Motivation

Working Paper Series

EXPECTANCY THEORY IN WORK AND MOTIVATION:
SOME LOGICAL AND METHODOLOGICAL ISSUES

=by=

Mahmoud A. Wahba
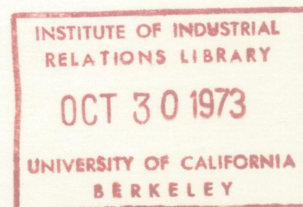Baruch College of the City University of New York

- and -

Robert J. House
University of Toronto

Working Paper   73-05

FACULTY OF MANAGEMENT STUDIES

UNIVERSITY OF TORONTO.

VELUT ARBOR ÆVO

Toronto, March 1973

EXPECTANCY THEORY IN WORK AND MOTIVATION:

SOME LOGICAL AND METHODOLOGICAL ISSUES

⊏by⊐

Mahmoud A. Wahba
Baruch College of the City University of New York

- and -

Robert J. House
University of Toronto

Expectancy Theory in Work and Motivation:

Some Logical And Methodological Issues

ABSTRACT

The development of expectancy theory is described briefly. Fifteen alternative models of expectancy are contrasted. It is argued that the essence of expectancy theory in work situations is the choice among alternative work behaviors of levels of effort. As such, it is shown that the present formulation of the theory in industrial and organizational psychology, and consequently the empirical research based on it, ignores the rationality assumptions underlying this choice behavior. Some of these implicit choice assumptions are specified. It is pointed out that the major constructs of the theory (expectancy, valence) lack the necessary theoretical clarification. The concept of instrumentality is found to be ambiguous and difficult to operationalize. Several major issues and need for further research are discussed. Finally, it is pointed out that the typical formulation of the theory is based on optimization choice criteria (maximizing or satisficing.) The empirical validity of these optimization criteria is questioned and alternative criteria are proposed.

Expectancy Theory in Work And Motivation:

Some Logical And Methodological Issues

The purpose of this paper is threefold: first, to review briefly, the development of expectancy theory as applied to work and motivation; secondly, to specify some of the implicit rationality assumptions underlying the theory; thirdly, to raise and clarify some of the methodological issues connected with the major constructs of the theory.

Expectancy or instrumentality-valence theory is based on two familiar concepts: expectancy (subjective probability) and valence (anticipated value). The theory proposes, generally, that work-related behavior can be predicted once we know the valences and probabilities people attach to certain outcomes. According to the theory, an individual chooses the behaviors he engages in on the basis of the interaction between: (1) the valences he perceives to be associated with the outcomes of the behavior under consideration; and (2) his subjective estimate of the probability that his behavior will indeed result in the outcomes. It is further proposed that the resulting function is a non-linear monotonically increasing product of expectations and valences. The theory has been proposed to predict a wide variety of important work related variables including the following: job effort and job performance (Georgopoulos, Mahoney & Jones, 1957; Vroom, 1964; Galbraith & Cummings, 1967; Lawler & Porter, 1967; Hackman & Porter, 1968; Graen, 1969; Gavin, 1970; Goodman,

Rose & Furcon, 1970; Mitchell & Albright, 1971; Wofford, 1971); job
satisfaction (Vroom, 1964; Porter & Lawler, 1968; Graen, 1969; Lawler,
1970; Wofford, 1971); organizational practices (Evans, 1969); managerial
motivation (Campbell, Dunnette, Lawler & Weick, 1970); occupational
choice (Vroom, 1964; Mitchell and Knudson, 1971); the importance of pay
and pay effectiveness (Dunnette, 1967; Lawler, 1971); and, leadership
behavior and leader effectiveness (Evans, 1969; House, 1971). In addition,
Vroom (1964) asserts that the theory could easily explain the following
work related variables: occupational preference, morale, need achievement,
group cohesiveness, and motivation for effective performance.

Recently, three literature reviews have been published by Mitchell
and Biglan (1971); Heneman and Schwab (1972); and House and Wahba (1972).
The three literature reviews showed that expectancy theory has a great
deal of potential for understanding job behavior and work motivation.
The predictions of the theory were generally supported in the studies
reviewed. However, it is also evident from the reviews by House and
Wahba that the magnitude of the support for the theory is inconsistent
from study to study.

Furthermore, it was pointed out by Heneman & Schwab (1972) that the
research on the theory suffers from several measurement weaknesses. Mitchell
& Biglan (1971) noted that the applications of expectancy theory in indus-
trial and organizational psychology have been less successful than its
applications in the areas of verbal conditioning and attitude formation.

Most prior studies dealt only with limited parts of the theory rather than the predictions of the total theory. Consequently, the overall predictive validity of the theory, based on measurement or control of all the independent variables simultaneously, is virtually unknown.

It is the contention of the authors that these and other weaknesses are due to unresolved logical and methodological issues basic to expectancy theory. Specifically, these unresolved issues are: the neglect of the choice assumptions underlying the theory; and the inadequate theoretical clarification of the concepts of expectancy, valence, instrumentality and their interactions. As yet, these issues have received little or no attention by industrial and organizational psychologists. This paper is an attempt to deal with these issues in order to enhance both the theoretical and empirical value of the theory. The discussion will proceed as follows:

    (I) A brief review of the development of expectancy theory

    (II) The rationality assumptions underlying expectancy theory

  (III) The concept of expectancy

   (IV) The concept of valence

    (V) The interactions between expectancy and valence

I. A Review of the Development of Expectancy Theory

As shown in Table 1, expectancy as formulated in industrial

and organizational psychology is similar to earlier models of choice

behavior in other areas of psychology, mathematical statistics and

economics, some of which appeared as early as the seventeenth century.

Insert Table 1 About Here

The first four models in Table 1 are attributed to economics and/or

mathematical statistics. These four models are based on the assumption

of independence between expectancy and utility and propose a multiplicative

interaction between them. The four models differ only in the assumptions

that the utility of money is linear or nonlinear with the objective (or

numerical) value of money and that expectancy is linear or nonlinear with

objective probability. The next five models in Table 1 were developed in

various areas of psychology. [The mathematical representations of Lewin's,

Tolman's, and Rotter's models are similar to those of Feather (1959)] .

All of the psychological models presuppose a subjective measure of proba-

bility and utility, and call them expectancy and valence, respectively.

The psychological models differ in the way they treat the interaction between expectancy and valence. Some models assume dependence between expectancy and valence, while others assume independence.

.   II.   The Rationality Assumptions Underlying Expectancy Theory

As seen in Table 1, the essence of expectancy theory, whether applied in economics, statistics, or psychology, is choice behavior. Choice behavior, in turn, is based on preference and indifference. Choices are particular responses at a point in time, while preferences and indifferences are dispositions which characterize the individual over time. Most theories of choice, notably those developed by economists and statisticians, were originally formulated as "normative theories" and validated in terms of what a rational person should or would do. Consequently, a number of assumptions or axioms were developed to govern the "rational" choice. Any violations of these axioms would be interpreted as an "irrational" choice. Unlike economists, psychologists are not interested in the development of axioms of normative choice behavior; rather they are more interested in describing, explaining and predicting real life or actual choice behavior (whether it is rational in the normative sense or not). Consequently, they attempted to develop "descriptive theories" of real life choice behavior.

To develop descriptive choice theories, psychologists had two alternatives: (1) to adapt the normative theories to describe real life situations (this could be done by removing some, but not all, of the underlying

rationality assumptions of the normative theories); or (2) to develop totally new theories that are primarily descriptive with regard to both the nature of the variables involved and the underlying assumptions.

As shown in Table 1, expectancy theory in industrial and organizational psychology belongs to the first type of theories. Namely, it is an adaptation of the subjective expected utility theory. It is surprising to note, however, that the rationality assumptions underlying the subjective expected utility theory and, in turn, expectancy theory, have never been discussed by industrial and organizational psychologists. Consequently, the empirical research based on the theory has completely ignored the issues concerning the rationality assumptions. In this section, we will discuss this and other related issues in an attempt to bring them to the attention of the writers in the field.

At the outset, it should be noted that there are many mathematical probability and utility axioms or models, each with its own assumptions of rationality. (For reviews see Becker & McClintock, 1967; Edwards, et. al., 1965; Luce & Suppes, 1965). We will only review here the assumptions which seem relevant to work situations.

To clarify the discussion, consider the choice situation in Table 2.

Insert Table 2 About Here

Suppose an employee is faced with the choice between two actions: A_1 and A_2 (effective or non-effective performance). Suppose further, that each action is certain (probability of 1) to lead to three typical work outcomes as shown in the Table. To be able to make a "rational" choice between the two actions, the behavior of the employee "should" satisfy the following assumptions:

First: Preference or Indifference Between Alternatives:

Formally, let a, b, c $\in$ A be the set of all possible actions, then for every a, b, c $\in$ A, a $>$ b or b $>$ a. That is, to make a choice among the two alternative actions, the employee should be able and willing to choose an outcome over the other or be indifferent between them. For example, following Table 2, the employee may prefer financial reward, or he may be (strangely enough) indifferent towards them.

This assumption is easy to satisfy in work situations, especially if the only required scale of measurement is a rank ordinal scale. The difficulty with the requirement of an interval scale lies in the uncertain range in which the precise point of indifference between outcomes is located. Since it is easy to see that many work outcomes are non-comparable, the crucial condition here is the implicit assumption of comparability between outcomes. However, the problem with the non-comparability of outcomes in work situations may be more theoretical than empirical. People, in fact, do not hesitate to make preferences between theoretically non-comparable outcomes in experimental settings (Suppes and Winet, 1955;

Fogat, 1956). These findings, however, should be subjected to further empirical testing in work situations.

Second: Transitivity of Preference and Indifferences:

Formally, for each a, b, c $\in$ A, if a $>$ b and b $>$ c, then a $>$ c. This assumption requires that the preference between outcomes be transitive. Likewise, the indifference between these outcomes should be transitive. Applying this assumption to Table 2, if the employee prefers the financial reward over group conformity and group conformity over task performance reward, he should prefer financial reward over task performance reward. Edwards et. al., (1965) pointed out that anyone who fails to satisfy this assumption could be exploited to the point of either bankruptcy or the recognition of this intransitivity. For example, following Table 2, assume an employee prefers a financial reward over group conformity and group conformity over task performance reward and then violates the transitivity assumption by preferring task performance reward over the financial reward. The employee could find himself in a situation where he will lose first by changing from financial reward to gain task performance reward; then lose again by changing from task performance reward to gain group conformity; and lose again by changing group conformity to gain financial reward, and so on until he admits his transitivity or goes bankrupt. In spite of this dramatization, there is substantial experimental evidence that people do not follow the transitivity assumption (Luce & Suppes, 1965).

Intransitivities may be expected to occur frequently in work situations due to the multidimensional nature of actions and outcomes. A possible solution to this problem is to use an ordinal scale or to assume a probabilistic (sometimes called weak,) rather than static transitivity. Suppose that the probability of choosing A over B is greater than .5 and the probability of choosing B over C is .5, then the probability of choosing A over C should be greater than some arbitrary minimum value. The concept of probabilistic transitivity, however, is not currently incorporated in expectancy theory as applied to work and motivation.

Third: Dominance

If under every condition one action, A_1, leads to an outcome that is at least as desirable as the outcome of action A_2, and for at least one possible condition, A_1, leads to a more desirable outcome than A_2, then A_2 should not be preferrred over A_1. Consider Table 2, if an employee thought that the first two outcomes attached to effective performance are at least as desirable as the first two attached to noneffective performance and that the third outcome attached to effective performance is more desirable than that attached to non-effective outcome, then he should choose effective performance.

This assumption has been criticized by many writers as being inconsistent with other choice criteria (Luce & Raiffa, 1957.) However, this

assumption is rather significant because it may be truly descriptive of choice behavior in work situations.

Dominance of an action over the other may actually be utilized by employees to simplify the choice process by the elimination of actions that are dominated by others. This significantly reduces the required calculations for the employee. Inversely, if this assumption is not valid in work situations, the calculation requirements become formidable. Consequently, it may be impossible to attribute a descriptive value to expectancy theory. Lawler (1971) recognized this problem by stating: "Thus, carried to all its permutations and combinations, our model would undoubtedly be much more complicated than the model that people actually use. The model of course does not have to be carried to all the combinations. It can be viewed as considering a limited number of alternatives, just as people do." The theory, however, does not specify the determinants of dominance. This again, is an empirical issue in need of further investigation.

Fourth: Independence of Irrelevant Outcomes

This assumption states that if for a particular situation, two actions A_1 and A_2 lead to equivalent outcomes, the choice among these actions should not be affected by the nature of the outcomes. That is, assume that an employee perceives as equivalent the sets of outcomes attached to effective and noneffective performance in Table 2. This means that a change in the nature of the outcomes in the table will not affect the employee's choice, provided that the two sets of outcomes are still perceived as equivalent. There is some evidence that people violate this assumption (Ellsberg, 1961;

MacCrimmon, 1965). These studies show that in laboratory experiments decision makers are indeed affected by irrelevant outcomes. Whether or not this assumption holds true in work situations is also a research issue. If the assumption is not true in work situations, this would explain why expectancy theory has been less successful in predicting job behavior (Mitchell & Biglan, 1971) than attitudes or verbal conditioning. Employees may actually resort to irrelevant outcomes (not accounted for in the model) to justify their choices. Such behavior is clearly inconsistent with the formulation of expectancy theory.

Fifth: Continuity:

Let outcomes O_1 and O_3 result from action A_1. Let outcome O_2 result from action B. Finally, let O_2 be preferred to O_1 and O_3 be preferred to O_2. This assumption states that under the above conditions there is a specific set of probabilities that can be assigned to outcomes O_1 and O_3 such that the decision maker will have no preference for action A or B if action B will result in O_2 for certain.

For example, assume that an employee has a choice between (a) working on a number of sales on which he is paid by straight sales commission and can earn either 500 (O_1) or zero dollars (O_3) per week, depending on how many sales he successfully completes, or (b) a straight salaried assignment on which he is assured of \$150 (O_2) during the same time period. The assumption of continuity would predict that there is a specific set of

probabilities that can be assigned to the outcome of O_1 ($500 earnings) and outcome O_3 (zero dollars) such that he will have no preference between actions A and B.

If this assumption is not true empirically, then there is no empirical justification for the assumed relationship between valence and expectancy as proposed by the theory. Again, the empirical validity of this assumption remains to be tested in work situations.

Sixth: Independence of Expectancy and Valence:

This assumption states that the preference for or against certain outcomes should not be affected by the expectancy of their occurence. As noted in Table 1, most of the psychological theories of expectancy suggest that these two parameters are not independent. Atkinson (1964) and McClelland (1961) have argued that feelings of mastery, achievement, growth and pride of accomplishment are greatest when expectancy of goal accomplishment is approximately .50; and, when it is higher, challenge is reduced, thus reducing the intrinsic satisfaction associated with goal accomplishment.

Feather (1959) found that the independence assumption may in fact be an over-simplification. Feather's results and other's (Edwards, 1961) suggest that this relation differs from one situation to another. As pointed out by Edwards (1961), if expectancy and valence are dependent, then subjective expected utility theory, and in turn, expectancy theory, will face serious measurement problems. However, it is yet to be empirically determined whether or not this assumption is true in work situations.

Conclusion: The Rationality Assumptions

It is possible to discuss additional assumptions; however, the
rationality assumptions are not proposed here as necessary conditions
to be satisfied by expectancy theory in industrial and organizational
psychology. The relevancy of these assumptions to expectancy theory is
in their descriptive value. The question is this: Which of these
assumptions holds true in work situations and which do not hold true and
consequently should be removed? Obviously, this question can only be
answered empirically. Removing all or some of these assumptions, however,
cannot be done without acceptable alternatives. That is, if these
assumptions are not truly descriptive of work choice behavior, what
assumptions are? Removing most, or all, of the rationality assumptions
will reduce the link between expectancy theory and choice theories. It
would also reduce the relationship between choice behavior and work be-
havior. As such, we may end up with different variables, different
patterns of interactions and consequently a totally different theory.
In short, because of the possibility that different assumptions actually
hold in work situations, findings resulting from prior research on the
theory may be a function of a set of relationships completely different
from those implicit in the theory.

III. The Concept of Expectancy

The concept of expectancy is defined by Vroom (1964) as a momentary belief about the likelihood that a particular act will be followed by a particular outcome. Its values range from zero to one. In other words, expectancy is equated to subjective probability. Several issues arise as a result of the lack of conceptual clarity of expectancy as a theoretical concept.

First: The Distinction Between the Conditions of Certainty, Uncertainty and Risk

In most choice theories there is a traditional distinction between the conditions of certainty (where the probability is assumed to be either zero or one), and the conditions of uncertainty (where the probability is assumed to be between zero and one). Some writers also distinguish between conditions of uncertainty and risk. To make this latter distinction, risk is defined as the case where the probability of occurrence of a given outcome is known. Consequently, uncertainty is redefined as either all cases that are neither risk nor certainty or, alternatively, all cases where there is no information about the probability distribution over outcomes (Luce and Suppes, 1965). Expectancy theory, as applied to work and motivation, does not deal with the distinction between conditions of certainty, uncertainty and risk. As noted by Luce and Suppes (1965), theories of certain outcome can be applied to uncertain outcomes and vice versa. However, they seem to be weak theories that fail to take into account the complex structure of the uncertain outcomes. It is ironic that

a descriptive theory of work choice behavior ignores this distinction. The behavioral implications of the distinction are greater than those of its theoretical importance. The lack of distinction between certainty, uncertainty and risk ignores for example individual and group differences with regard to risk taking behavior.

In an attempt to enhance the predictive power of the theory, it may be advisable, as a starting point, to concentrate on the development of the theory under conditions of certainty. This could be done by the development of a taxonomy of outcomes under different conditions and their valences for different groups of employees. Once we know enough about the structure and interaction of possible outcomes under conditions of certainty, we may then proceed to deal with the conditions of uncertainty and risk by incorporating both the expectancy side of the equation and the individual or group differences in risk taking behavior.

Second: The Additivity or the Nonadditivity of Expectancies

A second issue deals with the relationship between expectancy and objective probability. It is generally assumed that expectancy takes the same values as objective probabilities. That is, the sum of the probabilities of a mutually exclusive, exhaustive set of events adds to one. There are a number of experiments (Edwards, 1961) showing that people do not behave that way (e.g., people may assign a probability greater than .50 to both occurrence and nonoccurrence of an event). Accordingly, Edwards (1961) proposed two models of choice, one based on an additivity assumption of probabilities and another based on a nonadditivity assumption. He recognizes, however, that there are problems

with the second model because probabilities that do not add to one are
not measures in the sense of measurement theory.

Objective probability is based on the mathematical expectations of
frequencies, while subjective probability is based on personalistic per-
ception of likelihood. The factors that influence such perception seem
to differ according to different situations, different groups and different
individuals. As yet, expectancy theory in work and motivation has to deal
with the issue of additivity and/or the non-additivity of expectancies.
Furthermore, the factors that influence expectancy are yet to be determined.

Third: The Distinction Between Various Forms of Expectancy

A third issue concerns the outcome for which a particular expectancy
is relevant. Expectancy can be relevant to either first or second level
outcomes. Vroom referred to the subjective probability assigned by a
person to a first level outcome as an expectancy. He referred to the
perceived relationship between first and second level outcomes as instru-
mentality, and did not permit the person assign a probability estimate to
the instrumentality of first level outcomes for second level outcomes.
Porter and Lawler (1968), Campbell et. al. (1970), House (1971) and
Heneman and Schwab (1972) all view the motivational power of the second
level outcomes as the perceived valence of those outcomes multiplied by
Expectancy II (the probability that the first outcome will lead to the
attainment of the second level outcome).

Thus, these authors discriminate between the perceived probability that effort will result in performance or work goal accomplishment (Expectancy I) and the perceived probability that work goal accomplishment will result in outcomes that are valued by the person (Expectancy II).

Research by Graen (1968) and Mitchell and Albright (1971, in press) demonstrates that by being more specific in the treatment of Expectancy I and Expectancy II, greater predictive power can be obtained. Measuring Expectancy I and Expectancy II independently not only increases the predictive power of the theory but makes it possible to identify the conditions under which each is the most important.

Fourth: Expectancy of Intrinsic Outcomes

Finally, there is an issue concerning whether or not the expectancy construct applies to intrinsic as well as extrinsic valences. It can be argued that to the extent that behavior is intrinsically valent, it is also intrinsically motivational because the behavior is highly instrumental to the outcome of satisfaction. A person will be motivated to engage in such behavior because his expectancy that satisfaction will follow is nearly one. That is, if the outcomes were contingent on an external rewarder -- any significant other -- the expectancy would be less than unity because the behavior might not be observed or recognized by the rewarder. However, when the reward is essentially self-administering, expectancy approaches one.

Whether this assertion is indeed a valid one is an empiric question and remains to be tested. If it is valid, it should be possible to show

that measures of intrinsic valence are predictive of motivation, and that

the predictive coefficient is <u>not</u> increased by multiplying the intrinsic

valence by an expectancy measure.

IV. The Concept of Valence

Two issues result from the lack of theoretical clarity of the concept

of valence as applied to work situations.

<u>First: The Ambiguity of the Concept of Instrumentality</u>

There is a great deal of ambiguity concerning the meaning of the

concept of instrumentality and its relationship to valence. Valence is

defined by Vroom (1964) as an affective orientation toward a particular

outcome. Vroom views valence as a multi-dimensional construct. He

recognizes that behavior in social organizations usually leads to a number

of consecutive and simultaneous outcomes. Vroom utilized the concept of

instrumentality to link first and second level outcomes to each other by

viewing one as instrumental in the attainment of the other. As such,

instrumentality is viewed as an outcome-outcome association. Through

this association first level outcomes (performance) become instrumental

to the attainment or avoidance of second level outcomes. "It (the

instrumentality of performance) can take values ranging from -1, indicating

a belief that attainment of the second outcome is certain without the

first outcome (performance) and impossible with it, to +1, indicating that

the first outcome (performance) is believed to be a necessary and sufficient

condition for the attainment of the second outcome," (Vroom, 1964, p. 18).

Vroom distinguished between expectancy and instrumentality by viewing
expectancy as a subjective probability of the action-outcome association.
As such, expectancy takes values between 0 and 1.

The problem with the concept of instrumentality lies in the difficulty
of interpreting it and, in turn, operationalizing it. Unlike the other
major constructs of his theory, Vroom was ambiguous in his treatment of
instrumentality. For his other constructs he gave both a conceptual
definition and several examples as to how they might be operationalized.
Instrumentality was given less attention and only infrequent examples were
offered, usually in connection with a discussion of an issue other than
the meaning of instrumentality per se.

The clearest interpretation of the instrumentality of performance,
or first level outcomes, that we were able to find in the original state-
ment of the theory is given well toward the end of the book as follows:

> "If effective performance leads to attainment of positively valent
> outcomes or prevents the attainment of negatively valent outcomes
> then it should be positively valent; if it is irrelevant to the
> attainment of either positively or negatively valent outcomes, it
> should have a valence of zero; and if it leads to the attainment
> of negatively valent outcomes and prevent the attainment of positively
> valent outcomes, it should be negatively." (Vroom, 1964, p. 263)

As such, the valence of performance is determined by its relation-
ship to second level outcomes. Thus, instrumentality is the belief that
the performance causes avoidance or attainment of an outcome. This belief
determines the extrinsic valence a person assigns to performance.

This conception of instrumentality permits the theory to deal with approach and avoidance motivation with respect to extrinsic rewards or punishments. The valence of performance depends on whether it helps avoid or approach positively valent (desired) or negatively valent (undesired) outcomes. Accordingly, the instrumentality of performance is negative when it helps avoid an outcome and positive when it helps attain an outcome. Four predictions can be derived from Vroom's proposition I, that the valence of performance is a function of the instrumentality of that performance mutiplied by the valence of the outcomes of the performance. These predictions are illustrated in Table 3 where instrumentality is allowed to range from -1 to +1. As can be seen from this Table, if instrumentality takes on values from -1 to +1 the predictions with respect to avoidance are different than if instrumentality is allowed to range from zero to one. In the latter case performance that leads to certain avoidance will always be zero. Thus, allowing instrumentality to range from -1 to +1 has very substantive and logical implications for the theory.

Insert Table 3 About Here

An important issue then concerns whether avoidance motivation increases the tendency to perform as Vroom's model would predict or whether it dampens such a tendency as the use of expectancy II or subjective proability ranging from 0 to 1 would predict. Atkinson's (1957) original statement of a similar expectancy x value type theory contained the same assumption as Vroom's, namely that avoidance motivation will result in increased approach behavior. Atkinson and Feather (1966) state that as a result of attempts to design experiments to test the theory, "The misleading ideas which clearly depart from the inherent logic of the theory" were discovered. They go on to state that "Motivation to avoid failure should always be conceived as inhibitory in character. It specifies what activities a person is not likely to undertake, not what activities he is likely to undertake. This avoidant tendency always opposes, resists, or dampens the influence of motivation to achieve success and extrinsic positive motivational tendencies to undertake some task."

Due to the ambiguity of the concept of instrumentality, investigators have ignored or confounded the distinction between instrumentality and expectancy. This treatment is obviously inconsistent with the formulation of the theory since it confuses the concept of expectancy with that of valence. Some have combined expectancies of first and second level outcomes in a common index (Hackman & Porter, 1968; Goodman, Rose and Furcon, 1970; Lawler & Porter, 1967.) Lawler (1971) has interpreted instrumentality as subjective probability ranging from -1 to +1. (What is the meaning of a negative probability coefficient?)

Other writers have interpreted instrumentality to mean expectancy
that performance leads to second level outcomes (Campbell, Dunnette, Lawler
& Wieck, 1970); Mitchell and Albright, 1971; Heneman & Schwabb, 1972). To
deal with the ambiguity or the inconsistency of the concept others have
linked first and second level outcomes by means of subjective probability
estimates ranging from zero to +1. (Evans, 1968; Mitchell & Albright, 1971,
in press; Graen, 1969; House, 1971). Such a construct is essentially the
same as expectancy II, using the more precise and conventional mathematical
terminology of probabilities. This approach makes it possible to make
expectancy II a conditional probability -- conditional on the attainment
of first level outcomes.

Thus, there are at least two prominent versions of the instrumentality
concept: (1) Vroom's (1964) version which deals with instrumentality as
a determinant of the valence of first level outcomes -- ranging from -1 to
+1; and (2) a more commonly operationalized version which does not deal
with it as a determinant of valence, but rather deals with it as the
expectancy of second level outcomes.

Consequently, predictions of the initial version of the theory have
not been tested. With respect to motivation or performance as dependent
variables virtually all investigators have ignored negative instrumentality.
Consequently, the available evidence is more clearly relevant to Atkinson's
model than to Vroom's. Although prior tests of the theory have not included
negative instrumentality as a predictor of motivation or satisfaction there

is some evidence with respect to its relationship to performance. Studies

reviewed by Birney, Burelick and Teevan (1969) are relevant. Their review

indicates that whether Fear of Failure Motivation (one specific form of

avoidance and one form of negative instrumentality) facilitates or debili-

tates performance

> "clearly depends on the task demands themselves. In general,
> it appears that unfamiliar, complex, speeded, and non-game
> (threatening) achievement settings show the FF S at a dis-
> advantage. He does not master such situations rapidly, and
> his aspiration levels fluctuate in a manner having little to
> do with his actual performance. These findings are uniformly
> based on individual performance settings of a noncooperative
> nature, and these conditions may serve to increase the
> avoidance motivation of the S. Competition produces his worst
> performance. Individual tasks supported by rewards from E
> are better, as are tests of speed at easy tasks. Moreover,
> the same kind of pattern appears in game settings where the
> S seems more concerned with his relationship to the E than
> with maximizing his performance level. The one set of
> circumstances where the FF Ss perform well are those involving
> cooperation with others." (Birney, p. 187)

Since the dependent variable of these studies was generally performance

rather than the valence of performance (job satisfaction), and since Ss

ability levels were seldom systematically varied, these findings are only

indirectly related to the original theory. Assuming ability and intrinsic

valence of performance to be constant, these findings suggest that the

original predictions by Vroom concerning the effects of negative instrumen-

tality are likely to be valid at low occupational levels where tasks are

simple, and feedback and rewards are clear and rapid or where tasks are

interdependent and thus requiring cooperation. For higher level occupations

such as professional and managerial jobs a theory based on Expectancy of

rewards and punishment ranging from zero to one appears to best explain

motivation and performance.

In conclusion with respect to instrumentality it can be said that the predictive power of negative instrumentality is not yet known and, therefore the theory has not been adequately tested. Whether subjective probabilities, which according to probability theory must necessarily range from zero to one, or instrumentality ranging from -1 to +1 are the best predictors is yet also an unresolved issue.

Second: The Non-Additivity of Valences

A second issue deals with the non-additivity of valences. Although the multidimensional view of valence is a more accurate description of work behavior than the uni-dimensional view, it too is a difficult concept to operationalize. It is typically claimed that the valence of an action is the summation of the valences of all possible outcomes. This procedure obviously presupposes that the valences of different outcomes are additive. It is easy to see that this assumption is very difficult to operationalize (how would one add the valence of a financial bonus to the valence of pride in task accomplishment?) The problem gets more complicated once we consider the interaction between the quantity or frequency of outcomes and their valences. This problem has been recognized in economics at the turn of the century. In an attempt to solve the problem, economists proposed a marginal analysis of utility. They propose that the valence of a given outcome is inversely related to its quantity and that utility of a commodity equals the utility of the marginal (or additional) unit.

Psychologists have also found the concept of marginal utility holds for non-material valences (Eisenberger, 1970) as well as material valence (Cofer and Appley, 1967). Whether this is true or not in work motivation is yet to be tested.

V. The Interaction Between Expectancy and Valence

The theory proposes a multiplicative interaction between expectancy and valence. Two issues arise as a result of this formulation: The first is the problem of the choice criteria; and the second is the additivity or multiplicativity of expectancies and valence.

First: The Choice Criteria

The heart of the process of choice behavior is in determining the appropriate choice criterion, or criteria. The question is frequently answered in the literature of expectancy theory in two manners: first, it is implicitly assumed (especially in Vroom's model) that people attempt to maximize their expected valences, or conversely, to minimize their expected losses. The maximization criterion, however, has frequently been criticized both on theoretical grounds (March & Simon, 1958) and as a result of empirical findings (Edwards, 1954). This is due to the lack of knowledge by the decision maker of all the possible outcomes of a given action, the expectancies of the outcomes and the connections between them. As a result, an alternative criterion based on satisficing rather than maximizing was proposed. This satisficing criteria recognizes the inadequacy of information (Lawler, 1971) and suggests that people choose among the best known alternatives.

The maximizing vs. satisficing debate is rather well known in the literature of organization theory and need not be repeated here. However, presenting the issue as a choice only between these two criteria (maximizing vs. satisficing) ignores the possibility of considering other criteria. The simplest of these alternative criteria is "the sure thing principle" which was suggested by Savage (1954) and does not presume full knowledge of the expectancies and outcomes. Like the concept of dominance, the sure thing criterion asserts that if under every condition one action A_1 leads to an outcome that is at least as desirable as the outcome of action A_2, and for at least one possible condition A_1 leads to a more desirable outcome than A_2, then A_2 should not be preferred over A_1 and a "rational" person should choose A_1. Another alternative criterion is the "Variance preference." Allais(1953) argued that people make choices not because of their expectations of outcomes but because of the dispersion of the possible outcomes. This dispersion could be interpreted as the variance of the objective or the subjective distribution of outcomes, or a linear function of the mean and variance of the objective or the subjective distribution of outcomes. A yet third alternative criterion is the "probability preference." Edwards (1953) found that people choose certain actions because they prefer to approach and/or avoid certain probabilities? It has been proposed that people in organizations prefer certainty over uncertainty and constantly attempt to reduce uncertainty (Thompson, 1967). Additional competing choice criteria can be found in the literature of game theory. These alternative criteria

may or may not be acceptable normatively. However, some of them have shown predictive value in describing behavior of subjects in experimental settings (Luce and Suppes, 1965). The evidence indicates that various criteria are applicable to various situations and that different people utilize different criteria. The applicability of these criteris for different work situations and different groups of employees should be tested.

Second: The Multiplicativity vs. the Additivity of Expectancies and Valence

A second issue concerns whether valence and expectancies should be combined additively or multiplicatively to predict motivation. Some studies have supported additive combinations while others have supported multiplicative combinations. Unfortunately, as Heneman and Schwab (1972) indicate, none of the reseach has compared the two methods of combining the independent variables to determine which is the most predictive of motivation.

VI. Conclusions

The above discussion of the logical and methodological issues helps to explain why the predictions of expectancy theory have been less success- ful in field studies of work situations than in laboratory studies con- cerned with attitude formation and verbal conditioning. They also help to explain why some results of field studies are clearly more supportive of the theory in work motivation than others.

Clearly, research is called for to test the validity of the rationality assumptions of the theory and theoretical effort is required to clarify the ambiguities of the valence, expectancy and instrumentality constructs.

BIBLIOGRAPHY

Allais, M. Le comportement de l'homme rationel devant le risque: Critique
    des postulats et axiomes de l'ecole americaine. Econometrica, 1953,
    21, 503-546.

Atkinson, J.W. An introduction to motivation. Princetion, N.J.: Van
    Nostrand, 1964.

Atkinson, J.W. Motivational determinants of risk taking behavior.
    Psychological Review. 1957, 64, 395-372.

Atkinson, J. W. and Feuther, N.T. A theory of achievement motivation.
    New York: John Wiley and Sons, 1966.

Becker, G.M., & McClintock, C.G. Value: Behavioral decision theory.
    Annual Review of Psychology, 1967, 18, 239-286.

Bentham, J. The principles of morals and legislation. London, 1789.

Bernoulli, D. Specimen theories novae de mensura sortis. Comentari
    academiae scientiarum imperiales petrupolitanae, 1738, 5, 175-
    192. Trans, by L. Sommer in Econometrica, 1954, 22, 23-36.

Birney, R.C., Burelick, H., Teevan, R.C. Fear of failure, New York:
    Van Nostrand - Reinhold Co., 1969.

Campbell, J.P., Dunnette, M.C. Lawler, E.E., & Weick, K.E. Managerial
    behavior, performance and effectiveness. New York: McGraw-Hill, 1970

Cofer, C.N., & Appley, M.H. Motivation: Theory and research. New York:
    Wiley, 1964.

Definetti, B. La prevision: Ses lois logiques, ses sources subjectives.
    Ann. Inst. Poincare, 1937, 7, 1-68. English translation in
    H.E. Kyburg, Jr., & H.E. Smokler (Eds.). Studies in subjective
    probability. New York: Wiley, 1964. 93-158.

Dunnette, M.D. The role of financial compensation in managerial motivation
    Organizational behavior and human performance, 1967, 2, 175-216.

Edwards, W. The theory of decision-making. Psychological Bulletin,
    July 1954, 51 #4, 406.

Edwards, W. Probability-references in gambling. American Journal of
    Psychology. 1953, 66, 349-364

Edwards, W. Behavioral decision theory. In P.R. Farnsworth, A. McNemar,
    & Q. McNemar (Eds.) Annual Review of Psychology. Palo Alto, Calif.:
    Annual reviews, 1961, 463-498.

Eisenberger, R. Is there a deprivation-satisfaction function for social approval? Psychological Bulletin, Oct., 1970, 74 #4.

Ellsberg, D. Risk, ambiguity and the savage axioms. Quarterly Journal of Economics, 1961, 75, 643-69.

Evans, M. G. Conceptual and operational problems in the measurement of various aspects of job satisfaction. Journal of Applied Psychology, 1969, 53, 93-101.

Fagot, R. F. A theory of decision making. Ph.D. Dissertation. Stanford: Stanford University, 1956.

Feather, N. T. Subjective probability and decision under uncertainty. Psychological Review, 1959, 66, (3), 150-163.

Galbraith, J., & Cummings, L. An empiric investigation of the motivational determinants of past performance: Interactive effects between instrumentality-valence, motivation, and ability. Organizational Behavior and Human Performance, 1967, 2, (3), 237-267.

Gavin, J. F. Ability, effort, and role perception as antecedents of job performance. Experimental Publication System, 1970, 5, manuscript number 190A.

Georgopoulos, B.S., Mahoney, G. M., & Jones, N. W. A path-goal approach to productivity. Journal of Applied Psychology, 1957, 41, 345-353.

Goodman, P. S., Rose, J. H., & Furcon, J. E. Comparison motivational antecedents of the work performance of scientists and engineers. Journal of Applied Psychology, 1970, 14, 491-495.

Graen, G. Instrumentality theory of work motivation: Some experimental results and suggested modifications. Journal of Applied Psychology Monograph, 1969, 53 (2), 1-25.

Hackman, J. R., & Porter, L. W. Expectancy theory predictions of work effectiveness. Organizational Behavior and Human Performance, 1968, 3, 417-426.

Heneman III, H. H. & Schwab, D. P. An evaluation of research on expectancy theory predictions of employee performance. (in press)

House, R. J. A path-goal theory of leader effectiveness. Administrative Science Quarterly, 1971, 16, (3), 321-338.

House, R. J. & Wahba, M. A. Expectancy theory as a predictor of job satisfaction, performance and motivation: A model and a review of literature. Working Paper Baruch Graduate Center, 1972.

Lawler, E. E. Job attitudes and employee motivation: Theory, research, and practice. Personnel Psychology, 1970, 23, 223-237.

Lawler, E. E. Pay and organizational effectiveness: A psychological perspective. New York: John Wiley & Sons, 1971.

Lawler, E. E., & Porter, L. W. Antecedent attitudes of effective managerial performance. Organizational Behavior and Human Performance, 1967, 2, 122-142.

Lewin, K. The conceptual representation and the measurement of psychological Forces. Durham, N.C.: Duke University Press, 1938.

Luce, R. D., & Raiffa, H. Games and decisions: Introduction and critical survey. New York: Wiley, 1957.

Luce, R. D., & Suppes, P. Preference, utility, and subjective probability. In R. D. Luce, R. R. Bush & E. Galanter (Eds.), Handbook of Mathematical Psychology. New York: Wiley, 1965.

MacCrimmon, K. R. Descriptive and normative implications of the decision-theory postulates. In K. Borch & J. Mossin (Eds.), Risk and Uncertainty. New York: St. Martin's Press. 1968, p. 12.

March, J. G. & Simon, H. A., Organizations. New York: John Wiley & Sons, 1958.

McClelland, D. C. The achieving society. Princeton, N.J.: Van Nostrand, 1961.

Mitchell, T. R., & Albright, D. Expectancy theory predictions of job satisfaction, job effort, job performance, and retention of naval aviation officers. Organizational Behavior and Human Performance, 1971, in press.

Mitchell, T. R., and Biglan, A. Instrumentality theories: Current uses in Psychology. Department of psychology technical report 70-10, University of Washington, 1971.

Mitchell, T. R., & Knudson, B. W. Instrumentality Theory Predictions of Students' Attitudes Towards Business and Their Choice of Business As An Occupation. Working Paper, July 1971, University of Washington, Technical Report 71-27, 1971.

Mosteller, F., & Nogee, P. An Experimental Measurement of Utility. Journal of Political Economics, 1951, 59, 371-404.

Porter, L. W., & Lawler, E. E. Managerial attitudes and performance. Homewood, Ill.: Irwin-Dorsey, 1968.

Preston, M. G., & Baratta, P. An experimental study of the auction-value of an uncertain outcome. American Journal of Psychology, 1948, 61, 183-193.

Ramsey, F. P. Truth and Probability. In F. P. Ramsey, The Foundations of Mathematics and Other Logical Essays. New York: Harcourt, Brace, 1931. 156-198.

Rotter, J. B. Social Learning and Clinical Psychology. New York: Prentice Hall, 1954.

Savage, L. J. Foundations of Statistics. New York: Wiley, 1954.

Suppes, P., & Winet, M. An axiomization of utility based on the notion of utility differences. Management Science, 1955, 1, 259-270.

Thompson, J. D. Organizations in Action. New York: McGraw Hill, 1967.

Tolman, E. C. Principles of Performance. Psychological Review, 1955, 62. 315-326.

Von Neumann, J., & Morgenstern, O. Theory of Games and Economic Behavior. Princeton: Princeton Univ. Press, 1947.

Vroom, V. H. Work and Motivation. John Wiley & Sons, 1964.

Wofford, J. C. The motivationall basis of job satisfaction and job performance. Personnel Psychology, Autumn 1971, 24, 501-519.

TABLE 1

A Summary of the Development of Expectancy Theory

Concept	Formulation	Determinants
1. Expected Value (17th century's Economics)	$EV = \sum_{i}^{n} P_i \$i$	$/$ objective probability (P_i) $/$ $/$ objective value of money $(\$i)$ $/$
2. Expected Utility (Bernoulli 1738; Bentham, 1789; Von Neumann N. Morgenstern, 1947)	$EU = \sum_{i}^{n} P_i U_i$	$/$ objective probability (P_i) $/$ $/$ subjective value (U_i) $/$
3. Subjectively Expected Money Value (Preston & Barratta, 1948; Mosteller & Nogee, 1951)	$SEM = \sum_{i}^{n} i \$i$	$/$ subjective probability (x) $/$ $/$ objective value of money $(\$)$ $/$
4. Subjective Expected Utility (Ramsey, 1931; DeFinneti, 1937; Savage, 1954)	$SEU = \sum_{i}^{n} i U_i$	$/$ subjective probability $(\ \ )$ $/$ $/$ subjective utility (U_i) $/$
5. Potential for Behavior (Rotter, 1954)	$BP._x$	the function of behavior x in situational in relation to reinforcement a is a function of the occurancy of reimbursement following behavior x in situational and the value of reinforcement a.
6. Performance Vector (of animals) (Tolman, 1955)	$PV = f_x(n_f, \overset{v}{f}, expf)$	the need-push for food, (n_f) the positive valence of expected food, (v_f) the expectation of food (exp_f) the need-push against work, $(n-w)$ the negative valence of expected work $(v-w)$ (exp_w)
7. Force (Lewin, 1938)	$V_a(sucA_n) =$ $(V_a \ sucA_n)$. prob. $(Suc.A_n)$ $Va(faiA_n) = VafaiA \cdot$ prob. $(faiA_n)$	Weighted valence of success at level n V_a $(sucA^n)$ the valence and subjective probability of success at level n. Also, similar equation for the weighted valence of failure V_a $(faiA^n)$
8. Attitude (Peak, 1955)	$A = \sum_{i}^{n} I_i V_i$	$/$ instrumentality (I) in attaining reward $/$ $/$ the value of reward (V) $/$
9. Resultant Motive (Atkinson, 1957)	$RM = (M_s X P_s X \ I_s) +$ $(M_f X P_f - l_f)$	$/$ expectancy (P) $/$ $/$ motive (M) $/$ $/$ (incentive (I) $/$ value) $/$ where incentive values and subjective probabilities are inversely and linearly related (i.e. probability of success $I_s = 1-P_s$ and the negative incentive value failure $I_f = 1 - P_s$
10. Productivity of workers (Georgopolous, Mahoney Jones, 1957)	$p = PG$	Perceiving attainment of goal as conditional on path
11. Vroom's Models (1964)		
a) force to perform an act (job effort)	$F = \sum_{j=I}^{n} (E_{ij} V_j)$	$/$ (Expectancy (E) that act i will be followed by outcome j) $/$ $/$ (the valence (V) of outcome j) $/$
b) Valence of outcome (job satisfaction)	$V_j = \sum_{k=1}^{n} (I_{jk} V_k)$	$/$ (instrumentality of outcome j (I_j) for attainment of outcome k) $/$ $/$ (valence of outcome k) $/$
c) job performance	$P = F \times A = \sum_{j}^{n} = I (E_{ij} V_j)$ (A)	$/$ (Force to perform an act or motivation (F) $/$ $/$ (Abilities (A) $/$

2. Porter & Lawler (1967)

$$p = f(E \times A \times R)$$

Performance (P) is a function of the three way interaction among extended effort (E), or motivation; ability (A) and role perceptions (R)

Galbraith & Cummings (1967)

a) Valence of outcome

$$V_j = f_o(V_o) + f_i \left(\sum_{k=1}^{n} V_k I_{jk} \right),$$
$$j = 1, 2 \ldots m$$

the valence of an outcome (V_j) is a function of the valence acquired through internalized motivation (V_o) and the perceived instrumentations of outcome j in the attainment of externally – mediated outcomes. $(V_k I_{jk})$

b) Valence of high performance

$$V = V_e + V_m I_{pm} + V_f I_{pf} + V_p I_{pp} + V_s I_{ps} + V_g I_{pg}$$

Performance is a function of the extrinsic rewards and the intrinsic rewards:
Ego involvement (V_e);
Money (V_m); fringe benefits (V_f); promotion (V_p); supportiveness (V_s); group acceptance (V_g) and their corresponding instrumentalitie (I).

Grean (1969)

a) Gain in performance

$$B = \left(\sum_{i=1}^{I} A_i I_i \right) E' w_o + \left(\sum_{j=1}^{J} R_j P_j \right) w_1 + \left(\sum_{k=1}^{K} A_k E_k \right) w_2$$
$$(i = 1, 2, \ldots, I; j = 1, 2, \ldots, J; k = 1, 2, \ldots K)$$

Gain in performance a) is a function of path-goal utility b) external pressure and c) internal pressure.

b) gain in satisfaction

$$S_n = \left(\sum_{i=1}^{I} A_i I_i \right) E' b_o + \left| \frac{\sum_{j=1}^{J'} R_j P_j}{\sum_{j=1}^{J} R_j P_j} \right| b_1 + \left| \frac{\sum_{k=1}^{K'} A_k E_k}{\sum_{k=1}^{K} A_k E_k} \right| b_2$$
$$(i = 1, 2, \ldots, I; j = 1, 2, \ldots, J', \ldots J; k = 1, 2, \ldots, K', \ldots K)$$

The gain in satisfaction S_n is a function of the degree of path-goal utility, the amount of external pressure that is consonant with the given act relative to the total external pressure and the amount of internal pressure that is consonant with the act relative to the total internal pressure

House (1971)
Motivation

$$M = IV_b + E_1 \left(IV_a + \sum_{i=1}^{n} (E_{2i} Ev_i) \right)$$
$$i = 1, \ldots n$$

Motivation to work in a function of intrinsic valence associated with task accomplishment (IV_a) and task performance (IV_b) and extrinsic valences (V_i) and the corresponding expectancies (E_1 and E_2)

Table 2

A simplified two action, three outcomes work situation

possible outcomes / alternative actions	O_1	O_2	O_3
A_1 Effective performance	financial reward (e.g., $100 bonus)	task performance reward (e.g., development of valued skills)	task accomplishment reward (e.g., pride in work)
A_2 Non-effective performance	no financial reward	group conformity	slack

Table 3
Comparisons of Predictions Where
Allowing Instrumentality to Range
From -1 to +1 versus Zero to +1

| | Extrinsic Valence of Performance | |
	Instrumentality $-1 \leq I \leq 1$	Instrumentality $0 \leq I \leq 1$
(a) Performance leads to avoidance of a positively valent outcome	negative	0
(b) Performance leads to avoidance of a negatively valent outcome	positive	0
(c) Performance leads to attainment of a positively valent outcome	positive	positive
(d) Performance leads to attainment of a negatively valent outcome	negative	negative