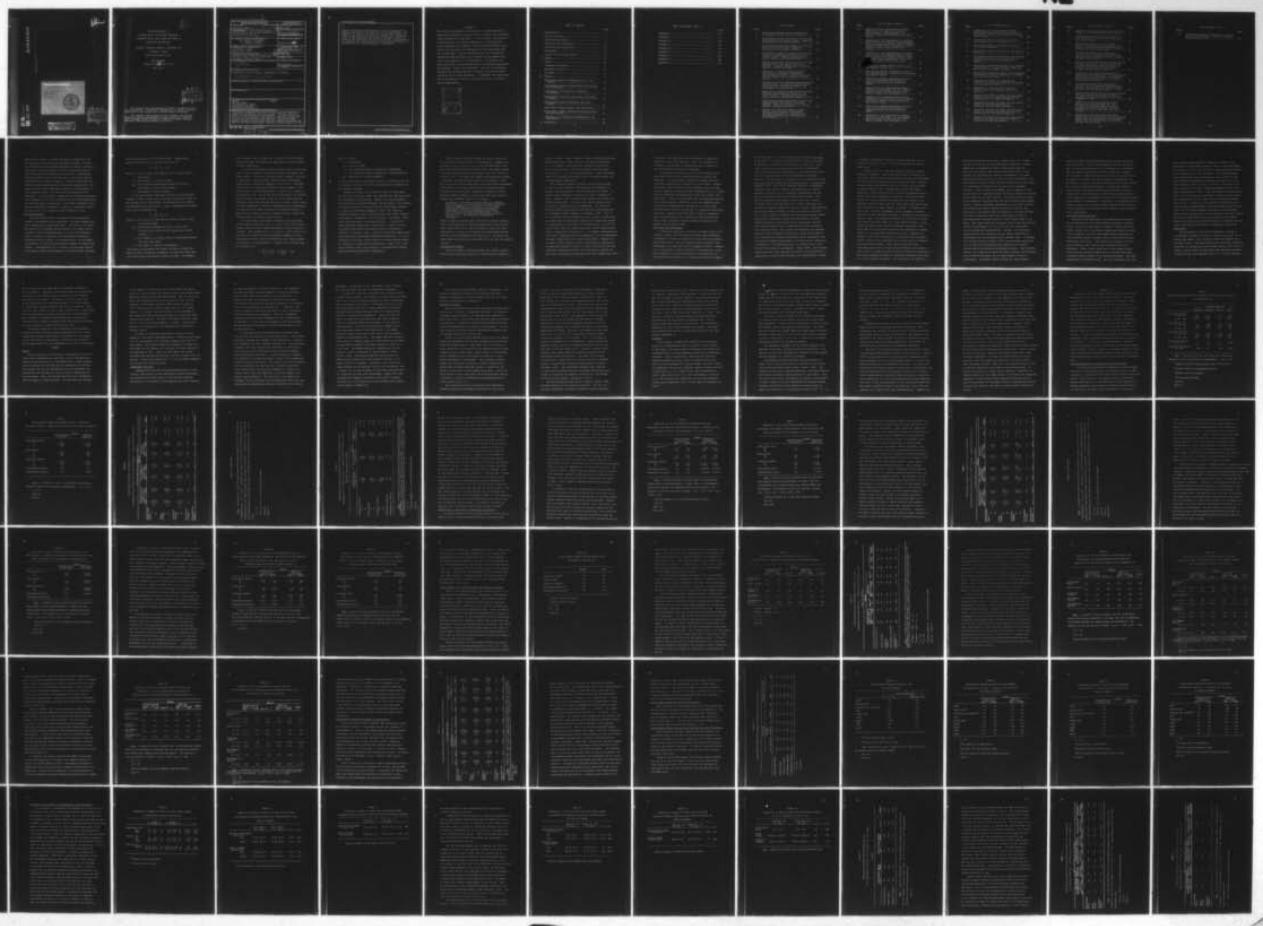
AD-A044 303 AKRON UNIV OHIO DEPT OF PSYCHOLOGY F/G 5/10
A LONGITUDINAL FIELD STUDY COMPARING A MULTIPLICATIVE AND AN AD--ETC(U)
JUL 77 G V BARRETT, R A ALEXANDER, M C RUSH N00014-75-C-0985
UNCLASSIFIED TR-11 NL

1 OF 2
AD A044303



AD A044303



DEPARTMENT OF PSYCHOLOGY

THE
UNIVERSITY
OF
AKRON

AD No.
DDC FILE COPY

DDC
RECEIVED
SEP 2 1977
B

DISTRIBUTION STATEMENT A
Approved for public release;
Distribution Unlimited

(6)

Technical Report 11

A Longitudinal Field Study Comparing a Multiplicative and an Additive Model of Motivation and Ability

Gerald V. Barrett, Ralph A. Alexander and

Michael C. Rush

The University of Akron

ONR Contract

N00014-75-C-~~0905~~ 0985, NR 151-377

July, 1977

DDC
RECEIVED
SEP 2 1977
B

This document has been approved for public release and sale; its distribution is unlimited. Reproduction in whole or part is permitted for any purpose of the United States Government.

This research was sponsored by the Personnel and Training Research Programs, Psychological Sciences Division, Office of Naval Research, under Contract No. N00014-75-C-0985, Contract Authority Identification Number, NR 151-377.

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: Technical Report 11	2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER: TR-11	
4. TITLE (and Subtitle): A Longitudinal Field Study Comparing a Multiplicative and an Additive Model of Motivation and Ability.	5. TYPE OF REPORT & PERIOD COVERED: Technical Report, 11
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): Gerald V. Barrett, Ralph A. Alexander, Michael C. Rush	8. CONTRACT OR GRANT NUMBER(s): N00014-75-C-0985
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Department of Psychology, University of Akron, Akron, Ohio 44325	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: 61153N; RR042-04; RR042-04-12; NR 151-377
11. CONTROLLING OFFICE NAME AND ADDRESS: Personnel and Training Research Programs, Office of Naval Research (Code 458), Arlington, Virginia 22217	12. REPORT DATE: Jul 77
	13. NUMBER OF PAGES
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report): Unclassified
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

N00014-75-C-0985

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Ability
Additive Model
Instrumentality Theory
Multiplicative Model
Performance Satisfaction
Tenure

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The relative contribution of motivation to ability measures in predicting performance criteria of sales personnel from successive fiscal periods was investigated. In this context, the merits of a multiplicative and additive combination of motivation and ability measures were examined. The relationship between satisfaction and motivation and combined motivation and ability was also investigated. Results provided support for the

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE
S/N 0102-014-6601 |

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

409394

20.

additive combination when motivation and a general ability measure were used in the prediction of job performance. In addition, job tenure was found to significantly affect job-related expectancies and valences. Results are discussed in terms of the conceptual and empirical problems involved in assuming the multiplicative dictum of ability times motivation. In addition, the restrictive use of only ability measures in the prediction of job performance is questioned.

Abstract

The relative contribution of motivation to ability measures in predicting performance criteria of sales personnel from successive fiscal periods was investigated. In this context, the merits of a multiplicative and additive combination of motivation and ability measures were examined. The relationship between satisfaction and motivation and combined motivation and ability was also investigated. Results provided support for the additive combination when motivation and a general ability measure were used in the prediction of job performance. In addition, job tenure was found to significantly affect job-related expectancies and valences. Results are discussed in terms of the conceptual and empirical problems involved in assuming the multiplicative dictum of ability times motivation. In addition, the restrictive use of only ability measures in the prediction of job performance is questioned.

ACCESSION for
NTIS White Section ☑
DDC Buff Section ☐
UNANNOUNCED ☐
JUSTIFICATION
BY
DISTRIBUTION/AVAILABILITY CODES
Dist. AVAIL. and/or SPECIAL
A

Table of Contents

		Pages
I	INTRODUCTION	1
	Motivation Models	2
	Multiplicative Models	6
	Motivation and Performance	8
	Motivation and Satisfaction	12
	Measurement	13
	Purpose of the Present Study	15
II	METHOD	16
	Sample	16
	Independent Variables	17
	Dependent Variables	20
	Procedure	22
III	RESULTS	26
	Relationship Between Instrumentality and Performance	26
	Relationship Between Combined Motivation-Ability and Performance	29
	Contribution of Motivation in Predicting Performance	34
	Relationships Involving Post-Survey Performance Criterion	48
	Relationship Between Performance and Satisfaction	61
	Relationship Between Ability and Satisfaction	64
	Relationship Between Combined Motivation-Ability and Satisfaction	64
	Influence of Job Tenure on Instrumentality and Performance	72
IV	DISCUSSION	94

Table of Contents (Cont'd.)

	Pages
REFERENCES	107
APPENDIX A	113
APPENDIX B	116
APPENDIX C	118
APPENDIX D	120
APPENDIX E	124
APPENDIX F	126
APPENDIX G	128
APPENDIX H	130

List of Tables

Table		Pages
1	Relationship between Ability Measures and Performance Criteria by Fiscal Periods.....	27
2	Relationship between Performance Criteria and Instrumentality by Fiscal Periods: Comparing Multiplicative and Additive Models.....	28
3	Relationship between Performance Criteria and Effort by Fiscal Periods: Comparing Multiplicative and Additive Models.....	30
4	Relationship between Performance Criteria and Combined Instrumentality and Ability by Fiscal Periods: Comparing Multiplicative, Partial Additive and Additive Models.....	31
5	Relationship between Performance Criteria and Combined Effort and Ability by Fiscal Periods: Comparing Multiplicative, Partial Additive and Additive Models.....	33
6	Comparison of the Relationships between Ability and Performance and Combined Instrumentality-Ability (Multiplicative and Additive Models) and Performance by Fiscal Period.....	36
7	Comparison of the Relationship between Ability and Performance and Combined Effort-Ability (Multiplicative and Additive Models) and Performance by Fiscal Period.....	37
8	Relationship between Performance Criteria and Combined Instrumentality and Ability by Fiscal Periods: Comparing Multiplicative, Partial Additive and Additive Models.....	39
9	Relationship between Performance Criteria and Combined Effort and Ability by Fiscal Periods: Comparing Multiplicative, Partial Additive and Additive Models.....	42
10	Comparison of the Relationships between Ability and Performance and Combined Instrumentality-Ability (Multiplicative and Additive Models) and Performance by Fiscal Period.....	43

List of Tables (Cont'd.)

Table		Pages
11	Comparison of the Relationships between Ability and Performance and Combined Effort-Ability (Multiplicative and Additive Models) and Performance by Fiscal Period.....	44
12	Comparison of the Relationships of Performance Criteria with Combined Instrumentality-Ability (Multiplicative and Additive Models) Using the Wesman Total Plus Bennett or Sales Selection Index as Ability by Fiscal Period.....	46
13	Comparison of the Relationships of Performance Criteria With Combined Effort-Ability (Multiplicative and Additive Models) Using the Wesman Total Plus Bennett or the Sales Selection Index as Ability by Fiscal Period.....	47
14	Relationship Between Ability Measures and Performance Criteria (T3).....	49
15	Relationship Between Performance Criteria (T3) and Motivation: Comparing Multiplicative and Additive Models.....	51
16	Relationship Between Performance Criteria (T3) and Combined Motivation-Ability: Comparing Multiplicative and Additive Models.....	52
17	Comparison of the Relationships Between Ability and Performance (T3) and Combined Motivation-Ability (Multiplicative and Additive Models) and Performance (T3).....	54
18	Comparison of the Relationships Between Combined Motivation-Ability (Multiplicative and Additive Models) and Performance for Each Fiscal Period.....	55
19	Relationship Between Performance Criteria (T3) and Combined Motivation-Ability: Comparing Multiplicative and Additive Models.....	57
20	Comparison of the Relationships Between Ability and Performance (T3) and Combined Motivation-Ability (Multiplicative and Additive Models) and Performance (T3).....	59

List of Tables (Cont'd.)

Table		Pages
21	Comparison of the Relationships Between Combined Motivation-Ability (Multiplicative and Additive Models) and Performance for Each Fiscal Period.....	60
22	Relationship Between Performance Criteria and Satisfaction by Fiscal Periods.....	62
23	Relationship Between Performance Criteria (T3) and Satisfaction.....	65
24	Relationship Between Satisfaction and Ability Measures.....	66
25	Relationship Between Satisfaction and Combined Instrumentality-Ability by Fiscal Period: Comparing Multiplicative and Additive Models.....	67
26	Relationship Between Satisfaction and Combined Effort-Ability by Fiscal Period: Comparing Multiplicative and Additive Models.....	68
27	Relationship Between Satisfaction and Combined Instrumentality-Ability Comparing Multiplicative and Additive Models.....	69
28	Relationship Between Satisfaction and Combined Effort-Ability Comparing Multiplicative and Additive Models.....	70
29	Comparison of Means for Short and Long Tenure Groups on Expectancy, Valence and Ability.....	73
30	Comparison of Means for Short and Long Tenure Groups on Combined Instrumentality-Ability (Multiplicative and Additive Models).....	74
31	Comparison of Means for Short and Long Tenure Groups on Combined Effort-Ability (Multiplicative and Additive Models).....	75
32	Comparison of Means for Short and Long Tenure Groups on Combined Instrumentality-Ability (Multiplicative and Additive Models).....	77
33	Comparison of Means for Short and Long Tenure Groups on Combined Effort-Ability (Multiplicative and Additive Models).....	78

List of Tables (Cont'd.)

Table		Pages
34	Comparison of Means for Short and Long Tenure Groups on 1975 Performance Criteria (T2).....	79
35	Relationship Between Ability Measures and 1975 Performance Criteria (T2) by Short and Long Tenure Groups.....	80
36	Relationship Between 1975 Performance Criteria (T2) and Combined Instrumentality-Ability (Multiplicative and Additive Model) by Short and Long Tenure Groups.....	82
37	Relationship Between 1975 Performance Criteria (T2) and Combined Effort-Ability (Multiplicative and Additive Model) by Short and Long Tenure Groups.....	83
38	Comparison of the Relationship Between Ability and 1975 Performance (T2) and Combined Instrumentality-Ability (Multiplicative and Additive Models) and 1975 Performance by Short and Long Tenure Groups.....	84
39	Comparison of the Relationships Between Ability and 1975 Performance (T2) and Combined Effort-Ability (Multiplicative and Additive Models) and 1975 Performance (T2) by Short and Long Tenure Groups..... ..	85
40	Relationship Between 1975 Performance Criteria (T2) and Combined Instrumentality-Ability (Multiplicative and Additive Model) by Short and Long Tenure Groups.....	87
41	Relationship Between 1975 Performance Criteria (T2) and Combined Effort-Ability (Multiplicative and Additive Model) by Short and Long Tenure Groups.....	88
42	Comparison of the Relationships Between Ability and 1975 Performance (T2) and Combined Instrumentality-Ability (Multiplicative and Additive Models) and 1975 Performance (T2) by Short and Long Tenure Groups.....	90
43	Comparison of the Relationships Between Ability and 1975 Performance (T2) and Combined Effort-Ability (Multiplicative and Additive Models) and 1975 Performance (T2) by Short and Long Tenure Groups.....	91

List of Tables (Cont'd.)

Table		Pages
44	Illustrative Example of Cost/Benefit Analysis for the Additive Model of Motivation-Ability and Sales Volume (T1).....	98

List of Figures

Figure		Page
1	Illustrative Example of Policy Analysis for the Additive Model of Motivation-Ability and Sales Volume (T1).....	101

Introduction

For centuries, the concept of motivation, although not always labeled as such, has been the focus of man's attempt to explain his own behavior (Cofer & Appley, 1964). The British Associationists, for instance, formalized the hedonistic principle in a manner which maintained that man consciously tries to maximize pleasure and reduce pain by calculating the various outcomes associated with a given course of action. Campbell and Pritchard (1976) have succinctly traced the history of process motivation theories from Hull and Spence through Tolman and Lewin to the modern Skinnerian approach, indicating that throughout this tradition reinforcement, drive and incentive have played a central role in the formulation of motivational determinants. As such, these theories attempt to explain the processes responsible for the direction, amplitude and persistence of human behavior (Campbell, Dunnette, Lawler, & Weick, 1970).

Landy and Trumbo (1976) have pointed out that work motivation probably does not differ significantly from motivation in general. This is a relatively common view of work motivation and for this reason, most of the industrial models have their roots in the more general models of motivation such as those proposed by Tolman and Lewin. One of the most heuristic models of work motivation has been instrumentality theory as proposed by Vroom (1964) and Porter and Lawler (1968). As noted by Mitchell and Biglan (1971), instrumentality theory is distinguished from other theories of motivation by the proposition that an individual's behavior is in part determined by the expectation that

behavior will result in various outcomes or consequences and the affective value associated with these outcomes. As early as 1955, Brayfield and Crockett suggested an explicit path-goal relationship between productivity and the perceived value of high productivity for attaining desired goals. Georgopoulos, Mahoney and Jones (1957) were the first to test this explicit hypothesis in an industrial setting. They maintained that performance could be predicted from the worker's perception of the degree to which high performance resulted in the attainment of valued personal goals. The results were supportive of the hypothesis. In an attempt to consolidate and extend the research of Georgopoulos et al. (plus research from the verbal conditioning and attitude areas of psychology), Vroom (1964) developed a motivational model which attempts to predict an individual's choice of effort level for a particular task or choice of task.

Motivation Models

Briefly, Vroom's model is composed of three components: valence, instrumentality and expectancy. The model combines the three components to produce two models. The first is to predict the valence of an outcome, and the second is to predict the individual's "force towards behavior" or level of task-related effort. Valence is defined as the anticipated satisfaction associated with an outcome, and instrumentality, in this model, is defined as the perceived relationship between one outcome and another. Instrumentality is, in effect, the perceived correlation between a level of performance (the first outcome) and some

other desired outcome (the second outcome). Symbolically, Mitchell and Biglan (1971) present this model as:

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

where V_j = the anticipated satisfaction for a certain level of performance.

V_k = the valence of a second outcome.

I_{jk} = the perceived relationship between the level of performance and the second outcome.

n = the number of second outcomes.

In the second model, expectancy, defined as the perceived probability that a given level of personal effort will result in the desired level of performance, is combined with the valence of performance (the first model). Again, symbolically the second model can be represented as:

$$F_i = \sum_{j=1}^{n} (E_{ij} \cdot V_j)$$

where F_i = the force on an individual to exert a certain level of personal effort.

E_{ij} = the perceived probability that a certain level of effort will result in the desired level of performance.

V_j = the valence of a certain level of performance derived from the first model.

n = the number of levels of performance.

Purportedly, an individual will exert the level of effort for which the force to perform is maximum. It should be noted that this theory deals with discrete levels of effort. As Campbell

and Pritchard (1976) pointed out, in order to test this model, expectancies must be measured for each level of effort and performance combination.

To avoid the problems of discrete effort levels, Porter and Lawler (1968) presented a slightly different and somewhat less complex model. The Porter and Lawler model attempts to predict an individual's level of effort directed toward performance rather than an individual's choice of effort level. The model maintains that an individual receives certain rewards or outcomes, either from the organization or himself, as a result of performing his job. One of the main determinants of an individual's motivation to perform on the job is the value that the individual associates with the resulting outcomes. While using the three components of valence, instrumentality and expectancy as Vroom did, this model estimates an individual's effort or motivation by summing across all possible outcomes rather than summing across all possible effort levels.

The second major determinant of effort is the perceived effort-reward probability; that is, the perceived relationship between exerting effort towards performance and the resulting outcomes. This probability is, in reality, a joint function of the perceived probability that performance depends on effort (expectancy) and the perceived probability that rewards depend on performance (instrumentality). Symbolically, the model may be represented as:

$$E = \sum_{k=1}^{n} \underbrace{(E \rightarrow P)}_{1} \cdot \underbrace{(P \rightarrow O_k)}_{2} \cdot V_{Ok}$$

where E = effort.

P = performance.

O_k = a given outcome.

1 = the effort-performance probability (expectancy).

2 = the performance-outcome probability (instrumentality).

V_{Ok} = the value of a given outcome O_k.

It can be seen that an individual's effort to perform on the job is a result of the sum of all the instrumentality statements for the resulting outcomes.

Heneman and Schwab (1972) suggested that the Vroom model and the Porter and Lawler model were substantially the same except for differences in terminology. However, as noted previously, there are subtle differences between the two models. Most notable of these differences is the fact that the Vroom model attempts to predict an individual's choice of effort level directed towards performance, while the Porter and Lawler model attempts to estimate an individual's level of effort. As Mitchell (1974) noted, the Vroom model is an ipsative model. It deals with intra-individual predictions of which task or effort level an individual would choose from among a range of alternatives (Campbell & Pritchard, 1976). The Porter and Lawler model, on the other hand, deals with between-individual predictions. It is interesting to note that Vroom's model is the most dominant theory of motivation in Organizational Psychology (Lawler, 1973), and yet as Mitchell noted, most research on instrumentality theory deals with between-individual comparisons.

Another subtle difference between the models deals with the relationship between effort and performance. Campbell and Pritchard (1976) pointed out that since the Vroom model deals with choice among alternative effort levels, the model assumes a discrete function relating each effort level with each performance level. The Porter and Lawler model apparently assumes a continuous function relating effort to performance. Thus, only one measure of the individual's perceived effort-performance relationship is necessary rather than the multiple measures required by the Vroom model. Typically, research on instrumentality theory attempts to measure the continuous function. Campbell and Pritchard (1976, p. 83) stated:

> In general, if we wish to use the model to interpret what's going on in a field setting or make predictions about the general level of effort in a particular situation then overall estimates of the relationship between effort and performance and between performance and outcomes seem appropriate, given that we satisfy the conditions which make an overall estimate (i.e., the correlation coefficient) meaningful.

Based on these points and other criticisms leveled by Mitchell (1974) on instrumentality research purportedly testing Vroom's model, there seems to be little advantage in using the Vroom formulation as a basis to investigate the relationship between motivation and performance on the group level. The Porter and Lawler model would seem more applicable for this type of research interest.

Multiplicative Models

Porter and Lawler (1968) maintained that valence, instrumentality and expectancy combine in a multiplicative fashion to

result in effort. Using a sample of female telephone operators, Hackman and Porter (1968) found that the median correlation ($\underline{r}$ = .27) between a multiplicative combination and various effort and performance criteria was higher than the median correlation ($\underline{r}$ = .17) for an additive model. Porter and Lawler (1968) and Pritchard and Sanders (1973) also found support for a multiplicative combination.

The conceptual argument favoring a multiplicative model is that if either valence, instrumentality or expectancy is lacking, then motivation or effort should also be lacking. A multiplicative combination provides for such an interactive model. However, there is significant concern over the use of a multiplicative model. Primarily, the concern centers on the statistical independence of the components. For the multiplicative model to make sense, the terms being multiplied must be independent events (Campbell & Pritchard, 1976). This is not to suggest that the components do not interact in the model, but rather that an individual's perception of expectancy should not depend upon his perception of instrumentality or vice-versa Gavin (1970), using the Lawler and Porter (1967a) questionnaire, found a significant correlation ($\underline{r}$ = .91) between instrumentality and valence, suggesting that the components of an instrumentality statement indeed covary to a significant extent. Campbell and Pritchard (1976) pointed out that a multiplicative combination of components generally results in higher correlations than the individual components alone but the difference is usually not very great; and typically multiplying by valence makes very little

difference since expectancy and instrumentality apparently account for most of the variance. Thus, the assumption of statistical independence of components which is crucial to the multiplicative model may be unfounded.

An additional problem seen in using the multiplicative model deals with the scale properties used to measure the components. A multiplicative combination assumes that the individual components are measured on a ratio scale. Hackman and Porter (1968) pointed out that although a zero point may occur on measures of expectancy and instrumentality, it is clear that the measurement procedures do not meet the criteria for a ratio scale. Schmidt (1973) showed that correlations resulting from a multiplicative combination, after the components were subjected to transformations appropriate to a ratio scale, fluctuated more than they should have if appropriate scales had been used. Schmidt's point was that in order to adequately test a multiplicative model, appropriate scaling procedures must be used. Mitchell (1974) reiterates this point, as do Campbell and Pritchard (1976).

Motivation and Performance

It should be noted that the Porter and Lawler model is intended to predict job related effort rather than performance. Performance is viewed as a function of many other determinants besides motivation. The most common paradigm maintains that performance is a function of ability times motivation. However, only a few studies in the literature on instrumentality theory have attempted to incorporate ability in the prediction of performance; and contrary to the conclusion offered by Campbell

and Willems (1975) in their review, empirical results generally do not support a combined motivation-ability model--regardless of whether the function is multiplicative or additive. Lawler (1966) found, when using supervisor's ratings of managerial qualifications as the ability measure, a significant main effect only for instrumentality on the two dependent performance measures. The main effect for ability and the interaction effect were significant for only one performance measure. Galbraith and Cummings (1967), also using a factorial design in a regression analysis, found that no valence, instrumentality, or ability component entered any of the equations significantly and only six of 54 possible interactions entered significantly. The ability measure was the length of time on the job. Using an "in-house" mental aptitude test, Gavin (1970) found that only an additive regression model for ability, valence, instrumentality and role perception resulted in significant multiple correlation. Graen (1969), in examining the relationship between Vroom's motivational components, ability and performance found that combined motivation and ability did not appreciably increase the variance accounted for in performance over that accounted for by ability alone. Arvey (1972), investigating the Campbell, Dunnette, Lawler and Weick (1970) model, tested Maier's motivation times ability dictum by correlating actual performance with a derived performance score based on a multiplicative combination of components. The correlation was .14, accounting for 2 percent of the variance in performance. Chung (1968), using correlational analysis, found that both an additive and multiplicative combination of ability and motivation were significantly related

to academic performance although no test was made for the increment over ability alone. The ability measure was college exam scores.

Henson (1976) also used the expectancy model to predict academic performance. Using separate multiple regressions for expectancy, ability and the interaction of ability and expectancy, he found that the interaction term accounted for more variance in performance than either of the main effects, but the unique variance in ability was considerably stronger than that of expectancy. The interaction term in this study apparently was a linear function of expectancy and ability. Ability was represented by a linear function of verbal and math scores on the Scholastic Aptitude Test, past GPA, high school rank and average, and a one-item self report measure of ability. In another academic study, Mitchell and Nebeker (1973) attempted to predict GPA using various expectancy measures in combination with ability. Ability, again, was a linear combination of Pre-college Entrance Exam Scores plus other data (e.g., high school average). Using simple correlations and multiple regression approaches, they found that only ability was related to GPA regardless of whether additive or multiplicative models were tested. Kopelman and Thompson (1976) also used ability in conjuntion with expectancy theory, although their study was not a direct test of a combined motivation-ability model. Their results indicated that expectancy predictions of supervisory performance were significant ($p < .01$) in both high and low ability subgroups of engineers. The ability measure was based on performance rankings rather than on a direct measure of ability. As they noted, this method of

assessing ability was quite crude. Terborg (1977) in a study designed to simulate real work experience, found that a linear combination of psychometric ability measures not used for selecting individuals (thus reducing the restriction of range problem) was significantly related to performance in a linear regression equation along with effort and role definitions. The interaction of ability, effort and role definitions did not result in a significant increment in R^2 on any of the performance criteria. Finally, Dachler and Mobley (1973) attempted to test a modification of expectancy theory including a combined motivation-ability model in two field settings. The ability data was based on the companies' selection tests and were collected from company records. Dachler and Mobley hypothesized a significant relationship between performance and the interaction of ability and motivation; unfortunately they were unable to test the hypothesis since ability measures which were significantly related to performance were available only for a short tenure group in one plant. They report that for this group, ability was significantly related to performance ($r=.36$, $p < .05$) but the relationship with motivation was nonsignificant. Further, the interaction between ability and motivation did not improve prediction of performance over the predictability by ability alone. In another field study, Lawler and Suttle (1973) found marginal support for both an additive and multiplicative combination of ability and motivation for predicting performance ratings. These results, however, are inconclusive since the ability measure, the Thurstone Test of Mental Alertness, was not significantly related to performance. As Dunnette (1973) pointed out, these results

seriously question a multiplicative rule for combining motivation and ability. Dunnette also suggested that ability alone was the most parsimonious basis for predicting job performance. But, as Campbell and Pritchard (1976) pointed out, although the attempts to combine motivation and ability multiplicatively to predict performance have been singularly unsuccessful, the performance = ability x motivation formulation is at best muddled and little else should be expected. It would seem that the multiplicative combination of motivation and ability would be liable to the same criticisms as directed towards the multiplicative combination of components; and as such, alternative combinations should be investigated. Furthermore, in contradistinction to Dunnette's point, the relevant research question should be what is the contribution of motivation over ability in the prediction of job performance.

Motivation and Satisfaction

The Porter and Lawler model also suggests that motivation and job satisfaction are related through a system of feedback loops. A time lag relationship is implied. Lawler and Porter (1967b) argued that if performance causes satisfaction as Vroom (1964) suggested, then the relationship between satisfaction and performance should be higher than the relationship between satisfaction and effort. Using superior's rankings of effort and performance, their results were consistent with this hypothesis. Lawler (1968) found that a cross-lagged correlational analysis generally supported the view that expectancy attitudes could be thought of as causing performance. The model incorporates two feedback loops. The first postulates that the

effort-reward relationship will change as a result of the individual's reinforcement history. That is, the relationship will change as a result of the actual reward practices followed by the organization or the individual. The second feedback loop suggests that actual satisfaction with a reward or outcome influences subsequent anticipated satisfaction or value of the rewards. Thus, the cycle is closed. According to the model, motivation at time 1 causes performance at time 1 and hence satisfaction at time 1. The satisfaction obtained during time 1 then influences the individual's perceived expectancies and valences during time 2 which in turn influences performance at time 2. There is little research investigating this relationship, although Wanous (1974) found some support for the cross-lag relationship between satisfaction and performance when satisfaction was split into intrinsic and extrinsic rewards. The explicit hypothesis is that the cross-lag relationship between motivation and satisfaction should be stronger than the static relationship obtained for a concomitant time period.

Measurement

The measurement of the various components involved in instrumentality theory is an area of concern as pointed out by Heneman and Schwab (1972), Mitchell (1974) and Campbell and Pritchard (1976). The model assumes that expectancy and instrumentality are probabilities with values ranging from 0.0 to 1.0. However, usually these variables have been measured with questionnaire items using summated rating (i.e., Likert) response

formats and almost no research has been carried out using process analysis or scaling techniques to see whether individual's are viewing the variables in the manner intended by the researcher (Campbell & Pritchard, 1976). Furthermore, most research retains the Likert format in the data analysis instead of at least transforming the scales into a format congruent with the dictates of the model. This could be a serious fault since Likert format scoring does not permit the type of results possible in a multiplicative model when 0.0 to 1.0 values are used. That is, a multiplicative instrumentality statement should reduce to zero when any of the components are zero. Similar problems are seen in the measurement of valence. The model suggests that valence represents a bipolar dimension reflecting anticipated satisfaction. Usually a Likert format of important-unimportant is used to measure valence without any reference to satisfaction (Mitchell, 1974). Again, most studies do not transform the Likert scale into a -1.0 to +1.0 scale prior to data analysis.

As noted previously, the model is not intended to predict performance. An estimate of performance is obtained only by combining motivation with ability. Even this formulation is probably an insufficient estimate of performance as indicated by the Graen (1969), Campbell et al. (1970) and Campbell and Pritchard (1976) modifications. When the model is validated against effort, either self reports of effort or peer or supervisor's ratings of effort are used as the dependent measure.

As Campbell and Pritchard pointed out, in the case of self report measures, method variance is a problem and in the case of supervisor's or peer ratings, the distinction between performance and effort is a problem. It would seem that research investigating the contribution of motivation over ability in predicting performance would be more beneficial than investigating the relationship between motivation and performance.

Purpose of the Present Study

In light of the unenthusiastic support for a multiplicative combination of motivation and ability or the combination of components involved in Porter and Lawler's (1968) instrumentality model, the present study intends to compare a multiplicative and additive model and the relationship between the models and performance in a field setting. The purpose is not to assess whether motivation or ability is the best predictor of performance, but rather to investigate whether motivation contributes over ability in the prediction of performance.

Lawler (1973) clearly distinguishes between a specific aptitude and a more general experiential ability as a partial determinant of performance. In defining performance as a function of ability times motivation, he suggested that ability includes all of the training, experience, talent and aptitude which are necessary for performance. Heneman and Schwab (1972), in a review of instrumentality research, indicated that most attempts to test the combined instrumentality-ability model such as Lawler (1966) and Galbraith and Cummings (1967) used a rather specific ability measure. They further suggested that

future research should experiment with numerous psychometric ability measures. Therefore, the present study will investigate the effect of two different ability measures in the combined motivation-ability model. One measure is a sales index used by the organization for selection purposes. The other measure is a more general ability measure not used for selection. This study will not attempt to deal, either conceptually or empirically, with the contaminating affect of motivation in ability measurement, although an argument could be made that the motivation involved in test taking is distinct from the motivation involved in a work setting as investigated in this study.

The present study will also investigate the relationship between motivation and job related satisfaction as well as the relationship between performance and satisfaction. The impact of job experience on expectancies, valences and the relationship between motivation and performance will also be investigated.

Method

Sample

The main sample for this project was composed of fifty-six field sales representatives drawn from thirteen geographically distinct sales districts of a nationwide optical supply company. Since the purpose of the study was to investigate the relationship between job related instrumentalities and performance and satisfaction for salesmen as a group, district membership was not considered. Thus, the thirteen districts were collapsed to form one sample of sales personnel. An individual was included

in this sample if he had been part of the sales force for at least the entire calendar year preceding the fiscal period during which the attitude survey was administered. That is, since the survey was completed during the first half of 1975, all the salesmen in this sample worked at least the entire year of 1974. Tenure with the company ranged from 1.0 to 3.5 years (median = 1.75 years), and all but three of the salesmen in this sample had been originally hired by the company for their current sales position. The age of the sample covered a range from 25 to 60 years of age (median = 32 years). Seventy-five percent of this sample ($\underline{N}$ = 42) completed and returned the attitude survey.

In order to investigate the effect of tenure with the company on job related instrumentalities, a smaller second sample ($\underline{N}$ = 14) was compared to 14 salesmen randomly drawn from the main sample. This smaller sample was composed of salesmen who had worked for the company for less than six months starting at the beginning of 1975. Thus, for this sample job related attitudes were measured during their initial six months with the company. Ninety-three percent ($\underline{N}$ = 13) of this sample completed and returned the attitude survey.

Independent Variables

Responses from the 1975 Attitude Survey permitted a longitudinal investigation of the relationship between performance data measured at several points in time and self reported perceptions of the extent to which personal job effort resulted

in incentive payments and future promotions. The assumption was made that both incentive payments and future promotions were at least indirectly a result of job performance. In effect, the study was undertaken to ascertain the relative contribution of motivation over ability measures in the prediction of job performance and satisfaction. In addition, the effect of combining motivation and ability either multiplicatively or additively was assessed. Thus, the independent variables of interest were statements of the instrumentality of personal job effort for the attainment of desired outcomes, derived estimates of personal job effort and measures of job related abilities.

For each salesman, two instrumentality statements were derived from the responses to the attitude survey. Each instrumentality statement was composed of two components: an expectancy component (EI) and a valence component (V). One expectancy component, (EI) pay, required the individual to indicate on a 7-point Likert scale the degree to which incentive payments reflected personal job effort. A second expectancy component, (EI) promotion, indicated the degree to which future promotions reflected personal job effort. The valence of pay and promotion for the individual were derived from a perceived importance questionnaire which required the respondent to indicate on a 7-point Likert scale the importance of pay and promotion for overall job satisfaction. The individual's instrumentality statement for pay [(EIV)pay] and for promotions [(EIV)prom] was constructed by combining the respective expectancy and valence

components. An estimate of the individual's level of effort was found by summing the two instrumentality statements.

In addition to the above variables, two different ability measures were available. One measure, the Sales Selection Index (SSI), was a recently developed predictive index of sales personnel performance with values in the range from one to five. This index was derived from a linear combination of several aptitude and personality measures found to be specifically related to a sales force performance. Within the last few years, the home office had been using the Sales Selection Index as a personnel selection instrument for all district sales personnel. The other ability measure (WESTB) used in this study was a simple linear combination of the Wesman Personnel Classification Test (total score) and the Bennett Mechanical Comprehension Test. The Wesman Personnel Classification Test is a general measure of intellectual ability which provides both a numerical and verbal subscore, as well as a total score. The Bennett Mechanical Comprehension Test is primarily a test of knowledge of applied physics (Bass & Barrett, 1972). Preliminary research indicated that the Wesman and the Bennett were each optimally related to different criteria of interest. Therefore, it was decided to simply combine the two measures into one ability measure; and in effect, utilize the relevance of both tests simultaneously as a predictor of sales force performance. Nagle (1953) has suggested that combining variables on the basis of judged relevance is to be preferred over more mathematically sophisticated means of combination.

The relevant attitude survey items are in Appendix A, the means and standard deviations of the attitude and ability measures in Appendix B, and the normative data for the instrumentality variables are in Appendix C.

Dependent Variables

Both objective performance data and subjective supervisor's ratings were available for dependent variables. The objective performance data consisted of transformed data representing sales quota ratio, sales volume and incentive payments measured semi-annually. In addition, supervisors provided performance ratings and promotability ratings for each salesman. The attitude survey also provided several satisfaction measures, both job related and personal life related.

As part of a continuing research project with the company, objective performance data for each salesman was collected for every semi-annual period. Sales quota ratio is the ratio of sales volume for a given period to the expected quota of sales volume set by the home office. Sales volume is a transformed figure representing the total amount of sales for a given period attributed to the salesmen. The salesman's incentive payment for the period is based on a complex formula which allows the individual additional income in relation to the extent to which sales volume exceeds sales quota. During the first period of each fiscal year, the sales personnel receive a supervisor's rating of performance and promotability on a scale ranging from 1 to 5.

This study specifically investigated the relationship between motivation and salesmen performance at three points

in time. The first time period (T1) represents a combination of the two periods immediately preceding the fiscal period during which the attitude survey was administered. That is, sales volume (T1) represents the combined sales volume for the first and second halves of 1974. The second time period (T2) represents the fiscal period concomitant with the administration of the attitude survey, and the third period (T3) is the post-survey fiscal period. The supervisor's ratings were obtained twice (T1 and T3) during the time span of interest. Inspection of the relationship between time periods for the objective performance data indicated that these criteria were essentially unreliable. Therefore, performance data for each period (T1, T2, and T3) were transformed to stanine scores (Guilford & Fruchter, 1973; Ferguson, 1976) in an attempt to reduce the standard error of measurement. Stanine scores correspond to equal intervals in standard deviation units on the base line of the unit normal curve. As such, a stanine transformation is a simple method for converting measures to an approximate normal distribution. The group, which results in scores with a range from 1 to 9 with a mean of 5, although coarse, is sufficiently refined for many practical purposes (Ferguson, 1976). The relationship between fiscal periods for both raw performance data and transformed performance data, as well as the means and standard deviations for each measure by fiscal period, appear in Appendices E and F.

The Job Descriptive Index (Smith, Kendall, & Hulin, 1969) provided measures of job related satisfaction. The JDI is a carefully researched instrument developed to measure satisfac-

tion with five facets of the job: work itself, pay, opportunities for promotion, supervision and co-workers. In the attitude survey, the co-worker scale was relabeled "accounts and prospects." This 72-item instrument has demonstrated satisfactory psychometric properties. Reported internal consistency reliability corrected to full length by the Spearman-Brown formula range from .80 to .88 for the five scales (Smith et al., 1969). Additionally, a personal life questionnaire provided measures of satisfaction with four aspects of personal life: life in general, home life, the job, and free time. The psychometric properties of this 4-item instrument are unknown. The means and standard deviations for all satisfaction scales and items appear in Appendix B.

Procedure

In an attempt to adhere more closely to the conceptual meaning of instrumentality than is typical of field research on motivation, the scale values of expectancy and valence were transformed prior to being combined to form an instrumentality statement. Since, conceptually, expectancy represents the perceived probability that a level of personal effort will result in the attainment of a valued outcome, the scale values for expectancy [(EI)pay and (EI)prom], which originally covered a range from 1 to 7 on a Likert Scale, were transformed to cover a range from 0.0 to 1.0. Thus, for example, a value of 1.0 on the (EI)prom scale indicates that the individual perceived future promotions to be a direct result of personal job effort.

Conceptually, this transformation is thought to be important because it permits a value of 0.0 for the expectancy component rather than the basal value of 1 permitted on the Likert Scale. The importance can be seen in the case in which an individual perceives no relationship between personal effort and an outcome. The 0.0 value could, in effect, eliminate the entire instrumentality statement for a multiplicative model.

Similarly, valence, defined as the strength of positive or negative affect for an outcome such as pay or promotions, was transformed. Valence should be measured on a bipolar scale with extreme values representing extreme affect. Therefore, the scale values for valence (Vpay and Vprom) which originally covered a range from 1 to 7 on a Likert scale were transformed to cover a range from -1.0 to +1.0. A value of 0.0 indicates ambivalence towards the outcome in question.

The expectancy component and the valence component were combined in two ways: multiplicatively and additively. This was done for both the instrumenality statement for pay (EIVpay) and the statement for promotions (EIVprom).

Instrumentality theory suggests that performance is a result of the individual's ability to perform and the motivation to perform (Vroom, 1964; Porter & Lawler, 1968). The question to which this study was addressed is how should ability and motivation combine, multiplicatively or additively. Thus, for each multiplicative instrumentality statement and estimate of effort (which is the two instrumentality statements added together) ability was either combined multiplicatively or additively resulting in a multiplicative model ([(EI) · V] · A)

or a partially additive model ([(EI) · V] + A), respectively. For each additive instrumentality statement and estimate of effort, ability was combined additively resulting in an additive model ([(EI) + V] + A). The resulting multiplicative, partially additive and additive models for effort were $(\Sigma[(EI) \cdot V] \cdot A)$, $(\Sigma[(EI) \cdot V] + A)$, and $(\Sigma[(EI) + V] + A)$, respectively. Models were constructed using both the Sales Selection Index and the Wesman total plus Bennett ability measures.

Correlational analysis was used to assess the relationship between motivation and performance and satisfaction, and to investigate the influence of multiplicative, partially additive and additive models on these relationships. When possible, the results for two fiscal periods (T1 and T2) are presented simultaneously to afford pre-survey comparisons. The results for the post-survey fiscal period are presented separately.

The use of correlational analysis involving multiplicative variables has received some criticism in the literature. Schmidt (1973) has provided one of the more pursuasive demonstrations arguing against the use of correlational analysis involving computed multiplicative instrumentality variables. He argues that multiplicative variables require a ratio scale of measurement, and that the instability of relationships involving such variables can be demonstrated by submitting these variables to transformations appropriate for ratio scale measurement and then observing the effect of the transformations on the correlation coefficient. The sample correlations used in his study did in fact vary considerably as a result of the data transformations. Schmidt con-

cluded, as others have, that correlational analysis should not be used to determine goodness of fit when multiplicative variables are involved in the analysis. While Schmidt's criticism is well-founded, it should be noted that the transformations chosen for use in his study effected the variances of the variables and hence the correlation coefficient would be expected to be altered from transformation to transformation. In addition, by adding large constant "errors" as was done under the interval transformations, the multiplicative correlations would be expected to vary more than under the typical case of small random error. Connolly (1976) suggests that rather large zero-point errors are required to change the predictive accuracy of the multiplicative models by the degree Schmidt report. Further, he suggests that the careful researcher would not likely be mislead when more probable degrees of error are involved. That is, when simple additive and multiplicative models are compared by correlational analysis support can be claimed for the multiplicative model when it clearly results in better prediction. However, the multiplicative model cannot be totally discounted, even when the additive model is clearly superior, since the assumptions underlying the multiplicative model have been violated. Thus, while the researcher cannot claim to test the theoretical correctness of a particular model, the predictive efficacy of a model can be discussed. Therefore, as Connolly points out, the simple models do not need to be completely abandoned in favor of more timing-consuming techniques such as conjoint measurement or functional analysis, provided some caution is given with regard to the scaling issues raised by Schmidt and others.

Results

Generally, the relationship between ability measures and performance is used as the basis against which to judge the contribution of motivation in predicting performance. Table 1 presents the relationship between the ability measures of interest and the performance criteria for both fiscal periods. As indicated by the results, both the Sales Selection Index and the Wesman total plus Bennett offer a slight advantage over either the Wesman or the Bennett in terms of the number of significant relationsips. Also, there does not appear to be any pattern of superiority for one ability measure over another; superiority residing in the particular criteria of interest. It was on this basis that Sales Selection Index and the Wesman total plus Bennett were chosen for use in the rest of the study. A t-test for correlated measures (Ferguson, 1976) was performed to test for significant differences between fiscal periods. As the t-values in parentheses indicate, there were no significant differences between fiscal periods for the relationship between ability measures and objective performance data.

Relationship Between Instrumentality and Performance

The relationship between instrumentality and performance criteria for both multiplicative and additive models is shown in Table 2. Inspection of the table reveals several interesting points. Most obvious is the complete lack of significance between performance and instrumentality of pay regardless of whether expectancy and valence are combined multiplicatively or additively. Secondly, only promotability rating was re-

Table 1

Relationship between Ability Measures and Performance Criteria by Fiscal Periods.

	Ability Measures			
	Wesman[A]	Bennett[B]	WESTB[C]	SSI[D]
Sales Quota Ratio				
T1 (N = 56)	.14	.11	.17	.19
	(1.72)	(-.22)	(.93)	(.11)
T2 (N = 48)	-.17	.15	.00	.17
Sales Volume (9)				
T1 (N = 56)	.16	.28*	.29*	.28*
	(.22)	(.07)	(.15)	(.23)
T2 (N = 48)	.13	.27	.27	.25
Incentive Payment				
T1 (N = 56)	.23	.26*	.32*	.23
	(1.84)	(.51)	(1.50)	(.07)
T2 (N = 48)	-.02	.19	.12	.22
Performance Rating (N = 56)	.01	.16	.11	.38**
Promotability Rating (N = 56)	.39**	.07	.30*	.26*

Note. t-values for a test of significant differences between T1 and T2 are enclosed in parentheses. $t_{.05} = 2.01$.

[A]Wesman Personnel Classification Test (Total Score).

[B]Bennett Mechanical Comprehension Test.

[C]Wesman total plus Bennett.

[D]Sales Selection Index.

*$p < .05$.

**$p < .01$.

Table 2

Relationship between Performance Criteria and Instrumentality by Fiscal Periods: Comparing Multiplicative and Additive Models.

	Models			
	Multiplicative [(EI).V]		Additive [(EI)+V]	
	Pay	Prom	Pay	Prom
Sales Quota Ratio				
T1	-.16	.25	-.12	.24
	(-2.40)*	(.26)	(-2.11)*	(.05)
T2	.29	.20	.28	.25
Sales Volume				
T1	.15	.24	.21	.24
	(1.51)	(.28)	(1.45)	(.28)
T2	-.07	.20	.00	.20
Incentive Payment				
T1	-.07	.22	.02	.22
	(-2.15)*	(-.14)	(-1.64)	(-.49)
T2	.24	.24	.26	.29
Performance Rating	.14	.26	.14	.28
Promotability Rating	.04	.48**	.08	.56**

Note. t-values for a test of significant differences between T1 and T2 are enclosed in parentheses. $t.05 = 2.02$.

$n = 42$

*$p < .05$.

**$p < .001$.

lated to instrumentality, and only for the instrumentality of promotions. A test for differences between fiscal periods resulted in three significant differences as indicated by the t-values in parentheses. There was a significant difference between fiscal periods in the relationship between sales quota ratio and the instrumentality of pay regardless of whether the models are combined multiplicatively or additively. Also, there was a significant difference for the incentive payment-multiplicative instrumentality of pay relationship. In each case, the fiscal period concomitant with the attitude survey displayed the significantly higher relationship.

Table 3 shows the relationship between performance criteria and effort by fiscal period. The results indicate that for objective performance data, only the additive model is significantly related to performance, and only for the concomitant fiscal period. Tests for significant differences between fiscal periods were nonsignificant. These two results suggest that there is some advantage in combining expectancy and valence additively rather than multiplicatively as instrumentality theory suggests.

Relationship Between Combined Motivation-Ability and Performance

As noted previously, instrumentality theory suggests that a combination of ability and motivation should be more strongly related to performance than either ability or motivation alone. Tables 4 and 5 show the relationship between performance criteria for each fiscal period and combined instrumentality-ability and effort-ability respectively. The ability measure

Table 3

Relationship between Performance Criteria and Effort by Fiscal Periods: Comparing Multiplicative and Additive Models.

	Models	
	Multiplicative $\Sigma[(EI).V]$	Additive $\Sigma[(EI)+V]$
Sales Quota Ratio		
T1	.08	.12
	(-1.09)	(-1.00)
T2	.29	.31*
Sales Volume		
T1	.24	.26
	(.96)	(.83)
T2	.10	.14
Incentive Payment		
T1	.18	.17
	(-.75)	(-1.11)
T2	.29	.33*
Performance Ratings	.26	.26
Promotability Ratings	.35*	.44**

Note. t-values for a test of significant differences between T1 and T2 are enclosed in parentheses. $t.05 = 2.02$.

$n = 42$

*$p < .05$.

**$p < .01$.

Table 4

Relationship between Performance Criteria and Combined Instrumentality and Ability[+] by Fiscal Periods: Comparing Multiplicative, Partial Additive and Additive Models.

	Models						t	
	Multiplicative [(EI)·V]·A[+]		Part. Additive [(EI)·V]+A		Additive [(EI)+V]+A			
	Pay	Prom	Pay	Prom	Pay	Prom	Pay	Prom
Sales Quota Ratio								
T1	-.04	.19	.13	.14	.13	.14	[-.86]	[.32]
	(-1.89)	(.05)	(-.10)	(.00)	(-.10)	(-.05)		
T2	.32*	.18	.15	.14	.15	.15	[.90]	[.19]
Sales Volume								
T1	.24	.22	.29	.29	.29	.29	[-.27]	[-.47]
	(1.53)	(-.06)	(.56)	(.49)	(.49)	(.49)		
T2	.02	.23	.21	.22	.22	.22	[-1.03]	[.07]
Incentive Payment								
T1	.07	.20	.18	.19	.19	.19	[-.61]	[.07]
	(-1.51)	(-.06)	(-.06)	(.13)	(.13)	(.13)		
T2	.29	.21	.17	.17	.17	.17	[.63]	[.26]
Performance Ratings	.27	.24	.30*	.30*	.30*	.31*	[-.16]	[-.47]
Promotability Ratings	.16	.45**	.16	.18	.16	.18	[.00]	[1.93]

Table 4 (Continued)

Note. t-values for a test of significant differences between T1 and T2 are enclosed in parentheses. t.05 = 2.02. t-values for a test of significant differences between the multiplicative and additive model are enclosed in brackets. A negative t-value indicates the relationship for the additive model is higher than the multiplicative model. t.05 = 2.02.

$n = 41$.

+Ability (A) is the Sales Selection Index.

*$p < .05$.

**$p < .01$.

Table 5

Relationship between Performance Criteria and Combined Effort and Ability[+] by Fiscal Periods: Comparing Multiplicative, Partial Additive and Additive Models.

	Models			
	Multiplicative $\Sigma[(EI).V].A^{+}$	Part. Additive $\Sigma[(EI).V].A^{+}$	Additive $\Sigma[(EI)+V]+A^{+}$	t
Sales Quota Ratio				
T1	.11	.14	.14	[-.19]
	(-.88)	(.00)	(-.10)	
T2	.28	.14	.16	[.77]
Sales Volume				
T1	.28	.29	.30*	[-.13]
	(.90)	(.49)	(.56)	
T2	.15	.22	.22	[-.44]
Incentive Payment				
T1	.17	.19	.19	[-.13]
	(-.82)	(.13)	(.07)	
T2	.29	.17	.18	[.71]
Performance Ratings	.30*	.31*	.31*	[-.07]
Promotability Ratings	.39*	.18	.19	[1.34]

Note. t-values for a test of significant differences between T1 and T2 are enclosed in parentheses. t.05 = 2.02. t-values for a test of significant differences between the multiplicative and additive model are enclosed in brackets. A negative t-value indicates the relationship for the additive model is higher than the multiplicative model. t.05 = 2.02.

$n = 41$.

[+]Ability measure (A) is the Sales Selection Index.

*$p < .05$.

was the Sales Selection Index. In each table, the multiplicative, partially additive, and additive models are compared. The most striking result obtained from Table 4 is the nearly complete lack of significant relationships between objective performance data and combined instrumentality-ability regardless of how instrumentality and ability are combined. It should also be noted that the partially additive and additive models resulted in virtually identical relationships with the performance criteria for each fiscal period. Tests for differences between fiscal periods were all nonsignificant as indicated by the t-values in parentheses. Inspection of both Tables 4 and 5 suggests that the additive model relationships may be slightly larger than the relationships involving the multiplicative model; however, t-tests for differences between the multiplicative model and the additive model were all nonsignificant as indicated by the t-values in brackets. Although the t-values are small, it should be noted that out of the possible eight comparisons each for instrumentality of pay, instrumentality of promotions and effort, 63%, 25%, and 63% of the perspective comparisons are in a direction favoring the additive model. The most notable exception to this pattern involved promotability ratings in which case the multiplicative model for instrumentality of promotions and effort were slightly more highly related than the corresponding additive model. Although the t-values are nonsigificant, the results seem to favor an additive model.

Contribution of Motivation in Predicting Performance

Information bearing directly on the question of the relative contribution of motivation beyond ability in predicting per-

formance is provided in Tables 6 and 7. Table 6 presents the t-values obtained in testing differences between the relationship of ability and performance and the relationship of combined instrumentality-ability and performance when the Sales Selection Index was used as the ability measure. A negative t-value indicates that the relationship between ability and performance was higher than the corresponding relationship between instrumentality-ability and performance. Differences were tested only for the multiplicative and additive models since the partially additive and additive models resulted in nearly identical correlations. In general, the results of Table 6 and 7 indicate that the Sales Selection Index by itself was a better predictor of performance criteria, particularly for the subjective performance criteria, than any combination of ability and motivation. The t-values in Table 6 suggest that the additive model is particularly weak, when compared to ability alone, in predicting performance. The same conclusions can be drawn from the results in Table 7, which compares combined effort-ability against ability alone.

To summarize, when the Sales Selection Index was used as the ability measure, results indicated that there were no significant differences between fiscal periods in the relationships between combined motivation-ability and performance, although the relationships were generally small. Also, there was a suggestion that the additive model was slightly superior to the multiplicative model in predicting performance, even though the difference between the multiplicative and additive model was nonsigificant. However, a comparison of the performance-ability

Table 6

Comparison of the Relationships between Ability and Performance and Combined Instrumentality-Ability[+] (Multiplicative and Additive Models) and Performance by Fiscal Period.

	Models			
	Multiplicative $[(EI)\cdot V]\cdot A^{+}$		Additive $[(EI)+V]+A^{+}$	
	Pay	Prom	Pay	Prom
Sales Quota Ratio				
T1	-1.23	.00	-3.12**	-2.51*
T2	.83	.07	-.95	-.95
Sales Volume				
T1	-.22	-.41	.49	.49
T2	-1.24	-.14	-1.47	-1.47
Incentive Payment				
T1	-.86	-.20	-1.98	-1.98
T2	.39	-.07	-2.53*	2.53*
Performance Rating	-.63	-.98	-4.94***	-4.07***
Promotability Rating	-.54	1.38	-6.87***	-4.67***

Note. A negative t-value indicates that the relationship between ability and performance is higher than the corresponding relationship between the combined model and performance. The opposite is true for positive t-values. $t_{.05} = 2.01$, $t_{.01} = 2.69$, $t_{.001} = 3.48$.

[+]Ability measure (A) is the Sales Selection Index.

*$p < .05$.

**$p < .01$.

***$p < .001$.

Table 7

Comparison of the Relationship between Ability and Performance and Combined Effort-Ability[+] (Multiplicative and Additive Models) and Performance by Fiscal Period.

	Models	
	Multiplicative $\Sigma[(EI)\cdot V]\cdot A^{+}$	Additive $\Sigma[(EI)+V]+A^{+}$
Sales Quota Ratio		
T1	-.51	-2.52*
T2	.72	-.47
Sales Volume		
T1	.00	.98
T2	-.65	-1.47
Incentive Payment		
T1	-.39	-1.98
T2	.46	-1.98
Performance Rating	-.55	-4.07**
Promotability Rating	.89	-3.87**

Note. A negative t-value indicates that the relationship between ability and performance is higher than the corresponding relationship between the combined model and performance. The opposite is true for positive t-values. $t.05 = 2.01$, $t.01 = 2.69$, $5.001 = 3.48$.

[+]Ability measure (A) is the Sales Selection Index.

*$p < .05$.

**$p < .001$.

relationships with the performance-combined motivation-ability relationships strongly suggest that motivation adds nothing in the prediction of performance. These results are rather discouraging in terms of the theoretical nature of instrumentality theory. The hypothesis that a combination of motivation and ability should be more strongly related to performance than either motivation or ability alone was not substantiated.

The Wesman total plus Bennett (WESTB) provided an additional ability measure which the organization did not use for selection. Table 8 shows the relationship between performance criteria and combined instrumentality-ability by fiscal period when the Wesman total plus Bennett (WESTB), a more general measure, was used as the ability measure. Again, several points should be noted. First, a comparison of the relationships between fiscal periods was generally nonsignificant, as the t-values in parentheses indicate. The exception to this point was the relationship between sales quota ratio and the multiplicative instrumentality of pay. For sales quota ratio, the concomitant fiscal period resulted in a significantly higher relationship. Second, the relationship between the additive model and sales volume is noticeably consistent between fiscal periods. Third, the partially additive and additive models resulted in nearly identical relationships with performance criteria, as was the case when the Sales Selection Index was used as the ability measure. Inspection of Table 8 suggests that use of the additive model resulted in slightly higher relationships than the multiplicative model.

Table 8

Relationship between Performance Criteria and Combined Instrumentality and Ability[+] by Fiscal Periods: Comparing Multiplicative, Partial Additive and Additive Models.

	Models						t	
	Multiplicative [(EI)·V]·A[+]		Part. Additive [(EI)·V]+A		Additive [(EI)+V]+A			
	Pay	Prom	Pay	Prom	Pay	Prom	Pay	Prom
Sales Quota Ratio								
T1	-.16	.25	.22	.23	.22	.23	[-1.76]	[.12]
	(-2.65)	(.31)	(.61)	(.72)	(.61)	(.66)		
T2	.33*	.19	.10	.09	.10	.10	[1.09]	[.53]
Sales Volume								
T1	.27	.28	.35*	.35*	.35*	.35*	[-.40]	[-.44]
	(1.75)	(-.07)	(.36)	(.34)	(.36)	(.29)		
T2	.02	.29	.30*	.30*	.30*	.31*	[-1.31]	[+.12]
Incentive Payment								
T1	.03	.30*	.40**	.41**	.41**	.41**	[-1.86]	[-.70]
	(-1.79)	(.55)	(1.64)	(1.72)	(1.66)	(1.65)		
T2	.29	.22	.17	.17	.18	.18	[.52]	[.24]
Performance Ratings	.18	.30*	.19	.19	.19	.20	[-.04]	[.61]
Promotability Ratings	.15	.56***	.42**	.43**	.42**	.44**	[-1.34]	[.87]

Table 8 (Continued)

Note. t-values for a test of significant differences between T1 and T2 are enclosed in parentheses. t.05 = 2.02. t-values for a test of significant differences between the multiplicative and additive model are enclosed in brackets. A negative t-value indicates the relationship for the additive model is higher than the multiplicative model. t.05 = 2.02.

$n = 42$.

+Ability (A) is the Wesman total plus Bennett.

*$p < .05$.

**$p < .01$.

***$p < .001$.

Table 9, showing the relationship between performance criteria and combined effort-ability suggests the same possibility. However, t-tests for differences between the multiplicative and additive models were all nonsignificant as indicated by the t-values in brackets. These t-values indicate that there were no statistically significant differences between the models; however, of the eight possible comparisons each for instrumentality of pay, instrumentality of promotion and effort, 75%, 38%, and 50% of the respective t-values were in a direction suggesting a slight advantage for the additive model. This pattern is similar to the one found when the Sales Selection Index was used as the ability measure.

Tables 10 and 11 provide information bearing directly on the relative contribution of motivation to ability in predicting performance criteria. Comparisons using t-tests for correlated measures were used to compare the relationship of performance and ability with performance and combined motivation-ability when the WESTB was used as the ability measure. A positive t-value indicates that the performance-combined motivation-ability relationship was higher than the corresponding performance-ability relationship. The most striking result from Tables 10 and 11 is that for the additive model, motivation significantly contributed to the prediction of performance for each fiscal period. For the multiplicative model, motivation did not significantly contribute to the prediction of performance. In fact, there is no significant difference between the performance-combined motivation-ability relationship and the performance-ability relationship when the multiplicative model is used.

Table 9

Relationship between Performance Criteria and Combined Effort and Ability[+] by Fiscal Periods: Comparing Multiplicative, Partial Additive and Additive Models.

	Models			
	Multiplicative $\Sigma[(EI).V].A^{+}$	Part. Additive $\Sigma[(EI).V]+A$	Additive $\Sigma[(EI)+V]+A$	t
Sales Quota Ratio				
T1	.10	.23	.23	[-.72]
	(-1.09)	(.66)	(.61)	
T2	.31*	.10	.11	[1.13]
Sales Volume				
T1	.35*	.36*	.36*	[-.05]
	(.93)	(.43)	(.36)	
T2	.22	.30*	.31*	[-.52]
Incentive Payment				
T1	.24	.41*	.41**	[-1.01]
	(-.55)	(1.65)	(1.57)	
T2	.32*	.18	.19	[.74]
Performance Ratings	.31*	.20	.20	[.63]
Promotability Ratings	.49***	.44**	.44**	[.33]

Note. t-values for a test of significant differences between T1 and T2 are enclosed in parentheses. $t_{.05} = 2.02$. t-values for a test of significant differences between the multiplicative and additive model are enclosed in brackets. A negative t-value indicates the relationship for the additive model is higher than the multiplicative model. $t_{.05} = 2.02$.

$n = 42$.

[+]Ability measure (A) is the Wesman total plus Bennett.

*$p < .05$. **$p < .01$. ***$p < .001$.

Table 10

Comparison of the Relationships between Ability and Performance and Combined Instrumentality-Ability+ (Multiplicative and Additive Models) and Performance by Fiscal Period.

	Models			
	Multiplicative $[(EI)\cdot V]\cdot A^{+}$		Additive $[(EI)+V]+A^{+}$	
	Pay	Prom	Pay	Prom
Sales Quota Ratio				
T1	-1.59	.49	2.59*	3.22**
T2	1.64	1.16	6.73***	6.73***
Sales Volume				
T1	-.10	.06	3.36**	3.36**
T2	-1.22	.13	1.52	2.08*
Incentive Payment				
T1	-1.44	-.13	6.29***	6.29***
T2	.84	.61	3.19**	3.19**
Performance Ratings	.34	1.19	4.68***	5.65***
Promotability Ratings	-.75	1.89	14.71***	

Note. A negative t-value indicates that the relationship between ability and performance is higher than the corresponding relationship between the combined model and performance. The opposite is true for positive t-values. t.05 = 2.01, t.01 = 2.69, t.001 = 3.48.

+Ability measure (A) is the Wesman total plus Bennett.

*$p < .05$.

**$p < .01$.

***$p < .001$.

Table 11

Comparison of the Relationships between Ability and Performance and Combined Effort-Ability^{+} (Multiplicative and Additive Models) and Performance by Fiscal Period.

	Models	
	Multiplicative $\Sigma[(EI).V].A^{+}$	Additive $\Sigma[(EI)+V]+A^{+}$
Sales Quota Ratio		
T1	-.39	3.22**
T2	1.80	8.33***
Sales Volume		
T1	.36	4.12***
T2	-.29	2.08*
Incentive Payment		
T1	-.47	6.29***
T2	1.16	3.88***
Performance Ratings	1.16	5.66***
Promotability Ratings	1.23	

Note. A negative t-value indicates that the relationship between ability and performance is higher than the corresponding relationship between the combined model and performance. The opposite is true for positive t-values. $t.05 = 2.01$, $t.01 = 2.69$, $t.001 = 3.48$.

$^{+}$Ability measure (A) is the Wesman total plus Bennett.

*$p < .05$.

**$p < .01$.

***$p < .001$.

A comparison of Tables 4 and 5 with Tables 8 and 9 suggests that the relationships between performance and combined motivation-ability were slightly higher when the WESTB was used as the ability measure rather than the Sales Selection Index, particularly when comparing the additive models. Tables 12 and 13 provide information bearing on this comparison. Comparisons using t-tests for correlated measures were used to compare the relationships resulting from combined motivation-WESTB. A negative t-value indicates that the relationships for combined motivation-SSI were higher than the corresponding relationships using the WESTB as the ability measure. Results indicate that the only significant difference, favoring the use of the WESTB, occurred when comparing the relationship involving instrumentality of promotion and promotability rating. The remaining t-values were non-significant, indicating that there was no particular advantage favoring either the SSI or the WESTB in conjunction with motivation regardless of whether the multiplicative or additive model was used.

To summarize the results involving the Wesman total plus Bennett as the ability measure, evidence indicates that in general, there were no significant differences between the relationships for different fiscal periods as was the case when the Sales Selection Index was used as the ability measure. The comparison of the relationships involving combined motivation-ability versus ability alone indicated that for the additive model only, the contribution of motivation in predicting performance criteria was highly significant. A comparison of the relationships involving the SSI versus the WESTB indicated

Table 12

Comparison of the Relationships of Performance Criteria with Combined Instrumentality-Ability (Multiplicative and Additive Models) Using the Wesman Total Plus Bennett or Sales Selection Index as Ability by Fiscal Period.

	Models			
	Multiplicative [(EI)·V]·A		Additive [(EI)+V]+A	
	Pay	Prom	Pay	Prom
Sales Quota Ratio				
T1	-1.64	1.11	.49	.50
T2	.14	.18	-.27	-.27
Sales Volume				
T1	.41	1.12	.35	.35
T2	.00	1.13	.45	.51
Incentive Payment				
T1	-.53	1.93	1.28	1.30
T2	.00	.18	.05	.05
Performance Rating	-1.24	1.13	-.61	-.62
Promotability Rating	-.13	2.45*	1.52	1.55

Note. A negative t-value indicates that the relationship between performance and combined instrumentality-ability using the Sales Selection Index as ability is stronger than the corresponding relationship using the Wesman total plus Bennett as ability.

$t_{.05} = 2.02$.

*$p < .05$.

Table 13

Comparison of the Relationships of Performance Criteria With Combined Effort-Ability (Multiplicative and Additive Models) Using the Wesman Total Plus Bennett or the Sales Selection Index as Ability by Fiscal Period.

	Models	
	Multiplicative $\Sigma[(EI).V].A$	Additive $\Sigma[(EI)+V]+A$
Sales Quota Ratio		
T1	-.13	.50
T2	.41	-.27
Sales Volume		
T1	.98	.35
T2	.95	.51
Incentive Payment		
T1	.95	1.30
T2	.42	-.05
Performance Rating	.14	-.62
Promotability Rating	1.52	1.50

Note. A negative t-value indicates that the relationship between performance and combined effort-ability using the Sales Selection Index as ability is stronger than the corresponding relationship using the Wesman total plus Bennett as ability. $t.05 = 2.02$.

no significant differences. These results taken as a whole seem confusing since no adequate explanation can be offered as to why motivation should significantly add to the prediction of performance when the WESTB was used as the ability measure and not add significantly when the SSI was used as the ability measure. It is possible that the SSI also contains a motivational component. The results also suggested that the combined additive model resulted in slightly higher correlations than the multiplicative model, although none of the comparisons were statistically significant.

Relationships Involving Post-Survey Performance Criterion

Lawler (1968) maintained that job related attitudes (i.e., instrumentality statements) were a determinant of performance rather than a result of performance. This suggests that the relationships between combined motivation-ability and post-attitude performance should be greater than the relationships found for pre-attitude performance periods. Since the temporal lag between attitudes and resulting performance is largely unknown, it is difficult to specify whether the post-attitude performance relationships should be greater than those found with performance criteria concomitant with the attitudes. This study attempted to investigate this point by examining the relationships between combined motivation-ability and performance criteria (T3) for the fiscal period directly following the administration of the attitude survey.

Tables 14 presents the relationships between the ability measures and the post-survey performance criteria (T3). These relationships were used as the basis against which the relative

Table 14

Relationship Between Ability Measures and Performance Criteria (T3)

	WESTB[A]	SSI[B]
Sales Quota Ratio[C]	-.14	.25
Sales Volume[C]	.33*	.21
Incentive Payment[C]	.06	.16
Performance Ratings[D]	-.10	.25
Promotability Ratings[D]	.06	.37*

[A] Wesman total plus Bennett.

[B] Sales Selection Index.

[C] $n = 40$.

[D] $n = 56$.

* $p < .05$.

contribution of motivation in the prediction of performance was judged. The results indicate that with but two exceptions the ability measures were not strongly related to performance for this fiscal period. Also, when the results are compared with those found in Table 1, it appears that in general, the relationships are diminishing as the time between ability measurement and performance measurement increases.

The relationships between performance (T3) and instrumentality and effort are presented in Table 15. Inspection of the table reveals that only promotability ratings were significantly related to job related attitudes. In general, this same pattern was seen in Tables 2 and 3 for the previous performance criteria.

The relationship between combined motivation-ability and the post-survey performance criteria (T3) when the Sales Selection Index was used as the ability measure is presented in Table 16. Inspection of the table reveals that promotability ratings were significantly related to combined motivation-ability. The relationships between sales quota ratio and multiplicative effort was also significant. A t-test for correlated measures was performed to test for differences between the multiplicative and additive models. A negative t-value indicates that the relationship for the additive model was higher than the corresponding relationship for the multiplicative model. The t-values found in the right hand column of Table 16 indicate that there were no significant differences between the multiplicative and additive models. Of the five possible comparisons each for instrumentality of pay, instrumentality of promotions and effort, 40, 20, and 20 percent respectively were in favor of the additive combination of motivation and ability.

Table 15

Relationship Between Performance Criteria (T3)

and Motivation: Comparing Multiplicative and Additive Models

	Models					
	Multiplicative [(EI) · V]			Additive [(EI) + V]		
	Pay	Prom	Effort[A]	Pay	Prom	Effort[B]
Sales Quota Ratio[C]	.14	.24	.24	.16	.21	.22
Sales Volume[C]	-.14	.18	.05	-.04	.17	.11
Incentive Payment[C]	.13	.20	.20	.23	.18	.23
Performance Ratings[D]	.22	.17	.22	.26	.18	.24
Promotability Ratings[D]	.31	.40*	.42*	.40*	.43*	.46*

[A] Effort = Σ[(EI) · V].

[B] Effort = Σ[(EI) + V].

[C] $\underline{n}$ = 38.

[D] $\underline{n}$ = 28.

* $\underline{p} < .05$.

Table 16

Relationship between Performance Criteria (T3) and Combined Motivation-Ability[+]: Comparing Multiplicative and Additive Models.

	Models						t		
	Multiplicative [(EI) · V] · A		Effort[A] · A	Additive [(EI) + V] + A		Effort[B] + A			
	Pay	Prom		Pay	Prom		Pay	Prom	Effort
Sales Quota Ratio[C]	.24	.30	.32*	.28	.28	.28	-.21	.13	.26
Sales Volume[C]	-.09	.22	.10	.19	.20	.20	-1.40	.13	-.61
Incentive Payment[C]	.18	.23	.25	.18	.18	.18	.00	.32	.44
Performance Ratings[D]	.30	.24	.31	.26	.26	.26	.18	-.11	.28
Promotability Ratings[D]	.40*	.45*	.49**	.37*	.38*	.39*	.15	.44	.62

Note. t-values for a test of significant differences between the multiplicative and additive model appear in the right hand column. A negative t-value indicates the relationship for the additive model is higher than the multiplicative model. $t_C.05 = 2,042$, $t_D.05 = 2.048$.

[A] Effort = [(EI) · V] · A.

[B] Effort = [(EI) + V] + A.

[C] $n = 38$.

[D] $n = 28$.

[+] Ability measure (A) is the Sales Selection Index.

*$p < .05$. **$p < .01$.

Table 17 presents the t-values for comparing the relationship between ability alone and post-survey performance criteria (T3) with the relationship between combined motivation-ability and performance when the SSI was used as the ability measure. A negative t-value indicates that the relationship between ability and performance is stronger than the corresponding relationship between the combined model and performance. The results indicate that there were no significant differences between the relationships. This pattern of results is contrary to those found in Tables 6 and 7 in which case motivation was found to contribute very little in the prediction of performance, regardless of whether a multiplicative or an additive model was used.

Table 18 presents the results from a comparison of the relationships between combined motivation-ability and performance for each fiscal period. A negative t-value indicates that the post-survey performance relationships were higher than the corresponding relationships. Inspection of the table reveals two points. First, the relationships found with the post-survey performance criteria (T3) were generally stronger than the corresponding relationships found with the pre-survey performance criteria (T1), although most of the differences were nonsignificant. The pattern is less clear when comparing the post-survey relationships with the concomitant relationships. Second, when considering the sign and size of the t-values, it appears that the relationships involving the multiplicative model are more varied from fiscal period to fiscal period than the relationships involving the additive model.

Table 17

Comparison of the Relationships between Ability and Performance (T3) and Combined Motivation-Ability[+] (Multiplicative and Additive Models) and Performance (T3)

	Models					
	Multiplicative [(EI) · V] · A		Effort · A	Additive [(EI) + V] + A		Effort + A
	Pay	Prom		Pay	Prom	
Sales Quota Ratio[C]	-.05	.32	.44	1.39	1.39	1.39
Sales Volume[C]	-1.52	.06	-.66	-.90	-.45	-.45
Incentive Payment[C]	.10	.44	.55	.89	.89	.89
Performance Rating[D]	.26	-.06	.37	.44	.44	.44
Promotability Rating[D]	.17	.54	.80	.00	.46	.93

Note. A negative t-value indicates that the relationship between ability and performance is stronger than the corresponding relationship between the combined model and performance. The opposite is true for positive t-values. $t_C.05 = 2.025$, $t_D.05 = 2.042$.

[C] $n = 41$.

[D] $n = 39$.

[+]Ability measure (A) is the Sales Selection Index.

Table 18

Comparison of the Relationships between Combined Motivation-Ability[+] (Multiplicative and Additive Models) and Performance for Each Fiscal Period

	Models					
	Multiplicative [(EI) · V] · A		Effort · A	Additive [(EI) + V] + A		Effort + A
	Pay	Prom		Pay	Prom	
Sales Quota Ratio[A]						
T1 $\bar{v}$ T3	-1.28	-.52	-.99	-.70	-.65	-.65
T2 $\bar{v}$ T3	-.35	.51	.18	.55	.55	.51
Sales Volume[A]						
T1 $\bar{v}$ T3	2.17*	.00	1.15	.65	.58	.65
T2 $\bar{v}$ T3	-2.29*	-.20	-1.00	-.60	-.40	-.40
Incentive Payments[A]						
T1 $\bar{v}$ T3	-.63	-.17	-.47	.06	.06	.06
T2 $\bar{v}$ T3	-.58	.10	-.21	.05	.05	.00
Performance Rating[B]						
T1 $\bar{v}$ T3	-.17	.00	-.06	.22	.28	.28
Promotability Rating[B]						
T1 $\bar{v}$ T3	-1.34	.00	-.60	-1.16	-1.11	-1.12

Note. A negative t-value indicates that the relationship between combined motivation-ability and performance (T3) was higher than the corresponding relationship. $t_A.05 = 2.021$, $t_B.05 = 2.045$.

[A] $n = 41$.

[B] $n = 32$.

[+]Ability measure (A) is the Sales Selection Index.

*$p < .05$.

To summarize the results involving the post-survey performance data and the Sales Selection Index in combination with motivation, results indicate that the relationships involving the post-survey performance criteria were slightly stronger than the relationships involving the pre-survey performance criteria, although most of the differences were nonsignificant. As was seen in Tables 4 and 5, there were no significant differences between the multiplicative and additive models, but contrary to the results obtained in Tables 6 and 7, there was no clear advantage for either ability alone or combined motivation-ability in the prediction of performance regardless of whether a multiplicative or additive model was considered. The results from Table 18 suggest that the relationships between combined motivation-ability and performance was more stable when the additive model was considered.

Table 19 presents the relationship between post-survey performance criteria (T3) and combined motivation-ability when the Wesman total plus Bennett was used as the ability measure. As was seen when the SSI was used, the results are generally nonsignificant, with two exceptions. A multiplicative combination of motivation and ability was significantly related to promotability ratings, and the additive combination was significantly related to sales volume. A test for significant differences between the multiplicative and additive models are indicated by the t-values in the right hand column of Table 19. Only the relationships involving the promotability rating were significantly different, favoring the multiplicative model. Of the 5 possible comparisons each for instrumentality of pay, instrumentality of

Table 19

Relationship Between Performance Criteria (T3) and Combined Motivation-Ability[+]: Comparing Multiplicative and Additive Models

	Models						t		
	Multiplicative [(EI) · V] · A		Effort[A] · A	Additive [(EI) + V] + A		Effort[B] + A			
	Pay	Prom		Pay	Prom		Pay	Prom	Effort
Sales Quota Ratio[C]	.07	.16	.15	-.12	-.11	-.11	.82	1.54	1.38
Sales Volume[C]	-.06	.30	.18	.32*	.33*	.33*	-1.72	-.18	-.83
Incentive Payment[C]	.11	.16	.17	.07	.07	.08	.17	.50	.47
Performance Rating[D]	.22	.19	.24	-.12	-.11	-.10	1.33	1.52	1.63
Promotability Rating[D]	.33	.42*	.47*	.03	.04	.05	1.20	2.07*	2.19*

Note. t-values for a test of significant differences between the multiplicative and additive model appear in the right-hand column. A negative t-value indicates the relationship for additive model is higher than the multiplicative model. $t_C.05 = 2.042$, $t_D.05 = 2.048$.

[A] Effort=Σ[(EI) · V] · A.

[B] Effort=Σ[(EI) + V] + A.

[C] $n = 38$.

[D] $n = 28$.

[+]Ability measure (A) is the Wesman total plus Bennett.

*$p < .05$.

promotions and effort, only 20, 20, and 20 percent respectively were in a direction favoring the additive model. Table 20 presents the t-values for examining the relative contribution of motivation above ability in the prediction of performance. With the exception of the relationships between a multiplicative combination of motivation and ability and promotability ratings, which favored the combined model, there were no significant differences between the relationships involving ability alone versus combined motivation-ability.

Table 21 presents the t-values obtained in comparing the relationships between combined motivation-ability and performance criteria for each fiscal period when the Wesman total plus Bennett was used as the ability measure. Two points should be noted. First, the results involving the multiplicative model were quite varied over fiscal periods suggesting that the relationship between performance and the multiplicative model was unstable. Second, only in the case of the additive model, were some of the comparisons found to be significant, revealing that the relationship between an additive combination of motivation and ability and post-survey performance criteria (T3) was substantially less than the relationships involving the pre-survey performance data (T1).

In summary, the results involving the WESTB and the post-survey performance criteria suggest that combined motivation-ability was rather weakly related to performance regardless of whether motivation and ability were combined multiplicatively or additively. Results from a comparison of the relationships involving the WESTB alone versus combined motivation-ability suggest

Table 20

Comparison of the Relationships between Ability and Performance (T3) and Combined Motivation-Ability[+] (Multiplicative and Additive Models) and Performance (T3)

	Models					
	Multiplicative [(EI) · V] · A		Effort[A] · A	Additive [(EI) + V] + A		Effort + A
	Pay	Prom		Pay	Prom	
Sales Quota Ratio[C]	.92	1.71	1.51	.89	1.35	1.35
Sales Volume[C]	-1.79	-.18	-.81	-.46	.00	.00
Incentive Payments[C]	.22	.56	.57	.44	.44	.88
Performance Rating[D]	1.39	1.61	1.75	-.86	-.43	.00
Promotability Rating[D]	1.21	2.14*	2.30*	-1.30	-.86	-.43

Note. A negative t-value indicates that the relationship between ability and performance is stronger than the corresponding relationship between the combined model and performance. The opposite is true for positive t-values. $t_C.05 = 2.025$, $t_D.05 = 2.042$.

[C] $n = 41$.

[D] $n = 39$.

[+]Ability measure (A) is the Wesman total plus Bennett.

*$p < .05$.

Table 21

Comparison of the Relationships between Combined Motivation-Ability[+] (Multiplicative and Additive Models) and Performance for Each Fiscal Period

	Models					
	Multiplicative [(EI) * V] * A		Effort[A] * A	Additive [(EI) + V] + A		Effort + A
	Pay	Prom		Pay	Prom	
Sales Quota Ratio[A]						
T1 $\bar{v}$ T3	-1.04	.42	-.23	.46	.55	.55
T2 $\bar{v}$ T3	-1.09	-.12	-.68	-.87	-.83	-.87
Sales Volume[A]						
T1 $\bar{v}$ T3	1.35	-.13	1.12	.20	.14	.20
T2 $\bar{v}$ T3	-1.16	.21	-.80	.41	.41	.41
Incentive Payment[A]						
T1 $\bar{v}$ T3	-.45	.83	.41	2.11*	2.11*	2.05*
T2 $\bar{v}$ T3	-.94	-.31	-,79	-.56	-.56	-.56
Performance Rating[B]						
T1 $\bar{v}$ T3	-.22	.61	.39	.37	.48	.53
Promotability Rating[B]						
T1 $\bar{v}$ T3	-.98	.89	.13	2.25*	2.33*	2.27*

Note. A negative t-value indicates that the relationship between combined motivation-ability and performance (T3) was higher than the corresponding relationship. $t_A.05 = 2.021$, $t_B.05 = 2.045$.

[A] $n = 41$.

[B] $n = 32$.

[+]Ability measure (A) is the Wesman total plus Bennett.

*$p < .05$.

that there was no clear advantage for either ability or combined motivation-ability in the prediction of performance, again, regardless of whether a multiplicative or additive model was considered. The relatively weak relationships between combined motivation-ability and post-survey performance criteria can in part be explained by the weakening relationship between ability and performance over fiscal periods. The results may also be a ramification of the possibility that the time lag between attitude measurement and performance measurement exceeded the time span for the influence of job related attitudes on work performance.

Relationship Between Performance and Satisfaction

Porter and Lawler (1968) suggested that satisfaction should be indirectly related to performance through the influence of instrumentality. That is, the experienced relationship between performance and the attainment of an outcome plus the actual satisfaction with the outcome influences the individual's perceived expectancy and valence for that outcome. Therefore, combined instrumentality-ability and combined effort-ability should be related to satisfaction. It should be noted, however, that this theory postulates that satisfaction at time 1 influences motivation and performance at time 2 (Wanous, 1974; Lawler & Porter, 1967b).

Table 22 shows the relationship between performance criteria and job related satisfaction (measured by the JDI) and personal life satisfaction by fiscal periods. In general, the results are small and insignificant particularly for subjective ratings, suggesting that performance and satisfaction are unrelated--a

Table 22

Relationship between Performance Criteria and Satisfaction by Fiscal Periods.

	JDI Scales					Personal Life Items			
	Work	Super.	Accounts & Prospects	Pay	Promotions	Life	Home	Job	Time
Sales Quota Ratio									
T1	.12	.02	.07	-.25	-.06	.04	-.09	.15	.11
	(-.05)	(-1.61)	(1.58)	(-2.29)*	(-1.76)	(.80)	(.11)	(2.75)**	(1.63)
T2	.13	.31	-.22	.16	.26	-.11	-.07	-.33*	-.19
Sales Volume									
T1	.32*	.31*	-.11	-.02	.01	.07	.15	-.15	.23
	(1.36)	(.75)	(-1.78)	(1.40)	(-1.63)	(2.02)	(1.09)	(-.29)	(.29)
T2	.14	.21	.13	-.21	.23	-.20	.00	-.11	.19
Incentive Payment									
T1	.18	.21	-.09	-.08	-.03	.04	.07	-.06	.19
	(-.50)	(-1.11)	(-.49)	(-1.34)	(-1.72)	(1.12)	(.84)	(2.34)*	(-2.03)*
T2	.25	.36*	-.02	.11	.21	-.12	-.05	-.37*	-.09
Performance Ratings	.28	.26	.04	-.06	.09	.00	.05	.04	-.05
Promotability Ratings	.10	.03	-.16	-.16	-.28	.15	.07	-.09	.21

Note. t-values for a test of significant differences between T1 and T2 are enclosed in parentheses. t.05 = 2.01, t.01 = 2.68. A negative t-value indicates that the relationship for T2 is higher than the corresponding relationship for T1. The opposite is true for a positive t-value.

*$p < .05$.

**$p < .01$.

common finding in the literature (cf. Brayfield & Crockett, 1955; Vroom, 1964). The exceptions to this point occurred during the first fiscal period in which case sales volume was significantly related to satisfaction with work and satisfaction with supervisors ($\underline{r}$ = .32 and $\underline{r}$ = .31, respectively). During the fiscal period concomitant with the attitude survey, sales quota ratio and incentive payments were significantly related to satisfaction with supervisors ($\underline{r}$ = .31 and $\underline{r}$ = .36, respectively) and satisfaction with the job ($\underline{r}$ = -.33 and $\underline{r}$ = -.37, respectively). The negative relationships for the personal life satisfaction items indicate that satisfaction increases monotonically with performance since the personal life items were scored reflectively. That is, a low score indicated greater satisfaction on the personal life items. A test for differences in the relationships between fiscal periods as shown by t-values in parentheses indicate that in general there were few significant differences. There was a significant difference between fiscal periods for the relationships between satisfaction with job and sales quota ratio and incentive payment. This suggests that, at least for sales quota ratio and incentive payment, the relationship between satisfaction and performance may be in part contingent upon the time lag between performance and satisfaction measures. Although the differences between fiscal periods were nonsignificant for satisfaction with supervision, the t-values suggest the same type of time contingent relationship between performance and satisfaction. Although these results do not

constitute a proof, they are consistent with Lawler and Porter's (1967b) postulation that performance at time 1 causes satisfaction at time 1. The results in Table 23 are also consistent with this point. Inspection of the table indicates that the relationships between post-survey performance data (T3) and satisfaction were generally nonsignificant.

Relationship Between Ability and Satisfaction

Table 24 shows the relationship between the ability measures and job related satisfaction and personal life satisfaction. The correlations are generally low and nonsignificant, except for the relationship between the Sales Selection Index and satisfaction with home (r = -.39) and the relationship between satisfaction with supervision and the WESTB (r = .33).

Relationship Between Combined Motivation-Ability and Satisfaction

The relationships between combined motivation-ability and satisfaction when the SSI was used as the ability measures are presented in Tables 25 and 26. Inspection of the tables reveals that the only significant relationship was between the additive model and satisfaction with home. It should be noted that this is the same significant relationship that was found for the Sales Selection Index alone.

Tables 27 and 28 show similar relationships when the WESTB was used as the ability measure. Again, the only significant relationship was between the additive model and satisfaction with supervision; the same significant relationship found with the WESTB alone.

Table 23

Relationship Between Performance Criteria (T3) and Satisfaction

	JDI Scales					Personal Life Items			
	Work	Supervision	Accounts & Prospects	Pay	Promotion	Life	Home	Job	Time
Sales Quota Ratio	-.04	-.12	.07	-.10	-.15	.26	-.30	.19	.02
Sales Volume	.13	.18	.14	-.20	.20	-.15	-.03	-.07	.25
Incentive Payment	.11	.10	.17	-.08	.04	.1[illegible]	-.09	-.07	.07
Performance Rating	.20	.20	-.04	-.13	.17	-.39*	-.42*	-.10	.18
Promotability Rating	.09	-.02	-.17	-.18	-.10	-.12	-.32	-.13	.32

n = 38.

* $p < .05$.

Table 24

Relationship between Satisfaction and Ability Measures.

	Ability Measures[+]	
	SSI (N = 41)	WESTB (N = 42)
Work[A]	.04	-.06
Supervision[A]	.15	.33*
Accounts and Prospects[A]	.04	.04
Pay[A]	-.18	-.23
Promotions[A]	-.02	-.18
Life[B]	-.21	-.09
Home[B]	-.39**	.11
Job[B]	-.18	-.17
Time[B]	.02	.12

[A]Job Descriptive Index Scales.

[B]Personal Life Satisfaction Items.

[+]Ability measures are the Sales Selection Index (SSI) and the Wesman total plus Bennett (WESTB)

*$p < .05$.

**$p < .01$.

Table 25

Relationship between Satisfaction and Combined Instrumentality-Ability[+]: Comparing Multiplicative and Additive Models.

	Models			
	Multiplicative [(EI)·V]·A		Additive [(EI)+V]+A	
	Pay	Prom	Pay	Prom
Work[A]	.23	.17	.05	.05
Supervision[A]	.03	.04	.15	.15
Accounts and Prospects[A]	-.03	-.03	.04	.04
Pay[A]	.14	-.04	-.17	.17
Promotions[A]	.12	.05	-.02	-.02
Life[B]	-.03	.14	-.21	-.20
Home[B]	-.02	-.27	-.38*	-.39*
Job[B]	-.13	.00	-.18	-.18
Time[B]	-.01	.12	.02	.02

$n = 41$

[A]Job Descriptive Index Scales.

[B]Personal Life Satisfaction Items.

[+]Ability measure is the Sales Selection Index.

*$p < .01$.

Table 26

Relationship between Satisfaction and Combined Effort-Ability[+]: Comparing Multiplicative and Additive Models.

	Models	
	Multiplicative $\Sigma[(EI).V].A^{+}$	Additive $\Sigma[(EI)+V]+A^{+}$
Work[A]	.24	.06
Supervision[A]	.04	.15
Accounts and Prospects[A]	-.04	.05
Pay[A]	.04	-.17
Promotions[A]	.09	-.01
Life[B]	.08	-.19
Home[B]	-.20	-.38*
Job[B]	-.07	-.18
Time[B]	.08	.02

$n = 41$

[A]Job Descriptive Index Scales.

[B]Personal Life Satisfaction Item.

[+]Ability measure is the Sales Selection Index.

*$p < .05$.

Table 27

Relationship between Satisfaction and Combined Instrumentality-Ability[+]: Comparing Multiplicative and Additive Models.

	Models			
	Multiplicative [(EI)·V]·A		Additive [(EI)+V]+A	
	Pay	Prom	Pay	Prom
Work[A]	.24	.16	-.06	-.05
Supervision[A]	.13	.11	.33*	.33*
Accounts and Prospects[A]	.00	-.03	.04	.04
Pay[A]	.22	-.02	-.23	-.23
Promotions[A]	.16	.00	-.17	-.17
Life[B]	.05	.15	-.08	-.08
Home[B]	.23	-.16	.11	.09
Job[B]	-.23	.03	-.18	-.17
Time[B]	-.02	.17	.12	.12

$n = 42$

[A]Job Descriptive Index Scales.

[B]Personal Life Satisfaction Items.

[+]Ability measure is the Wesman total plus Bennett.

*$p < .05$.

Table 28

Relationship between Satisfaction and Combined Effort-Ability[+]

Comparing Multiplicative and Additive Models.

	Models	
	Multiplicative $\Sigma[(EI).V].A^{+}$	Additive $\Sigma[(EI)+V]+A^{+}$
Work[A]	.24	-.04
Supervision[A]	.14	.33
Accounts and Prospects[A]	-.02	.05
Pay[A]	.10	-.23
Promotions[A]	.09	-.17
Life[B]	.14	-.07
Home[B]	.00	.10
Job[B]	-.10	-.18
Time[B]	.11	.12

$\underline{n}$ = 42

[A]Job Descriptive Index Scales.

[B]Personal Life Satisfaction Item.

[+]Ability measure is the Wesman total plus Bennett.

In summary, the results involving job related satisfaction and personal life satisfaction are rather discouraging. The results indicate that satisfaction is generally unrelated to combined motivation and ability, regardless of whether motivation and ability are combined multiplicatively or additively. Furthermore, combining motivation with ability did not contribute to the prediction of satisfaction beyond ability measures alone. This should not be too surprising, however, since the theory postulates that prior satisfaction influences current motivation. This causal relationship has partial support by Oliver (1977) who found support for a path model, based on Lawler's (1971) theory of pay perception, which suggested that the valence of pay was a negative function of pay satisfaction and that instrumentality of pay was a positive function of valence of pay. In the present study, in which satisfaction and motivation variables were measured concurrently, valence of pay and valence of promotions were marginally related respectively to pay and motivation satisfaction in the expected direction ($r=^{-}.26$, $p<.10$; $r=^{-}.28$, $p<.07$). In addition, contrary to the results obtained by Oliver, instrumentality of pay and instrumentality of promotions were significantly related, respectively, to pay and promotion satisfaction ($r=.32$, $p<.05$; $r=.51$, $p<.001$).

Instrumentality theory also suggests that performance at time 1 should be related to satisfaction at time 1. The results involving the relationship between satisfaction and performance by fiscal period are generally consistent with this suggestion.

Influence of Job Tenure on Instrumentality and Performance

In an attempt to investigate the influence of job tenure on instrumentality and on the relationship between instrumentality and performance, a small group of salesmen (N = 14) who had been with the company for only 6 months (short tenure group) was compared with a sample of salesmen (N = 14) who were randomly selected from the main sample of salesmen who had at least 12 months tenure prior to the fiscal period during which the attitude survey was administered (long tenure group). Table 29 reports a comparison of the two groups on the means for expectancy, valence and the two ability measures. Inspection of the table reveals that the two groups differ significantly on expectancy for pay and expectancy for promotions. In each case, the short tenure group held a higher expectancy that personal job effort was reflected in incentive payments and future promotions. There was no significant difference in how the two groups valued pay and promotions or in their ability levels. This suggests that experience on the job influences an individual's job related expectancies. Tables 30 and 31 compare the two groups on combined instrumentality-ability and combined effort-ability when the Sales Selection Index was used as the ability measure. The two groups were significantly different only on the multiplicative instrumentality of pay, suggesting that the short tenure group was more motivated to perform to obtain pay even though they did not value pay any more than the long tenure group. It should be noted that the significant difference between the two groups on combined instrumentality-ability is in part a reflection of the fact that the nearly significant difference between the groups on

Table 29

Comparison of Means for Short and Long Tenure Groups on Expectancy, Valence and Ability.

	Long			Short				
	$\bar{X}$	(S.D.)	N	$\bar{X}$	(S.D.)	N	t	P
Expectancy (EI)								
Pay	.37	(.25)	13	.79	(.18)	13	-4.98	.000
Prom	.60	(.30)	13	.86	(.11)	13	-2.87	.008
Valence (V)								
Pay	.90	(.16)	13	.77	(.37)	13	1.147	.263
Prom	.72	(.33)	13	.64	(.55)	13	.43	.670
Ability (A)								
WESTB[A]	48.32	(9.0)	14	45.42	(13.9)	13	.65	.521
	52.09	(10.8)	14	58.50	(6.4)	14	-1.91	.067

[A] Wesman total plus Bennett.

[B] Sales Selection Index.

Table 30

Comparison of Means for Short and Long Tenure Groups on Combined Instrumentality-Ability+ (Multiplicative and Additive Models).

	Long (N=13) X	(S.D.)	Short (N=12) X	(S.D.)	t	P
Multiplicative Model [(EI)·V]·A+						
Pay	17.52	(12.6)	33.84	(20.0)	-2.49	.020
Prom	23.30	(18.0)	30.88	(29.7)	-.79	.439
Additive Model [(EI)+V]+A+						
Pay	54.48	(10.3)	59.71	(6.5)	-1.55	.134
Prom	54.54	(10.3)	59.64	(6.6)	-1.51	.145

+Ability measure is the Sales Selection Index.

Table 31

Comparison of Means for Short and Long Tenure Groups on Combined Effort-Ability[+] (Multiplicative and Additive Models).

	Long (N = 13) $\bar{X}$ (S.D.)	Short (N = 12) $\bar{X}$ (S.D.)	t	P
Multiplicative Model $\Sigma[(EI)\cdot V]\cdot A^{+}$	40.81 (25.0)	64.72 (37.5)	-1.91	.068
Additive Model $\Sigma[(EI)+V]+A^{+}$	55.80 (10.3)	61.21 (6.6)	-1.60	.123

[+]Ability measure is the Sales Selection Index.

the Sales Selection Index interacts with the significantly different expectancy for pay.

A comparison of the two groups on combined instrumentality-ability and combined effort-ability when the WESTB was used is reported in Tables 32 and 33. Inspection of the tables reveals that there were no significant differences between the groups, although the difference for the multiplicative instrumentality of pay approaches significance. Table 34 indicates that there were no significant differences between the two groups on objective performance data (T2).

The relationships between ability measures and 1975 performance criteria (T2) are reported in Table 35 for each group. Inspection of the table reveals that the correlations are generally nonsignificant except for the relationship between WESTB and sales volume in the short tenure group ($\underline{r}$ = -.63). Of interest, is the fact that the correlations involving the SSI reverse signs depending on the tenure group. For the short tenure group the SSI, the organization's selection instrument, is negatively related to performance while being positively related to performance in the long tenure group. The WESTB is negatively related to performance in both groups. Tests for differences in the relationships between groups were performed using independent sample Z tests (Ferguson, 1976). The Z-values in the far right columns of Table 35 indicate that none of the differences were significant.

The relationships for each group between 1975 performance criteria (T2) and combined instrumentality-ability and effort-

Table 32

Comparison of Means for Short and Long Tenure Groups on Combined Instrumentality-Ability[+] (Multiplicative and Additive Models).

	Long (N = 13) $\bar{X}$ (S.D.)	Short (N = 12) $\bar{X}$ (S.D.)	t	P
Multiplicative Model $[(EI)\cdot V]\cdot A^{+}$				
Pay	14.60 (9.2)	24.90 (19.1)	-1.74	.094
Prom	19.43 (13.5)	26.24 (19.6)	-1.02	.318
Additive Model $[(EI)+V]+A^{+}$				
Pay	48.34 (7.8)	47.64 (14.2)	.15	.879
Prom	48.39 (7.7)	47.57 (14.5)	.18	.860

[+]Ability measure is the Wesman total plus Bennett.

Table 33

Comparison of Means for Short and Long Tenure Groups on Combined Effort-Ability[+] (Multiplicative and Additive Models).

	Long (N = 13) $\bar{X}$ (S.D.)	Short (N = 12) $\bar{X}$ (S.D.)	t	P
Multiplicative Model $\Sigma[(EI)\cdot V]\cdot A^{+}$	34.02 (16.8)	51.13 (32.4)	-1.68	.106
Additive Model $\Sigma[(EI)+V]+A^{+}$	49.66 (7.5)	49.10 (14.5)	.12	.904

[+]Ability measure is Wesman total plus Bennett.

Table 34

Comparison of Means for Short and Long Tenure Groups on 1975 Performance Criteria (T2).

	Long (N = 14) X (S.D.)	Short (N = 14) X (S.D.)	t	P
Sales Quota Ratio	1.07 (.17)	1.04 (.16)	.47	.640
Sales Volume	30051.14 (6943.0)	30730.64 (6091.5)	-.28	.785
Incentive Payment	1783.07 (1415.7)	1330.57 (870.7)	1.02	.318

Note. Comparisons based on raw score performance data.

Table 35

Relationship between Ability Measures and 1975 Performance Criteria (T2) by Short and Long Tenure Groups.

	Long Tenure (N=14)		Short Tenure (N=14)		Z	
	SSI	WESTB	SSI	WESTB	SSI	WESTB
Sales Quota Ratio	.20	-.42	-.07	-.08	.64	-.86
Sales Volume	.35	-.25	-.24	-.63*	1.43	1.14
Incentive Payment	.27	-.43	-.27	-.17	1.30	-.68

Note. A test for differences in the relationship between groups is indicated by the Z-values in the far right column. $Z_{.05} = 1.96$, $Z_{.01} = 2.58$. Relationships involved raw score performance data.

*$p < .05$.

ability when the Sales Selection Index was used as the ability measure are presented in Tables 36 and 37. The relationships between multiplicative instrumentality of pay and sales quota ratio and incentive payments are the only significant correlations and only for the short tenure group. The Z-values in the far right columns of Table 36 indicate that only for these relationships are the groups significantly different. The Z-values comparing the two groups on the multiplicative model are consistently larger than the corresponding Z-values for the additive model, suggesting that the multiplicative combination of motivation and the SSI is more reflective of the influence of job tenure than the additive model. The same pattern of results is seen when the Z-values in Table 37 are inspected. As a whole, these results seem to indicate that job tenure effects the relationship between combined motivation-ability when the SSI is used as the ability measure, particularly for the multiplicate model. Unfortunately, motivation is negatively related to performance for the group which had the significantly higher motivation for pay.

Tables 38 and 39 present the t-tests comparing the relationship between combined instrumentality-ability and effort-ability and performance to the relationships involving the SSI alone. An "m" in parentheses indicates that the relationship between the model and performance is stronger than the corresponding relationship between ability and performance. An "A" indicates the ability-performance relationship is stronger. An inspection of Table 38 reveals that none of the comparisons were significant. However, the sign and size of the t-values

Table 36

Relationship between 1975 Performance Criteria (T2) and Combined Instrumentality-Ability[+] (Multiplicative and Additive Model) by Short and Long Tenure Groups.

	Long Tenure (N=13)				Short Tenure (N=13)				Z			
	Multiplicative [(EI)·V]·A		Additive [(EI)+V]+A		Multiplicative [(EI)·V]·A		Additive [(EI)+V]+A		Multiplicative [(EI)·V]·A		Additive [(EI)+V]+A	
	Pay	Prom	Pay	Prom	Pay	Prom	Pay	Prom	Pay	Prom	Pay	Prom
Sales Quota Ratio	.30	.44	.13	.15	-.58*	-.07	-.11	-.09	2.17*	1.21	.54	.54
Sales Volume	.31	.27	.28	.29	-.32	-.46	-.29	-.31	1.46	1.73	1.31	1.38
Incentive Payment	.44	.41	.20	.22	-.72**	-.15	-.31	-.28	3.09**	1.31	1.17	1.14

Note. A test for differences in the relationships between groups is indicated by the Z-values in the far right column. $Z_{.05} = 1.96$, $Z_{.01} = 2.58$. Relationships involve raw score performance data.

[+]Ability measure is the Sales Selection Index.

*$p < .05$.

**$p < .01$.

Table 37

Relationship between 1975 Performance Criteria (T2) and Combined Effort-Ability[+] (Multiplicative and Additive Model) by Short and Long Tenure Groups.

	Long Tenure (N=13)		Short Tenure (N=13)		Z	
	Multiplicative $\Sigma[(EI)\cdot V]\cdot A$	Additive $\Sigma[(EI)+V]+A$	Multiplicative $\Sigma[(EI)\cdot V]\cdot A$	Additive $\Sigma[(EI)+V]+A$	Multiplicative $\Sigma[(EI)\cdot V]\cdot A$	Additive $\Sigma[(EI)+V]+A$
Sales Quota Ratio	.47	.16	-.36	-.12	1.98*	.63
Sales Volume	.35	.29	-.53	-.32	2.14*	1.41
Incentive Payment	.52	.23	-.50	-.32	2.52*	1.27

Note. A test for differences in the relationships between groups is indicated by the Z-values in the far right column. $Z_{.05} = 1.96$, $Z_{.01} = 2.58$. Relationships involve raw score performance data.

[+]Ability measure is the Sales Selection Index.

AD-A044 303 AKRON UNIV OHIO DEPT OF PSYCHOLOGY F/G 5/10
A LONGITUDINAL FIELD STUDY COMPARING A MULTIPLICATIVE AND AN AD--ETC(U)
JUL 77 G V BARRETT, R A ALEXANDER, M C RUSH N00014-75-C-0985
UNCLASSIFIED TR-11 NL

2 OF 2
AD
A044303



END
DATE
FILMED
10-77
DDC

Table 38

Comparisons of the Relationship Between Ability and 1975 Performance (T2) and Combined Instrumentality-Ability[+] (Multiplicative and Additive Models) and 1975 Performance by Short and Long Tenure Groups.

	Long Tenure				Short Tenure			
	Multiplicative [(EI)·V]·A		Additive [(EI)+V]+A		Multiplicative [(EI)·V]·A		Additive [(EI)+V]+A	
	Pay	Prom	Pay	Prom	Pay	Prom	Pay	Prom
Sales Quota Ratio	.26(m)	.66(m)	-1.83(A)	-1.22(A)	-1.46(m)	.00	-.94(m)	-.45(m)
Sales Volume	-.11(A)	-.21(A)	-1.93(A)	-1.58(A)	-.20(m)	-.65(m)	-1.25(m)	-1.90(m)
Incentive Payment	.48(m)	.38(m)	-1.87(A)	-1.24(A)	-1.59(m)	.32(A)	-.98(m)	-.23(m)

Note. An "m" in parentheses indicates that the relationship between the model and performance is stronger than the corresponding relationship between ability and performance. An "a" indicates the ability-performance relationship is stronger. t.05 = 2.23, t.01 = 3.17. Comparisons are based on raw score performance data.

[+] Ability measure is the Sales Selection Index.

Table 39

Comparisons of the Relationships between Ability and 1975 Performance (T2) and Combined Effort-Ability[+] (Multiplicative and Additive Models) and 1975 Performance (T2) by Short and Long Tenure Groups.

	Long Tenure		Short Tenure	
	Multiplicative $\Sigma[(EI)\cdot V]\cdot A$	Additive $\Sigma[(EI)+V]+A$	Multiplicative $\Sigma[(EI)\cdot V]\cdot A$	Additive $\Sigma[(EI)+V]+A$
Sales Quota Ratio	.77 (m)	-.95 (A)	-.80 (m)	-1.20 (m)
Sales Volume	.00	-1.58 (A)	-.89 (m)	-2.31 (m)
Incentive Payment	.75 (m)	-.97 (A)	-.69 (m)	-1.26 (m)

Note. An "m" in parentheses indicates that the relationship between the model and performance is stronger than the corresponding relationship between ability and performance. An "A" indicates the ability-performance relationship is stronger. $t.05 = 2.23$, $t.01 = 3.17$. Comparisons are based on raw score performance data.

[+] Ability measure is the Sales Selection Index.

suggests that a reversal occurs when comparing the two groups on the additive model. In the short tenure group, motivation appears to contribute slightly in the prediction of performance. In the long tenure group motivation apparently contributes nothing in the prediction of performance. This pattern is somewhat similar to that seen when considering the multiplicative model, although not quite as clearly. The t-values in Table 39 conform to the same pattern, with the comparison involving the additive model and sales volume significantly favoring the combined effort-ability relationship for the short tenure group.

In summary, the comparison of tenure groups when the SSI was used suggests that there were significant differences between groups only for the multiplicative instrumentality of pay and the multiplicative model of effort relationships. Also, the results from the t-tests, although generally not statistically significant, suggest that motivation contributes something beyond the SSI in predicting performance for the short tenure group. As noted previously, however, the relationship between combined motivation-ability and performance (T2) is negative in the short tenure group.

The relationships for each group between 1975 performance criteria (T2) and combined instrumentality-ability and effort-ability, when the WESTB was used, are presented in Tables 40 and 41. Significant relationships occur only for the short tenure group, particularly those involving sales volume. Inspection of the Z-values indicates that the two groups are significantly different when the multiplicative effort-ability model is considered and nearly significantly different when the

Table 40

Relationship Between 1975 Performance Criteria (T2) and Combined Instrumentality-Ability[+] (Multiplicative and Additive Model) by Short and Long Tenure Groups.

	Long Tenure (N=13)				Short Tenure (N=13)				Z			
	Multiplicative [(EI)·V]·A		Additive [(EI)+V]+A		Multiplicative [(EI)·V]·A		Additive [(EI)+V]+A		Multiplicative [(EI)·V]·A		Additive [(EI)+V]+A	
	Pay	Prom	Pay	Prom	Pay	Prom	Pay	Prom	Pay	Prom	Pay	Prom
Sales Quota Ratio	.25	.41	-.38	-.35	-.54	-.06	-.10	-.08	1.92	1.11	-.67	-.64
Sales Volume	.22	.19	-.13	-.13	-.50	-.58*	-.63*	-.62*	1.73	1.91	1.37	1.33
Incentive Payment	.32	.31	-.36	-.35	-.68**	-.19	-.20	-.18	2.60**	1.15	-.39	-.41

Note. A test for differences in the relationships between groups is indicated by the Z-values in the far right column. $Z_{.05} = 1.96$, $Z_{.01} = 2.58$. Relationships involve raw score performance data.

[+] Ability measure is the Wesman plus Bennett.

* $p < .05$.

** $p < .01$.

Table 41

Relationship Between 1975 Performance Criteria (T2) and Combined Effort-Ability[+] (Multiplicative and Additive Model) by Short and Long Tenure Groups.

	Long Tenure (N=13)		Short Tenure (N=13)		Z	
	Multiplicative $\Sigma[(EI)\cdot V]\cdot A$	Additive $\Sigma[(EI)+V]+A$	Multiplicative $\Sigma[(EI)\cdot V]\cdot A$	Additive $\Sigma[(EI)+V]+A$	Multiplicative $\Sigma[(EI)\cdot V]\cdot A$	Additive $\Sigma[(EI)+V]+A$
Sales Quota Ratio	.47	-.35	-.36	-.10	1.98*	.59
Sales Volume	.27	-.12	-.65*	-.63*	2.35*	1.39
Incentive Payment	.43	-.35	-.52	-.19	2.32*	-.39

Note. A test for differences in the relationships between groups is indicated by the Z-values in the far right column. $Z.05 = 1.96$, $Z.01 = 2.58$. Relationships involve raw score performance data.

[+] Ability measure is the Wesman total plus Bennett.

* $p < .05$.

multiplicative instrumentality of pay model is considered. The Z-value for the multiplicative instrumentality of pay and incentive payment relationship is highly significant. In general, the relationships involving the multiplicative model are stronger in the short tenure group than in the long tenure group, although the relationships are negative in the short tenure group. These results again suggest that higher motivation results in lower performance for the short tenure group; and that job tenure influences an individual's job motivation when a multiplicative model is considered.

Comparisons of the relationship between WESTB and performance with the relationship between combined motivation-ability as shown in Tables 42 and 43 indicate that motivation did not contribute significantly to the prediction of performance in any of the relationships regardless of tenure group or whether motivation and ability were combined multiplicatively or additively. Although the t-values are nonsignificant, it is interesting to note that in the long tenure group motivation consistently contributes slightly to the prediction of performance in the multiplicative model but not so for the short tenure group.

The set of results involving the WESTB are paradoxical in that the tenure groups were generally not significantly different except when considering the multiplicative effort-ability model; in which case the relationships for the short tenure group appeared slightly stronger. This is similar to the pattern of results seen when the SSI was used as the ability measure. However, unlike the results obtained when

Table 42

Comparison of the Relationships Between Ability and 1975 Performance (T2) and Combined Instrumentality-Ability[+] (Multiplicative and Additive Models) and 1975 Performance (T2) by Short and Long Tenure Groups

	Long Tenure				Short Tenure			
	Multiplicative [(EI)·V]·A		Additive [(EI)+V]+A		Multiplicative [(EI)·V]·A		Additive [(EI)+V]+A	
	Pay	Prom	Pay	Prom	Pay	Prom	Pay	Prom
Sales Quota Ratio	1.50(m)	1.92(m)	1.03(A)	2.01(A)	-1.53(m)	.09(A)	-.45(m)	.00
Sales Volume	.98(m)	.91(m)	5.44(A)**	5.44(A)**	.50(A)	.32(A)	.00	.29(A)
Incentive Payment	1.71(m)	1.66(m)	2.02(A)*	2.46(A)*	-1.94(m)	-.09(m)	-.70(m)	-.23(m)

Note. An "m" in parentheses indicates that the relationship between the model and performance is stronger than the corresponding relationship between ability and performance. An "A" indicates the ability-performance relationship is stronger. t.05 = 2.23, t.01 = 3.17. Comparisons based on raw score performance data.

[+] Ability measure is the Wesman total plus Bennett.

* $p < .05$.

** $p < .01$.

Table 43

Comparison of the Relationships Between Ability and 1975 Performance (T2) and Combined Effort-Ability[+] (Multiplicative and Additive Models) and 1975 Performance (T2) by Short and Long Tenure Groups

	Long Tenure		Short Tenure	
	Multiplicative $\Sigma[(EI)\cdot V]\cdot A$	**Additive** $\Sigma[(EI)+V]+A$	**Multiplicative** $\Sigma[(EI)\cdot V]\cdot A$	**Additive** $\Sigma[(EI)+V]+A$
Sales Quota Ratio	2.03 (m)	2.01 (A)	-1.24 (m)	-.05 (m)
Sales Volume	1.05 (m)	8.37** (A)	-.11 (m)	.00
Incentive Payment	1.93 (m)	2.46* (A)	-1.73 (m)	-.05 (m)

Note. An "m" in parentheses indicates that the relationship between the model and performance is stronger than the corresponding relationship between ability and performance. An "A" indicates the ability-performance relationship is stronger. t.05 = 2.23, t.01 = 3.17. Comparisons based on raw score performance data.

[+] *Ability measure is the Wesman total plus Bennett.*

* $p < .05$.

** $p < .01$.

the SSI was used, a comparison of the relationships involving ability alone versus combined motivation-ability suggested that motivation did not contribute to the prediction of performance in the short tenure group regardless of how motivation and ability were combined. Moreover, the results suggested that for the long tenure group, motivation contributed slightly when motivation and ability are combined multiplicatively. This is in direct contradiction to the conclusions drawn from the main sample when the WESTB was used as the ability measure. In the main sam motivation was found to contribute significantly in the ve model. The paradox may in part be a ramification of the fact that the WESTB was negatively related to performance in both the long and short tenure group, while motivation alone was positively related to performance in the long tenure group and negatively related in the short tenure group. Inspection of the relationships between the WESTB and 1975 performance (T2) for the main sample as seen in Table 1 suggests that in comparison to the relationships found during the first fiscal period (T1), the relationship between WESTB and performance becomes less positive with time. Thus, the negative relationship between WESTB and performance found in the comparison of the tenure groups may in part be explained by the organization's selection procedure. That is, as the organization continues to select individuals high on the SSI, the WESTB becomes negatively related to performance. This explanation would fail to explain why the SSI is negatively related to performance in the short tenure group. Also, the WESTB and SSI are positively related in the short tenure group

(r = .36). Therefore, the results involving the WESTB in investigating the effect of job tenure on motivation remain a paradox.

In summarizing the set of results pertaining to the effect of job tenure on motivation, it appears that experience with the company does influence job related attitudes and the relationship between motivation and performance. The short tenure group held significantly higher expectancies than incentive payments, and future promotions were a result of personal job effort. They also valued pay and promotions slightly less than the long tenure group. When considering the relationship between combined motivation-ability and performance, the results indicated that the two ability measures reflected the influence of job tenure differently. When the Sales Selection Index (SSI) was used as ability, results indicated that relationships between combined motivation-ability and performance were negative and generally stronger in the short tenure group, and that in general, the two groups were found to differ when the multiplicative combination of motivation and ability was used. The same pattern of results emerged when the Wesman total plus Bennett (WESTB) was used as the ability measure. However, when the contribution of motivation over that of ability in predicting performance was considered, use of the two ability measures produced discrepant results. When the SSI was used, the pattern of results suggested that in the short tenure group an additive combination of motivation and ability was generally more predictive of performance than ability alone, and that no clear advantage for either ability alone or combined motivation-ability was

evident in the multiplicative combination. Motivation contributed nothing to the prediction of performance in the long tenure group regardless of how motivation and ability were combined. When the WESTB was used as the ability measure, motivation was found to contribute slightly in the prediction of performance when combined multiplicatively with ability in the long tenure group and contributed little when combined additively. No clear advantage for either combined motivation-ability or ability alone was evident in the short tenure group. As suggested above, these results may be a ramification of the organization's selection instrument.

Discussion

The results from this study are consistent enough to suggest several tentative conclusions. First, concerning the main sample, the results consistently suggested the relative efficiency of combining motivation and ability additively rather than multiplicatively as suggested by Vroom (1964) and Porter and Lawler (1968). Additionally, it was shown that when a more general ability measure such as the Wesman total plus Bennett was used in the additive model, a combination of motivation and ability was significantly better in predicting performance than ability alone. Third, results indicated that the partial additive and additive model resulted in virtually identical relationships with performance, suggesting that the manner of combining expectancy and valence is not as crucial as the manner in which motivation and ability are combined. Fourth, combined motivation-ability and satisfaction generally seem to be unrelated when measured concurrently. However, performance and

job related satisfaction appear to be related when each is measured within the same time span. As noted previously, these results are consistent with Lawler and Porter's (1967b) suggestions. Fifth, experience with the company apparently influences an individual's job related attitudes as was seen when a short tenure group was compared with a long tenure group. The influence of job tenure is also seen in the relationships of combined motivation-ability and performance. However, unlike the pattern of results emerging from the main sample, the comparison of tenure groups suggested that the multiplicative model resulted in stronger relationships with performance. When these relationships were compared with those obtained using ability alone, the results again favored the additive model. (Dachler and Mobley (1973) have also found tenure can moderate word motivation models). Future research is needed to further investigate these tentative conclusions and to elaborate on the effect of job tenure and the additive combination of motivation and ability.

The results also indicated a generally consistent and highly significant relationship between promotability ratings and both motivation and combined motivation-ability. These relationships are in part a function of the significant relationship ($p < .005$) between valence of promotions and promotability ratings from each fiscal period. In total, the results suggest a simple causal model consistent with Lawler and Porters (1967b) model in which individuals who highly value promotions are more likely to display behaviors resulting in higher ratings of promotability.

Perhaps the most notable finding was the relatively consistent, although not always statistically significant, support for an additive model. Generally, the additive combination of motivation and ability was found to have a slightly higher relationship with performance than the multiplicative combination. When the WESTB was used as the ability measure, motivation was found to contribute significantly over ability in the prediction of performance for the additive model. As Campbell and Pritchard (1976) noted, the support for a multiplicative combination is generally unconvincing. In a study using a factorial design, Pritchard and DeLeo (1973) failed to find a significant effect for the hypothesized interaction between ability and valence. They also found that the interaction between instrumentality and valence, although significant, did not conform to the predicted pattern. The multiplicative model is advocated because it permits the hypothesized interaction between components. The results from this study indicated that there were no differences between a partial additive and an additive model. That is, combining the components of instrumentality, either multiplicatively or additively was unimportant; instead, how ability was combined with motivation was the crucial factor. Pritchard and Sanders (1973) also found that a multiplicative combination of components predicted no better than the additive combination, as did Arvey (1972). Although the results indicate that motivation significantly contributed over ability in the prediction of performance when the WESTB was used as the ability measure, they do not indicate that motivation is a better predictor

or as good a predictor as ability alone. Thus, Dunnette (1973) seems to have been correct when he suggested that ability was the most parsimonious predictor of performance but motivation does seem to contribute something. A relevant question is how much does motivation contribute and at what point in the individual's performance history.

The practical implications of a combined motivation-ability model for an organization are reflected in the potential for the organization to adjust either motivation or ability or both through some intervention strategy to accomplish a desired change in performance. In addition, methods such as a cost/benefit analysis (cf. Cronbach and Gleser, 1965) and a policy analysis (cf. Raiffa & Schlaifer, 1961) provide information on the relative increment in performance attributed to each component and information on the expected utility for any given course of action. A combination of the two methods can be used, as in the case of accident training (Barrett, Alexander, & Forbes, 1973), to decide on a course of action which will maximize outcomes for the organization.

For example, assuming that an additive model represents the true state of the world, the organization has the option of increasing the mean level of either or both components in an attempt to increase the mean sales performance of its members. Using total sales volume (T1) (a transformed figure representing actual sales volume), the Sales Selection Index and effort for illustrative purposes, Table 44 indicates that a change in sales (Δsales) of 2801.756 units would result from changing the mean

Table 44

Illustrative Example of Cost/Benefit Analysis

for the Additive Model of Motivation-Ability and Sales Volume (T1)

	Variable	M	SD	$r_{v \cdot s}$	A $\Delta_3 v$	B Δv	C $\{\Delta_3 v\}$	Δ Sales = $r_{v \cdot s}$ $(\Delta_3 v)$	Δ Sales	Benefit
	Sales Volume	59474.25	15063.2	--						
1.	Ability	2.96	1.56	.29	.641	.1	--	.186	2801.756	2801.756-C_1
2.	Effort	2.64	.69	.23	.641	.442	--	.147	2214.290	2214.290-C_2
	(EIV) pay	1.33	.31	--	--	.442	1.426	.147		
	(EIV) prom	1.29	.50	--	--	.442	.884	.147		
3.	(EIV) prom	1.29	.50	.22	.641	.320	--	.141	2123.911	2123.911-C_3
	V prom	.63	.44	--	--	.320	.727	.141		
	(EI) prom	.66	.26	--	--	.320	1.231	.141		
4.	Effort & Ability	5.60	1.94	.31	.641	1.245	--	.199	2993.208	2993.208-C_4
	Effort	2.64	.69	--	--	1.245	1.80	.199		
	Ability	2.96	1.56	--	--	1.245	.80	.199		

a $\Delta_3 v$ = Change of variable in standard deviation units
b Δv = Change of variable in natural scale units
c $\Delta_3 v$ = Change of component in standard deviation units to reflect change in the variable given the covariance between components.

level of the Sales Selection Index from 3 to 4. Cronbach and Gleser's (1965) decision theory suggests that the actual benefit accrued by a given strategy is equal to the increment resulting from the change minus the cost of the change. Thus in the illustration, the benefit from increasing the SSI by one point is 2801.75 units minus the cost (C.) of such a change. Further inspection of Table 44 reveals that a change in effort equivalent to the change in ability would result in a change of sales of 2214.290 units. Since effort is composed of instrumentality of pay and instrumentality of promotions, the change in effort could be reflected in an increment of 1.4 or .8 standard deviation units for instrumentality of pay and instrumentality of promotion respectively. It should be noted that because of the covariance between the two components of effort, a change in standard deviation units of either component equivalent to a change in effort standard deviation units does not result in the same payoff. This is seen in the case of instrumentality of promotions. A change in this variable equivalent to the change in ability would result in an increase of 2123.911 sales volume units, which is slightly less than the increase indicated by effort. Continuing in this fashion, the organization could gather information on the benefits resulting from an increase in the mean level of any component.

Policy analysis would allow the organization to ascertain which course of action would result in the highest expected utility for the organization. This technique as described by Raiffa and Schlaifer (1961) requires the decision maker to assign probabilities to each course of action. The expected utility

of the action is then the product of the probability and the expected benefit from the course of action. For example, the organization may want to increase the mean level of ability within a certain time period in order to accomplish a desired increase in sales performance. Two possible courses of action are to increase the mean level of ability through selection or through training. Based on other evidence and his own preferences for each action, the decision maker may assign probabilities of .8 and .2 respectively for the accomplishment of each course of action. Thus the expected utility for selection is much greater than for training. Using the information presented in Table 44, an illustrative example of policy analysis is presented in Figure 1. Inspection of the expected monetary utilities for each course of action as indicated in Figure 1 suggests that the organization would do well in attempting to increase both ability, through selection, and effort, providing that the cost of each course of action is equivalent (which is probably not true). Effort could be increased by changing either component making up effort. Inspection of Table 44 for the required change in component standard deviation units ($\{\Delta_{3v}\}$) indicates that the change for instrumentality of promotions is less than that for instrumentality of pay. Similarly, the required change in valence of promotion suggests that valence rather than expectancy would be easier to change. Thus a combination of cost/benefit analysis and policy analysis suggests that the organization could increase the mean level of sales volume by increasing the mean ability level through selection and the mean effort level by increasing the

Figure 1

Illustrative Example of Policy Analysis for

the Additive Model of Motivation-Ability and Sales Volume (T1)



	Course of Action for Change	P(e)	Expected Benefit	Expected Monetary Utility
A_1	Selection	.80	$2801.765-C_1$	$2241.405 - .8(C_1)$
	Training	.20	$2801.765-C_1$	$560.351 - .2(C_1)$
A_2	Effort	.80	$2214.290-C_2$	$1771.432 - .8(C_2)$
A_3	Selection & Effort	.80	$2993.208-C_4$	$2394.567 - .8(C_4)$
	Training & Effort	.50	$2993.208-C_4$	$1496.604 - .8(C_4)$

valence of promotions and reaffirming that promotions are in fact dependent upon performance. Although this conclusion is based on an illustrative example, it demonstrates the practical utility of specifying the relationship between motivation and ability and the utility of using a cost/benefit analysis and policy analysis for making decisions based on the implications of the model.

As previously noted, the results obtained when comparing the two ability measures were not congruent. The results indicated that an additive model produced slightly higher relationships for both ability measures, but motivation contributed significantly only when the WESTB, a general ability measure, was used. In addition, no significant difference was found when comparing the models using each of the ability measures. One possible explanation is that idiosyncrasies in the data may account for the differences between the ability measures. Although cross-validation is necessary, the consistency of results across two of the fiscal periods suggests that another explanation is needed. These results could also be a function of the fact that the SSI was a relatively specific ability measure related to performance, and the WESTB was a more general ability measure. This explanation is consistent with Porter and Lawler's (1968) definition of ability.

Another possible explanation is slightly more complex. There could be a trade off between motivation and ability such that motivation contributes to the prediction of performance only when ability is not highly related to performance. This would indicate that as an individual develops the specific

ability required for a certain type of performance, motivation would play less of a role in determining performance. This is consistent with the common sense notion which suggests that after an individual knows how to do something, he doesn't have to try as hard to achieve the same goal. The explanation also suggests that job related expectancies should be affected by job experience. The results from the comparison of tenure groups in the present study support this hypothesis. Partial support is also seen in the studies by Jorgenson, Dunnette and Pritchard (1973) and Graen (1969) in which performance-outcome perceptions were experimentally manipulated. At this point, it is impossible to say which explanation is the most adequate.

Another perplexity in this study concerns the relatively small relationships found between post-survey performance criteria (T3) and combined motivation-ability. Porter and Lawler's model clearly indicates that job related attitudes (e.g., expectancies and valences) precede the resulting performance (Porter & Lawler, 1968; Lawler, 1968; Lawler, 1973). In the present study, significant relationships were found between combined motivation-ability and performance measured both prior (T1) to the attitude survey and concomitant with the attitude survey (T2). However in general, neither the multiplicative nor the additive combination of motivation and ability were found to be significantly related with the post-survey performance data (T3). These results may in part be a ramification of the decreasing strength in the relationship between ability and performance over time, or a ramification of the possibility that the time lag between the attitude survey

and the post-survey performance data exceeded the time span of influence for job related attitudes on work performance. The optimal time limit for the influence of instrumentality on performance is largely unknown and presents a substantial concern for research on instrumentality theory. Although the model permits changing expectancies as a result of new information, a relevant question is how rapidly should expectancies change and how long should it take for the change to influence performance (Campbell & Pritchard, 1976). Mitchell (1974) has pointed out that although estimates of internal consistency reliability for instrumentality measures are reasonably high, test-retest reliability is generally low. Whether this unreliability is a result of changing expectancies or poor measurement is a question for future research. In the event that the low reliability is a result of changing expectancies, the specification of an optimal time limit for the influence of job-related attitudes on work performance is crucial.

The present study also found that combined motivation-ability was not related to satisfaction. Performance, on the other hand, was found to be related to satisfaction with supervision and with the job for the concomitant fiscal period (T_2) only. These results are consistent with instrumentality theory and with the results obtained by Wanous (1974). Instrumentality theory suggests that the relationship between motivation and satisfaction for a concurrent time period should be substantially less than the relationship found for an adjacent time period, since satisfaction at Time 1 is supposed to influence motivation at Time 2. The relationship found in this study

was concurrent in nature. The theory also suggests that performance at Time 1 causes satisfaction at Time 1. The study by Wanous was consistent with this hypothesis, as were the results obtained in this study.

Mitchell (1974) pointed out that one serious problem in most instrumentality research is that the investigator dictates the relevant outcomes. Campbell and Pritchard (1976) noted that the instrumentality model as a process theory does not specify which outcomes are relevant for certain individuals in a particular situation. In order to be congruent with the model, subjects should generate their own list of outcomes which are relevant for them in a particular situation. This has rarely been done. The study by Hackman and Porter (1968) is one of the few exceptions; however, even in their study, the generated lists were reduced to include only the most frequently mentioned outcomes. The degree of attenuation in the predictions resulting from using a restricted list of outcomes is unknown. In the present study, only pay and promotions were used as outcomes. A related problem is that current research has almost exclusively investigated extrinsic outcomes. Only a few studies have used outcomes such as prestige, security, and autonomy (cf. Porter & Lawler, 1968; Lawler, 1968; Lawler & Porter, 1976; Lawler, 1973; Graen, 1969; Mitchell & Albright, 1972). Broedling (1975) found that intrinsic motivation for participating in work activities predicted supervisors' ratings of performance and self-report measures of effort as well as extrinsic motivation for several outcomes. The present study only investigated extrinsic outcomes. More research is needed

in the area of intrinsic outcomes, perhaps using preference for certain job structural attributes as a measure of valence for intrinsic outcomes.

An additional problem with the present study involves measurement. As has been noted, expectancy and instrumentality are supposed to reflect the individual's perceived probability of the relationship between effort and outcomes. Although the present study attempted to conform to the conceptual meaning of expectancy and valence by transforming the responses into 0.0 and 1.0 and -1.0 to +1.0 scales respectively, there is no guarantee that the subject's actual perception of expectancy and valence would correspond to the transformations. A related problem was noted by Slovic and Lichtenstein (1968). They suggested that people tend to underestimate the probability of certain events and overestimate the probability of rare events when subjective probabilities are compared to objective probabilities. More research is needed on the measurement of instrumentality components using process analysis or scaling techniques (Campbell & Pritchard, 1976).

In conclusion the results from the present study are very promising, however, more research is needed in the areas noted, particularly research further investigating the additive model and the possible use of job structural attributes as valued intrinsic outcomes. In addition, experimental studies are needed as noted by Pritchard and DeLeo (1973) and Campbell and Pritchard (1976). The model is intended to predict change in the dependent variable as a result of change in the independent variables.

References

Arvey, R. D. Task performance as a function of perceived effort-performance and performance-reward contingencies. Organizational Behavior and Human Performance, 1972, 8, 423-433.

Barrett, G. V., Alexander, R. A., & Forbes, J. B. Analysis of performance measurement and training requirements for driving decision making in emergency situations. (Tech. Rep. No. 55). University of Rochester, Management Research Center, 1973.

Bass, B. M., & Barrett, G. V. Man, work, and organizations. Boston: Allyn and Bacon, 1972.

Brayfield, A. H., & Crockett, W. H. Employee attitudes and employee performance. Psychological Bulletin, 1955, 52, 396-424.

Broedling, L. A. The use of an intrinsic index of motivation in an expectancy theory framework. Paper presented at the Western Academy of Management Meeting, March 1975.

Campbell, D. E., & Willems, E. P. Expectancy theory of work motivation: A review. JSAS Catalog of Selected Documents in Psychology, 1975, 5, 255.

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

Campbell, J. P., & Pritchard, R. D. Motivation theory in industrial and organizational psychology. In M. D. Dunnette (Ed.), Handbook of industrial and organizational psychology. Chicago: Rand McNally, 1976.

Chung, K. E. Developing a comprehensive model of motivation and performance. Academy of Management Journal, 1968, 11, 63-73.

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

Connolly, T. Some conceptual and methodological issues in expectancy models of work performance motivation. The Academy of Managerial Review, 1976, 37-47.

Cronbach, L. J., & Gleser, G. C. Psychological tests and personnel decisions. Urbana: University of Illinois Press, 1965.

Dachler, H. P., & Mobely, W. H. Construct validation of an instrumentality-expectancy-task-goal model of work motivation: Some theoretical boundary conditions. Journal of Applied Psychology, 1973, 58, 397-418.

Dunnette, M. D. Performance equals ability and what? (Tech. Rep. No. 4009). The Center for the Study of Organizational Performance and Human Effectiveness. University of Minnesota, 1973.

Ferguson, G. A. Statistical analysis in psychology and education (4th ed.). New York: McGraw-Hill, 1976.

Galbraith, J., & Cummings, L. L. An empirical investigation of motivational determinants of task performance: Interactive effects between instrumentality-valence and motivation-ability. Organizational Behavior and Human Performance, 1967, 2, 237-257.

Gavin, J. F. Ability, effort, and role perception as antecedents of job performance. Experimental Publication System, 1970, 5, Ms. No. 190A, 1-26.

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

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

Guilford, J. P. Psychometric methods. New York: McGraw Hill, 1954.

Guilford, J. P., & Fruchter, B. Fundamental statistics in psychology and education (5th ed.). New York: McGraw-Hill, 1973.

Guion, R. M. Personnel testing. New York: McGraw-Hill, 1965.

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

Heneman, H. G., III, & Schwab, D. P. An evaluation of research on expectancy theory predictions of employee performance. Psychological Bulletin, 1972, 78, 1-9.

Henson, R. Expectancy beliefs, ability, and personality in predicting academic performance. Journal of Educational Research, 1976, 70, 41-44.

Jorgenson, D. O., Dunnette, M. D., & Pritchard, R. D. Effects of the manipulation of a performance-reward contingency on behavior in a formulated work setting. Journal of Applied Psychology, 1973, 57, 271-280.

Kopelman, R. E., & Thompson, P. H. Boundary conditions for expectancy theory predictions of work motivation and job performance. Academy of Management Journal, 1976, 19, 237-258.

Landy, F. J., & Trumbo, D. A. Psychology of work behavior. Georgetown, Ontario: Dorsey Press, 1976.

Lawler, E. E. Ability as a moderator of the relationship between job attitudes and job performance. Personnel Psychology, 1966, 19, 153-164.

Lawler, E. E. A causal correlation analysis of the relationship between expectancy attitudes and job performance. Journal of Applied Psychology, 1968, 52, 462-468.

Lawler, E. E. Pay and organizational effectiveness: A psychological view. New York: McGraw-Hill, 1971.

Lawler, E. E. Motivation in work organizations. Belmont, California: Brooks/Cole, 1973.

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

Lawler, E. E., III, & Porter, L. W. The effect of performance on job satisfaction. Industrial Relations, 1967, 7, 20-28. (b)

Lawler, E. E., & Suttle, J. L. Expectancy theory and job behavior. Organizational Behavior and Human Performance, 1973, 9, 482-503.

Mitchell, T. R. Expectancy models of job satisfaction, occupational preference and effort: A theoretical, methodological, and empirical appraisal. Psychological Bulletin, 1974, 81, 1053-1077.

Mitchell, T. R., & Albright, D. W. Expectancy theory predictions of satisfaction, effort, performance and retention of Naval Aviation Officers. Organizational Behavior and Human Performance, 1972, 8, 1-20.

Mitchell, T. R., & Biglan, A. Instrumentality theories: Current uses in psychology. Psychological Bulletin, 1971, 76, 432-454.

Mitchell, T. R., & Nebeker, D. M. Expectancy theory predictions of academic effort and performance. Journal of Applied Psychology, 1973, 57, 61-67.

Nagle, B. F. Criterion development. Personnel Psychology, 1953, 6, 271-289.

Oliver, R. L. Antecedents of salesmen's compensation perceptions: A data analysis interpretation. Journal of Applied Psychology, 1977, 62, 20-28.

Porter, L. W., & Lawler, E. E. Managerial attitudes and performance. Homewood, Illinois: Dorsey Press, 1968.

Pritchard, R. D., & Sanders, M. S. The influence of valence, instrumentality, and expectancy on effort and performance. Journal of Applied Psychology, 1973, 57, 55-60.

Pritchard, R. D., & DeLeo, P. J. Experimental test of the valence-instrumentality relationship in job performance. Journal of Applied Psychology, 1973, 57, 264-270.

Raiffa, H., & Schlaifer, R. Applied statistical decision theory. Boston: Division of Research, Harvard Business School, 1961.

Slovic, P., & Lichtenstein, S. C. The relative importance of probabilities and payoffs in risk taking. Journal of Experimental Psychology Monograph Supplement, 1968, 78, (3, Part 2).

Schmidt, F. L. Implications of a measurement problem to expectancy theory research. Organizational Behavior and Human Performance, 1973, 10, 243-251.

Smith, P. C., Kendall, L. M., & Hulin, C. L. The measurement of satisfaction in work and retirement. Chicago: Rand McNally, 1969.

Terborg, J. R. Validation and extension of an individual difference model of work performance. Organization Behavior and Human Performance, 1977, 18, 188-216.

Thorndike, R. L. Personnel selection. New York: John Wiley, 1949.

Vroom, V. H. Work and motivation. New York: Wiley, 1964.

Wanous, J. P. A causal-correlational analysis of the job satisfaction and performance relationship. Journal of Applied Psychology, 1974, 56, 140-144.

Appendix A

1975 Sales Personnel Attitude Survey

Appendix A

1975 Sales Personnel Attitude Survey

In the section below are listed several aspects of your job. Please indicate the importance of each of these aspects for your overall job satisfaction. This can be done by using the 7-point scale below each aspect. You are to circle the number of the scale that represents the degree of importance you attach to the aspect being rated. The higher the number circled, the more importance is indicated.

For each scale, please circle only one number.

PROMOTIONS:
(unimportant) 1 2 3 4 5 6 7 (important)

ACCOUNTS & PROSPECTS:
(unimportant) 1 2 3 4 5 6 7 (important)

SUPERVISION:
(unimportant) 1 2 3 4 5 6 7 (important)

PAY:
(unimportant) 1 2 3 4 5 6 7 (important)

EMPLOYEE BENEFITS:
(unimportant) 1 2 3 4 5 6 7 (important)

WORK:
(unimportant) 1 2 3 4 5 6 7 (important)

The following questions relate to your job. Please circle the number which comes nearest to expressing your feeling regarding that particular aspect.

1. How satisfied are you that your incentive payments will reflect your personal job effort?

Completely Satisfied 1 2 3 4 5 6 7 Completely Dissatisfied

2. How satisfied are you that future promotions will reflect your personal job effort?

Completely Satisfied 1 2 3 4 5 6 7 Completely Dissatisfied

The following four questions are related to your personal life. Please remember that individual responses will be analyzed only by Dr. Barrett.

Simply check the appropriate response for you beneath each question.

Which of these statements come nearest to saying how you feel about your life in general? Would you say that you are

____completely satisfied

____well satisfied

____neither satisfied nor dissatisfied

____a little dissatisfied

____very dissatisfied

Thinking about your family and home life as they are now which of these statements comes nearest to saying how you feel?

____completely satisfied

____well satisfied

____neither satisfied nor dissatisfied

____a little dissatisfied

____very dissatisfied

Which of these statements tells best how you feel about your job? Would you say that you are

____completely satisfied

____well satisfied

____neither satisfied nor dissatisfied

____a little dissatisfied

____very dissatisfied

Which of these statements comes nearest to saying how you feel about the way you spend your time when you're not working? Would you say you are

____completely satisfied

____well satisfied

____neither satisfied nor dissatisfied

____a little dissatisfied

____very dissatisfied

Appendix B

Means and Standard Deviations for Attitude and Ability Measures (Raw Score)

Appendix B

Means and Standard Deviations for Attitude and Ability Measures (Raw Score)

	$\bar{X}$	S.D.	Possible Range
Job Descriptive Index			
Work	44.36	4.79	0-78
Supervision	48.33	7.39	0-78
Accounts and Prospects	44.10	7.85	0-78
Pay	11.48	6.66	0-33
Promotions	20.83	6.66	0-33
Importance for Satisfaction			
Promotions	5.88	1.31	1-7
Pay	6.76	0.48	1-7
Incentive Payments Reflect Your Personal Job Effort?	4.40	1.62	1-7
Future Promotions Reflect Your Personal Job Effort?	3.02	1.58	1-7
Personal Life Satisfaction			
Life in General	2.48	0.86	1-5
Family and Home Life	2.12	0.86	1-5
Job	2.57	0.89	1-5
Free Time	2.17	0.82	1-5
Sales Selection Index (SSI)	2.96	1.56	1-5
Wesman Total Plus Bennett (WESTB)	96.64	9.80	0-200

$\underline{n}$ = 42

Appendix C

Mean and Standard Deviation for Instrumentality Variables (Transformed Scores)

Appendix C

Mean and Standard Deviation for Instrumentality Variables (Transformed Scores)

	N	$\bar{X}$	S.D.	Possible Range
Expectancy (EI)				
Incentive Payments	42	0.43	0.27	0-1.0
Future Promotions	42	0.66	0.26	0-1.0
Valence (V)				
Pay	42	0.92	0.16	-1.0-+1.0
Prom	42	0.63	0.44	-1.0-+1.0
[(EI)·V]				
Pay	42	0.40	0.26	-1.0-+1.0
Prom	42	0.41	0.34	-1.0-+1.0
[(EI)+V]				
Pay	42	1.35	0.31	-1.0-+2.0
Prom	42	1.29	0.50	-1.0-+2.0
[(EI)·V]·WESTB^{+}				
Pay	42	19.01	11.82	-90-+90
Prom	42	20.80	16.35	-90-+90
[(EI)·V]·SSI^{+}				
Pay	41	20.53	13.45	-90-+90
Prom	41	21.57	18.14	-90-+90
[(EI)+V]+WESTB^{+}				
Pay	42	50.94	9.24	9-92
Prom	42	50.88	9.40	9-92
[(EI)+V]+SSI^{+}				
Pay	41	52.40	10.04	9-92
Prom	41	52.32	10.22	9-92
Effort				
Multi Σ[(EI)·V]·WESTB^{+}	42	39.81	22.25	-180-+180
Multi Σ[(EI)·V]·SSI^{+}	41	42.10	26.34	-180-+180
Add Σ[(EI+V]+WESTB^{+}	42	52.23	9.36	-180-+360
Add Σ[(EI)+V]+SSI^{+}	41	53.68	10.21	-180-+360

$^{+}$The Wesman total plus Bennett (WESTB) and the Sales Selection Index (SSI) were transformed into $\underline{t}$ scores (M=50, S.D.=10) prior to being combined with instrumentality.

Appendix D

Transformation of Performance Criteria

Appendix D

Transformation of Performance Criteria

As part of a continuing research project, performance data for district salesmen is collected for each semi-annual period. The present study was concerned with data from 1974 and both halves of 1975. For each salesman, data was collected on the total sales volume and incentive payments received per fiscal period, as well as the sales quota set by the home office. Sales quota ratio is the ratio of sales volume to expected quota of sales volume. Data from the first and second half of 1974 were summed to establish performance data for the entire year. As indicated in Appendix E, the relationship between fiscal periods was not very high for any of the performance criteria and decreased considerably as the time between fiscal periods increased. The relationships between total 1974 (T_T) and both halves of 1975 (T_3 and T_4) were of particular interest since these fiscal periods comprised the performance measurements for the present study. In an attempt to decrease the standard error of measurement, raw performance data was transformed to stanine scores by grouping the Z scores into nine categories, each category having an interval of .5 S.D. (Ferguson, 1976). Although the effect of transforming to stanine scores was not dramatic, as Appendix E indicates, the inter-fiscal relationships did increase for each performance criteria. The most notable increase occurred for the fiscal periods of interest. Appendix F presents the means and standard deviations of the performance criteria for both raw scores and transformed scores.

Conceptually, instrumentality theory requires the measurement of expectancy to include values ranging from 0.0 to 1.0, reflecting the perceived probability that effort leads to outcomes. Similarly, valence requires values ranging from -1.0 to +1.0. In the attitude survey, questions representing these measures required the individual to respond on a 7-point Likert scale. In the present study, the scores from the Likert scales were transformed to the values appropriate for expectancy and valence. Although there is no guarantee that the transformations would be consistent with the individual's perceptions, a reasonable question is whether the transformations had any effect on the resulting relationships with performance. It was hypothesized that the transformations would result in higher correlations with the performance criteria.

Appendix G presents the relationship between performance criteria and instrumentality statements using the raw score data in combination. Inspection of the table reveals that none of the relationships were significant. A test for differences between fiscal periods was conducted using a t-test for correlated measures. As the t-values in parentheses indicate, three of the comparisons were significant and three of the values approached significance, thus suggesting that the relationships between performance criteria and raw scores by fiscal periods were not very stable. Appendix H compares the relationships between performance and instrumentality obtained using transformed scores with the relationships obtained using raw scores. A positive t-value indicates

that the transformed score relationship was higher than the corresponding raw score relationship. Using a one-tailed test, eight of the comparisons significantly favored the transformed data, and 83% of the *t*-values were positive. These results suggest that the transformation did have the hypothesized effect on the obtained relationships with performance criteria.

Appendix E

Relationship Between Fiscal Periods for Raw Performance Data and Transformed^{+} Performance Data

Appendix E

Relationship Between Fiscal Periods for Raw Performance Data and Transformed[+] Performance Data.

	Fiscal Periods							
	T_1-T_2 (n=56)	T_1-T_3 (n=48)	T_1-T_4 (n=40)	T_2-T_3 (n=48)	T_2-T_4 (n=40)	T_3-T_4 (n=40)	TT-T_3 (n=48)	TT-T_4 (n=40)
Sales Quota Ratio	.18	.30*	-.08	-.14	.18	-.23	.18	.03
Sales Volume	.78***	.30*	.28	.41**	.35*	.99***	.37*	.34*
Incentive Payment	.68***	.40**	.45**	.53***	.37*	.22	.46***	.46**
Performance Rating(n=30)	--	--	--	--	--	--	--	.47**
Promotability Rating(n=30)	--	--	--	--	--	--	--	.45**
Sales Quota Ratio(9)[+]	.19	.31*	-.09	-.11	.24	-.24	.19	.04
Sales Volume(9)[+]	.79***	.48***	.47**	.58***	.46**	.95***	.55***	.50***
Incentive Payment(9)[+]	.63***	.44**	.41**	.58***	.35*	.23	.53***	.40**

Note. T1 = first half of 1974, T2 = second half of 1974, T3 = first half of 1975, T4 = second half of 1975 and TT = 1974 total (first and second half combined).

[+]Raw data was transformed to stanine scores (9).

*$p < .05$.

**$p < .01$.

***$p < .001$.

Appendix F

Means and Standard Deviations of Raw Performance Data and Transformed[+] Performance Data by Fiscal Periods

Appendix F

Means and Standard Deviations of Raw Performance Data and Transformed[+] Performance Data by Fiscal Periods.

	T_1 (1974)[A] (n=56)		T_2 (1974)[B] (n=56)		TT (1974)[C] (n=56)		T_3 (1975)[D] (n=48)		T_4 (1975)[E] (n=40)	
	$\bar{X}$	(S.D.)	$\bar{X}$	(S.D.)	$\bar{X}$	(S.D.)	$\bar{X}$	(S.D.)	$\bar{X}$	(S.D.)
Sales Quota Ratio	1.16	(0.1)	0.86	(0.1)	2.02	(0.2)	1.08	(0.1)	.96	(.12)
Sales Volume	27625.13	(7739.4)	31849.13	(8234.0)	59474.25	(15063.2)	42684.23	(43758.2)	39432.82	(40750.1)
Incentive Payments	2090.83	(1176.6)	399.27	(378.9)	2490.11	(1459.7)	1878.77	(1320.5)	1184.30	(632.5)
Performance Ratings					2.73	(.84)			4.17 (n=30)	(.87)
Promotability Ratings					2.43	(.91)			3.87 (n=30)	(1.17)
Sales Quota Ratio (9)[+]	5.01	(2.0)	4.96	(2.0)	5.05	(1.9)	4.93	(2.0)	5.10	(1.88)
Sales Volume (9)[+]	5.03	(1.9)	5.01	(2.0)	4.98	(2.0)	4.72	(1.3)	4.78	(1.33)
Incentive Payment (9)[+]	4.96	(1.9)	4.98	(1.9)	4.96	(1.9)	4.87	(1.7)	5.00	(2.00)

[A] First half of 1974.

[B] Second half of 1974.

[C] 1974 total (first and second half combined)

[D] First half of 1975.

[E] Second half of 1975.

[+] Raw data was transformed to Stanine scores (9).

Appendix G

Relationships Between Performance Criteria and Instrumentality and Effort (Raw Score) by Fiscal Period; Comparing Multiplicative and Additive Models

Appendix G

Relationships Between Performance Criteria and Instrumentality and Effort (Raw Score) by Fiscal Period; Comparing Multiplicative and Additive Models.

	Models					
	Multiplicative [(EI)·V]			Additive [(EI)+V]		
	Pay	Prom	Effort[a]	Pay	Prom	Effort[b]
Sales Quota Ratio						
T1	.14	.15	.17	.13	.22	.22
	(1.96)	(1.41)	(2.01)	(1.79)	(1.57)	(2.07)*
T2	-.24	-.13	-.22	-.22	-.09	-.18
Sales Volume						
T1	-.06	.08	.01	-.05	.15	.08
	(-1.49)	(.66)	(-.46)	(-1.49)	(.73)	(-.27)
T2	.16	-.02	.08	.17	.04	.12
Incentive Payment						
T1	.13	-.02	.07	.13	.05	.10
	(2.18)*	(.19)	(1.46)	(2.11)*	(.26)	(1.25)
T2	-.19	-.05	-.15	-.18	.01	-.09
Performance Ratings	-.11	.04	-.04	-.10	.11	.02
Promotability Ratings	.04	.09	.07	.05	.21	.17

Note. A test for differences between fiscal periods is indicated by the t-values enclosed in parentheses, $t.05 = 2.02$.

[a] Effort = $\Sigma[(EI) \cdot V]$

[b] Effort = $\Sigma[(EI) + V]$

*$p < .05$.

Appendix H

Values for a Test of Difference Between Relationships Using Transformed Scores and Raw Scores: Comparing Multiplicative and Additive Models

Appendix H

Values for a Test of Difference between Relationships Using Transformed Scores and Raw Scores: Comparing Multiplicative and Additive Models.

	Models					
	Multiplicative [(EI)·V]			Additive [(EI)+V]		
	Pay	Prom	Effort[a]	Pay	Prom	Effort[b]
Sales Quota Ratio						
T1	-.97	.43	-.33	-.86	.10	-.42
T2	1.76*	1.38	1.90*	1.78*	1.71*	2.09**
Sales Volume						
T1	.69	.68	.85	.91	.45	.76
T2	-.76	.92	.07	-.60	.79	.08
Incentive Payments						
T1	-.65	1.00	.41	-.38	.84	.29
T2	1.42	1.22	1.63	1.55	1.41	1.79*
Performance Ratings	.81	.94	1.11	.83	.86	1.00
Promotability Ratings	.00	1.85*	1.13	.10	2.06**	1.27

Note. A positive t-value indicates that the relationship involving the transformed scores was higher than the corresponding relationship using raw scores, $t.05 = 1.68$, $t.025 = 2.02$, one-tailed test.

[a] Effort = $\Sigma[(EI) \cdot V]$

[b] Effort = $\Sigma[(EI) + V]$

*$p < .05$.

**$p < .025$.

DISTRIBUTION LIST

NAVY

4 Dr. Marshall J. Farr, Director
Personnel and Training Research Programs
Office of Naval Research (Code 458)
Arlington, VA 22217

1 ONR Branch Office
495 Summer Street
Boston, MA 02210
ATTN: Dr. James Lester

1 ONR Branch Office
1030 East Green Street
Pasadena, CA 91101
ATTN: Dr. Eugene Gloye

1 ONR Branch Office
536 South Clark Street
Chicago, IL 60605
ATTN: Dr. Charles E. Davis

7 Dr. M. A. Bertin, Scientific Director
Office of Naval Research
Scientific Liaison Group/Tokyo
American Embassy
APO San Francisco 96503

1 Office of Naval Research
Code 200
Arlington, VA 22217

6 Director
Naval Research Laboratory
Code 2627
Washington, D. C. 20390

1 Technical Director
Navy Personnel Research and
Development Center
San Diego, CA 92152

1 Assistant Deputy Chief of Naval Personnel
for Retention Analysis and
Coordination (Pers 12)
Room 2403, Arlington Annex
Washington, D. C. 20370

1 CDR J. L. Johnson, USN
Naval Amphibious School
Little Creek
Naval Amphibious Base
Norfolk, VA 23521

1 LCDR Charles J. Theisen, Jr.,
MSC, USN
4024
Naval Air Development Center
Warminster, PA 18974

1 Dr. Lee Miller
Naval Air Systems Command
AIR-413E
Washington, D. C. 20361

1 Commanding Officer
U. S. Naval Amphibious School
Coronado, CA 92155

1 CDR Paul D. Nelson, MSC, USN
Naval Medical R & D Command (Code 44)
National Naval Medical Center
Bethesda, MD 20014

1 Commanding Officer
Naval Health Research Center
San Diego, CA 92152
ATTN: Library

1 Chief of Naval Education & Training
Naval Air Station
Pensacola, FL 32508
ATTN: CAPT Bruce Stone, USN

1 Mr. Arnold I. Rubinstein
Human Resources Program Manager
Naval Material Command (0344)
Room 1044, Crystal Plaza #5
Washington, D. C. 20360

1 Mr. Murray Howder
ERIC Facility
4833 Rugby Avenue
Bethesda, MD 20014

1 Director, Navy Occupational Task Analysis Program (NOTAP)
Navy Personnel Program Support Activity
Building 1304, Bolling AFB
Washington, D. C. 20336

1 Office of Civilian Manpower Management
Code 64
Washington, D. C. 20390
ATTN: Dr. Richard J. Niehaus

1 Office of Civilian Manpower Management
Code 263
Washington, D. C. 20390

1 Assistant to the Assistant Deputy Chief of Naval Operations (Manpower)
Head, NAMPS Project Office
Room 1606, Arlington Annex
Washington, D. C. 20370
ATTN: Dr. Harry M. West

1 Superintendent
Naval Postgraduate School
Monterey, CA 93940
ATTN: Library (Code 2124)

1 Mr. George N. Graine
Naval Sea Systems Command
SEA 047C12
Washington, D. C. 20362

1 Chief of Naval Technical Training
Naval Air Station Memphis (75)
Millington, TN 38054
ATTN: Dr. Norman J. Kerr

1 Principal Civilian Advisor for Education and Training
Naval Training Command, Code 00A
Pensacola, FL 32508
ATTN: Dr. William L. Maloy

1 Director
Training Analysis & Evaluation Group
Code N-00t
Department of the Navy
Orlando, FL 32813
ATTN: Dr. Alfred F. Smode

1 LCDR C. F. Logan, USN
F-14 Management System
COMFITAEWWINGPAC
NAS Miramar, CA 92145

1 Navy Personnel Research and Development Center
Code 01
San Diego, CA 92152

5 Navy Personnel Research and Development Center
Code 02
San Diego, CA 92152
ATTN: A. A. Sjoholm

2 Navy Personnel Research and Development Center
Code 310
San Diego, CA 92152
ATTN: Dr. Martin F. Wiskoff

1 Navy Personnel Research and Development Center
San Diego, CA 92152
ATTN: Library

1 Navy Personnel Research and Development Center
Code 9041
San Diego, CA 92152
ATTN: Dr. R. Morrison

1 Mr. Victor H. Brown, Director
Career Training Analysis Group
Chief of Naval Education & Training
(Code N54)
Naval Air Station
Pensacola, FL 32507

ARMY

1 Technical Director
U. S. Army Research Institute for the Behavioral and Social Sciences
1300 Wilson Boulevard
Arlington, VA 22209

1 Headquarters
U. S. Army Administration Center
Personnel Administration Combat Development Activity
ATCP-HRQ
Ft. Benjamin Harrison, IN 46249

1 Armed Forces Staff College
Norfolk, VA 23511
ATTN: Library

1 Commandant
U. S. Army Infantry School
Fort Benning, GA 31905
ATTN: ATSH-DET

1 Deputy Commander
U. S. Army Institute of Administration
Fort Benjamin Harrison, IN 46216
ATTN: EA

1 Dr. Ralph Dusek
U. S. Army Research Institute for the Behavioral and Social Sciences
1300 Wilson Boulevard
Arlington, VA 22209

1 Dr. Joseph Ward
U. S. Army Research Institute for the Behavioral and Social Sciences
1300 Wilson Boulevard
Arlington, VA 22209

1 HQ USAREUR & 7th Army
ODCSOPS
USAREUR Director of GED
APO New York 09403

1 ARI Field Unit - Leavenworth
Post Office Box 3122
Fort Leavenworth, KS 66027

1 Dr. Ralph Canter
U.S. Army Research Institute for the Behavioral and Social Sciences
1300 Wilson Boulevard
Arlington, VA 22209

1 Dr. Milton S. Katz, Chief
Individual Training & Performance Evaluation
U.S. Army Research Institute for the Behavioral and Social Sciences
1300 Wilson Boulevard
Arlington, VA 22209

AIR FORCE

1 Research Branch
AF/DPMYAR
Randolph AFB, TX 78148

1 Dr. G. A. Eckstrand (AFHRL/AST)
Wright-Patterson AFB
Ohio 45433

1 AFHRL/DOJN
Stop #63
Lackland AFB, TX 78236

1 Dr. Martin Rockway (AFHRL/TT)
Lowry (AFB)
Colorado 80230

1 Dr. Alfred R. Fregly
AFOSR/NL
1400 Wilson Boulevard
Arlington, VA 22209

1 Dr. Sylvia R. Mayer (MCIT)
Headquarters Electronic Systems Division
LG Hanscom Field
Bedford, MA 01730

1 AFHRL/PED
Stop #63
Lackland AFB, TX 78236

MARINE CORPS

1 Director, Office of Manpower Utilization
Headquarters, Marine Corps (Code MPU)
MCB (Building 2009)
Quantico, VA 22134

1 Dr. A. L. Slafkosky
Scientific Advisor (Code RD-1)
Headquarters, U.S. Marine Corps
Washington, D. C. 20380

1 Mr. E. A. Dover
2711 South Veitch Street
Arlington, VA 22206

COAST GUARD

1 Mr. Joseph J. Cowan, Chief
Psychological Research Branch (G-P-1/62)
U.S. Coast Guard Headquarters
Washington, D. C. 20590

OTHER DOD

1 Military Assistant for Human Resources
Office of the Secretary of Defense
Room 3D129, Pentagon
Washington, D. C. 20301

1 Dr. Robert Young
Advanced Research Projects Agency
Cybernetics Technology, Room 625
1400 Wilson Boulevard
Arlington, VA 22209

12 Defense Documentation Center
Cameron Station, Building 5
Alexandria, VA 22314
ATTN: TC

OTHER GOVERNMENT

1 Dr. Lorraine D. Eyde
Personnel Research and
Development Center
U.S. Civil Service Commission
1900 E Street, N.W.
Washington, D. C. 20415

1 Dr. William Gorham, Director
Personnel Research and
Devleopment Center
U.S. Civil Service Commission
1900 E Street, N.W.
Washington, D.C. 20415

1 Dr. Very Urry
Personnel Research and
Development Center
U.S. Civil Service Commission
1900 E Street, N.W.
Washington, D. C. 20415

1 U.S. Civil Service Commission
Federal Office Building
Chicago Regional Staff Division
Regional Psychologist
230 South Dearborn Street
Chicago, IL 60604
ATTN: C. S. Winiewicz

1 Dr. Carl Frederiksen
Learning Division, Basic Skills
Group
National Institute of Education
1200 19th Street, N.W.
Washington, D. C. 20208

MISCELLANEOUS

1 Dr. Bernard M. Bass
University of Rochester
Graduate School of Management
Rochester, N.Y. 14627

1 Century Research Corporation
4113 Lee Highway
Arlington, VA 22207

1 Dr. A. Charnes
BEB 512
University of Texas
Austin, TX 78712

1 Dr. Kenneth E. Clark
University of Rochester
College of Arts and Sciences
River Campus Station
Rochester, N.Y. 14627

1 Professor W. W. Cooper
Graduate School of Business Administration
Harvard University
Soldiers Field Road
Boston, MASS 02163

1 Dr. Joseph E. Champoux
School of Business & Administration
The University of New Mexico
Albuquerque, NM 87131

1 Dr. Rene V. Dawis
University of Minnesota
Department of Psychology
Minneapolis, MN 55455

1 Dr. Norman R. Dixon
200 South Craig Street
University of Pittsburgh
Pittsburgh, PA 15260

1 Dr. Robert Dubin
University of California
Graduate School of Administration
Irvine, CA 92664

1 Dr. Marvin D. Dunnette
University of Minnesota
Department of Psychology
Minneapolis, MN 55455

1 ERIC
Processing and Reference Facility
4833 Rugby Avenue
Bethesda, MD 20014

1 Dr. Barry M. Feinberg
Bureau of Social Science Research, Inc.
1990 M Street, N.W.
Washington, D. C. 20036

1 Dr. Victor Fields
Montgomery College
Department of Psychology
Rockville, MD 20850

1 Dr. Edwin A. Fleishman
Advanced Research Resources Organization #603
8555 Sixteenth Street
Silver Spring, MD 20910

1 Dr. Richard S. Hatch
Decision Systems Associates, Inc.
5640 Nicholson Lane
Rockville, MD 20852

1 Dr. M. D. Havron
Human Sciences Research, Inc.
7710 Old Spring House Road
West Gate Industrial Park
McLean, VA 22101

1 HumRRO Central Division
400 Plaza Building
Pace Boulevard at Fairfield Drive
Pensacola, FL 32505

1 HumRRO/Western Division
27857 Berwick Drive
Carmel, CA 93921
ATTN: Library

1 HumRRO Central Division/Columbus Office
Suite 23, 2601 Cross Country Drive
Columbus, GA 31906

1 HumRRO/Western Division
27857 Berwick Drive
Carmel, CA 93921
ATTN: Dr. Robert Vineberg

1 Dr. Lawrence B. Johnson
Lawrence Johnson & Associates, Inc.
2001 S Street, N.W., Suite 502
Washington, D. C. 20009

1 Mr. W. E. Lassiter
Data Solutions Corporation
6849 Old Dominion Drive, Suite 211
McLean, VA 22101

1 Dr. Ernest J. McCormick
Purdue University
Department of Psychological Sciences
Lafayette, IN 47907

1 Dr. Leo Munday, Vice President
American College Testing Program
P.O. Box 168
Iowa City, IA 52240

1 Mr. Luigi Petrullo
2431 North Edgewood Street
Arlington, VA 22207

1 Dr. Steven M. Pine
University of Minnesota
Department of Psychology
Minneapolis, MN 55455

1 Dr. Lyman W. Porter, Dean
University of California
Graduate School of Administration
Irvine, CA 92650

1 Dr. Joseph W. Rigney
University of Southern California
Behavioral Technology Laboratories
3717 South Grand
Los Angeles, CA 90007

1 Dr. Leonard L. Rosenbaum, Chairman
Montgomery College
Department of Psychology
Rockville, MD 20850

1 Dr. George E. Rowland
Rowland and Company, Inc.
P.O. Box 61
Haddonfield, NJ 08033

1 Dr. Benjamin Schneider
University of Maryland
Department of Psychology
College Park, MD 20742

1 Dr. Arthur L. Siegel
Applied Psychological Services
404 East Lancaster Avenue
Wayne, PA 19087

1 Dr. Henry P. Sims, Jr.
Room 630 - Business
Indiana University
Bloomington, IN 47401

1 Dr. C. Harold Stone
1428 Virginia Avenue
Glendale, CA 91202

1 Mr. Dennis J. Sullivan
c/o HAISC, Building 119, M.S. 2
P.O. Box 90515
Los Angeles, CA 90009

1 Dr. David J. Weiss
University of Minnesota
Department of Psychology
N660 Elliott Hall
Minneapolis, MN 55455

1 Mr. George Wheaton
American Institutes for Research
3301 New Mexico Avenue, N.W.
Washington, D. C. 20016

1 Dr. K. Wescourt
Stanford University
Institute for Mathematical Studies
in the Social Sciences
Stanford, CA 94305

1 Richard T. Mowday
College of Business Administration
University of Nebraska, Lincoln
Lincoln, NE 68588

1 Dr. John J. Collins
Vice President
Essex Corporation
6305 Caminito Estrellado
San Diego, CA 92120

1 Dr. Lyle Schoenfeldt
Department of Psychology
University of Georgia
Athens, GA 30602

1 Dr. Patrick Suppes, Director
Institute for Mathematical Studies
in the Social Sciences
Stanford University
Stanford, CA 94305

1 Dr. Andrew M. Rose
American Institutes for Research
3301 New Mexico Avenue, N.W.
Washington, D. C. 20016

1 Major I. N. Evonic
Canadian Forces Personnel
Applied Research Unit
1107 Avenue Road
Toronto, Ontario, CANADA

1 Dr. Larry Cummings
Grad School Bus.
University of Wisconsin
1155 Observatory
Madison, WI 53706

1 Dr. Norman Cliff
University of S. California
Department of Psychology
University Park
Los Angeles, CA 90007

1 Sharon R. Jenkins
Boston University
Gerontology Center
730 Commonwealth Ave.
Boston, MA 02215