freedom they had in deciding work methods, to check if subjects were perceiving control in the mode intended. This analysis of variance appears in Table 4, which shows that leaders and control type had a significant effect on the responses to the manipulation check A4.

The remaining pair of questions were intended to check if leaders were perceived as returning feedback as instructed. The questions asked subjects to indicate the extent to which the leader monitored how they did their jobs (A1) and to what extent did the leader monitor production output (A3).

Leaders and level of feedback exhibit significant effects on responses to A1 (Table 1). Interaction between treatments is very close.
to significant at the 95% level. Analysis of variance of A3 (Table 3) shows feedback having a significant effect on the variation of A3.
Table 1. Analysis of Variance -- Dependent Measure: Al

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Table 2. Analysis of Variance -- Dependent Measure: A2

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Total | 19 | 31.18 |
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Table 4. Analysis of Variance -- Dependent Measure: A4

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Figure 3. Full Normal Plot of ANOVA Residuals -- Dependent Measure: Al
Figure 4. Full Normal Plot of ANOVA Residuals -- Dependent Measure: A2
Figure 5. Full Normal Plot of ANOVA Residuals -- Dependent Measure: A3
Figure 6. Full Normal Plot of ANOVA Residuals -- Dependent Measure: A4
B. ANOVAs

Analysis of variance of the variates of interest appear in Tables 1 through 11. Each analysis of variance includes a partition of the sum of squares due to error for the purpose of examining homogeneity of variance (no ratio of partitioned mean squares exceeds the test statistic $F_{\text{max}}(4,4;0.05) = 20.6$).

Full normal plots of residuals are in Figures 3-13 (Box, Hunter and Hunter; 1978, p. 219). Appendix E contains normal plots of the variates. Means, standard deviations and coefficients of variation are reported in Table 15 in Appendix E.
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Table 6. Analysis of Variance -- Dependent Measure: Quality

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Partition of Error

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Total                        | 19 | 0.63|      |             |
Table 7. Analysis of Variance — Dependent Measure: Initiating Structure

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Table 8. Analysis of Variance -- Dependent Measure: Consideration

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<td>99.01</td>
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<tr>
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Partition of Error

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<tr>
<td>Leaders x interaction</td>
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<td>8.85</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>573.30</td>
<td></td>
</tr>
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Table 9. Analysis of Variance -- Dependent Measure: Work Satisfaction

<table>
<thead>
<tr>
<th>Source</th>
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<th>MS</th>
<th>F</th>
<th>Exceedance probability</th>
</tr>
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<td></td>
<td>21.27</td>
<td>1.33</td>
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<td>28.43</td>
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</tr>
<tr>
<td>Control type</td>
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<td>8.45</td>
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<td>0.53</td>
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<tr>
<td>Feedback</td>
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<td></td>
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<td>1.80</td>
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<td>16.01</td>
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Partition of Error

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<tr>
<td>Leaders x control type</td>
<td>4</td>
<td>104.64</td>
<td></td>
<td>26.16</td>
<td></td>
</tr>
<tr>
<td>Leaders x feedback</td>
<td>4</td>
<td>49.11</td>
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<td>12.28</td>
<td></td>
</tr>
<tr>
<td>Leaders x interaction</td>
<td>4</td>
<td>38.36</td>
<td></td>
<td>9.59</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>362.50</td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>
Table 10. Analysis of Variance -- Dependent Measure: Satisfaction with Leader

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>Exceedance probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaders</td>
<td>4</td>
<td>107.77</td>
<td>26.94</td>
<td>2.84</td>
<td>0.07</td>
</tr>
<tr>
<td>Treatments</td>
<td>3</td>
<td>112.41</td>
<td>37.47</td>
<td>3.95</td>
<td>0.04</td>
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<tr>
<td>Control type</td>
<td>1</td>
<td>0.45</td>
<td>0.45</td>
<td>0.05</td>
<td>0.83</td>
</tr>
<tr>
<td>Feedback</td>
<td>1</td>
<td>110.45</td>
<td>110.45</td>
<td>11.65</td>
<td>0.005</td>
</tr>
<tr>
<td>Interaction</td>
<td>1</td>
<td>1.51</td>
<td>1.51</td>
<td>0.16</td>
<td>0.69</td>
</tr>
<tr>
<td>Error</td>
<td>12</td>
<td>113.81</td>
<td></td>
<td>9.48</td>
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</table>

Partition of Error

<table>
<thead>
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<th></th>
<th>df</th>
<th>SS</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaders x control type</td>
<td>4</td>
<td>50.96</td>
<td>12.74</td>
<td></td>
</tr>
<tr>
<td>Leaders x feedback</td>
<td>4</td>
<td>35.58</td>
<td>8.90</td>
<td></td>
</tr>
<tr>
<td>Leaders x interaction</td>
<td>4</td>
<td>27.27</td>
<td>6.82</td>
<td></td>
</tr>
</tbody>
</table>

Total                   | 19 | 333.99|       |      |
Table 11. Analysis of Variance -- Dependent Measure: Satisfaction with Coworkers

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>Exceedance probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaders</td>
<td>4</td>
<td>13.42</td>
<td>3.36</td>
<td>0.16</td>
<td>0.96</td>
</tr>
<tr>
<td>Treatments</td>
<td>3</td>
<td>51.93</td>
<td>17.31</td>
<td>0.80</td>
<td>0.51</td>
</tr>
<tr>
<td>Control type</td>
<td>1</td>
<td>35.11</td>
<td>35.11</td>
<td>1.63</td>
<td>0.23</td>
</tr>
<tr>
<td>Feedback</td>
<td>1</td>
<td>16.20</td>
<td>16.20</td>
<td>0.75</td>
<td>0.40</td>
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<tr>
<td>Interaction</td>
<td>1</td>
<td>0.61</td>
<td>0.61</td>
<td>0.03</td>
<td>0.87</td>
</tr>
<tr>
<td>Error</td>
<td>12</td>
<td>258.36</td>
<td>21.53</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Partition of Error

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>Exceedance probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaders x control type</td>
<td>4</td>
<td>165.04</td>
<td>41.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leaders x feedback</td>
<td>4</td>
<td>74.58</td>
<td>18.65</td>
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<tr>
<td>Leaders x interaction</td>
<td>4</td>
<td>18.73</td>
<td>4.68</td>
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<tr>
<td><strong>Total</strong></td>
<td>19</td>
<td>323.70</td>
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</table>
Figure 7. Full Normal Plot of ANOVA Residuals -- Dependent Measure: Quantity
Figure 8. Full Normal Plot of ANOVA Residuals -- Dependent Measure: Quality
Figure 9. Full Normal Plot of ANOVA Residuals --Dependent Measure: Initiating Structure
Figure 10. Full Normal Plot of ANOVA Residuals -- Dependent Measure: Consideration
Figure 11. Full Normal Plot of ANOVA Residuals -- Dependent Measure: Work Satisfaction
Figure 12. Full Normal Plot of ANOVA Residuals -- Dependent Measure: Satisfaction with Leader
Figure 13. Full Normal Plot of ANOVA Residuals -- Dependent Measure: Satisfaction with Coworkers
C. Productivity Measures

The analysis of variance for the productivity measures, quality and quantity showed treatments having no significant effects (Tables 5 and 6).

The treatments sum of squares for quantity is very small. However, a normal plot of the residuals (Figure 7, p. 44) supports normality. Further, a partitioning of the treatments sum of squares displayed homogeneous variances; likewise, partitioning of the error sum of squares exhibited homogeneity of variance (albeit, a different variance).

Tukey's test (Snedecor & Cochran, 1967, p. 331) revealed no departure from the additivity assumption.

A leader-by-leader comparison (Table 12) shows no consistent pattern in the productivity measures. This obviates speculation on the relationship between mode of control and leader personality.

Table 12. Comparison of Control Modes by Leader

<table>
<thead>
<tr>
<th>Control type</th>
<th>Leader</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Quan</td>
<td>Qual</td>
<td>Quan</td>
<td>Qual</td>
<td>Quan</td>
</tr>
<tr>
<td>Behavior</td>
<td></td>
<td>28</td>
<td>0.53</td>
<td>23.5</td>
<td>0.45</td>
<td>17</td>
</tr>
<tr>
<td>Output</td>
<td></td>
<td>23.5</td>
<td>0.69</td>
<td>25.5</td>
<td>0.45</td>
<td>17</td>
</tr>
</tbody>
</table>
D. Perceived Leader Behavior

Tables 7 and 8, analyses of variance of perceived leader behavior measures initiating structure and consideration, show over half ($r^2 = 0.58$ for initiating structure and $r^2 = 0.54$ for consideration) of the variation is due to the differences in individual leaders and the leader effect is highly significant for both. Thus, these measures are more sensitive to individual differences in leaders than intentional, specified leader behavior and error combined.

Initiating structure exhibits a significant effect for mode of control and control type-feedback interaction. Consideration was significantly affected by the level of feedback.

E. Satisfaction Measures

In general, treatments had no significant effect on satisfaction measures (Tables 9 through 11). The lone exception was a highly significant feedback effect on satisfaction with leader (Table 10). And, as could be expected, the individual leader had an effect on the subordinate's satisfaction with leader ($\alpha = .10$).

Partitioning of the sums of squares due to error in the analysis of variance of satisfaction with coworkers reveals a large (though still homogeneous) leader-control type interaction mean square. An examination of leader by control type cell means (Table 13) shows that, with the exception of groups working under leader B, subjects (apparently) were more satisfied with each other under the output control mode.
Table 13. Satisfaction with Coworkers for Individual Leaders

<table>
<thead>
<tr>
<th>Control type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavior</td>
<td>39.9</td>
<td>44.6</td>
<td>41.4</td>
<td>42.8</td>
<td>40.1</td>
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<tr>
<td>Output</td>
<td>44.1</td>
<td>38.9</td>
<td>45.8</td>
<td>44.9</td>
<td>44.9</td>
</tr>
</tbody>
</table>

$^3$ Satisfaction with coworkers grand mean = 42.8.
V. INTERPRETATION OF RESULTS

A. Validity of Manipulations

Manipulation checks A2 and A4 were intended to establish the validity of control mode treatment. Question A4 ("work methods") did this. Subjects directed by leaders using the behavioral control mode reported significantly less freedom with respect to work method decisions than did subjects directed by leaders using output controls (behavior and output control means are reported in Table 14.)

Responses to the effects of control type in Question A2 ("degree of job structure") were not significantly different. One possible explanation is that the physical task requirements were the same under all conditions — all groups performed the same basic job: folding a paper airplane. Thus, the inherent structure of the job may have overshadowed any variation in structuring due to leader behavior.

The response to Question A4 gave strong support to the validity of the manipulation of control type, but the response to A2 did not.

Questions A1 and A3 asked subjects how much the leader monitored how they did their jobs (A1) and how much did the leader monitor production (A3). The subjects responded significantly differently in accordance with the absence of presence of feedback. The presence of significant main effects for feedback on these questions indicates success in the manipulation of feedback. The presence of a significant interaction effect exhibited by the responses to Question A1 indicates that the subjects were sensitive to the word choice "how you did your job" but "moni-
<table>
<thead>
<tr>
<th>Variate:</th>
<th>Control Type</th>
<th>Feedback Level</th>
<th>Cell Means</th>
<th></th>
<th></th>
<th></th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No Feedback</td>
<td>Feedback</td>
<td>B₀</td>
<td>B₁</td>
<td>O₀</td>
<td>O₁</td>
</tr>
<tr>
<td>a1</td>
<td></td>
<td>4.325</td>
<td>3.825</td>
<td>5.025</td>
<td>3.20</td>
<td>5.45</td>
<td>4.45</td>
</tr>
<tr>
<td>A2</td>
<td></td>
<td>5.750</td>
<td>5.525</td>
<td>5.500</td>
<td>5.25</td>
<td>6.25</td>
<td>5.80</td>
</tr>
<tr>
<td>A3</td>
<td></td>
<td>5.000</td>
<td>4.450</td>
<td>6.050</td>
<td>4.10</td>
<td>5.90</td>
<td>4.80</td>
</tr>
<tr>
<td>A4</td>
<td></td>
<td>3.950</td>
<td>5.000</td>
<td>5.700</td>
<td>3.75</td>
<td>4.15</td>
<td>6.25</td>
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<tr>
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<td>23.200</td>
<td>22.800</td>
<td>23.00</td>
<td>23.20</td>
<td>23.40</td>
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<tr>
<td>Quality</td>
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<td>0.501</td>
<td>0.607</td>
<td>0.44</td>
<td>0.65</td>
<td>0.56</td>
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<tr>
<td>Consideration</td>
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<td>20.800</td>
<td>18.925</td>
<td>23.375</td>
<td>17.95</td>
<td>23.65</td>
<td>19.90</td>
</tr>
<tr>
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<td>26.850</td>
<td>25.950</td>
<td>29.050</td>
<td>26.50</td>
<td>27.20</td>
<td>25.40</td>
</tr>
<tr>
<td>Satisfaction with Leader</td>
<td></td>
<td>44.125</td>
<td>41.625</td>
<td>46.325</td>
<td>41.50</td>
<td>46.75</td>
<td>41.75</td>
</tr>
<tr>
<td>Satisfaction with Coworkers</td>
<td></td>
<td>41.475</td>
<td>43.700</td>
<td>43.700</td>
<td>40.75</td>
<td>42.20</td>
<td>43.05</td>
</tr>
<tr>
<td>n</td>
<td></td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>
tor production output" (the words of A3) meant either mode of control to the subjects. More specifically, subjects perceive "how you did your job" as behavior control, not output control. However, "production output" to them is either the task or the result of the task.

B. Productivity Measures

This experiment was intended to investigate four questions, the first of which was:

Will a group under a leader using output control be more productive than a group under a leader using behavioral controls?

Mode of control had no effect on output measures, according to the data generated by this experiment. Three possible uncontrolled factors were:

1. The novelty of the exercise. Subjects were students participating in an out-of-classroom class exercise.

2. The leader-subordinate relationship was artificial and of short duration. Subordinates were producing for only a fifteen-minute period; the leader-subordinate relationship only existed for three-quarters of an hour.

3. The experiment assumed that the basic job -- folding a paper airplane -- was sufficiently elementary to be learned by all subjects in a short time. Further, the job was assumed instrumental, so that behavior feedback would be redundant. These assumptions were not tested. The validity of these two assumptions could be further impaired by the short duration of the experiment.
C. Perceived Measures

1. Initiating structure

The second question this experiment was intended to answer was:

Will leaders using behavioral controls be perceived by subordinates as higher in initiating structure than leaders using output controls?

The analysis of variance (Table 7) test results in a rejection of the hypothesis there is no difference in initiating structure between modes of control. Table 13 reveals initiating structure is higher under behavior control -- as hypothesized. However, the analysis of variance also indicates a significant interaction effect. Cell means of the four treatments (from Table 14) are:

<table>
<thead>
<tr>
<th>Level of Feedback</th>
<th>Control Type</th>
<th>No Feedback</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Behavior</td>
<td>19.05</td>
<td>24.90</td>
</tr>
<tr>
<td></td>
<td>Output</td>
<td>18.10</td>
<td>14.25</td>
</tr>
</tbody>
</table>

The significant interaction effect points out that subordinates whose leaders use full behavioral control -- both direction and feedback -- are regarded as much higher in initiating structure ("production orientation") than those leaders who utilize full output control -- even though, in this case, the concern for production was the same, it was just directed differently. Unfortunately, the cross-effects (output direction...
with behavior feedback, behavior direction with output feedback) were not tested in this experiment, but it is clear that initiating structure is insensitive to qualitative changes in production orientation.

2. Consideration

The next question to be answered is the other side of the Ohio State coin with respect to control type initiating structure/consideration.

Will leaders utilizing output controls be perceived as having higher consideration than leaders using behavioral controls?

Analysis of the data gathered in this experiment shows control type having no effect on consideration. These data do, however, show that the addition of feedback within a control mode increases leader consideration as perceived by subordinates. Consideration, according to the evidence of this experiment, is just what it says it is.

D. Subordinate Satisfaction

The question posed was:

Will the use of output controls result in higher satisfaction for subordinates than the use of behavioral controls?

The evidence of the data says no. It can be speculated that the period in which subjects were in a subordinate role was too short for any experimental condition to affect the satisfaction measures (naturally, the individual leader significantly influenced satisfaction with leader). Additionally, the data supported the notion that groups working in a short-term situation were more satisfied with their fellow-workers when they were not dependent on those coworkers for task accomplishment (such as the instrumental job represented by the output control treatment).
E. Feedback

The role of feedback in the work situation modeled by this experiment was quite limited. It enhanced the effect of control type on the perceived leader control measure initiating structure.

The other effect of feedback is quite commonsensical: workers are more pleased with leaders that tell them how they are doing (supplying feedback) than with leaders who don't. The subordinates displayed this increased pleasure by perceiving the leader as higher in consideration and by being more satisfied with him. However, this, too, could be due to the short-term nature of the situation. With this novel task, the subordinates may be unusually dependent on their leader for information. In more enduring work situations, other information sources -- such as the results of the task at hand, tempered by the worker's experience -- may supersede this element of the leader's role, lessening the effects of the level of feedback.
VI. CONCLUSION

A. Conclusion

The results of this study give support, albeit not overly strong, to the original premise that control mode orientation can affect group measures. It is clear that the conceptualization of leader behavior must be based on a sounder view of the mechanism inherent in the situation than is currently espoused. A clearer view of the inherent mechanism of leadership should clarify the certain anomalies (Kerr and Schriesheim, 1974) seemingly present in earlier research.

B. Reservations

There are many reservations about this study. The original intent was to explore the notion that output control would produce more positive effects than behavior control. The results were mixed. The methodology used, upon reflection, was crude. Leader training could have been more complete. A certain haze in the definition of the treatments yielded nesting of feedback within the control mode, negating the independence of the treatments and barring cross-effects (e.g., behavior direction and output feedback). Further, the sample size, while at the practical limit, was small in relation to the variability of the data and the subjects were not grouped efficiently.

The output control treatment may have been incomplete. Goal setting is clearly a part of output control, but was rejected for this experiment. The goal would have been another parameter that the size of the experiment could not afford.
The experiment used one task which was assumed instrumental. Until the inherent structure of tasks is more fully understood and defined, it is difficult to transfer these results to other situations.

The study attempted to establish a basis for inferences about conditions in formal organizations; the experiment attempted to simulate outside conditions in the laboratory. The subjects of the experiment were generally college sophomores and juniors. While they are an expedient experimental group, they do not necessarily duplicate the characteristics of the working population. The experiment operated in the short-term with a novel task. In formal organizations most tasks are well-known, the members have some commitment to the organization's goals and leaders have some power to compel. These conditions could not be duplicated.

A laboratory experiment using an artificial task, by its very nature, makes it impossible to attach a cost curve to the manipulations. Manipulating leader behavior, like everything else, has a cost attached. If a cost could be ascribed to the change, a definite, set incremental change in productivity could be sought -- sufficient to cover the cost of change. With a set productivity change sought, experimental size and precision could be specified.

C. Suggestions for Further Study

Further experiments (with more careful experimental planning) would be desirable. Presumably, any replication would use improved methodology and a larger sample size. Applications of the methods used in this experiment on a non-instrumental task -- where workers have more need for clarification of task behavior -- may result in opposite findings. i.e.,
for a non-instrumental task, behavioral control should be perceived as more considerate and having higher productivity.

Independence of direction and feedback modes should be tested. Arm chair experimentation concludes that for an instrumental task, behavioral direction and output feedback would be the optimal strategy.

Much previous work, and the massive data therein, should be re-evaluated. Some of the questions in the LBDQ show face validity for highlighting behavioral and output controls. A selective rescoring may clarify, at least in part, the relation of the perceptive dimensions of leader behavior and control modes.

Like all other attempts at modeling reality, these concepts must be tested in the field. This will create measurement problems that perhaps can be resolved by observation. Perceptive measures do measure perceptions which can be at variance with actuality.

Finally, this study has been concerned with the difference between behavioral and output control. It has offered no explanation why an organization would choose one technique over the other in seemingly inappropriate circumstances. The assembly line is a classic one. An assembly line is total structuring of a task by technology. It is often accompanied by behaviorally oriented leadership, at apparently great cost. Maguire, Ouchi (1975) notes that behavioral control does not create information useful to the organization. A possible explanation worthy of testing has been offered by Thompson (1967). He notes that jobs become less instrumental higher up the hierarchy and that subordinate supervisors assume the style of their superiors. Thus, behavioral control, which may
be appropriate to the non-instrumental tasks at the highest levels of management, is transferred, step by step, to the lowest levels where behavioral control may be least appropriate.
VII. SELECTED BIBLIOGRAPHY


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Stogdill, Ralph M. Manual for the Leader Behavior Description Questionnaire -- Form XII. Columbus: Bureau of Business Research, Ohio State University, 1963.


VIII. ACKNOWLEDGMENTS

Acquisition methods for the data used in this study were approved by the University Committee on the Use of Human Subjects in Research, Iowa State University.

An education is made up of a great deal of human effort by many individuals. I have room to pay tribute by name to only a few of the people who have contributed to mine.

I would like to acknowledge my debt to my teachers who have served on my supervisory committee: Prof. James McElroy, Prof. C. P. Cox, Prof. Harvey Lapan, and Prof. C. W. Millard.

I was assisted with this paper by Iowa State University faculty members Robert Strahan, Leroy Wolins, and G. S. Wilson. Their assistance is greatly appreciated.

I would like to thank my friends George Hanrahan, Dave Samo, Gordon Wolders, Truman Blair, and Lyle Paris, of The Des Moines Register & Tribune Co., for their support which made so much of this possible.

I have sustained my education through the gracious efforts of my family and friends. I have attempted to stay on the path, following the guiding light of my undergraduate mentor, Harold W. Davey.

Finally, I would like to acknowledge Elizabeth Ballantine, who made this all necessary.
IX. APPENDICES
A. The Airplane: Raw Material
B. Leader Scenarios
1.1
Cell One: Behavior Control, No Feedback

Leader Role

The leadership role you will be playing for this scenario will be one of assigning tasks and training your workers to do those assigned tasks. The tasks you will assign are the various steps in the production of aircraft (folding a paper airplane). You will (arbitrarily) assign your workers to their stations and show each worker the sub-tasks (folds) that are required at his/her station.

As you will have had an earlier opportunity to learn the placement and sequence of the folds, please make some notes so that you will be able to divide the tasks according to this scenario, as you will not let the workers know of this set of instructions or be able to show it to them.

Your first duty is to introduce yourself and the exercise. Please explain to your workers that the object of this exercise is to produce aircraft, as many as possible within the time limit. Your group's production will be evaluated for quality and quantity in comparison to all groups participating in this exercise, so output, with a stress on quality, is important -- make this very clear.

Second, arbitrarily and as randomly as you can, assign your workers to the four stations on the assembly line, and train them in their assigned tasks.

As soon as you feel that your workers are capable of performing their assigned tasks, the fifteen minute production period will begin.
However, do not tell the group the specific length of the production period. Your duties during the production period are confined to affixing the aircraft's serial number to the left wing. You will do this by writing, in pencil, a three digit code, which will be given to you, and the aircraft's production number, for example: A10-0004. During the production period, please refrain from making any comment about any individual's work. Further, do not comment, speculate or discuss the number (or quality) of the aircraft expected or actually produced.

The object of this scenario is to structure the tasks for the workers and then leave the production of the aircraft to them -- they are essentially on their own after you have satisfied yourself with their competence at their assigned tasks.
Station One

1. You should have a sheet of paper that looks like this:

2. Turn the paper over to the blank side so that the markings are at the bottom:

Markings at bottom

3. Fold corner A to point B so that it looks like

4. Reopen and fold point C to D, thus establishing fold lines AB and CD.
A. 2

Station Two

5. Reopen and press side AD towards side CB while pushing flat surface ACE towards the surface EDOOB so that the aircraft will take this shape and press folds.

6. Bring points A and C to point E and press folds so that the aircraft now looks like:
Station Three

7. Bring points F and G to point H and fold

so that the aircraft looks like:

8. Fold the tip over line FG so the aircraft looks like:
Station Four

9. Open the first tabs underneath the folded-over tip

and tuck into pocket which exists on both sides of the folded-over tip. The aircraft retains the shape of step 8, but with the tabs tuck ed in, all the folds will hold together.

10. Turn aircraft over. It should look like this:

11. Fold wing tips up to sharp 90° angle at the lines x-y, and z-w. The finished aircraft should now look like this:
Quality Control Standards

1. There can be no "extra" folds in the aircraft.

2. The markings must appear as in the blueprint, give or take a small margin for error.

3. The two wings must be level and even with each other.
2.1

Cell Two: Behavior Control, With Feedback

Leader Role

The leadership role you will be playing for this scenario will be one of assigning tasks, training your workers to do those assigned tasks and providing feedback about their performance of those tasks. The tasks you will assign are the various steps in the production of aircraft (folding a paper airplane). You will (arbitrarily) assign your workers to their stations and show each worker the sub-tasks (folds) that are required at his/her station. During the production run, you will provide feedback, both positive and negative, about their work, including criticisms on the individual folds, praise for excellent work and possible suggestions on improvement of methods, such as paper placement, etc.

As you will have had an earlier opportunity to learn the placement and sequence of the folds, please make some notes so that you will be able to divide the tasks according to this scenario, as you will not let the workers know of this set of instructions or be able to show it to them.

Your first duty is to introduce yourself and the exercise. Please explain to your workers that the objective of this exercise is to produce aircraft, as many as possible within the time limit. Your group's production will be evaluated for quality and quantity in comparison to all groups participating in this exercise, so output, with a stress on quality, is important -- make this very clear.
Second, arbitrarily and as randomly as you can, assign your workers to the four stations on the assembly line, and train them in their assigned tasks.

As soon as you feel that your workers are capable of performing their assigned tasks, the fifteen minute production period will begin. However, do not tell the group the specific length of the production period. Your duties during the production period are to monitor each of your workers as they perform their assigned tasks and to provide verbal feedback (positive or negative) about the quality and quantity of individual worker performance. Additionally you will affix the aircraft's serial number to the left wing. You will do this by writing, in pencil, a three digit code, which will be given to you, and the aircraft's production number, for example: A10-0004. During the production period, please refrain from making any comment about the number of aircraft produced. Further, do not speculate or discuss the expected aircraft production.

The object of this scenario is to structure the tasks for the workers and to provide information to the workers about their success at performing the individual tasks you have assigned them and they have have received training.
Station One

1. You should have a sheet of paper that looks like this:

2. Turn the paper over to the blank side so that the markings are at the bottom:

3. Fold corner A to point B so that it looks like

4. Reopen and fold point C to D, thus establishing fold lines AB and CD.
5. Reopen and press side AD towards side CB while pushing flat surface ACE towards the surface EDOOB

so that the aircraft will take this shape and press folds.

Will be two folds here
An interior fold where ADE meets CBE

6. Bring points A and C to point E and press folds

so that the aircraft now looks like:

Fold lines
A. 3

Station Three

7. Bring points F and G to point H and fold

so that the aircraft looks like:

8. Fold the tip over line FG so the aircraft looks like:
9. Open the first tabs underneath the folded-over tip

and tuck into pocket which exists on both sides of the folded-over tip. The aircraft retains the shape of step 8, but with the tabs tucked in, all the folds will hold together.

10. Turn aircraft over. It should look like this:

11. Fold wing tips up to sharp $90^\circ$ angle at the lines x-y, and z-w. The finished aircraft should now look like this:
Quality Control Standards

1. There can be no "extra" folds in the aircraft.

2. The markings must appear as in the blueprint, give or take a small margin for error.

3. The two wings must be level and even with each other.
3.1

Cell Three: Output Control, No Feedback

Leader Role

The leadership role you will be playing for this scenario will consist of the demonstration of the production of the necessary components of a particular finished good. The production components you will demonstrate are the various steps in the production of aircraft (folding a paper airplane). You will avoid breaking down the production of the airplane into tasks — you are only concerned that the group can construct the aircraft.

As you will have had an earlier opportunity to learn the placement and sequence of the folds, please make some notes so that you will be able to demonstrate the construction of the aircraft, as you will not let the workers know of this set of instructions or be able to show it to them.

Your first duty is to introduce yourself and the exercise. Please explain to your workers that the objective of this exercise is to produce aircraft, as many as possible within the time limit. Your group's production will be evaluated for quality and quantity in comparison to all groups participating in this exercise, so output, with a stress on quality, is important — make this very clear.

Second, show your group how to fold the airplane. All members of the team must be able to make all folds. Do not suggest, hint or discuss any method of breaking down the production into tasks. If the group decides to allocate tasks on its own, you will not interfere.
As soon as you feel that each individual in the group is capable of producing the aircraft, the fifteen minute production period will begin. However, do not tell the group the specific length of the production period. Your duties during the production period are confined to affixing the aircraft's serial number to the left wing. You will do this by writing, in pencil, a three digit code, which will be given to you, and the aircraft's production number, for example: A10-0004. During the production period, please refrain from making any comment about any individual's work. Further, do not comment, speculate or discuss the number (or quality) of the aircraft expected or actually produced.

The object of this scenario is to endow all members of the group with the ability to make aircraft and then leave the production of the aircraft to them -- they are essentially on their own after you have satisfied yourself with each individual's competence at folding the airplane.
The following directions will serve as a blueprint for the manufacture of the aircraft.

1. You should have a sheet of paper that looks like this:

2. Turn the paper over to the blank side so that the markings are at the bottom:

3. Fold corner A to point B so that it looks like

4. Reopen and fold point C to D, thus establishing fold lines AB and CD.
5. Reopen and press side AD towards side CB while pushing flat surface ACE towards the surface EDOOB so that the aircraft will take this shape and press folds.

Will be two folds here
An interior fold where ADE meets CBE

6. Bring points A and C to point E and press folds so that the aircraft now looks like: Fold lines
7. Bring points F and G to point H and fold

so that the aircraft looks like:

8. Fold the tip over line FG so the aircraft looks like:

9. Open the first tabs underneath the folded-over tip

and tuck into pocket which exists on both sides of the folded-over tip. The aircraft retains the shape of step 8, but with the tabs tucked in, all the folds will hold together.
10. Turn aircraft over. It should look like this:

11. Fold wing tips up to sharp $90^\circ$ angle at the lines x-y, and z-w. The finished aircraft should now look like this:

You will be given one piece of paper to test this manufacturing procedure upon the return of your group leader.
Quality Control Standards

1. There can be no "extra" folds in the aircraft.

2. The markings must appear as in the blueprint, give or take a small margin for error.

3. The two wings must be level and even with each other.
4.1

Cell Four: Output Control, With Feedback

Leader Role

The leadership role you will be playing for this scenario will consist of the demonstration of the production of the necessary components of a particular finished good and supplying feedback about the goods produced. The production components you will demonstrate are the various steps in the production of aircraft (folding a paper airplane). You will avoid breaking down the production of the airplane into tasks -- you are only concerned that the group can construct the aircraft. During the production run you will provide feedback, both positive and negative, about the aircraft produced, while avoiding comment on how it came to be produced that way.

As you will have had an earlier opportunity to learn the placement and sequence of the folds, please make some notes so that you will be able to demonstrate the construction of the aircraft, as you will not let the workers know of this set of instructions or be able to show it to them.

Your first duty is to introduce yourself and the exercise. Please explain to your workers that the objective of this exercise is to produce aircraft, as many as possible within the time limit. Your group's production will be evaluated for quality and quantity in comparison to all groups participating in this exercise, so output, with a stress on quality, is important -- make this very clear.
Second, show your group how to fold the airplane. All members of the team must be able to make all folds. Do not suggest, hint or discuss any method of breaking down the production into tasks. If the group decides to allocate tasks on its own, you will not interfere.

As soon as you feel that the workers in your group are capable of constructing the aircraft, the fifteen minute production period will begin. However, do not tell the group the specific length of the production period. Your duties during the production period are to monitor the output of the group as a whole and to provide verbal feedback (positive or negative) about its quality and quantity. Additionally you will affix aircraft's serial number to the wing. You will do this by writing, in pencil, a three digit code, which will be given to you, and the aircraft's production number, for example: A10-0004. During the production period, please refrain from making any comment about any individual's work.

The object of this scenario is to endow all members of the group with the ability to make the aircraft and to provide to them feedback about the quality and quantity of the group's output during the production period.
AIRCRAFT BLUEPRINT

The following directions will serve as a blueprint for the manufacture of the aircraft.

1. You should have a sheet of paper that looks like this:

2. Turn the paper over to the blank side so that the markings are at the bottom:

   Markings at bottom

3. Fold corner A to point B so that it looks like

4. Reopen and fold point C to D, thus establishing fold lines AB and CD.
5. Reopen and press side AD towards side CB while pushing flat surface ACE towards the surface EDOOB

so that the aircraft will take this shape and press folds.

Will be two folds here

An interior fold where ADE meets CBE

6. Bring points A and C to point E and press folds

so that the aircraft now looks like:
7. Bring points F and G to point H and fold

so that the aircraft looks like:

8. Fold the tip over line FG so the aircraft looks like:

9. Open the first tabs underneath the folded-over tip

and tuck into pocket which exists on both sides of the folded-over tip. The aircraft retains the shape of step 8, but with the tabs tucked in, all the folds will hold together.
10. Turn aircraft over. It should look like this:

![Diagram of aircraft]

11. Fold wing tips up to sharp $90^\circ$ angle at the lines x-y, and z-w. The finished aircraft should now look like this:

![Diagram of aircraft]

You will be given one piece of paper to test this manufacturing procedure upon the return of your group leader.
Quality Control Standards

1. There can be no "extra" folds in the aircraft.

2. The markings must appear as in the blueprint, give or take a small margin for error.

3. The two wings must be level and even with each other.
C. Survey Instruments

Leader-Work Description Questionnaire

Directions: In order to determine whether people do, in fact, react differently to job situations - and the degree of reaction differences - please complete the following questionnaire. While we ask your cooperation in completing this information you are under no obligation to do so. You may refuse to answer any question. Indeed, you may decline to turn in any of your responses. Nowhere do we ask for any identification information, however, so we can guarantee that any returned responses will be anonymous.

Part A. This section of the questionnaire is to be used to describe the nature of your work. Place a circle around the number that best corresponds to your perceptions or feelings.

1. To what extent did your supervisor monitor how you did your job?

1 2 3 4 5 6 7 8 9

Not at all To a great extent

2. To what degree was your job highly structured?

1 2 3 4 5 6 7 8 9

Not at all To a great extent

3. To what extent did your supervisor monitor production output?

1 2 3 4 5 6 7 8 9

Not at all To a great extent

4. To what degree were you able to decide work methods for yourself?

1 2 3 4 5 6 7 8 9

Not at all To a great extent

5. To what degree did your supervisor's behavior overlap with your job description information?

1 2 3 4 5 6 7 8 9

Not at all To a great extent
6. To what degree was your supervisor's behavior independent of your job duties?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Part B. This section is to be used to describe the leader of your group. Your opinions of your leader's behavior are to be indicated by placing a circle around one answer for each question.

1. He makes his attitudes clear to the group.
   - always
   - often
   - occasionally
   - seldom
   - never

2. He assigns group members to particular tasks.
   - always
   - often
   - occasionally
   - seldom
   - never

3. He schedules the work to be done.
   - always
   - often
   - occasionally
   - seldom
   - never

   - always
   - often
   - occasionally
   - seldom
   - never

5. He encourages the use of uniform procedures.
   - always
   - often
   - occasionally
   - seldom
   - never

6. He asks that group members follow standard rules and regulations.
   - always
   - often
   - occasionally
   - seldom
   - never

7. He lets group members know what is expected of them.
   - always
   - often
   - occasionally
   - seldom
   - never

8. He decides what shall be done and how it shall be done.
   - always
   - often
   - occasionally
   - seldom
   - never

9. He makes sure that his part in the group is understood by the group members.
   - always
   - often
   - occasionally
   - seldom
   - never
10. He tries out his ideas with the group.
   always     often     occasionally     seldom     never

11. He does little things to make it pleasant to be a member of the group.
   always     often     occasionally     seldom     never

12. He keeps to himself.
   always     often     occasionally     seldom     never

13. He refuses to explain his actions.
   always     often     occasionally     seldom     never

14. He acts without consulting the group.
   always     often     occasionally     seldom     never

15. He treats all group members as his equals.
   always     often     occasionally     seldom     never

16. He is willing to make changes.
   always     often     occasionally     seldom     never

17. He is friendly and approachable.
   always     often     occasionally     seldom     never

18. He puts suggestions made by the group into operation.
   always     often     occasionally     seldom     never

19. He gives advance notice of changes.
   always     often     occasionally     seldom     never

20. He looks out for the personal welfare of group members.
   always     often     occasionally     seldom     never
Part C. In this section of the questionnaire, you are asked to judge the extent to which each of the following descriptive words accurately describes your job or work environment. For each statement, ask yourself how true the statement is, so far as you are concerned. If the statement is true, then it satisfactorily describes your own feelings. If you feel that the word is untrue, then it does not accurately describe your feelings. In this case the word would be unsatisfactory as far as you are concerned.

This part of the questionnaire is composed of three categories; work, your supervisor (leader), and your coworkers. Under each category you will find a list of words. Place a "Y" beside a word if the word describes the particular aspect of your job in this exercise (work, leadership, coworkers). Place an "N" if the word does not describe that aspect of your job in this exercise, or a "?" if you cannot decide.

For example: Under the work category, the first word is fascinating. If you believe that this word describes your work in this exercise, place a Y in the space. If it is not an accurate description, place an N, and if you have no opinion, place a ? in the space.

**WORK**

- ___ Fascinating
- ___ Routine
- ___ Satisfying
- ___ Boring
- ___ Good
- ___ Creative
- ___ Respected
- ___ Hot
- ___ Pleasant
- ___ Tiresome
- ___ Healthful
- ___ Challenging
- ___ On your feet
- ___ Frustrating
- ___ Simple
- ___ Endless
- ___ Gives a sense of accomplishment
- ___ Useful
SUPERVISION (Group Leader)

- Asks my advice
- Hard to please
- Impolite
- Praises good work
- Tactful
- Influential
- Up-to-date
- Doesn't supervise enough
- Quick-tempered
- Tells me where I stand
- Annoying
- Stubborn
- Knows job well
- Bad
- Intelligent
- Leaves me on my own
- Around when needed
- Lazy

COWORKERS

- Stimulating
- Boring
- Slow
- Ambitious
- Stupid
- Responsible
- Fast
- Intelligent
- Easy to make enemies
- Talk too much
- Smart
- Lazy
- Unpleasant
- No privacy
- Narrow interests
- Loyal
- Hard to meet
D. Experimental Layout
### Time One: 11:00 a.m., Thursday, April 23, 1980

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<th>Leader A</th>
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<th>Leader C</th>
<th>Leader D</th>
<th>Leader E</th>
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- Group 11: Subject 41, Subject 42, Subject 43, Subject 44
- Group 12: Subject 45, Subject 46, Subject 47, Subject 48
- Group 13: Subject 49, Subject 50, Subject 51, Subject 52

### Time Four: 3:15 p.m., Thursday, April 23, 1980

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- Group 16: Subject 61, Subject 62, Subject 63, Subject 64
- Group 17: Subject 65, Subject 66, Subject 67, Subject 68
- Group 18: Subject 69, Subject 70, Subject 71, Subject 72
- Group 19: Subject 73, Subject 74, Subject 75, Subject 76
- Group 20: Subject 77, Subject 78, Subject 79, Subject 80
E. Normal Plots
Figure 14. Full Normal Plot of Al
Figure 15. Full Normal Plot of A2
Figure 16. Full Normal Plot of A3
Figure 17. Full Normal Plot of A4
Figure 18. Full Normal Plot of Quantity
Figure 19. Full Normal Plot of Quality
Figure 20. Full Normal Plot of Initiating Structure
Figure 21. Full Normal Plot of Consideration
Figure 22. Full Normal Plot of Work Satisfaction
Figure 23. Full Normal Plot of Satisfaction with Leader
Figure 24. Full Normal Plot of Satisfaction with Coworkers
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