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Of cognitive theories of motivation, the most intensively researched in recent years is the Valence-Instrumentality-Expectancy (VIE) theory. A recent review of VIE research (9) shows the valence model to be reasonably predictive of occupational preference, job satisfaction, and valence of performance. The behav-

ioral choice model has not fared so well; although it moderately predicts self-ratings of job effort, its efficiency in predicting criteria measured by other than self-ratings is questionable. When the behavioral choice model is used in research, the following findings are typical:

1. Intrinsic outcomes (feelings of accomplishment, etc.) are better predictors of

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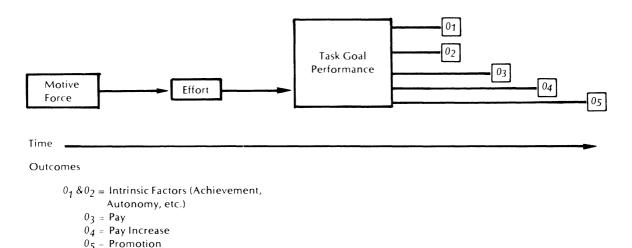
Time

Outcomes

O_1 & O_2 = Intrinsic Factors (Achievement,
Autonomy, etc.)
O_3 = Pay
O_4 = Pay Increase
O_5 = Promotion

FIGURE 1. The Temporal Dimension.

satisfaction and performance than are extrinsic outcomes (pay, promotions, etc.).

2. Small variances are obtained in valence measures; thus, multiplying expectancy by valence does not increase predictability over use of expectancy alone.

3. Causal tests using time series designs are inconclusive.

In addition to a number of methodological problems, these findings led Mitchell (9) to suggest development of more accurate theoretical representations and better construct measures.

The Forgotten Variable

Behavioralists have long recognized the importance of the performance-reward time lag in administration of rewards and punishments to influence behavior. The notion is that the more immediate the consequence of a behavior, the more likely the behavior will be reinforced. Opsahl and Dunnette (10) state that one of the most important variables in determining the effectiveness of money as a reinforcer is the schedule by which it is administered.
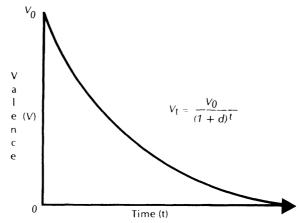
Surprisingly expectancy theorists have overlooked such an important variable in shaping behavior.

Even though some writers (4, 5, 7, 12, 15, 16) have recognized the utility of considering the impact of time lag effects on motivation, no one has attempted to incorporate this variable into a VIE formulation. The purpose of this article is to present a reformulation of the VIE *behavioral choice* model that accounts for time-lag effects.

The Temporal Dimension

Obviously the VIE components (motive, force, effort, task goal performance, and outcome attainment) occur sequentially. Figure 1 represents this temporal relationship. Some motive force precedes effort which, in turn, leads to some level of task goal performance. When outcomes are contingent upon performance, they will accrue to the individual after performance is demonstrated, but experience and intuition lead us to believe that these outcomes could be staggered in their receipt.

In Figure 1, O_1 and O_2 are intrinsic outcomes which are experienced immediately upon performance of a task. There is no perceptible time

Where: V_t = Valence of an outcome to be received at time t.
V_0 = Valence of an outcome if received immediately (t = 0).
d = Discount rate applicable to outcome.
t = Length of time between effort and outcome.

FIGURE 2. Hypothesized Effect of Time Lag on Valence.

lag between performance and outcome attainment, although there might be an effort-performance time lag. 0_3, 0_4, and 0_5 could be considered extrinsic outcomes and might accrue at different points in time. The important issue is that a single behavior can lead to multiple outcomes, all of which may not be attainable immediately. This time lag between expenditure of effort and attainment of an outcome is hypothesized to have some impact on the motivational force to expend effort.

The Relationship of Time to Valence

According to Vroom (14), valence is the anticipated satisfaction derived from an outcome and should be distinguished from the value of an outcome, which is the amount of actual satisfaction derived from its attainment. Whether one considers valence as a value or an anticipated satisfaction, clearly outcomes may possess differing valences, and individuals are capable of establishing preferences for outcomes based on these differences in valence. VIE theorists have not considered adequately the possible relationship of time to attractiveness of outcomes.

The time value of money has been established in the practice of financial management. Discount factors (interest rates and cost of capital computations) are used to determine the present value of investment alternatives. Those with the highest net present value are typically chosen. Persons who have secured loans from lending institutions are aware of interest charges based on the length of time the loan will be in effect. Even individuals who have not borrowed money are aware that the purchasing power of the dollar has declined steadily over the past 10 years.

The influence of time on the attractiveness of non-monetary incentives has not yet been determined empirically. But it is intuitively appealing to assume that individuals would prefer a promotion today rather than next month and immediate praise from a supervisor rather than praise at some later date. The distinction between intrinsic and extrinsic rewards can be explained to some degree by the time lapse between performance and reward. The finding that intrinsic rewards are better predictors of satisfaction and performance (9) may rest on the time differential of their receipt.

If perceptions of valence are related to the effort-reward time lag, what is the mathematical nature of this relationship? People seem to perceive present time units as being longer in duration than time units associated with past events (11). If future time units are assumed to be collapsed by individuals in a manner similar to past time units and if outcomes are assumed to retain some valence no matter how distant their attainment, an exponential function might be appropriate in linking valence to the temporal dimension (see Figure 2).

Such an exponential function has some interesting properties. First, valence will be strongest for immediately attainable outcomes such as those normally termed intrinsic. As the time lag increases, the effect of each time increment on valence is reduced. Thus, anticipated rewards may have some motivating effect no matter how distant their attainment. Typical deferred rewards of this nature are pensions, sabbatical leaves, and the less materialistic salvation. Second, this model specifies a discount factor d that determines the rate of valence reduction over time. This discount rate may be different for each outcome attainable. That is, some types of outcomes may be more time sensitive than others when determining outcome valence.

Whether or not this proposed exponential relationship is indeed the true relationship between perceptions of outcome valence and the time lag preceding outcome attainment is an empirical issue. Similarly, the assumption that different outcomes may show differential time sensitivity lends itself to empirical verification.

The Time Discounted Expectancy Model

In view of the above considerations, the expectancy behavioral choice model should be reformulated in terms of the time dimension. Since outcomes of work behavior do not occur at the same point in time, we must account for the effect these time differences might have on motivation. Specifically, it is hypothesized that the force acting on an individual to perform an act at a given time is not just a function of ex-

pectancy and valence, but a function of expectancy and valence of outcomes discounted to the point in time at which the act takes place. Present performance is a function of the *discounted* valence of first level outcomes multiplied by the expectancy that performance will *eventually* lead to the outcome. Mathematically:

$$F_i = fE1_i \sum_{t=0}^{T} \sum_{j=1}^{n} \frac{E2_{ij} V_{t,j}}{(1+dj)^t}$$

Where:

F_i = The motive force acting on an individual to perform activity i at time $t = 0$.

$E1_i$ = The expectancy that effort exerted will result in the performance of activity i.

T = The total time frame over which first level outcomes resulting from activity i are expected to accrue. It is assumed that time will be measured in discrete units such as days, weeks, months, and years.

$E2_{ij}$ = The expectancy that performance of activity i will lead to outcome j independent of time.

$V_{t,j}$ = The undiscounted valence of outcome j to be received at time t.

d_j^* = The time based discount factor for outcome j.

t = The time elapsed since exertion of effort to accomplish activity i.

n = The number of first level outcomes anticipated as a result of activity i.

The following assumptions are implict in this formulation:

1. The primary effect of the effort-reward time lag is on perceptions of valence.

2. Although time is a continuous variable, it is treated as discrete in this model, in accordance with the usual industrial practice of administering rewards at dis-

crete intervals such as weekly, or monthly. Even though rewards may be accrued continuously as in piece rate systems, actual reward receipt occurs at discrete time intervals.

3. The possibility exists that individuals assign a different time discount factor to each first level outcome or class of outcomes. This discount factor can be derived empirically. The exponential relationship proposed is based on the notion that some outcomes, money for example, can be invested to accrue additional similar outcomes and from the elastic perceptions individuals have regarding units of time.

Empirical Support for VIE Reformulation

In addition to folk knowledge ("A bird in hand is worth two in the bush,"), there is some empirical support for the contention that as the attainment of a reward becomes more immediate the reward becomes more preferred. Mahoney (8) reported that managers prefer straight salary as a reward to less immediately attainable pensions, insurance, or vacations. In a recent study (3), money earned by subjects on the first day of the study was not paid out until the last day. Researchers found an increase in perceived importance of money as an outcome over the six day time frame of the experiment. This elevation of importance was independent of expectancy manipulations. Although the increase could be due to subjects' compensation for the lack of intrinsic job value (1) or to an increase in basic needs related to money, it also is possible that as the payoff date drew nearer, the valence of the reward increased as a function of time. Other researchers (13) have shown that during the job choice process as employment drew near, the valence of immediate and tangible outcomes increased. Although other explanations are plausible, reward valence did increase as time of receipt approached.

The incorporation of the time dimension into the expectancy model is further supported by selected methodological findings. Heneman and Schwab (2) report the test-retest reliability for expectancy measures to be higher than for valence measures. One explanation is that some rewards were more immediately attainable at the second administration of the questionnaire than at the first. The valence measure would change as a result of a shorter discount period at the second administration. Other writers (5, 6) provide more direct support for a time discounted model in their finding that ($E \times V$) loses predictive pwower with increase in the time lag between E and V measures and the measure of effort or performance. The time-lag model would make such a prediction in that it assumes present, not future behavior to be determined by ($E \times V$). Valence measures repeatedly have shown little variance, and combining valence and expectancy does not improve on the use of expectancy alone in predicting behavior. This may be due to employing questionnaire items that measure valence of rewards as if they are attainable in the present. Since organizations design incentive systems around highly attractive rewards, each should be highly valent in the present. Adjustment of these valences measures to account for the differential receipt of rewards with respect to time should increase variance in these measures and perhaps the predictive power of the model.

Implications of the Time Discounted Model

The primary distinction of this model is that current behavior is a function of the *discounted* valence of the rewards expected as a consequence of that behavior and the expectancy that effort will eventually lead to these rewards. Unlike earlier formulations of the expectancy model, this revision allows for the consideration that rewards may be received sequentially and furthermore that the same class of reward may be obtained at different time intervals. Bonuses might be paid in increments to reduce an employee's tax liability, or one's share of a profit

sharing fund might not be available for use until some future date, even though the amount in the fund depended upon current performance. Thus, even though these incentives are based on current performance, a pay raise (also a monetary incentive) immediately available might carry more motive weight even if the absolute amount of the raise were far less than the future bonus payment.

Time may differentially affect the valence assigned to different classes of incentives. Awareness of this relationship could guide administration of incentive plans. An optimal mix of incentives may be granted at specified time intervals after task accomplishment to maximize such factors as job satisfaction or productivity. Intrinsic rewards received at time $t = 0$ would not be discounted at all whereas pay raises might not accrue until some future salary review had taken place. The emphasis an organization places on various rewards should be tempered by time considerations.

Future research must be addressed to the temporal relationships among VIE variables. A requisite first step would be to insure that instruments used to measure valence be worded to obtain *present* values/attractiveness of outcomes. Additional questionnaire items should be included to determine over what time frame receipt of outcomes is to take place. But even with appropriate instruments, viewing behavior as occurring immediately following motivational antecedents presents an interesting research design problem. How can causal relationships between motivational factors and behavior be demonstrated in field survey designs? The time discounted model would require measurement of a behavioral criterion immediately following measurement of the motivationally based predictor. Traditional time lags of one to six months between measurement of predictors and criteria may be inappropriate for testing VIE based hypotheses. Unfortunately, time lags of only a few minutes, or perhaps hours, may lead to extreme subject reactivity to the research, thus requiring elaborate study designs to control for this effect.

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