The Status of the Dominant Cognitive and Operant Theories of Motivation in Industrial Psychology

Walter M. Baker III
Western Michigan University

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THE STATUS OF THE DOMINANT
COGNITIVE AND OPERANT THEORIES OF MOTIVATION
IN INDUSTRIAL PSYCHOLOGY

by
Walter M. Baker, III

A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment
of the
Degree of Master of Arts

Western Michigan University
Kalamazoo, Michigan
August 1975
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Experience teaches us that our accomplishments are more dependent upon those who help us than upon our ability and effort.

I extend my sincere appreciation to Dr. Bradley Huitema who not only guided my efforts in the preparation of this thesis, but also helped me along the road to quantitative literacy. My thanks also to Dr. Frank Fatzinger and Dr. Chris Koronokos for their suggestions and counsel. Finally, I wish to express my gratitude to my secretary Linda Wakefield. Without her insistence that I stop procrastinating, her help in organizing my activities, and her expert preparation of the manuscript, I could never have completed this thesis.

Walter M. Baker, III
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MASTERS THESIS

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HISTORICAL PROSPECTIVE

The efforts of industrial psychologists reflect a continuing interest in the process which determines type of behavior and activity level in the work setting. The principle of hedonism influences many theories which are used to explain both of these phenomena. Hedonism suggests that behavior is directed toward pleasure and away from pain. Individuals select, from alternative courses of action, that behavior which they perceive will maximize pleasure and minimize pain.

Modern theories of motivation may be viewed as evolved refinements of this ancient doctrine; the refinements consisting of increased precision in the model statement and of connecting important model concepts to observable and measurable events. Two products of this evolutionary process are expectancy theory (a cognitive approach) and the operant conditioning model (a noncognitive approach).

EXPECTANCY THEORY

Although a number of different theorists utilize the expectancy paradigm, the models are quite similar. These theorists conceptualize the force acting on an individual to make choices and to exert effort as a function of three variables: (1) the perceived attractiveness of the consequences of performance, (2) the perceived degree to which the performance is related to the obtaining of the consequence, and (3) the perceived degree of the relationship between effort and
resultant performance. As may be seen by referring to Table 1, theorists have given these variables many labels.

Table 1
Labels Used for Expectancy Theory Variables

<table>
<thead>
<tr>
<th>Theorist</th>
<th>Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tolman</td>
<td>Expectancy of goal, demand for goal</td>
</tr>
<tr>
<td>Lewin</td>
<td>Potency X Valence</td>
</tr>
<tr>
<td>Edwards</td>
<td>Subjective Probability X Utility</td>
</tr>
<tr>
<td>Atkinson</td>
<td>Expectancy X (Motive X Incentive)</td>
</tr>
<tr>
<td>Rotter</td>
<td>Expectancy, reinforcement value</td>
</tr>
<tr>
<td>Vroom</td>
<td>Expectancy X Valence X Instrumentality</td>
</tr>
<tr>
<td>Peak</td>
<td>Instrumentality X Attitude (affect)</td>
</tr>
<tr>
<td>Rosenberg</td>
<td>Instrumentality X Importance</td>
</tr>
<tr>
<td>Dulany</td>
<td>Hypothesis of the Distribution of the Reinfacer X Value of the Reinforcer</td>
</tr>
<tr>
<td>Fishbein</td>
<td>Probability X Attitude</td>
</tr>
</tbody>
</table>

Adapted from Mitchell (1974).

We will select one of these theorists, Victor H. Vroom (1964), and first, explain his model of expectancy theory; second, examine some of the studies conducted to test his model; third, noting that these studies yield varying results, we will examine the measurement of theoretical components as a possible source of this variance.
We will then explore an approach to work behavior which is diametrically opposed to that of Vroom, the noncognitive, operant conditioning framework of Skinner (1938, 1953, 1969); this approach assumes that man responds to contingencies in his environment in ways that may be explained without reference to thinking or choice. As we shall see, Vroom advocates a highly cognitive explanation of behavior at work, assuming man to be an autonomous being who directs his life through a conscious decision-making process.

VROOM'S MODEL

In explaining his model, Vroom begins by making the reasonable assumption that at any point in time a person has preferences among outcomes or consequences of behavior. He may prefer one outcome as compared to another, or he may be indifferent as to which occurs. Vroom uses the term valence to refer to these affective orientations toward specific outcomes. An outcome is positively valent if one prefers attaining it to not attaining it; the valence of an outcome is zero when one is indifferent to attaining it or not attaining it; an outcome is negatively valent if one prefers not attaining it to attaining it. Vroom assumes that valence may be given a wide range of either positive or negative values, and he is careful to distinguish the valence of an outcome (its anticipated satisfaction) from the value of an outcome (the actual satisfaction that accompanies its attainment).
In Proposition I of his model, Vroom states: "The valence of an outcome to a person is a monotonically increasing function of the algebraic sum of the products of the valences of all other outcomes and his conceptions of its instrumentality for the attainment of these other outcomes."

\[ V_j = f \sum_{k=1}^{n} (V_k I_{jk}) \]

where

- \( V_j \) = the valence of outcome \( j \);
- \( I_{jk} \) = the cognized instrumentality of outcome \( j \) for the attainment of outcome \( k \);
- \( V_k \) = the valence of outcome \( k \);
- \( n \) = the number of outcomes.

In Proposition II of his model, Vroom states: "The force on a person to perform an act is a monotonically increasing function of the algebraic sum of the products of the valences of all outcomes and the strength of his expectancies that the act will be followed by the attainment of these outcomes."

\[ F_i = \sum_{j=1}^{n} (E_{ij} V_j) \]

where

- \( F_i \) = the force on an individual to perform act \( i \);
- \( E_{ij} \) = the strength of the expectancy that act \( i \) will be followed by outcome \( j \);
- \( V_j \) = the valence of outcome \( j \);
- \( n \) = the number of outcomes.
Vroom defines expectancy as a momentary belief concerning the likelihood that a particular act will be followed by a particular outcome. Instrumentality, on the other hand, is seen as the degree to which one views the outcome in question as leading to the attainment of other outcomes. Expectancy is distinguished from instrumentality in that expectancy is an action-outcome association; it takes values from zero to one. Instrumentality is an outcome-outcome association; it can take values ranging from -1 to +1. Expectancies are perceived probabilities, while instrumentalities are perceived correlations.

Having briefly discussed Vroom's version of expectancy theory, we will now look at the studies which test his model. Researchers direct their attention to both Proposition I and Proposition II. Almost every test of Proposition I yields results which support it. We will concentrate our efforts on twelve studies published since 1970 testing Proposition II which, as you recall, predicts the force on an individual to perform an act. In particular we will examine the measurement of the critical variables: valence, instrumentality, expectancy, and effort.

RESEARCH STUDIES

Schuster, Clark, and Rogers (1971)

Measurement of Critical Variables

Valence. According to Vroom, valences should have the potential to take a wide range of either positive or negative values. To measure
valences, Schuster, Clark, and Rogers use a questionnaire with a five-point scale ranging from +1 to +5 for some questions and a seven-point scale ranging from +1 to +7 for others. Thus no valences can be negative, a potentially serious problem considering that valences are to be multiplied by instrumentalities.

Instrumentality. Vroom states that instrumentalities should "... take values from -1, indicating a belief that attainment of the second outcome is certain without the first outcome and impossible with it, to +1, indicating that the first outcome is believed to be a necessary and sufficient condition for the attainment of the second outcome."

Instrumentality most often describes the relationship between good performance and outcomes. Schuster, Clark, and Rogers operationalize this variable as the degree to which raises are perceived as rewards for good performance and a form of recognition for a job well done. They use a five-point scale ranging from +1 to +5.

What are the consequences of not measuring valence and instrumentality as suggested by Vroom? Consider the following examples:

<table>
<thead>
<tr>
<th>Valence</th>
<th>Scale A₁</th>
<th>Scale B₁</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1  2  3  4  5  6  7  8  9  10</td>
<td>-5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5</td>
</tr>
<tr>
<td></td>
<td>Strongly prefer not to attain outcome.</td>
<td>Strongly prefer to attain outcome.</td>
</tr>
</tbody>
</table>
Instrumentality

<table>
<thead>
<tr>
<th>Scale A₂</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale B₂</td>
<td>-1</td>
<td>-0.8</td>
<td>-0.6</td>
<td>-0.4</td>
<td>-0.2</td>
<td>0</td>
<td>+0.2</td>
<td>+0.4</td>
<td>+0.6</td>
<td>+0.8</td>
</tr>
</tbody>
</table>

At either end of the previous scales we should obtain the same force by multiplying valence times instrumentality. If we measure these variables as Vroom suggests (Scale B₁ and B₂) such will be the case. For example, (-5)(-1) = 5 and (+5)(+1) = 5. However, if we measure valence and instrumentality with positive values only (Scale A₁ and A₂) we obtain very different results. For example, (1)(1) = 1 and (10)(10) = 100. If we measure these variables by some combination of the above scales, say B₁ and A₂, we again obtain aberrant results. For example, (-5)(1) = -5 and (5)(10) = 50.

Expectancy. Vroom views expectancy as a probability. So do Schuster, Clark, and Rogers, although they do not assign it values from .00 to 1.00. They operationalize expectancy as the degree to which respondents perceive effort determining their level of performance; it is measured on a five-point scale ranging from +1 to +5. Thus, no problems occur with this variable.

Effort. Please recall that Vroom states that the force on a person to exert effort is a function of the algebraic sum of the products of valences of all outcomes and strength of his expectancies that the act will be followed by the attainment of these outcomes.
Vroom predicts effort, not performance. Effort is a behavior resulting from force, while performance is an outcome of behavior. Performance is influenced by many factors other than force, not the least of which is ability.

Schuster, Clark, and Rogers operationalize this criterion as supervisor performance ratings. Although they use performance as the criterion rather than effort, they adjust for this procedure by ascertaining the degree to which workers perceive their effort determines their performance. Such an adjustment is helpful but not entirely satisfactory; Vroom, as well as Lawler and Porter (1967), develops separate models to predict performance.

Wofford (1971)

Measurement of Critical Variables

Wofford's version of expectancy theory, effort model, is as follows:

\[ \text{Job Motivation} = f \left( \text{Strength of Needs} \times \text{Expectancy that performance will result in need gratification} \right) \]

where

Job Motivation = tendency to perform or expend effort
Expectancy = employee subjective probability that effort will result in need fulfillment
Need Strength = degree of tendency to respond so as to attain fulfillment

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Valence. Wofford's strength of need corresponds to Vroom's valences. Wofford operationalizes this variable as a score obtained on a Need-Gratification Index of the type used by Porter and Lawler (1968); this index employs seven-point scales ranging from +1 to +7 and is thus subject to the same criticism as discussed previously.

Instrumentalities. Wofford telescopes instrumentalities and expectancies into one concept—expectancy that performance will result in need gratification. The concept is measured by an expectation index. This index consists of a Likert-type scale of 17 items; it measures the degree to which performance is expected to result in need fulfillment.

Not only are instrumentalities and expectations thus confounded, but they are measured on a positive, five-point scale. For example: "If I perform well, I can expect to be recognized by my superior. (a) always, (b) usually, (c) occasionally, (d) seldom, (e) never."

Effort. Job motivation is defined by Wofford as "... the tendency to perform or to expend the effort required to maintain a high quantity and quality of output." This variable is measured by the use of supervisor performance ratings. Employees are rank-ordered in terms of quantity of output, quality of output, and effort. Biserial correlations are computed between performance and expectancy ($r_b = .363$).
Measurement of Critical Variables

Valence. The *perceived attraction* variable of Mitchell and Albright corresponds to the *valence* of Vroom. They state that it ". . . refers to the degree of satisfaction a person expects to derive from work-role outcomes. The amount of attraction can vary from positive through zero to negative values."

However, the type of outcomes used are favorable, and they are measured on a seven-point scale ranging from +1 to +7. For example:

Importance of outcome: The prestige of my position: How important is this to me?

(Min) 1 2 3 4 5 6 7 (Max)

Instrumentality. Perceived instrumentality \(I_{perf}\) is defined as an individual's perception of the connection between his work-role and work-role outcomes. Mitchell and Albright state that this variable should "theoretically" take on values from +1.00 to -1.00. However, they measure it on a seven-point scale ranging from +1 to +7. For example:

Instrumentality of performance: If I do a good job in my present position, it will increase my chances for promotion.

(Not at all true) 1 2 3 4 5 6 7 (Very true)

Expectancy. Mitchell and Albright define expectancy ". . . as the degree of belief that working hard will lead to successful performance." They view expectancy as a probability, as did Vroom, and
they score it from one (indicating a belief of complete improbability) to five (representing a belief of complete certainty).

In addition, in two hypotheses they hold expectancy constant, and in one they allow it to vary according to the subject's response. They then compare results obtained. They find that the weighting of E, where E varies, does not significantly increase the power to predict effort or performance.

**Effort.** Mitchell and Albright define job effort "... as job-related physical and mental exertion that can vary from the minimum required to maintain work-role to working extremely hard." They operationalize this variable as the average effort evaluation of each subject on the CO/XO rating form. They also have a performance criterion, thus making the necessary distinction, according to Vroom, between effort and performance.

**Arvey (1972)**

**Measurement of Critical Variables**

**Valence.** Subjects state how much they want the outcome of performance, additional points in their psychology course. They respond on a four-point scale anchored as follows:

1 2 3 4
Do Not Want Do Not Care Want Somewhat Want Very Much

**Instrumentality.** Arvey elects to test Campbell, Dunnette, Lawler, and Weick's (1970) version of the expectancy model; this version avoids use of the term *instrumentality* and instead employs a second expectancy
(Expectancy II). The Expectancy II of Campbell et al. and Arvey is identical to the instrumentality of Vroom. Both are defined as the degree of belief that achievement of performance will be followed by reward outcomes. Expectancy II is treated as a probability and assigned 0.25 for the low Expectancy II group and 0.75 for the high Expectancy II group.

Expectancy. The expectancy of Campbell and Arvey (Expectancy I) is identical to the expectancy of Vroom. They view this variable as the perceived probability of individual effort leading to performance. Arvey assigns this variable values of 0.25, 0.50, and 0.75 for various groups.

Effort. Arvey operationalizes this variable as the number of correct answers on an arithmetic test, thus measuring performance rather than effort. The study shows clearly that high ability subjects perform better than middle or low ability subjects. Arvey states that he operationalized ability as the score made on the American College Math Test.

Mitchell and Pollard (1973)

Measurement of Critical Variables

Valence. Mitchell and Pollard use bipolar scales ranging from +1 to +5 to measure this variable (desirable-undesirable and important-unimportant). The evaluation measure consists of the mean of these two scales. Since the ranges of both scales are positive, the mean must also be positive; thus negative valences are not used.
Instrumentality and Expectancy. Instrumentality and expectancy are telescoped into one measure, a probability estimate made by each subject as to her belief that effort leads to the desired outcome. Thus, the degree to which effort leads directly to outcome is measured. The magnitude of the error introduced by confounding instrumentality with expectancy is unknown.

Effort. Mitchell and Pollard operationalize this variable as the perceived amount of time each subject spends per week on each activity. These scores are converted to percentage scores (time on specific activity divided by total work time). Inaccurate subject estimates of time spent in various activities and investigator inattention to activity level or energy quality could result in unexplained variance and attenuation of correlations.

Mitchell and Nebeker (1973)

Measurement of Critical Variables

Valence. Mitchell and Nebeker operationalize this variable as the perceived degree to which obtaining or maintaining a high level of each outcome is important and is pleasant. For example:

Unimportant -3 -2 -1 0 +1 +2 +3 Important
Unpleasant -3 -2 -1 0 +1 +2 +3 Pleasant

They compute the mean of the two scores and record it as the valence of each outcome.

Thus, we have the first instance of valence taking a range of positive and negative values as called for in Vroom's theory.
Instrumentality. To measure this variable, each subject estimates the degree to which obtaining good grades contributes to obtaining each outcome. Consistent with Vroom's theory a seven-point scale is employed, ranging from +3 to -3.

Expectancy. Mitchell and Nebeker ask their subjects to estimate the degree to which academic effort leads to good grades. A seven-point scale ranging from 0 to 6 is used.

Effort. As a measure of effort, subjects indicate the average number of hours devoted to academic activities for the last quarter. Such a measure of effort necessarily introduces extraneous variance. For example, the subjects are unlikely to accurately recall the average number of hours devoted to academic activities for their last quarter, their answers are likely to be influenced by what they perceive to be expected of them as students, and the activity level or quality of the energy spent during the estimated hours is an important unspecified consideration.

Lawler and Suttle (1973)

Measurement of Critical Variables

Valence. The critical variables in this study are measured in three sections of a six-part questionnaire. The instructions are as follows for that part of the questionnaire pertaining to valence: Listed below are a number of things that you can either do in your job or can receive from your job. For each one, would you please indicate how desirable it is to you.
Please use the following numbering systems in order to indicate how desirable you consider each item to be:

1. Extremely desirable
2. Very desirable
3. Desirable
4. Moderately desirable
5. Neutral
6. Moderately undesirable
7. Undesirable
8. Very undesirable
9. Extremely undesirable

A listing of 21 outcomes follows.

Instrumentality. In this study Lawler and Suttle make use of an expectancy model developed by Lawler (1971). This model follows the terminology of Campbell et al. which avoids use of the term instrumentality and instead employs a second expectancy (EII). Expectancy II is the instrumentality of Vroom, the degree of belief that performance will produce outcomes.

Expectancy. Lawler and Suttle create three types of expectancies. As just discussed, Expectancy II is Vroom's instrumentality masquerading under a new label. Expectancy I is the unqualified, unmodified expectancy of Vroom—the perceived probability that individual effort leads to performance.

A third expectancy is E(E + 0), the perceived probability that effort produces outcomes. This measure is ambiguous; it does not clearly differentiate effort which leads to performance which in turn leads to outcomes from effort which leads directly to outcomes, independent of performance. For example, supervisor recognition
for trying hard even though results are negligible. Although not precisely stated, the latter interpretation is suggested.

The investigators measure all three types of expectancies with a questionnaire. The section of the six-part questionnaire pertaining to expectancy contains the following instructions:

Below you will see a number of pairs of factors that look like this:

________ Warm Weather → Sweating

You are to indicate on the line to the left of each pair how often it is true for you personally that the first factor leads to the second on your job. In doing this, please use the following numbers to represent different feelings about how frequently the first factor leads to the second.

1. Never
2. Seldom
3. Occasionally
4. Sometimes
5. Often
6. Usually
7. Always

Examples:

(E → P) _______ Working hard → High productivity
(P → O) _______ Good job performance → High pay
(E → O) _______ Working hard → High pay

Effort. Lawler and Suttle employ two types of performance measures—subjective ratings by the subject, his supervisor, and his peers, and objective sales data. The subject rates himself and his peers on two traits—overall job performance and effort put into the
job. The subject's supervisor also provides these ratings. The measurement of effort put into the job most closely reflects Vroom's model and yields the following results:

<table>
<thead>
<tr>
<th>Expectancy Measure</th>
<th>Rating by Self</th>
<th>Rating by Supervisor</th>
<th>Rating by Peers</th>
</tr>
</thead>
<tbody>
<tr>
<td>((E+P)\Sigma[(P\cdot O)(V)])</td>
<td>.39</td>
<td>.28</td>
<td>.16</td>
</tr>
</tbody>
</table>

Pritchard and DeLeo (1973)

Measurement of Critical Variables

Valence. Subjects assess hourly rates on a nine-point Likert scale ranging from "unattractive" to "extremely attractive." To determine whether the higher pay rate of $2.50 per hour is perceived as being more attractive than the lower rate of $1.75 per hour, the means of the subjects' ratings of these two hourly rates are compared. A t test shows that the $2.50 rate is significantly more attractive (p < .01).

Instrumentality. Pritchard and DeLeo measure this variable by asking subjects to respond to the following question:

If you were to increase your performance on this job, what are the chances in 10 that you will make more money?

Thus, instrumentality is measured as a probability rather than as a correlation. Negative values are not used.
Expectancy. The degree to which subjects perceive an increase in effort leading to an increase in performance is not investigated.

Effort. Pritchard and DeLeo correctly perceive that expectancy theory measures the force on an individual to exert effort. They also correctly perceive that performance is largely a function of ability and effort (or motivation), and if they can partial out ability from performance they will have a measure of effort. Unfortunately they fail to accomplish this laudable goal.

After receiving a demonstration, the subjects engage in a fifteen minute practice session. The authors assume that performance on this task is a measure of ability. A regression equation is constructed and a predicted performance score calculated for each subject. The deviation of the actual score from this predicted score is taken to be a measure of effort.

The preceding methodology appears to be a questionable way to arrive at a measure of effort. The activity of the subjects during the practice session is clearly a measure of performance involving both ability and motivation (or effort). According to the authors, "They (the subjects) were urged to do their best, since 'successful performance on this task would be a necessary condition for employment.'" Thus, the subjects are motivated by the instructions given, if from no other source.

Following the practice session, one-half of the subjects are told they are to be paid on an hourly basis. This group becomes the low instrumentality group. (The other half are told they are to be paid on piece-rate and are designated the high instrumentality group.)
ANOVA indicates a main effect due to instrumentality, scarcely a startling outcome. Other results did not conform to what the authors perceive to be the predictions of expectancy theory. Considering the questionable use of the deviation scores to measure effort, this too is not a surprising result.

In the authors' defense, they do understand the importance of addressing effort rather than performance and try to do so. It is also important to appreciate the difficulty of their task; the relationship of ability to performance is very complex and not easily partialled out. Some (actualization theorists) propose that ability in and of itself is a motivating factor.

Jorgenson, Dunnette, and Pritchard (1973)

Measurement of Critical Variables

Valence. A modified Q-sort method is used to obtain measures of valence. Subjects are asked to categorize outcomes as follows:

1. Not a necessary part of a job.
2. Okay to have in a job, but not really important.
3. Rather desirable in a job.
4. Highly desirable in a job.
5. Absolutely necessary in a job.

Instrumentality. Jorgenson, Dunnette, and Pritchard avoid the term instrumentality and use instead the term performance expectancy. They operationalize the concept by subject response to this question:
The chances are ____ in 100 that a person who puts in a lot of effort will make more money than a person who only puts in a little effort.

Thus, expectancy becomes a probability estimate of the extent that effort leads directly to outcomes. The magnitude of the error thus introduced is unknown.

**Effort.** A unique, one might even say peculiar, multiple rank order, paired comparison method is used to measure effort. According to the authors:

The task for the subject was to rank order nine triads of the inputs in terms of 'how much you feel you bring the characteristic to the job.' The perceived level of effort was measured by the number of times each input was ranked over the remaining inputs, adjusted for the neutral point.

If the measure of effort was difficult to understand or inappropriate, it explains the absence of many predicted correlations between effort and other variables. Likewise, it explains the failure to obtain higher effort ratings for the high reward contingency conditions.

_Dachler and Mobley (1973)_

**Measurement of Critical Variables**

**Valence.** Dachler and Mobley measure this variable using a five-point verbally anchored scale ranging from +2 to -2. Employees rate
the desirability of 45 outcomes pertaining to pay, supervision, promotion, interpersonal relations, working conditions, and work itself.

Here we have the second study where the authors allow valence to range from positive through negative values as reflected in the theory of Vroom.

**Instrumentality.** The authors have each employee rate, on a five-point scale, his perceived chances of obtaining an outcome at each of five levels of performance. Instrumentality is considered a probability rather than a correlation.

**Expectancy.** Dachler and Mobley operationalize this variable as the employees' perceived probability of being able to reach each specified level of performance. A five-point verbally anchored scale is used for assessment.

**Effort.** The authors measure productivity rather than effort; they test the theory in two settings, Plant I and Plant II. For Plant I the measure is the quarterly earnings figure during the period in which the study is conducted. For Plant II the weekly efficiency index is used. Dachler and Mobley define efficiency as the hours required by standard of performance divided by the actual hours worked.

**Pritchard and Sanders (1973)**

**Measurement of Critical Variables**

**Valence.** Measurement of valence is obtained by having the subjects rate each outcome on the following scale:
Conforming to the theory of Vroom, valence is allowed to take on a wide range of positive and negative values.

**Instrumentality.** Pritchard and Sanders measure instrumentality by having subjects estimate the chances in 10 that completing the training program produces each of the job outcomes. To illustrate, one of the instrumentality items reads:

The chances are _____ in 10 that learning the routing system will result in gaining the admiration and respect of my fellow workers.

Instrumentality is thus rated as a probability rather than as a correlation. In addition, it cannot take on negative values.

Since instrumentality is intended to measure the relationship between performance and job outcomes, the outcomes selected are an important consideration. In this study, some outcomes which do not result from completing the training program are given high subject ratings. Examples of these outcomes include promotions and pay raises. Although it is permissible, as a control procedure, to include outcomes which could not result from performance, high subject ratings of such outcomes suggest ambiguity or misinterpretation of the concept.
 Expectancy. The authors use the mean of three items in the "chances-in-ten" format to measure expectancy. The items are:

a. If a person studies very hard, we will learn the system.
b. If I study very hard, I will learn the system.
c. If a person puts in a great deal of work, effort, and home study on learning the system, he will pass the system test.

Effort. Pritchard and Sanders measure this variable by averaging the response to the following four items, each measured on a seven-point scale.

1. The level of effort put into the learning system.
2. The level of effort in relation to other people in the training program.
3. The level of effort in relation to the amount needed to pass the system test.
4. The frequency of keeping up with the class assignments.

The authors obtain ratings from each subject and from the training supervisor.

Arvey and Neel (1974)

Measurement of Critical Variables

Valence. The authors require subjects to distribute 100 points among ten outcomes, the points to be distributed according to the perceived importance of the outcome. This weighting procedure
deviates markedly from the suggestions of Vroom, where valences are to take on a wide range of positive and negative values.

**Instrumentality.** The authors avoid the use of instrumentality as a term. Following Campbell et al., they employ Expectancy II to indicate the probable results of effective performance. Subjects utilize the following scale:

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quite certain outcome will probably occur.</td>
<td>Outcome one way or the other.</td>
<td>Not sure</td>
<td>Outcome probably will occur.</td>
<td>Quite certain outcome will occur.</td>
</tr>
</tbody>
</table>

**Expectancy.** Arvey and Neel operationalize this variable as the subjects' response on a five-point scale to the following question:

If I apply a great deal of effort in my job, that is, work very hard, I will be regarded by my supervisor as an effective performer.

**Effort.** Supervisors rate subjects using a set of behaviorally anchored rating scales. The motivational dimensions are:

1. **Team attitude** - tendency to recognize the expertise of others potentially in conflict with his own and ability to evaluate such conflicts in terms of overall goals, as opposed to being self-centered and unable to evaluate and negotiate differences intelligently.

2. **Task concentration** - tendency to work for long periods of time without awareness of things other than the task at hand as proposed to easy distract-ability.
3. **Independence/self-starter** - tendency to do what needs to be done without being told as opposed to waiting for instruction before beginning even routine tasks.

4. **Organization identification** - a broad concern for and acceptance of company goals as opposed to a kind of organization myopia.

5. **Job curiosity** - consistency in exploring ramifications of assigned work as opposed to confining one's interest to the assigned task itself.

6. **Persistence** - tendency to keep working in the face of adversity as opposed to giving up too easily.

7. **Professional identification** - a desire to continue self-development within the profession as opposed to seeing the profession as an entry occupation.

Supervisors usually are not in a position to observe effort; they more often see performance or output. In most studies, as in this one, self-ratings of effort result in higher correlations with expectancy variables than do supervisor ratings.

Other measurement problems which may contribute to the negative results in this study include: The investigators weight valence rather than allowing it to take on a wide range of positive and negative values, and they, rather than the subjects, choose the outcomes.
SUMMARY OF REVIEWED RESEARCH STUDIES

Purpose

The majority of reviewed studies measure individual components of expectancy theory and assess their relationship with the basic model. In addition, some investigators such as Arvey explore the possible interaction between variables; others such as Mitchell and Albright examine the relationship of performance to extrinsic and intrinsic motivation; still others such as Mitchell and Nebeker, as well as Mitchell and Pollard, test the predictability of attitude versus the predictability of the basic model; and finally, others such as Pritchard and DeLeo, as well as Pritchard and Sanders, evaluate the multiplicative versus the additive relationship among critical variables.

Results

Most of the reviewed studies provide modest support for the basic model. However, the results are not consistent. The data may be seen by referring to Table 2 where they are presented according to investigator, criterion used, results obtained, and associated probability values. We will now focus attention on the possibility that a factor contributing to the variability in results is investigator failure to adequately resolve measurement difficulties.
Table 2
Results in Conformation of Expectancy Theory

<table>
<thead>
<tr>
<th>Investigator</th>
<th>Effort Criterion</th>
<th>Results</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schuster, Clark, &amp; Rogers, 1971</td>
<td>Self-effort</td>
<td>$x^2 = 21.71$</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Supv. rated perf.</td>
<td>$x^2 = 1.85$</td>
<td>ns</td>
</tr>
<tr>
<td>Wofford, 1971</td>
<td>Supv. rated perf.</td>
<td>$r = .43$</td>
<td>.01</td>
</tr>
<tr>
<td>Mitchell &amp; Albright, 1972</td>
<td>Supv. rating</td>
<td>$r = .26$</td>
<td>.05</td>
</tr>
<tr>
<td></td>
<td>Self-rating</td>
<td>$r = .64$</td>
<td>.01</td>
</tr>
<tr>
<td>Arvey, 1972</td>
<td>Obj. perf.</td>
<td>$F = 2.84$</td>
<td>.06</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$F = .30$</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$F = 2.06$</td>
<td>.13</td>
</tr>
<tr>
<td>Mitchell &amp; Pollard, 1973</td>
<td>Hours spent</td>
<td>$r = .44$</td>
<td>.10</td>
</tr>
<tr>
<td>Mitchell &amp; Nebeker, 1973</td>
<td>Hours spent</td>
<td>$r = .23$</td>
<td>.05</td>
</tr>
<tr>
<td>Lawler &amp; Suttle, 1973</td>
<td>Self-rating</td>
<td>$r = .39$</td>
<td>.01</td>
</tr>
<tr>
<td>Pritchard &amp; DeLeo, 1973</td>
<td>Obj. perf.</td>
<td>$F = 9.24^*$</td>
<td>.005</td>
</tr>
<tr>
<td>Jorgenson, Dunnette, &amp;</td>
<td>Self-effort</td>
<td>$F = .54$</td>
<td>ns</td>
</tr>
<tr>
<td>Pritchard, 1973</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pritchard &amp; Sanders, 1973</td>
<td>Self-effort</td>
<td>$r = .47$</td>
<td>.05</td>
</tr>
<tr>
<td></td>
<td>Supv. rated effort</td>
<td>$r = .16$</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Supv. rated perf.</td>
<td>$r = .17$</td>
<td>ns</td>
</tr>
<tr>
<td>Dachler &amp; Mobley, 1973</td>
<td>Obj. perf.</td>
<td>$r = .30$</td>
<td>.05</td>
</tr>
<tr>
<td></td>
<td>(Plant I)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Obj. perf.</td>
<td>$r = .17$</td>
<td>.05</td>
</tr>
<tr>
<td></td>
<td>(Plant II)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arvey &amp; Neel, 1974</td>
<td>Supv. rated perf.</td>
<td>$r = .21$</td>
<td>.10</td>
</tr>
<tr>
<td></td>
<td>(Old)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Supv. rated perf.</td>
<td>$r = .03$</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>(Young)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant but opposite to prediction.
Measurement Difficulties

To test the effort model of expectancy theory, one must resolve the difficulties associated with measurement of the critical variables: valence, instrumentality, expectancy, and effort. We will now examine each of these constructs in turn. First, we will review Vroom's definition of the concept and how he suggested it should be measured. We will then assess the measurement techniques used and relate these techniques to the results obtained.

Valence

As you recall, Vroom makes the assumption that at any point in time a person has preferences among outcomes or consequences of behavior. He may prefer one outcome as compared to another or he may be indifferent as to which occurs. Vroom uses the term *valence* to refer to these affective orientations toward specific outcomes. An outcome is positively valent if one prefers attaining it to not attaining it; the valence of an outcome is zero when one is indifferent to attaining it or not attaining it; an outcome is negatively valent if one prefers not attaining it to attaining it. Vroom assumes that valence may be given a wide range of either positive or negative values.

Valence measurements and the corresponding study results are summarized in Table 3. Please observe that those studies which allow valence to assume both positive and negative values, as suggested by Vroom, provide support for expectancy theory.
Table 3
Valence Measurement and Study Results

<table>
<thead>
<tr>
<th>Investigator</th>
<th>Scale Range</th>
<th>Dimension</th>
<th>Effort Criterion</th>
<th>Study Results</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schuster, et al.</td>
<td>+1 to +7</td>
<td>Unimportant-Important</td>
<td>Self effort</td>
<td>$x^2 = 21.71$</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Supv. perf.</td>
<td>$x^2 = 1.85$</td>
<td>ns</td>
</tr>
<tr>
<td>Wofford</td>
<td>+1 to +7</td>
<td>Unimportant-Important</td>
<td>Supv. perf.</td>
<td>$r = .43$</td>
<td>.01</td>
</tr>
<tr>
<td>Mitchell &amp; Albright</td>
<td>-3 to +3</td>
<td>Unimportant-Important</td>
<td>Supv. rating</td>
<td>$r = .26$</td>
<td>.05</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Self rating</td>
<td>$r = .64$</td>
<td>.01</td>
</tr>
<tr>
<td>Arvey</td>
<td>+1 to +4</td>
<td>Undesirable-Desirable</td>
<td>Obj. perf.</td>
<td>$F = 2.84$</td>
<td>.10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Obj. perf.</td>
<td>$F = .30$</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Obj. perf.</td>
<td>$F = 2.06$</td>
<td>.13</td>
</tr>
<tr>
<td>Mitchell &amp; Pollard</td>
<td>+1 to +7</td>
<td>Undesirable-Desirable</td>
<td>Hours spent</td>
<td>$r = .44$</td>
<td>.05</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Unimportant-Important</td>
<td>$r = .23$</td>
<td>.05</td>
</tr>
<tr>
<td>Mitchell &amp; Nebeker</td>
<td>-3 to +3</td>
<td>Unimportant-Important</td>
<td>Hours spent</td>
<td>$r = .23$</td>
<td>.05</td>
</tr>
<tr>
<td>Lawler &amp; Suttle</td>
<td>+1 to +9</td>
<td>Undesirable-Desirable</td>
<td>Self rating</td>
<td>$r = .39$</td>
<td>.01</td>
</tr>
<tr>
<td>Pritchard &amp; DeLeo</td>
<td>+1 to +9</td>
<td>Unattractive-Attractive</td>
<td>Obj. perf.</td>
<td>$F = 9.24^*$</td>
<td>.005</td>
</tr>
<tr>
<td>Jorgenson, et al.</td>
<td>+1 to +5</td>
<td>Unnecessary-Necessary</td>
<td>Self effort</td>
<td>$F = .54$</td>
<td>ns</td>
</tr>
<tr>
<td>Pritchard &amp; Sanders</td>
<td>-5 to +5</td>
<td>Bad to Good</td>
<td>Self effort</td>
<td>$r = .47$</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Supv. effort</td>
<td>$r = .16$</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Supv. perf.</td>
<td>$r = .17$</td>
<td>ns</td>
</tr>
<tr>
<td>Dachler &amp; Mobley</td>
<td>-2 to +2</td>
<td>Undesirable-Desirable</td>
<td>Obj. perf (Plant I)</td>
<td>$r = .30$</td>
<td>.05</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Obj. perf (Plant II)</td>
<td>$r = .17$</td>
<td>.05</td>
</tr>
<tr>
<td>Arvey &amp; Neel</td>
<td>0 to 100</td>
<td>Unimportant-Important</td>
<td>Supv. perf. (Old)</td>
<td>$r = .21$</td>
<td>.10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Supv. perf. (Young)</td>
<td>$r = .03$</td>
<td>ns</td>
</tr>
</tbody>
</table>

*Significant but opposite to prediction.
Instrumentality

Instrumentality, according to Vroom, should "... take values from -1, indicating a belief that attainment of the second outcome is certain without the first outcome and impossible with it, to +1, indicating that the first outcome is believed to be a necessary and sufficient condition for the attainment of the second outcome." This variable most often describes the relationship between good performance and outcomes. Vroom perceives instrumentality as an outcome-outcome correlation; most investigators treat it as a probability.

Of the twelve reviewed studies, only Mitchell and Nebeker measure instrumentality as recommended by Vroom. Note that this study provides support for expectancy theory (r = .23).

Expectancy

Vroom views expectancy as a probability; so do most investigators. Some, such as Arvey, Mitchell and Pollard, and Mitchell and Nebeker treat it as a probability with values from 0.00 to 1.00. Others use Likert scales, ranks, and paired comparisons. Almost every author operationalizes expectancy as the degree to which respondents perceive effort determining their level of performance; thus, few problems occur with the measurement of this variable.

Effort

Vroom assumes that the level of effort exerted or the choice of acts performed by a person indicates the relative strength of forces...
acting upon him. It is important to recognize that Vroom predicts effort, not performance. Performance is influenced by many factors other than force, not the least of which is ability.

Nevertheless, performance has been the criterion in many studies. Of the twelve studies reviewed, only four use effort as the criterion: Mitchell and Pollard, Mitchell and Nebeker, Lawler and Suttle, and Pritchard and Sanders. Note that all four of these studies provide significant support for expectancy theory (Table 3).

As we examine the data obtained from the reviewed studies we may make two observations. First, the more closely an investigator follows the conceptual measurement suggestions of Vroom, the more likely is his study to yield results in support of expectancy theory. Second, even though this trend is apparent, the support obtained is modest.

The low level of support may be accounted for, in part, by mathematical difficulties encountered in testing the theory as conceptualized by Vroom. In addition, important sources of effort variance other than $\Sigma E(IV)$ may be present. We will now consider these two possibilities.

Mathematical Difficulties

While discussing the concept of force, Vroom states: "There are many possible ways of combining valences and expectancies mathematically to yield this hypothetical force. On the assumption that choices made by people are subjectively rational, we would
predict the strength of force to be a monotonically increasing function of the product of valences and expectancies." Thus, valences and instrumentalities are to combine multiplicatively.

In order to be mathematically valid, the multiplication of scales require the existence of a true rational zero point on all measures entering into the product. Ratio scales must be used.

The measurement scales used in the twelve reviewed studies appear to be interval at best. Most studies use five- or seven-point Likert scales. A few, such as Mitchell and Nebeker and Pritchard and Sanders attempt to establish a rational zero point. Pritchard and Sanders, for example, use an eleven-point Likert scale ranging from -5 to +5. A value of zero is anchored by the phrase, "I don't care one way or the other." Such an arbitrarily assigned zero point might possibly reflect the true point of indifference, but merely assigning a zero point is not evidence for a ratio scale. The procedure for obtaining such a zero point is quite complicated and not always successful. A procedure for constructing such scales has been developed by Thurstone and Jones (1957).

Most investigators of expectancy theory who test the multiplicative relationship ignore the necessity for ratio scales. However, Hackman and Porter (1968) address this issue. They state, "Although there are zero values on both the E and V questionnaire scales, it is clear that these measurement procedures do not meet the criteria for ratio scales. Thus, it is not legitimate to claim that the predictor is a psychometrically valid measure of the 'motivation' of individual subjects. Instead, the predictor is viewed as
a numerical score which, given the measurement and arithmetic operations employed to obtain the score and the theory from which the operations were derived, should reflect gross differences in the motivation of subjects to work hard. Thus, the procedures used follow Comfrey's (1951) 'practical validity criteria.' As Comfrey (1951) and Hays (1963) note, such procedures are reasonable as long as the scores are substantively meaningful on extra (other than) mathematical grounds and so long as the scores do in fact relate to the criterion variables of interest."

Schmidt (1973) replies that such scores could perhaps be used for predictive purposes, but clearly cannot be used to demonstrate the theoretical meaningfulness of the multiplicative model.

To the extent that the use of non-ratio scales are ambiguous and inappropriate, they constitute a source of unexplained variability and help elucidate the low level of support obtained for expectancy theory. There are, of course, many other sources of effort variance. Some of these sources are summarized in Table 4. To explore each in depth would constitute an unwarranted departure from our purpose. However, we will briefly discuss one of them--competitive theories.

**Competitive Theories**

Vroom's expectancy theory is ahistorical in form; it assumes that decisions made among alternate courses of action are lawfully related to psychological events which occur contemporaneously with the behavior. Other assumptions are that motivation is conscious,
is based on a maximization of pleasure principle, and is the outcome of a complex decision process.

These assumptions might be seriously questioned by other theorists. Drive theorists, such as Thorndike and Hull, most likely would emphasize previous stimulus-response and behavior-reward connections. Behaviorists, such as Skinner, most likely would emphasize reinforcement history and state of deprivation or satiation. Freudians most likely would emphasize unconscious motivation.

Table 4
Sources of Effort Variance Other Than $E(VI)$

<table>
<thead>
<tr>
<th>Source</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decisions about outcomes</td>
<td>Issues relating to outcome acquisition, level of specificity, and content are difficult to resolve.</td>
</tr>
<tr>
<td>Across-subject analysis</td>
<td>Within-subject model is being measured across subject.</td>
</tr>
<tr>
<td>$E(VI)$ predicts force to behave</td>
<td>Whatever limitations there are on freedom of action lowers relationship.</td>
</tr>
<tr>
<td>Force dependent on anticipated outcomes</td>
<td>Received outcomes are measured.</td>
</tr>
<tr>
<td>Boundry conditions</td>
<td>If employees do not perceive that performance is determined by effort or that performance leads to desired outcomes, the predictions of expectancy theory are unlikely to be supported.</td>
</tr>
<tr>
<td>Competitive theories</td>
<td>Alternative theories may better account for effort in certain situations.</td>
</tr>
</tbody>
</table>
Moreover, few individuals, theorists or not, would be willing to view job-related effort as the result of a computer-like decision involving, first, the probability that effort will lead to performance; second, the correlation between performance and outcomes; third, the quantified, affective attitude toward each outcome; fourth, for each outcome, the probability \( E \) multiplied by the product of the correlation \( I \) and the attitude \( V \); and finally, involving the total results being summed across outcomes \( f = \sum E(IV) \).

We must carefully consider whether or not Vroom's version of expectancy theory reflects reality. Perhaps certain individuals tend to occasionally follow a procedure similar to that proposed by Vroom (particularly if they are subjects engaged in a test of his model) but do so in an imprecise and unsystematic way. If true, most of the studies which have tried to test the theory reflect reality at least to the extent they too follow a procedure similar to that suggested by Vroom, but do so in an imprecise and unsystematic way.

If Vroom's theory does not faithfully reflect reality and if other theories better account for part of the effort variance, then the low level of support for expectancy theory is further explained.

As we contemplate the magnitude of the problems associated with testing expectancy theory, we must be inclined to agree with Lawler and Suttle, "... the theory has become so complex that it has exceeded the measures which exist to test it."

Even though the data suggest that expectancies, instrumentalities, and valences are significantly related to their various criteria, the
precise nature of this relationship remains unknown. The empirical
tests do not accurately reflect the overall theory. The measurement
of critical variables does not represent the underlying theoretical
components. The assumptions concerning the manner in which critical
variables are to combine are inadequately tested.

An alternate approach which avoids some, but not all, of the
preceding difficulties is to study work behaviorally. The behavioral
analysis of work concentrates on observable work behavior rather than
on measures of attitudes or opinions such as expectancy, instrumentality,
and valence.

As V. F. Vroom may be seen as the representative of expectancy
theorists, so may B. F. Skinner be seen as the spokesman for the
behavioral analysis of behavior. We shall next discuss his operant
model of behavior, specific applications to the work setting, and
criticisms made of his approach.

THE OPERANT MODEL

The basic assumption of the Skinnerian framework is that behavior
is environmentally determined. The task of the behaviorist is to
discover, rather than hypothesize, lawful relationships between observ­
able events. Behavior, or the dependent response, is defined as the
rate of responding. The rate is affected by the following three
factors:

Positive reinforcer - Any stimulus the presentation of which
strengthens the behavior upon which it is made contingent.
Negative reinforcer - Any stimulus the withdrawal of which strengthens the behavior upon which its withdrawal is made contingent.

Punishment - The result of withdrawing a positive reinforcer or presenting a negative reinforcer.

Skinner designates responses which are elicited by known stimuli as respondents. Another type of response, which he considers to be much more important, is not correlated with known stimuli and these emitted responses are designated operants. The term *operant* emphasizes the fact that the behavior operates upon the environment to generate consequences. According to Skinner, "If the occurrence of an operant is followed by presentation of a reinforcing stimulus, the strength is increased," (1938, p. 21). The order or schedule of this reinforcement has been shown to be an important factor.

Skinner has explored two major classes of reinforcement schedules, nonintermittent and intermittent. Both of these classes are further subdivided and briefly explained in Table 5. Schedules of reinforcement have been investigated in the industrial setting. Yukl, Wexley, and Seymore (1972) compared production obtained under three pay incentive conditions in order to test hypotheses from instrumentality theory and operant conditioning. Instrumentality theory was not supported by the results. Variable ratio schedules were more effective in motivating increased production than were continuous reinforcement schedules.

In a more recent study, Yukl and Latham (1975) compared the effects of three different schedules on production (planting a bag
Table 5

Schedules of Reinforcement

<table>
<thead>
<tr>
<th>Schedule and Abbreviation</th>
<th>Program of Reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. Nonintermittent schedules</strong></td>
<td></td>
</tr>
<tr>
<td>1. Continuous reinforcement (crf)</td>
<td>Every emitted response reinforced.</td>
</tr>
<tr>
<td>2. Extinction (ext)</td>
<td>No response reinforced.</td>
</tr>
<tr>
<td><strong>II. Schedules of intermittent reinforcement</strong></td>
<td></td>
</tr>
<tr>
<td>3. Fixed-ratio (FR)</td>
<td>A given ratio of responses to reinforcements is indicated by the addition of a number to the letters FR. Thus in FR 100 the one-hundredth response after the preceding reinforcements is reinforced.</td>
</tr>
<tr>
<td>4. Variable-ratio (VR)</td>
<td>A random series of ratios lying between arbitrary values with a fixed means (as in VR 100).</td>
</tr>
<tr>
<td>5. Fixed-interval (FI)</td>
<td>The first response occurring after a given interval of time since the preceding reinforcement is reinforced. The designation, as in FI 5, is normally in minutes.</td>
</tr>
<tr>
<td>6. Variable-interval (VI)</td>
<td>A random series of intervals lying between arbitrary values and with a fixed mean, as in VI 5, expressed in minutes.</td>
</tr>
<tr>
<td>7. Alternative (alt)</td>
<td>Reinforcement is delivered according to a fixed ratio or fixed interval schedule, whichever is satisfied first; designated as in alt FI 5 FR 300.</td>
</tr>
<tr>
<td>Schedule and Abbreviation</td>
<td>Program of Reinforcement</td>
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<tr>
<td></td>
<td>If 300 responses occur before 5 minutes is over, reinforcement will occur; if not, reinforcement will occur when 5 minutes have elapsed.</td>
</tr>
<tr>
<td>8. Conjunctive (conj)</td>
<td>The requirements of both the fixed ratio and the fixed interval must be satisfied, e.g., in conj FI 5 FR 300, reinforcement is contingent on at least 5 minutes of time and at least 300 responses.</td>
</tr>
<tr>
<td>9. Interlocking (interlock)</td>
<td>This is a decreasing ratio program in which the number of responses required per reinforcement decreases steadily with time after each reinforcement. The organism is, in effect, penalized for responding rapidly enough to be reinforced early, for then more responses are required for reinforcement than if his responses are spread out in time.</td>
</tr>
<tr>
<td>10. Tandem (tand)</td>
<td>A single reinforcement is contingent upon the successive completion of two units, each of which would have been reinforced according to a single schedule. Thus in FI 10 FR 5, reinforcement depends upon a response after 10 minutes have passed, followed by 5 additional responses, whatever their spacing.</td>
</tr>
</tbody>
</table>

Adapted from Hilgard and Bower (1966, p. 118).
of trees). The treatments were randomly assigned to work crews and consisted of a continuous reinforcement schedule and two forms of what the authors considered to be a variable ratio schedule. A fourth group served as a control. The continuous reinforcement schedule was associated with the highest productivity. This unanticipated outcome could have been a result of difficulties encountered in conducting a field study. The authors suggest that failure to control for potentially critical differences between conditions may have biased the results. Having briefly summarized the operant model and the use of different schedules of reinforcement, we will now consider the model's application to the work situation.

Applications to the Work Situation

Industry utilizes the operant model and behavior modification most often in the area of training. Programmed instruction techniques are being successfully used with increasing frequency; these techniques are based on operant principles of reinforcement.

1. The student is constantly asked to respond in some way to each new fact or idea learned.

2. The student knows immediately whether or not his understanding of each point is complete and correct.

3. The student moves along a series of steps gradually leading from basic facts toward mastery of highly complex concepts, each step building on the material just learned.
4. The student makes very few errors. In the unusual situation when an error is made, it is corrected before any new knowledge is built on an unsound foundation.

5. The student can work through the material at his own optimal rate.

In addition to its use with programmed instruction, industry employs the operant model and behavior modification in other areas of training. Murphy (1972) prepared guidelines for the implementation of operant techniques; these guidelines include setting of behavioral objectives, specifying stimuli, specifying responses and their consequences, and a careful description of the reinforcers both in the training setting and on the job. Sorcher and Goldstein (1972) utilize modeling and reinforcement to enable trainees to shape their own behavior. They employ video tape to demonstrate correct behavior in a job situation, and to have trainees observe their own behavior in the same situation. Through practice the trainees redirect their behavior to closer approximations of the model.

O'Connor and Rappaport (1970) report success in training disadvantaged persons to perform satisfactorily on civil service examinations. They dispense positive reinforcement immediately following desired behavior; this technique is apparently powerful enough to lead to success even though the trainees have a history of many previous failures.

Nord (1970) reports that positive reinforcement programs carried out in two work organizations were both successful. One organization
gave cash bonuses for perfect attendance; the other operated a lottery
for those with a specified attendance record.

The operant model and behavior modification have been applied
not only to train hard-core unemployed and for entry-level jobs,
but also for better control and motivation among other workers.
Hersey and Blanchard (1972) suggest that managers could facilitate
change in work organizations by reinforcing behavior rather than
attitudes. The manager sets terminal behavioral objectives, communi-
cates them to his employees, and sets interim goals as part of a
shaping procedure.

Other possible applications include quality control and adver-
tising research. Adam and Scott (1971) show how an employee’s
behavior could be changed when the quality of his output is substan-
dard. They suggest changing environmental contingencies rather than
focusing attention upon ability or attitudes. They present evidence
that systematic operant procedures sustain desired behavior longer
than poorly planned procedures of reward and punishment. Nathan and
Wallace (1965) and Winters and Wallace (1970) present an application
of operant techniques to advertising research. Subjects look at an
advertisement (stimulus object) as long as they find it reinforcing.
The researchers operationalize relative attractiveness as the length
of time subjects choose to observe the various advertisements.

Edward Feeney (1972, 1973) of Emery Air Freight has applied
operant techniques extensively in the management of that firm.
Feeney provides feedback to employees to demonstrate to them how
their performance differs from their perceptions and from company
standards. Employees use this performance audit to help them change their behavior in the proper direction and to receive positive reinforcement; it also helps the company to better determine proper performance standards. In his company manual entitled *Positive Reinforcement*, Feeney cites the following anecdotes to illustrate the benefits of his system:

- Two salesmen, praised by their Sales Manager three times a week for reviewing their sales calls in terms of whether they got OA (Observable Action) for identifying the key step in the success or failure to get OA, for coming up with a solution to a problem, and for applying that solution reported independently in just 10 days that "they had the best day they ever had in Emery Air Freight."

- A customer service supervisor, distressed by the agents' slow response to answering the phone in 30 seconds, waited until an agent answered the call promptly, praised each agent three times a week for a month. In just four days the agents were answering 80% of the calls in just five seconds.

- A regional Manager, bothered by the Manager's failure to submit reports or to submit them on time, switched from criticizing to praising the Manager for anything done right. On-time compliance jumped from 62% to 94%.

- A Customer Service Manager, faced with a problem of a slow pickup in the downtown section of a major office, praised the drayage agent for any improvement in terms of pickups made in
just 60 minutes as reported in a daily feedback report. Pickups made in 60 minutes rose to 80% and business increased substantially faster than the system, region, or local office.

- An Emery Manager, faced with a subordinate who reacted adversely to any new idea and with resulting performance deficiencies caused because improvements were not made, praised the subordinate for the ideas he accepted and for prompt implementation. In four weeks when a new idea was broached, the subordinate's hand was observed to instantly shoot out for a telephone to implement the idea.

- Two Customer Service units, faced with high absenteeism rates, did not comment on poor performance but praised each girl when they came to work each day this week. "We are shooting for a standard of 96% or higher." Attendance rose to 96%.

- A Customer Service Manager constantly faced the problem of the AM trucks leaving on time. A typical day: 4 trucks out of 23 left on time. The dispatcher and dockmen were asked to measure their own performance each day. Each day the performance was praised. One week later, 23 out of 23 trucks left on schedule.

- One Manager reinforced his Regional Manager for approving his ideas. Previously, the Manager was on the verge of quitting because he couldn't obtain approval of essential things he felt he needed to be a success. Today the RM approves 80% of the proposals.

- A Sales Manager found one salesman paying no attention to the Credit Sales Report and to the movement up and down of his
accounts. Through praise of any reaction—however slight— to the report, the Manager soon had the salesman preparing a written summary of the changes in the accounts and a plan of action. His revenue began to increase.

In summary, evidence has been presented which shows the application of the operant model to the work situation. Currently, the evidence is modest and only suggestive of future possibilities. These possibilities and their implications for organizational management have been admirably discussed by Walter R. Nord (1969) and include implications for job design, compensation, and organizational climate.

Job Design

According to Nord, the operant model suggests we should not view motivation as an internal state, but rather deal with the manipulation of environmental factors which influence the rate of behavior. He maintains that such an approach can better explain what is generally called greater motivation or what the behaviorist calls higher rates of desired behavior.

For example, the job enlargement of McGregor (1960) and the job enrichment of Herzberg (1968) are apt to lead to greater motivation. McGregor and Herzberg suggest that feelings of achievement and responsibility explain these results. The behaviorist searches for specific reinforcers in these newly designed jobs.
Sensory deprivation research suggests that stimulation itself is reinforcing particularly if one has been deprived of it. An increased variety of tasks may be intrinsically rewarding because of the reinforcers associated with the work itself rather than to greater feelings of responsibility or achievement. Thus, the effects of job enlargement can be more parsimoniously explained in operant terms rather than appealing to an internal state.

Herzberg also maintains that some jobs cannot be "enriched" or made more motivating in themselves. In Nord's opinion, it is not the tasks which are the problem, but rather the reinforcement schedules. He cites the example of bingo and other games of chance to illustrate his point and concludes by stating that, "With respect to job design, the important requirement is that rewards follow performance on an effective schedule."

Nord calls upon Homans (1961) for another job design suggestion. Based on his research, Homans indicates that optimal results will obtain if tasks are designed in such a manner that repeated activities lead up to the accomplishment of some final, reinforced result. Activities are reinforced at a low frequency, if at all, until this final result is achieved. Nord then illustrates with an example of producing bottled soda. All routine activities prior to capping are completed before any capping is done. The capping is accomplished at the end of the day and the reinforcement follows immediately. Supposedly, high output and high worker satisfaction would then occur simultaneously. In any event, the operant approach provides interesting
possibilities for designing jobs with powerful reinforcers in the job itself.

Compensation

In discussing compensation, Nord notes the studies which have indicated money to be a "generalized reinforcer," but in his opinion the evidence is not conclusive. Even though monetary incentive programs often increase productivity, they also occasionally invoke restriction of output and have other unanticipated consequences.

Nord indicates a preference for group incentive programs such as the Scanlon Plan which combines both economic and social rewards, the latter occurring soon after an employee's idea has been used. Individual incentive programs are thought to have a greater potential for producing problems.

Fringe benefits often reinforce the wrong responses, according to Nord. Sick pay, recreation programs, employee lounges, work breaks, and other personnel programs all reinforce the employee for staying away from the job or for not working. These costly programs often reduce problems such as turnover, but an employer should realize what behavior he is developing. More productive effort could be obtained if some of the money used for these programs was used instead to redesign jobs to make them more reinforcing in themselves.

The pay schedule represents another area where the application of operant techniques may improve productivity. The usual fixed interval pay schedule is not optimal for generating high output.
Furthermore, pay is often not contingent upon performance. Nord presents an interesting compensation program, originally described by Aldis (1966) which employs a variable ratio schedule, a more effective schedule than the fixed interval. Aldis suggests a lottery system instead of the Christmas bonus or other similar types of salary supplements. The employee's name is placed in a hat if he produces above an agreed-upon standard and a drawing is held. Such a system supposedly approximates the desired variable ratio schedule.

Nord also discusses alternatives to monetary rewards as reinforcers. The critical characteristic of effective reinforcers is that they be made contingent upon desired performance to the greatest degree possible, although to arrange such contingencies may tax administrator ingenuity. Two of the more promising reinforcers are leisure and information. After establishing an agreed-upon standard output higher than the current average, the group or individual could be allowed the alternative of going home. Such an arrangement could result in a marked increase in average output without an increase in cost! Guetzkow (1965) noted that communication or feedback is an important reinforcer. Discussions, letters, notes, graphs, charts, or even tokens which show immediate or cumulative results are effective. Nord suggests that the reinforcing effect of communication or feedback could account for some of the widely accepted benefits of participative management.
Organizational Climate

Available evidence leads Nord to conclude that the potential exists to restructure organizations in a manner to promote desired behavior. The first step is to identify and define this behavior and the available reinforcers. The next step is to make the reinforcers contingent upon performance.

The way these reinforcers are administered is also an important consideration. Nord points out that hostility, fear, anxiety, and other undesirable outcomes can result from a dependency relationship created by reinforcers being given by a person or group of people rather than by the environment. Two ways to make rewards come from the environment are to make them contingent upon reaching certain agreed-upon goals and to design meaningful jobs in which achievement itself is rewarding. Nord concludes his discussion by emphasizing how the Skinnerian operant model focuses attention on planned and rational administration to control outcomes previously viewed as spontaneous occurrences.

Total Performance Systems

In addition to the organizational uses of the operant model as discussed by Nord, Brethower (1972) has developed a total performance system which he uses as a framework for the application of behavioral technology. The total performance system is a functional combination of systems analysis and feedback systems. Brethower defines it as "... an adaptive system comprised of a set of components..."
which, when operational, are sufficient to improve or maintain the performance of the system."

The basic components of a total performance system are represented in the following diagram:

Figure 1
Total Performance System

Components
1. Inputs
2. Processing System
3. Outputs
4. P. S. Feedback
5. R. S. Feedback
6. Receiving System

A sales training program will serve as an example. First, the training manager (who operates the training system) and the district sales managers (who receive the salesmen after their training) establish behavioral objectives. These objectives are stated in terms of readily observable and measurable performance, i.e., upon completion of the training program, trainees are to deliver effective presentations and answer objections to the use of any product of the company's manufacture.

The program, which lasts six weeks, employs programmed learning, classroom discussion, video tape for instant feedback to the trainees, weekly performance tests, and a final examination. Evaluation forms are completed by the trainees and by the district sales
managers who conduct their own performance tests. The total training system is represented in the following diagram.

Figure 2
Sales Training Total Performance System

Components
1. Inputs - Trainees
2. Processing System - Training Program
3. Outputs - Trained Salesmen
4. P. S. Feedback - Video tape, weekly performance tests, final examination, trainee evaluation forms.
5. R. S. Feedback - District Manager performance test, District Manager evaluation forms.
6. Receiving System - District Sales Managers

Brethower then discusses key concepts of behavior modification technology and how they are used in the total performance system. The key concepts he discusses are: feedback, motivation, discipline, behavior change, reinforcement, building on strengths, setting performance goals, achieving performance goals, and managing reinforcement contingencies.

In addition to analyzing the behavior of functional groups, Brethower's total performance system may also be used to analyze individual behavior. To contrast the nature of the expectancy model
with that of the operant framework, we will utilize Brethower's total performance system diagram and a schematic representation of expectancy theory adapted from Campbell, et al. (p. 346). The specific example will be that of a pants presser working in a dry cleaning plant.

The pants presser receives a specific amount for each pair of pants pressed. All of his work is checked by an inspector. The presser is expected to maintain a standard daily output with a low specific level of rejections. Records of performance are posted daily. The pressed pants are returned to customers by the owner who is informed of the quality of the presser's work by the inspector and by the customers. Both the inspector and the owner compliment the presser for good work. The generic representations for both models are presented in Figure 3, and the basic components for this specific situation are as follows:

**Total Performance System Operant Model**

1. Inputs - Pants to be pressed.
2. Processing System - Presser (Pressing pants).
3. Outputs - Pressed pants.
5. Receiving System Feedback - Inspector's comments, owner's comments, customer's comments.
Expectancy Model

Expectancy - Approaches one since presser is well-trained and experienced. Greater effort leads to more pants pressed.

External:

TG₁ - Number of pants pressed per day  
TG₂ - Low specified number of rejections

Internal:

TG₁ - Increased pride from being excellent pants presser  
TG₂ - Not becoming fatigued from overwork

Instrumentality - Approaches one. Good performance leads to more money, compliments from inspector, and compliments from owner.

Outcomes:

O₁ - Money  
O₂ - Compliments from inspector  
O₃ - Compliments from owner

The basic difference between the expectancy model and the operant framework is that the former is cognitive and the latter is noncognitive. Cognition is defined as the process of knowing; it implies a mental operation by which we become aware of objects and concepts through perception and thought. Expectancy theory looks within the individual to account for behavior; it assumes that motivation is conscious, based on cognition, and the outcome of a complex decision process. Job related effort is seen as the result of a decision involving: the probability that effort will lead to performance,
Figure 3

Total Performance System
Operant Model
(Adapted from Brethower—1972)

Components
1. Inputs
2. Processing System
3. Outputs
4. P. S. Feedback
5. R. S. Feedback
6. Receiving System

Expectancy Model
(Adapted from Campbell, et al.—1970)

INSTRUMENTALITY
(Perceived correlation between performance and outcomes)

EXPECTANCY
(Perceived probability of effort leading to task goal)
the correlation between performance and outcomes, the quantified affective attitude toward each outcome, and for each outcome, the probability (E) multiplied by the product of the correlation (I) and the attitude (V). Total results are then mentally summed across outcomes to yield force on the individual to act, \( F = \sum [E(IV)] \).

The Skinnerian operant model looks to the environment to account for behavior. The operant model assumes that behavior is not based on cognition and is largely determined by its consequences. If a desired response is not occurring, one manages the reinforcement contingencies to increase the probability of its occurrence. Effective techniques for use in the work setting are discussed by Brethower.

As demonstrated by Nord, Brethower, and others, applications of the operant model to industry have been diverse and effective; nevertheless, some authors accept it with guarded enthusiasm—others criticize it severely.

**Criticisms**

Negative comments regarding operant conditioning and behavior modification abound in the literature. However, because of the limited use of this technology in the work setting, there are few published criticisms of this specific application. Argyris (1971) and Whyte (1972) will serve as representatives of this critical group. Argyris concentrates his criticism on the problems associated with reasoning from a controlled laboratory experiment to the uncontrolled, complex work situation.
However, the point is that no program, no matter how sophisticated, will work in the non-contrived world if in order to be successful it must assume that: (1) the recipient of the reinforcement will interpret the reinforcement precisely as intended by the reinforcer; the recipient will not add his additional meanings to any given reinforcement, (2) the recipient will not add up reinforcements to generate a history of the relationship which, in turn, could give new meaning to the relationship, (3) the recipient will not discuss the reinforcement program covertly or overtly, knowingly or unknowingly, with anyone else or himself.

Whyte's comments are similar to those of Argyris; he advances four criticisms of the operant model:

1. Defining and measuring desired behavior in the complex work setting is a very arduous task; thus, appropriate reinforcement would be difficult to dispense.

2. A worker's performance often produces rewards from one source and punishment from another. Such conflicting stimuli may confuse the worker.

3. Unavoidable time lags between performance and rewards attenuate the reinforcement process. Unpredictable behavior of those dispensing reinforcers and, more often, punishment complicate the situation.

4. The role of peer reinforcement is omitted from the operant model.
Earlier portions of this paper contain answers to the criticism of Argyris and Whyte. Nevertheless, a brief response is indicated at this point.

Argyris suggests that an administrator will decide upon what is reinforcing for the worker and then personally dispense the reinforcers. He further suggests that to be effective the reinforcement program must be kept a secret. Obviously, his suggestions are unrelated to the Skinnerian model. Reinforcers are discovered preferably through experimentation or at least through consultation with the workers. Once reinforcers are made contingent upon desired behavior, the environment provides the reinforcement. To be effective a reinforcement program must be communicated to and understood by the work force.

Whyte also reflects a misunderstanding of the operant model. His remark that complex behavior is difficult to define and measure is true but irrelevant; such a comment would apply to any psychological theory. His point that many reinforcers and punishers may be operating in the environment is also true, but not disquieting to behaviorists; all relevant facts must be considered. His third criticism regarding the unpredictability of individuals who dispense rewards suggests a problem that the operant model is designed to resolve; the environment rather than an individual is to dispense rewards. His final statement is false. Again, the environmental contingencies, not other individuals, are to control worker behavior. One could contend that individuals other than the worker are part of the environment. If so, they are to be controlled through an appropriate arrangement of contingencies.
Criticism of the Skinnerian operant model as it pertains to the work setting would be incomplete without discussing the ubiquitous controversy of autonomous man versus man being controlled by the environment. The following remarks of Nord and of Hart and Scott (1972) will serve to illustrate the controversy.

- Modern Americans, especially of the managerial class, prefer to think of themselves and others as being self-actualized creatures operating at the top of Maslow's need hierarchy, rather than as animals being controlled and even manipulated by their environment. (Nord)

- Perhaps the reason why we have not done serious science in the domain of behavior control and modification is because we are haunted by our metaphysical heritage concerning the nature of man. Skinner's position is an extreme expression of the image of man in the sense that the autonomous element is completely and scornfully rejected. (Hart and Scott)

The behaviorist position reflects both an ethical and a practical answer. The ethical answer calls attention to the fact that administrators are presently involved in behavior control and that punishment and threat of punishment are the devices most often used. Punishment is unpleasant, ineffective, and leads to unanticipated, adverse consequences for the organization. In contrast, positive reinforcement is more effective and obviously more pleasant.

The practical answer is more direct. It is an empirical fact that behavior is largely determined by its consequences. If a desired
response is not occurring, one must change the reinforcement contingencies to increase the probability of its occurrence.

CONCLUSIONS

1. The available data suggest that the more closely investigators of expectancy theory follow the conceptual and measurement suggestions of Vroom, the more likely their studies will yield statistically significant results, although the support obtained is usually modest.

2. The present analysis indicates that this low level of support is a result of measurement difficulties encountered in testing expectancy theory as conceptualized by Vroom and of the presence of important sources of effort variance other than $E(IV)$. Other expectancy theorists, Porter and Lawler and Dachler and Mobley, suggest extensions and refinements of the theory which render it even more complex.

3. An alternative is to concentrate on observable work behavior rather than on measures of attitudes. The basic assumption of such an approach is that behavior is environmentally determined. If we wish to change behavior, we must change environmental contingencies.

4. Applications of the operant model to industry have been diverse and effective. Most criticisms of this approach have been recognitions of the difficulty of implementation rather than criticisms of the model itself.

5. The expectancy model of Vroom and the operant model of Skinner agree on some points and diverge on others. For example, the positively
Valent outcomes of Vroom and the reinforcers of Skinner both tend to increase rates of behavior, provided they are contingent upon performance. On the other hand, expectancy theorists predict continuous reinforcement schedules to be more motivating than variable ratio schedules; proponents of the operant model predict the opposite.

There is another important difference between the two models. The expectancy model represents a hypothetico-deductive system in that it stresses the formulation of hypotheses and their testing. The operant model is empirical in that it looks to the environment to discover and control behavioral relationships. Skinner has criticized hypothetico-deductive systems as being an extravagant and futile exercise. As we recall the studies reviewed earlier, we must concede that his criticism has merit. Nevertheless, the power achieved by other sciences through theoretical formulation and confirmation is immense. Hopefully there is room in psychology for both approaches.

6. Implications of this analysis for organizational management depend upon whether one assumes the role of partisan zealot or that of benevolent eclectic. Fully recognizing the legitimate place for the former, I prefer to take the role of the latter. Thus, the implications for management are that they should first define desired behavior and identify available reinforcers. They should then make their reinforcers contingent upon performance. They should also train employees to be effective workers and place them in jobs where effort leads to performance. Finally, management should insure that such performance leads to employee desired outcomes.
References


