Multiattribute Measurement Models and Multiattribute Attitude Theory: A Test of Construct Validity

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A distinction is drawn between the multiattribute attitude model as a measurement device and as a theory of attitude formation and change. Using an analysis of variance paradigm to investigate the underlying multiplicative and summative assumptions, Fishbein's multiattribute theory is found to demonstrate reasonably high construct validity. Individual differences in attribute combination rules are identified, and the issue of cognitive averaging vs. cognitive summation is raised.

Wilkie and Pessemier's (1973) excellent review of multiattribute model research in marketing illustrates the rather large bulk of evidence supporting the model as a powerful attitude measurement device. However, with its foundation in the social psychology literature (almost every published work on the model refers to the earlier work of Fishbein and/or Rosenberg), the multiattribute "model" is, in addition to being *a model of attitude measurement, a theory of attitude formation and change.* The theory should offer more than predictive power; it should also demonstrate explanatory power with regard to the processes by which consumers form and change attitudes.

The issue of explanatory power, or construct validity, of multiattribute attitude theory has been virtually ignored in the consumer behavior literature, although the potential of the model for suggesting attitude change strategies has been widely acknowledged. If the multiattribute model is to fulfill its potential as a means of facilitating the development of attitude change strategies, then it must be demonstrated that the *theory* underlying the model is reasonably valid. This cannot be accomplished through the use of the typical static, correlational research paradigm. Rather, the *processes of attitude formation and change must be investigated.*

The purpose of the present research is to investigate, at the individual level, the validity of multiattribute atti-

tude theory in an attitude formation situation (see Lutz, 1975, for an investigation of the validity of the theory in an attitude change situation). Specifically, the assumptions of component multiplication (i.e., $b_{ij} \times a_i$) and subsequent summation (i.e., $b_{1j}a_1 + b_{2j}a_2 + \ldots + b_{nj}a_n$) are examined. Before turning to the empirical portion of the study, it is appropriate to discuss in more detail the distinction between attitude measurement and attitude theory within the multiattribute model.

MODEL VS. THEORY

A Model of Attitude Measurement

The basic form of the multiattribute attitude measurement model can be represented by Fishbein's (1963) equation:

$$A_j = \sum_{i=1}^{n} b_{ij}a_i,$$

[1]

where A_j is an individual's attitude (i.e., affect for or against) toward an object (e.g., brand) j; b_{ij} is the individual's *belief* (expressed as a subjective probability) that object j is associated with some other "object" i (e.g., a brand attribute); a_i is the *evaluative aspect* (i.e., judged goodness or badness) of attribute i; and n is the number of salient beliefs. Therefore, Equation 1 represents a *model of attitude measurement* wherein an individual's beliefs about a particular attitude object are weighted and summed to yield an index of overall affect, or attitude.

The bulk of multiattribute research in marketing and

consumer behavior can be regarded as pertaining to the *convergent validity* of the model (Campbell and Fiske, 1959). Typically, scores generated by the multiattribute model are correlated with some other measure of attitude, like the semantic differential. The higher the correlation between the two measures, the greater the degree of convergent, or predictive, validity. The convergent validity of the model has been generally acceptable (Wilkie and Pessemier, 1973), thus providing empirical support for the multiattribute measurement model;[1] however, the consumer researcher is often interested in more than attitude measurement. He also wants to determine the motivational bases of consumer attitudes, so that he might effectively modify existing attitudes. By relying on salient beliefs, the multiattribute model purports to offer an explanation, or diagnosis, of attitude which has implications for attitude change strategies. But to claim diagnostic or explanatory power for the model, it must be demonstrated that the theory underlying the model holds. Evidence of predictive validity is necessary, but insufficient, for this purpose; a more dynamic research paradigm is demanded.

It is the premise of this research that the predictive validity of the multiattribute model has been reasonably well established, but that little evidence exists regarding the construct validity of the model within a theoretical framework.

A Theory of Attitude Formation and Change

Attitudes are generally conceived to be "learned predispositions to respond to an object or class of objects in a consistently favorable or unfavorable way" (Fishbein, 1967b, p. 257). In attempting to explain the process through which the learning of an attitude takes place, Fishbein (1967a) employed behavioristic learning theory. Under this approach, attitude is viewed as a "mediating evaluative response" which is acquired through the processes of mediated generalization and classical conditioning. Fishbein and Ajzen (1975) summarize the theory in this fashion:

> (1) An individual holds many beliefs about a given object, i.e., the object may be seen as related to various attributes such as other objects, characteristics, goals, etc.; (2) associated with each of these attributes is an implicit evaluative response, i.e., an attitude; (3) through conditioning these evaluative responses are associated with the attitude object; (4) these con-

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[1] A serious problem exists with respect to the *discriminant validity* of the model. In a recent application of the Rosenberg form of the model, Lutz (1974) found discriminant validity to be much lower than that of a semantic differential measure of attitude. This result is not surprising, as a high degree of shared variance for attitudes toward brands within the same product class is guaranteed by the fact that the same evaluative aspects (a_i) are used to weight the b_{ij} terms for all brands. On this basis alone, a strong argument could be made against the appropriateness of the multiattribute model as a measure of attitude.

ditioned evaluative responses summate, and thus, (5) on future occasions the attitude object will elicit this summated evaluative response, i.e., the overall attitude (Fishbein and Ajzen, 1975, pp. 60-1).

Fishbein's assumption of a summative process is one which can be questioned and he has pointed out that an *averaging* assumption would be just as viable. (Fishbein, 1965). Anderson (1971) has also argued strongly for this approach. Thus the summative assumption of the Fishbein theory needs to be examined more closely.

Fishbein has also theorized that the degree to which the evaluative aspect (a_i) of any attribute contributes to overall brand attitude is tempered by the strength of the individual's belief (b_{ij}) that the attribute is related to the brand:

> . . . the stronger the belief . . . , the greater will be the amount of its evaluative response that is available for summation (Fishbein, 1967a, p. 394).

To represent the above reasoning, Fishbein posited a multiplicative relationship between b_{ij} and a_i. This, too, is an assumption which should be empirically tested in attempting to establish the construct validity of the Fishbein theory.

In summary, Fishbein's multiattribute theory holds that an attitude toward a brand is formed through the summation of varying amounts (depending on the strength of b_{ij}) of the affect associated with salient brand attributes. Thus, the b_{ij} and a_i components are no longer regarded merely as *indicants* of brand attitude; rather, they are seen as the *determinants* of that attitude (Fishbein, 1967a, p. 395). This is a much stronger interpretation of Equation 1 than that invoked when the *multiattribute measurement model* was discussed in that a *causal* relationship between beliefs and attitudes is postulated. It is this causal relationship which gives the multiattribute model its supposed diagnostic strength; therefore, it is essential that the relationship in Equation 1 be tested in a fashion which allows statements of causality to be made.

While the multiattribute attitude model has generally been regarded as a model of *attitude structure*, as reflected in the vast majority of consumer research applications of the model, it is clear from the theory underlying the model that its ultimate value lies in its ability to explain the *processes* of attitude fo __tion and change. A new approach to examining these processes is outlined below.

Integration Theory

A research paradigm for investigating cognitive processes has recently been developed by Anderson and his associates (Anderson, 1970, 1971, 1974a, b; Anderson and Shanteau, 1970). Based on a factorial ANOVA design, the method has been applied to a wide range of psychological phenomena in which the integration of information is presumed to underlie the process

under investigation (e.g., social perception, risky deci-sion-making, attitude change).

One of the basic features of integration theory is that it allows the researcher to examine the assumptions of the theoretical combination rules implied by the models (denoted *model algebra*) by studying the actual com-bination rules which experimental subjects seemingly employ (denoted *cognitive algebra*). In the case at hand —i.e., multiattribute attitude theory—the model algebra states that b_{ij} and a_i components first *multiply*, then *summate*, to yield an overall attitude toward a brand. The purpose of this research is to test these two assump-tions of model algebra by examining individuals' cogni-tive algebra. If these assumptions are supported by individual level data, then there is a reasonable basis to conclude that the theory is operating as hypothesized— i.e., that it possesses construct validity.

METHOD[2]

In two earlier papers (Bettman, Capon and Lutz, 1974, 1975) integration theory was used to investigate the multiplicative assumption within multiattribute models. A full development for the rationale underlying the application of the method can be found in those papers; hence, it is summarized more briefly here. Basically, the method consists of presenting certain bits of stimulus information to subjects and asking them to give responses—in this case, attitudes. The informa-tion is varied in systematic fashion through the use of factorial designs, where each factor in the design repre-sents one of the theoretical constructs in the model being tested (e.g., b_{ij} and a_i components of cognitive structure). Levels of the factors correspond to different "amounts" of the theoretical constructs. For instance, levels of a b_{ij} factor might correspond to high, medium, and low likelihood of a brand possessing a particular attribute. By having each subject respond to the entire set of treatment combinations and then performing ANOVA on the resultant data, the cognitive algebra employed by that individual in making his judgments can be identified, using methods outlined below. By comparing the subject's cognitive algebra with the model algebra of the model being tested, the validity of the theory underlying the model can be assessed.

Experimental Design

The two-attribute case of the multiattribute model is the simplest one in which the assumptions of component multiplication (i.e., $b_{ij} \times a_i$) and the summation (i.e., $b_{1j}a_i + b_{2j}a_2$) can be examined. Thus a total of four pieces of information (i.e., two b_{ij} components and two a_i components) were to be presented to Subjects to

allow them to form attitudes toward a hypothetical stimulus, Brand X. This resulted in a completely crossed four-way factorial design (see Anderson and Shanteau, 1970, for a similar design) in which each of the treat-ment combinations was presented as a "profile" of the following form:

You believe that Brand X is very likely :_X_:___:___: ___:___:___:___: very unlikely to possess a quality which you feel is: very good :___:___:___:___:___:___:_X_: very bad, *AND ALSO* is very likely :___:___:___: ___:___:___:_X_:___: very unlikely to possess a quality which you feel is: very good :___:_X_:___:___:___: ___:___: very bad. In this case, how would you feel about using Brand X? very favorable :___:___:___: ___:___:__::___:___:___:___:___: very unfavorable

The complete design appears in Figure 1. As shown, there were three levels of the factors corresponding to b_{1j} (Belief One) and a_1 (Evaluation One), and two levels of the factors representing b_{2j} (Belief Two) and a_2 (Evaluation Two). The circled entries in the Figure represent the particular treatment levels of the sample profile presented above. In total there are 36 different treatment combinations ($3 \times 3 \times 2 \times 2$).

Experimental Task

After a brief warm-up task in which Subjects rated four brands of toothpaste on each of two attributes, they were presented with instructions for the hypothetical brand rating task. The instructions emphasized that Brand X was a hypothetical product with hypothetical attributes, and that the information presented in the profiles was meant to represent the Subject's own feel-ings about the attributes, not someone else's. Finally, Subjects were instructed to evaluate Brand X on the basis of only the two attributes in each profile, and that the various profiles were independent of one another.

Following a page of "practice profiles," each Subject rated a total of 72 profiles, two replications each of the 36 treatment combinations. Subjects' ratings were pro-vided on eleven-point bipolar scales of the type shown in the profile example above, and were anchored by presenting "extreme" profiles first (i.e., profiles in which the most extreme values were "checked" for each attribute). Order of all other profiles (including repli-cates) was randomized, and the ordering of attributes within the profiles was balanced to control for possible primacy and recency effects.

In summary, then, each Subject provided ratings of 72 attribute profiles conforming to the experimental design shown in Figure 1. These data were to be used in ANOVA to ascertain the cognitive algebra underlying each Subject's attitudinal responses.

Subjects and Procedures

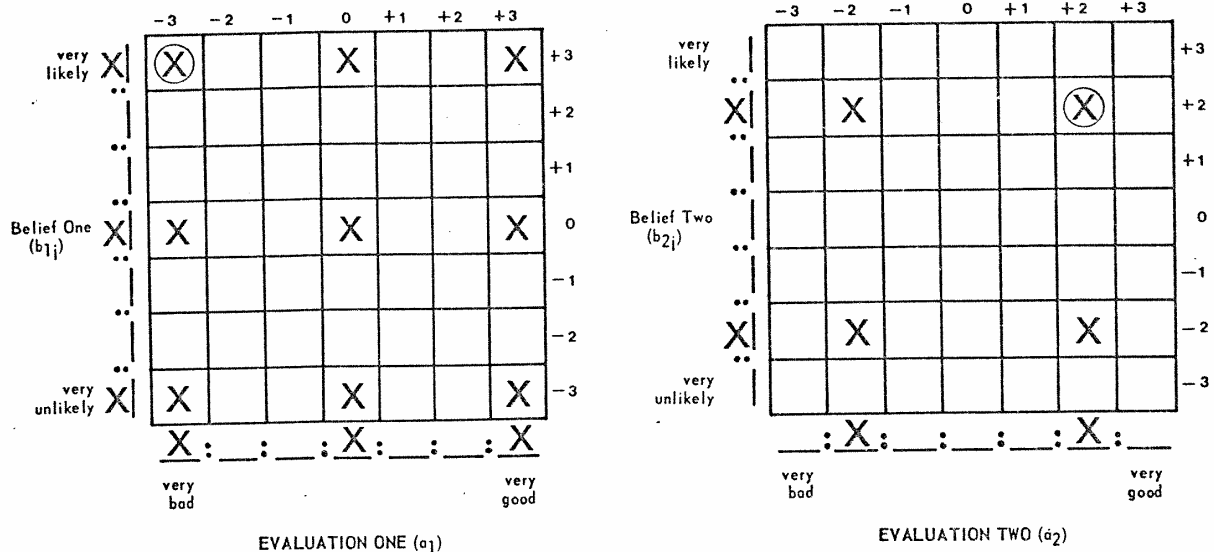Subjects were 72 undergraduate psychology students who were required to participate in several hours of

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[2] Many details of the methodology, including a discussion of the nature of the task and its limitations, scaling issues, and external validity are found in Bettman, Capon, and Lutz (1975). Rather than complicate an already involved discussion, the reader is referred to this earlier paper.

FIGURE 1

Experimental Design. Four factors, completely crossed. Treatment levels indicated by ×'s

experiments. Subjects were processed in groups of 15-20, and treatments were administered in the form of a mimeographed booklet. Following completion of the booklet, Subjects were given a written debriefing notice explaining fully the nature of the study.

Appropriateness of the Task

This ANOVA task, derived from previous work in integration theory, is felt to be the most appropriate method for examining the construct validity of multiattribute theory. The approach most typically used in previous work has been a correlational paradigm. However, there are many problems with this approach. First, asking subjects to respond to familiar brands yields data on cognitive *structure* rather than cognitive *process*. While attitudes and their supposed underlying components are measured, *combination* of components is not required of the subjects. Integration of cognitive components *is* directly studied by the ANOVA task.

A second problem with the typical correlational approach is that a priori scaling must be assumed for b_{ij} and a_i. Since the model is multiplicative, and interval scales are not sufficient to ensure invariant results in a multiplicative model, both of the components must be ratio-scaled. It is extremely unlikely that the measures of b_{ij} and a_i typically used in consumer research are ratio-scaled, since there is no logical natural zero point. The ANOVA method avoids this problem, since *no assumptions are necessary about the scaling of the independent variables* to analyze the ANOVA data.

A third problem with the correlational approach is that degree of fit (r^2) is typically used to judge whether

a particular combination rule is an adequate descriptor of a subject's behavior. However, as Anderson (1974a) points out, degree of fit is inappropriate for judgments of model validity. What is necessary is a paradigm that allows one to *directly* test a theoretical model and, more importantly, test for *significant deviations from the model*. The ANOVA method is explicitly designed to allow this (Anderson, 1974a).

Finally, correlational approaches are ill-suited to the study of individual differences in combination rules. One must devise a model to represent each possible combination rule which might occur, and assume that the model with the highest correlation is most appropriate. Birnbaum (1973) shows how this approach can yield erroneous results, particularly when scaling problems arise, as discussed above.[3] In addition, one must conceive of possible combination rules a priori. Inductive approaches are not aided by correlational analyses. In contrast, the ANOVA approach is such that differing patterns of results in the ANOVA suggest different combination rules, some of which may have been previously unconsidered, as will be seen in the discussion of results.

In summary, the ANOVA approach seems uniquely appropriate for testing the validity of multiattribute theory: combination *processes* are examined; scaling

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[3] It should be noted that both Rorer (1974) and Alf and Abrahams (1974) have criticized Birnbaum's (1973) article. However, the main point of their criticism was directed at whether his empirical demonstration in fact supported his conclusions, and not at his premise. Nevertheless, the value of correlation in the study of cognitive process is still undergoing examination.

issues regarding the b_{ij} and a_i components are avoided; and inferences about the specific form of the combination rules used by subjects are relatively unambiguous.

ANALYSIS AND RESULTS

Data in the form of (assumed) interval scale affect ratings for each individual were submitted to a $3 \times 3 \times 2 \times 2$ factorial ANOVA with two replications per cell. Individual subject analyses are most relevant for testing the validity of the theory. These analyses allowed tests of not only the multiplicative and summative assumptions in the Fishbein model, but also the coding assumptions typically employed by researchers utilizing the Fishbein model. See Bettman, Capon and Lutz (1975) for a fuller discussion of this issue. Since the coding scheme employed for both the b_{ij} and a_i components is bipolar (e.g., -3 to $+3$),[4] the Fishbein model predicts two "crossover" interactions of the form shown in Figure 2. Should these two interactions appear in a subject's data, this would provide support for the coding and multiplicative assumptions jointly. If subjects process the data in a different fashion, i.e., they do not appear to multiply or to code the components in a bipolar manner, then the resulting data pattern should differ from that shown in Figure 2. In an earlier paper, Bettman, Capon and Lutz (1975) found that the multiplicative assumption was supported in 57 percent of the cases when a single attribute form of the model was being tested. However, it is possible that the presence of an additional attribute may lead to an invalidation of the multiplicative assumption.

Other than the two significant interaction terms, all other interaction effects in the ANOVA were expected to be nonsignificant. Any other interaction effects in a subject's data would result in a violation of the assumptions underlying the Fishbein model. In other words, any data pattern other than that shown in Figure 2 would mean that Equation 1 is not an accurate reflection of that particular individual's attitude formation process in the present case.

It should be pointed out that, strictly speaking, the design employed in the present research does not allow a distinction to be drawn between a "summation" model of the form proposed by Fishbein, and an "averaging" model with equal weights such as the one studied by Anderson (1971). In either instance, no higher-order interactions would be predicted. Thus, any subject whose responses exhibit only the two expected interaction effects is *either* averaging *or* summing, but is definitely not employing some sort of configural strategy,

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[4] Note that the coding scheme used here is simply as an example of typical previous coding practices. The figures are labeled using these codes strictly for convenience. These codes are *not* used in data analyses; codes for the independent variables are *unnecessary* for analyzing the ANOVA data. The only assumption necessary is that the dependent variable be at least interval scaled.

which would appear either as higher-order interactions or as unexpected two-way interactions. Thus, the present research can best be viewed as a test of additivity vs. configurality in attribute combination rules.

Classification of Cognitive Algebra

Based on the results of the 72 individual ANOVA, Subjects with similar patterns of effects were classified into subgroups. The bases for these subgroup classifications were statistical significance levels and proportion of variance explained by the effects, as calculated through the use of Hays' (1963) omega-squared statistic. Since only one pattern of effects was predicted by the Fishbein model, the additional subgroups were formed on the basis of *ex post* examination of the data. The subgroups and the criteria for their formulation are described below. Further discussion of these subgroups will be undertaken in the Interpretation section.

Bipolar Multiplying-Additive Subgroup. This subgroup is the one predicted by Fishbein's attitude theory. As shown in Figure 2, the expected pattern consisted of two 2-way interactions and no other significant effects. In fact, the expectation was that all explained variance should be concentrated in the two interaction terms. Thus, for a subject to be included in. this subgroup, the following criteria had to be met: Each of the two predicted interaction terms was statistically significant ($p < .05$), *and* each accounted for at least 20 percent of the variance in Affect ratings. Theoretically the main effects should not have reached significance. However, if main effects reached statistical significance but explained only a relatively trivial amount of the variance (operationalized in this case by requiring that the interaction effect explain at least three times as much variance as each main effect taken separately), then Subjects displaying these data were also classified into this subgroup. As shown in Table 1, 24 Subjects (33 percent) fell into this subgroup.

Bipolar Multiplying-Configural Subgroup. Data for Subjects in this subgroup met the same criteria as the ones discussed immediately above. However, in addition to the two expected interaction effects, these Subjects' data exhibited other interaction effects ($p < .05$), thus violating the attribute additivity assumption in the Fishbein model. Twenty Subjects or about 28 percent of the sample utilized this form of configural cognitive algebra after satisfying the multiplicative assumption and therefore were classified into this subgroup. Further description of this subgroup is undertaken below in an attempt to understand the pattern of interactions obtained.

Asymmetric Multiplying-Additive Subgroup. In two earlier papers (Bettman, Capon and Lutz, 1974, 1975), groups of Subjects were identified that appeared to be multiplying b_{ij} and a_i components, but not in the symmetric fashion implied by the Fishbein model. Inter-
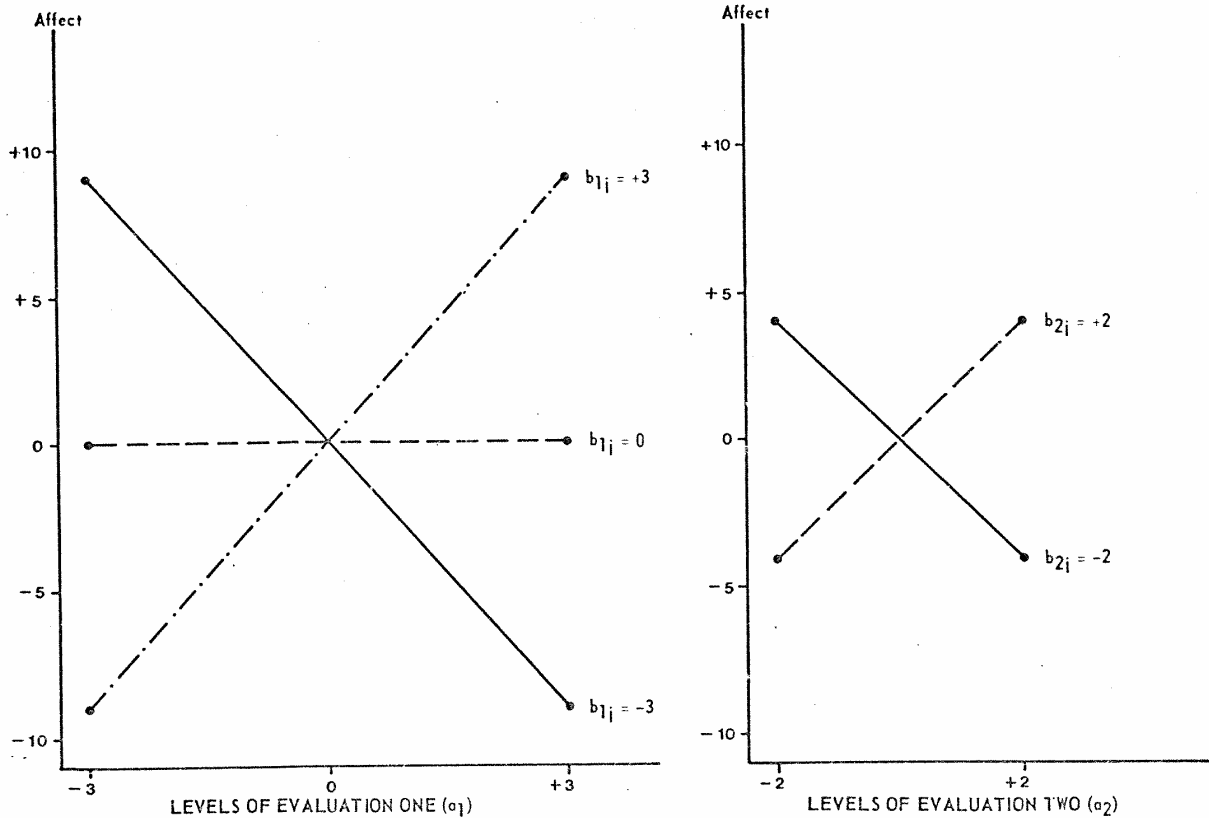
FIGURE 2

Data Pattern Predicted by the Fishbein Model

pretation of this phenomena was presented in the earlier papers, and will not be further amplified here. It is interesting to note that while the previous studies dealt with only single attributes, the same asymmetric pattern emerged in the present two-attribute case. Criteria for a subject's inclusion in this subgroup were that both of the expected interaction terms were significant and that either one of the main effects associated with each interaction term was significant $(p < .05)$. Further, the significant main effects were to be of roughly the same magnitude as the interaction effects, in terms of explained variance, and the nonsignificant main effects were to be no larger than 25 percent of the significant main effects. Finally, other than the two significant interactions and the significant main effect(s), all other effects in the ANOVA were to be nonsignificant, thus meeting the additivity assumption of the Fishbein model. Ten Subjects (14 percent) of the sample were classified into this subgroup.

Asymmetric Multiplying-Configural Subgroup. In an analagous manner to the two Bipolar Multiplying subgroups, this subgroup consisted of Subjects whose data met all the criteria of the Asymmetric Multiplying-

Additive Subgroup above, except that one or more additional interaction terms reached statistical significance $(p < .05)$, thus violating the additivity assumption. Ten Subjects or 14 percent of the sample fell into this subgroup.

Linear-Additive Subgroup. Subjects falling into this category failed to meet the multiplicative assumption of the Fishbein model. Criteria for inclusion were that all four main effects were significant $(p < .05)$, and none of the interaction terms was significant. Three Subjects fit this description.

Other Effects Subgroup. Subjects in this subgroup fit none of the criteria mentioned heretofore. Furthermore, they were only five in number (7 percent of the sample), and no commonality of effects could be induced. Therefore, they were simply lumped together into the "Other Effects" category.

These various classification criteria are relatively complex, and some are admittedly arbitrary. Nevertheless, the spirit of the classification procedure was to provide meaningful subgroups of Subjects to aid in the interpretation of the findings. In that respect, it appears to have been successful, as will be seen below.

TABLE 1

AVERAGE PERCENTAGE OF VARIANCE IN AFFECT RATINGS EXPLAINED BY EACH EFFECT IN THE
3 × 3 × 2 × 2 ANOVA AS CALCULATED BY HAYS' OMEGA-SQUARED STATISTIC

Subgroup	Bipolar Multiplying		Asymmetric Multiplying		Linear	Other
	Additive	Configural	Additive	Configural	Additive	Effects
Effect						
Belief One— A	.004	.007	.017	.015	.093	.063
Evaluation One— B	.020	.029	.100	.120	.137	.106
Belief Two— C	.005	.005	.012	.019	.144	.090
Evaluation Two— D	.011	.019	.078	.077	.140	.104
*A × B	.256**	.319	.128	.230	.019	.047
A × C	.003	.001	.001	.005	.001	.016
A × D	.002	.005	.000	.009	.000	.028
B × C	.001	.003	.009	.003	.000	.017
B × D	.003	.005	.008	.003	.002	.001
*C × D	.304	.348	.170	.254	.002	.023
A × B × C	.002	.006	.002	.003	.001	.008
A × B × D	.004	.006	.000	.007	.003	.018
A × C × D	.004	.007	.004	.010	.000	.000
B × C × D	.002	.012	.001	.013	.000	.000
A × B × C × D	.007	.019	.007	.010	.000	.002
Average Total Explained Variance	.628	.793	.537	.778	.542	.523
n	24	20	10	10	3	5

* Predicted effects.
** Underlined entries represent effects which were statistically significant (p < .05) for *all* Ss within that subgroup.

Response Reliability

Before turning to a discussion of the main findings, a brief statement regarding the reliability of Subject's Affect ratings is in order. By requiring each Subject to respond to a total of 72 fairly complex stimulus profiles, the possibilities of fatigue and low task involvement were raised. Either or both of these effects could be reflected as random response on the part of Subjects. Therefore, two measures of response reliability were calculated. The first measure was the within-individual correlation between the 36 responses constituting the first replicate and the 36 corresponding responses in the second replicate. The average correlation across all Subjects was .672, indicating a fairly high degree of reliability.

Secondly, the amount of variance explained by all effects in the ANOVA was computed for each Subject. Averaged across the entire sample, 66.2 percent of the variance in Affect ratings was explained, again indicating relatively high reliability. Therefore, interpretation of the findings can be undertaken with a good degree of confidence.

INTERPRETATION[5]

The Multiplicative Assumption

The multiplicative assumption of the Fishbein model received strong support from the present findings. As

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[5] Interpretation is focused directly on the validation issues raised earlier—multiplication and summation. Analysis of the meaning of the asymmetric multiplying data is not undertaken

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shown in Table 1, 64 Subjects or 89 percent of the sample fell into either the Bipolar Multiplying or Asymmetric Multiplying categories (diagrammed in Figures 3 and 4). This is even stronger than earlier findings (Bettman, Capon and Lutz, 1975) in which a single-attribute form of the Fishbein model was investigated. In that study, 69 percent of the Subjects engaged in some form of multiplication of b_{ij} and a_i terms, while 23 percent combined them in a linear (i.e., $b_{ij} + a_i$) fashion. The percentage of linear types in the present study dropped to only four percent. Thus the present study, while focusing primarily on the additivity assumption *across* attributes also brings a new perspective to the assumption of multiplication *within* attributes.

One plausible interpretation of the earlier findings is that the 18 Subjects who appeared to be "adding" a_i and b_{ij} terms were actually "multiplying" them, but did not treat the response scale in an equal interval fashion. If they in fact provided Affect ratings that were only ordinal in nature, then the ANOVA procedure would allow no distinction to be drawn between the "Unipolar Multiplying" and "Additive" categories (Green, 1973). This possibility was alluded to in the earlier paper, and the present findings can be interpreted as some support for that notion. If this interpretation is correct, then the percentage of "multipliers" in the Bettman, Capon and Lutz (1974) study would become 88 percent, 92 percent, and 95 percent for the adequacy-importance task,

here. It is discussed in some detail in Bettman, Capon, and Lutz (1975). Note that similar to the results of the earlier study, the evaluation (a_i) terms yield the main effects for these subgroups, as shown in Table 1.
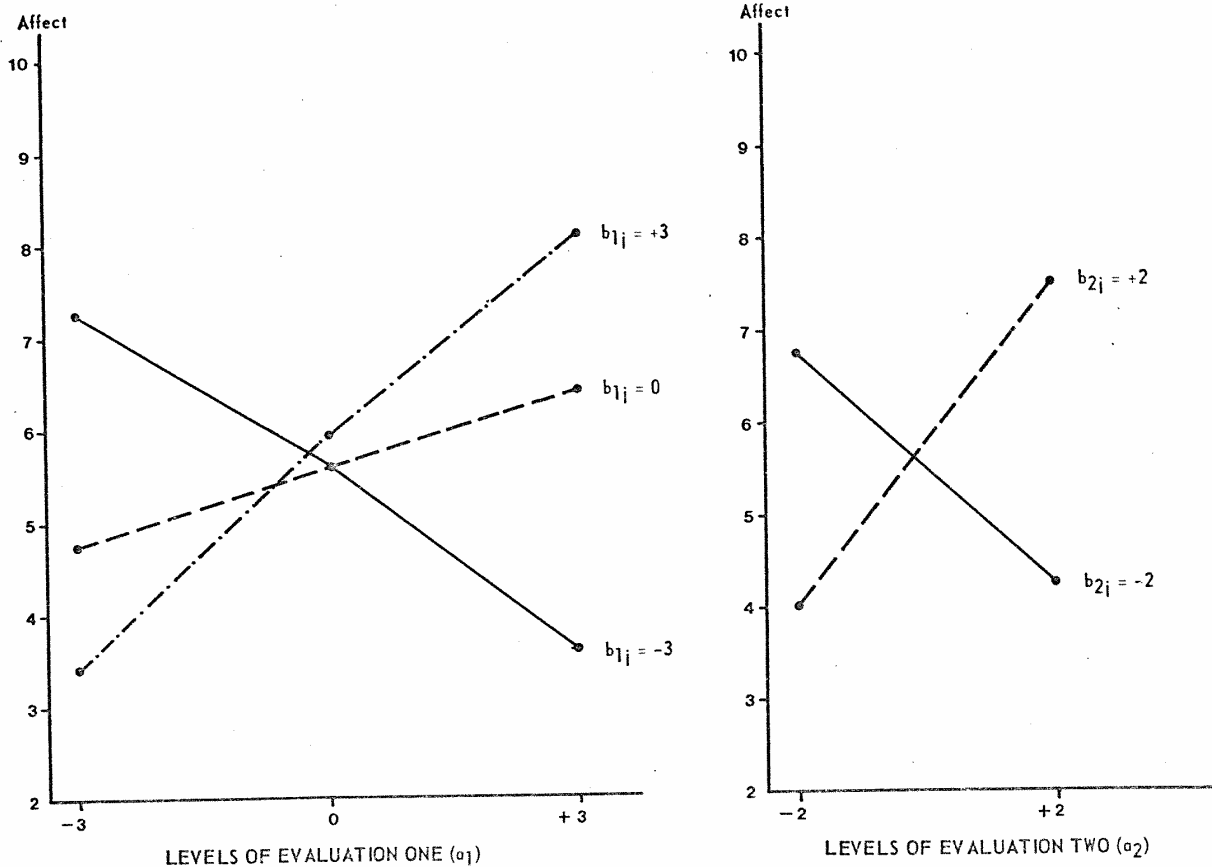
FIGURE 3

Average Cell Means for Bipolar Multiplying Subgroups

(Forty-four Cases)

the Fishbein task, and the "adequacy-evaluation" task, respectively. While this reinterpretation of the earlier findings is little more than informed speculation, the results thus reinterpreted coincide well with the present findings. In any event, it is the multiattribute case which is of primary interest, and the present results strongly support the multiplicative assumption in the two-attribute case.

The Summative Assumption

As noted previously, the summative assumption of the Fishbein model cannot be rigorously tested under the present design. At best, a distinction can be made between *additive processes* (including summation and equal weight averaging) and *configural processes* of the types mentioned earlier. As shown in Table 1, 34 Subjects or roughly 51 percent of the sample displayed additivity in their attribute combination rules, with the

other half of the sample exhibiting interactions that violated the additivity assumption.

However, these violations were relatively minor, as can be seen from the magnitudes of the mean omega-squared statistics shown in Table 1. When the data in the Bipolar Multiplying-Additive and Asymmetric Multiplying-Additive Subgroups are combined, the average amount of variance explained by each of the nine interaction terms other than the two predicted ones (i.e., $A \times B$ and $C \times D$) is only 0.3 percent. Combining the two Configural Subgroups in similar fashion yields a value of only 0.7 percent. Thus while the Configural Subgroups were characterized by violations of the additivity assumption in a strict statistical significance sense, the magnitudes of the deviations from the model were quite small; indeed, the variance explained by the offending interaction effects were scarcely more than the variance explained by the same effects when they were nonsignificant (i.e., in the Additive Subgroups). This
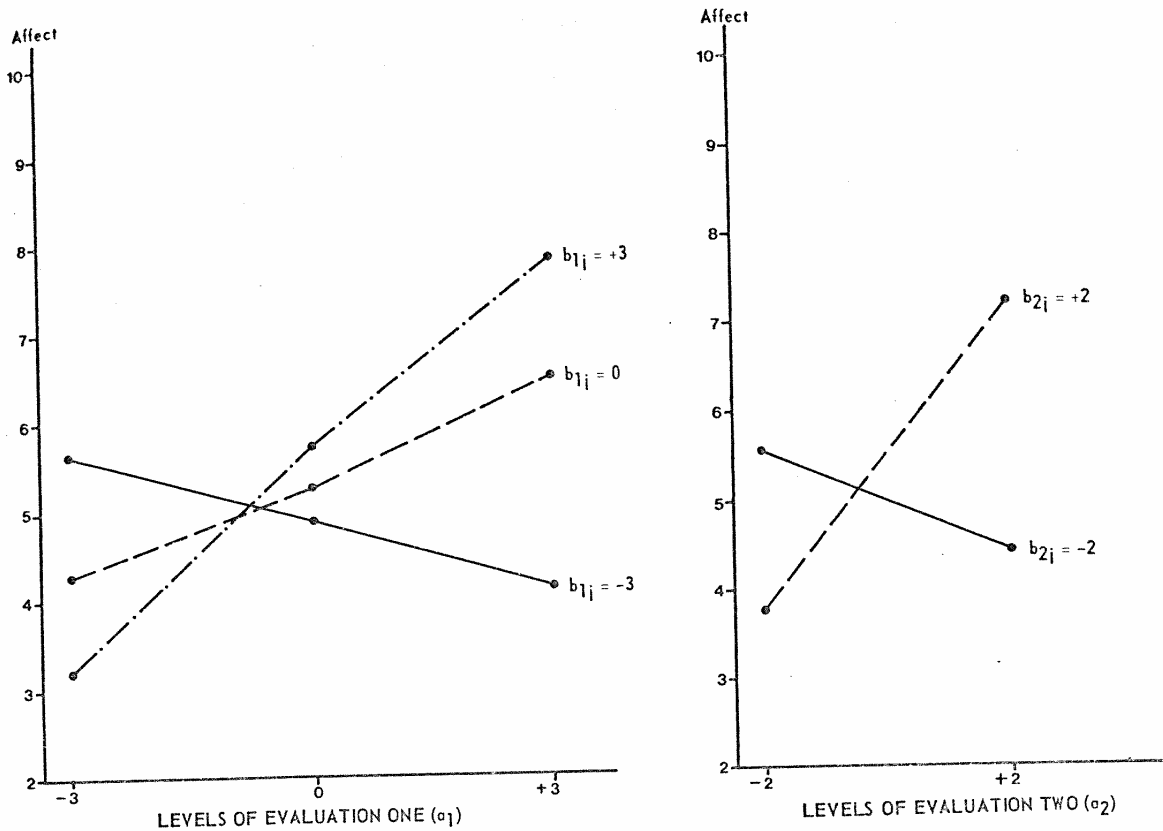
FIGURE 4

Average Cell Means for Asymmetric Multiplying Subgroups

(Twenty Cases)

pattern of small deviations from the theoretical model was also obtained by Anderson and Shanteau (1970) in their investigation of additive processes in decisions involving risk. Employing a duplex betting task conforming to a $5 \times 4 \times 2 \times 2$ factorial design, they found small but statistically significant interactions which violated the model.

When minor discrepancies of this sort are identified, more detailed investigation of the data is warranted. In this way, possibilities for refinement of the model are introduced. In this case, analysis of the Configural Subgroups may provide further insights into the deviations from the theoretical model which were observed both in this study and by Anderson and Shanteau (1970). Thus the two explorations of the data undertaken in the present research can be viewed as a form of inductive model building in which systematic deviations from the assumed model may lead to the formulation of a more general model.

Analyses of configurality. Of the 30 Subjects who were classified as multipliers but demonstrated configural patterns as well, two distinct patterns emerged. Fifteen Subjects exhibited a significant $B \times C \times D$ interaction, while twelve subjects displayed a significant four-way interaction effect. These two clusters of Subjects were not mutually exclusive, as some Subjects showed both effects. In an attempt to discover meaningful patterns in their data, mean values were obtained for both clusters, and the resultant values plotted in Figures 5 and 6.

Figure 5 shows the data for the fifteen Subjects for which the three-way interaction of the two Evaluation factors and Belief Two was statistically significant ($p < .05$). The mean amount of variance explained by this effect within the cluster was 2.5 percent, which is quite small in relation to the mean amount of variance explained by the two predicted two-way interactions, which totaled 60.7 percent. As seen in the Figure, the
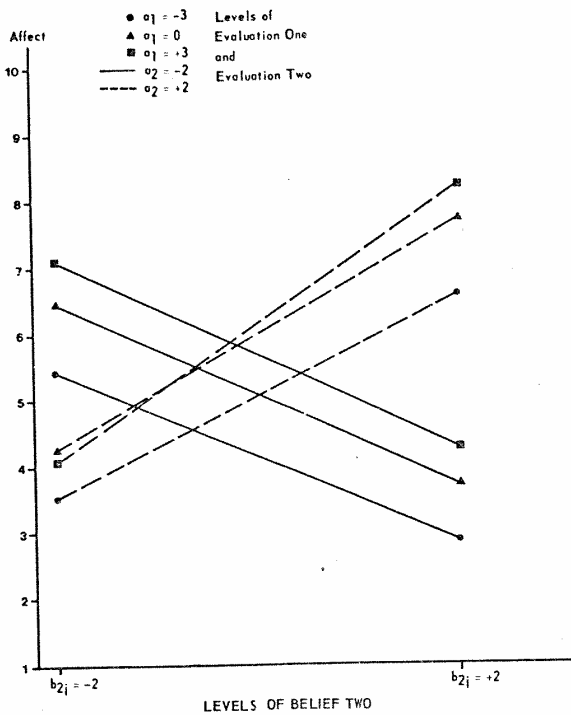
FIGURE 5

Average Cell Means for the Cluster Showing a Significant
Three-Way Interaction of Evaluation One, Belief Two
and Evaluation Two (B × C × D)

(Fifteen Cases)

three-way interaction, which should be reflected in differing slopes among either the three solid lines or among the three dashed lines, is essentially trivial. Therefore, no meaningful interpretation of this particular pattern of data was possible.

Data for the second cluster—that characterized by a significant (p < .05) four-way interaction—is plotted in Figure 6. In this case, the interaction should be reflected by differences in slopes between any pair of lines within one of the three segments of the Figure. In this cluster, the four-way interaction accounted for an average of only 3.5 percent of the variance in Affect ratings, again a very weak effect. As seen in the Figure, the deviations from parallelism are few, and are not large. The only hint of a consistent configural pattern is in the leftmost segment, where the plots for treatment combinations $(b_{2j} = +2, a_2 = +2$ and $b_{2j} = —2,$ $a_2 = —2)$ differ fairly substantially from the other combinations of those two factors (i.e., $b_{2j} = —2,$ $a_2 = +2$ and $b_{2j} = +2,$ $a_2 = —2)$. While a rather complicated psychological interpretation might be given for this pattern of results, there is a strong possibility of a "floor" effect in that the values for $b_{ij} = +3$ approach

the lower endpoint of the scale. Due to this possible artifact and the relatively small magnitude of the interaction effect, no psychological interpretation of this result was undertaken.[6]

Based on both of these rather unsuccessful attempts to identify consistent configural patterns in the data, the conclusion appears to be that there is a fairly strong degree of support for the summation assumption in the Fishbein model. Slightly over half of the sample showed no deviations from the predicted pattern of results, while the deviations exhibited by the remainder of the subjects were, for the most part, minor.

Summation or averaging? It will be recalled that the present design was not intended to distinguish between summation and equal-weight averaging, but was focused primarily on sorting out additive and configural effects. However, in the course of the data analysis, it became evident that the present findings could indirectly be brought to bear on this issue.

The question of cognitive summation vs. cognitive averaging has not attracted much attention among consumer researchers, although there has been a lively debate over the issue in social psychology for more than a decade (Fishbein and Ajzen, 1972, 1975; Anderson, 1971, 1974b). It is not surprising that the issue has not been broached in the consumer behavior literature, because it is a moot point when static tests of the model are undertaken. That is, a cognitive summation theory and a cognitive averaging theory make the same predictions *except under conditions of attitude formation or change,* which have seldom been investigated in the consumer literature on multiattribute models.

The basic distinctions between averaging and summation can be illustrated as follows: suppose a consumer holds a highly favorable attitude toward a particular brand. For purposes of simplicity, assume that the attitude is based on only one belief (e.g., the consumer believes that it is *very likely* (+3) that the brand possesses a *very good* (+3) attribute). Then the consumer discovers that the brand is *somewhat likely* (+2) to possess another attribute that the consumer feels is *somewhat good* (+2). This new information should theoretically lead to a change in the consumer's attitude toward the brand—but in which direction? *Cognitive summation theory would predict an increase in attitude,* since another positive thing about the brand has been learned. In contrast, *cognitive averaging theory would predict a decrease in attitude,* because the new information is less positive than the old information underlying the attitude.

The issue of summation vs. averaging is as yet unresolved in the social psychology literature, and it seems likely that one or the other may occur as a result of different attitude objects, response situations, and/or

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[6] Another factor contributing to this decision was that the configural subjects tend to be more reliable across replications. Hence, small effects may reach significance.
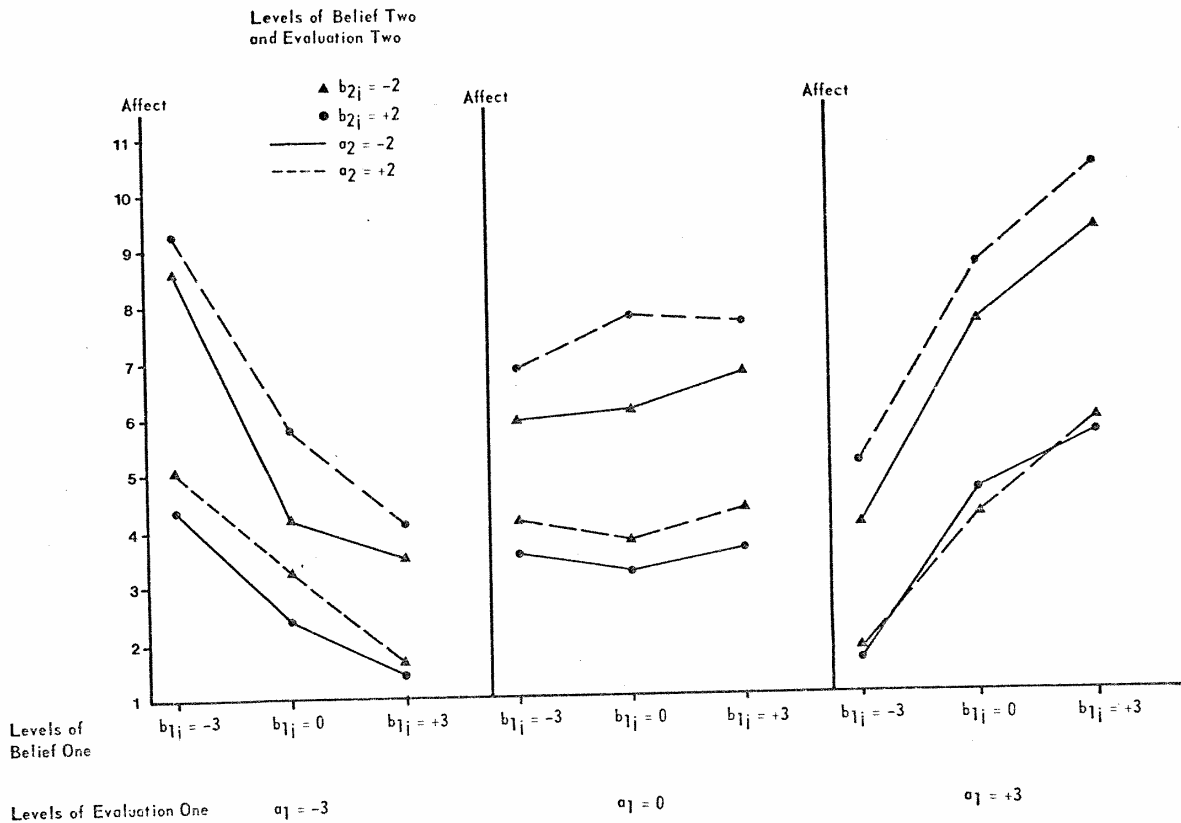
FIGURE 6

Average Cell Means for the Cluster Showing a Significant Four-Way Interaction

(Twelve Cases)

individual differences. In any event, it would appear to be an important issue for consumer researchers to consider, given the obvious implications for decision makers.

Figure 7 represents an attempt to assess indirectly whether the additivity in the present findings was summation, as assumed by the Fishbein model, or averaging. This can be achieved by performing a comparison with data from a previous study (Bettman, Capon and Lutz, 1975). The basic idea underlying this comparison of the present results with the earlier results is as follows: The initial study dealt with only a single attribute and therefore could not be brought to bear on the adding issue. The present study dealt with two attributes, the first of which (Attribute One) can be roughly compared with the single attribute in the earlier study. Thus, Attribute Two in the present study can be viewed as being "added" to Attribute One and the results compared with the single attribute case reported previously

to provide some initial insights into the summation vs. averaging issue.

The eighteen data points plotted in Figure 7 represent the nine treatment combinations for Attribute One in the present study (See Figure 1) and the corresponding treatment combinations from the Fishbein task in the previous study. The comparison is somewhat tenuous, as the earlier study presented stimuli on 5-point scales, while the current study utilized 7-point scales. In each study, however, the scale endpoints were labeled identically (e.g., "very good" to "very bad"), so it may be assumed for the moment that the endpoints and midpoints of the stimuli in both studies are comparable; comparison of intervening scale points is virtually impossible.

Using the earlier data as a baseline, the expected pattern of findings in the present study would have been a perfect replica of the previous findings if cognitive summation were the "cognitive algebra" being used by
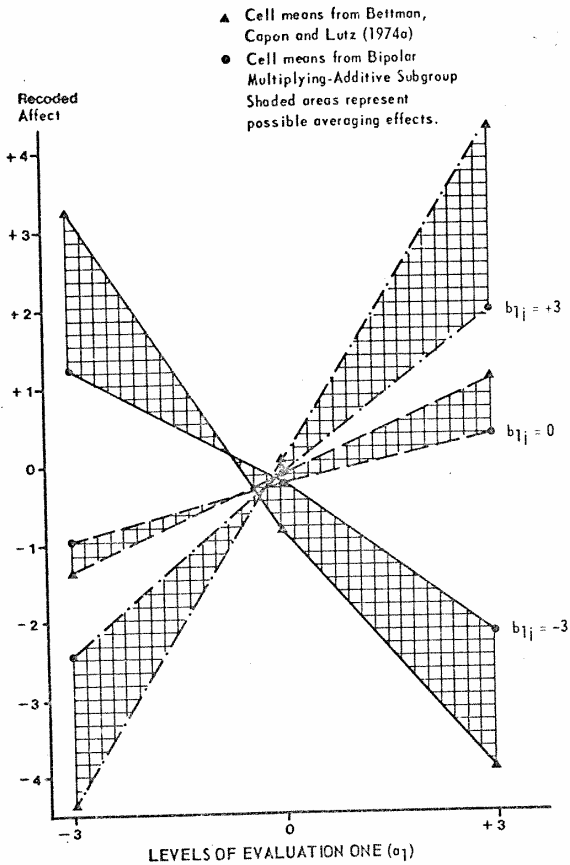
▲ Cell means from Bettman,
Capon and Lutz (1974a)

● Cell means from Bipolar
Multiplying-Additive Subgroup

Recoded
Affect

Shaded areas represent
possible averaging effects.

+4
+3
+2
+1
0
-1
-2
-3
-4

$b_{1j} = +3$

$b_{1j} = 0$

$b_{1j} = -3$

-3   0   +3
LEVELS OF EVALUATION ONE (o_1)

FIGURE 7

Comparison of Average Cell Means for the Belief One by
Evaluation One Interaction within the Bipolar Multi-
plying-Additive Subgroup (Twenty-four Cases)
and the Belief by Evaluation Interaction
within the Bipolar Multiplying Group
in the Bettman, Capon and Lutz
(1975) Study

(Forty-four Cases)

Subjects. This is due to the fact that the "expected
value" of the second attribute in the present study is
zero over the four treatment combinations $((+2x+2)$
$+ (+2x-2) + (-2x+2) + -2x-2)).$[7] However,
if cognitive averaging were the rule being applied, then
a pattern similar to that shown in Figure 7 would be
expected. That is, any treatment combinations which

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[7] Note that an assumption *is* being made here about scale
values for the independent variables; thus the expected value
of zero is only an approximation, not a fact, due to the prob-
lems discussed above with assuming scale value for a_i and b_{ij}.
It should be reemphasized that such assumptions were not
made for the earlier analyses; however, they seem reasonable,
given the exploratory nature of this section.

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had positive mean Affect ratings in the earlier study
would presumably be reduced by the expected value of
zero for the additional attribute; conversely, negative
mean values in the earlier study would be expected to
increase when averaged with a zero value. This is the
exact pattern of results in Figure 7. (The 11-point
Affect scale used in both studies has been recoded to a
bipolar scale for illustrative purposes). Note that the
evidence for averaging is, strictly speaking, strongest at
the endpoint levels of a_i. The data in the center of the
Figure are very difficult to interpret due to the differing
cross-over points.

Taken at face value, the data pattern in Figure 7
would strongly suggest that averaging, rather than sum-
mation, was occurring within the Bipolar Multiplying-
Additive Subgroup. However, there is one major prob-
lem with that conclusion. The same 11-point Affect
scale was used as the dependent variable in both studies,
and Subjects in the first study used the scale endpoints
frequently, as shown by the extreme values in the
Figure. Thus there was virtually no room for upward
movement in the "positive" cells or downward move-
ment in the "negative" cells from the data pattern in
the earlier study to the findings of the present research.
This fact alone is enough to rule out at least a portion
of the "averaging" in the four extreme corners of the
Figure. Nevertheless, the effects appear to be some-
what larger than would be anticipated if only the scaling
effect were operating on the ratings. Additionally, the
discrepancies in the Figure relating to the $b_{ij} = 0$ treat-
ment level cannot be explained by scale effects. Thus the
relatively smaller discrepancies of the "neutral" treat-
ment level are actually a stronger indication of a pos-
sible averaging effect than are the larger discrepancies
for the "extreme" treatment combinations. It should be
reemphasized that this comparison is very tenuous and
inconclusive; however, the data are suggestive enough
and the issue is important enough, that it was thought
appropriate to discuss it despite the obvious limitations.

In summary, then, the present results provide further
support for the multiplicative assumption of the Fish-
bein model and reasonably strong support for the
additive assumption. Deviations from additivity were
minor in terms of relative explained variance. A newly-
raised issue is whether the additivity is in the form of
summation or equal-weight averaging. The present
results are mildly suggestive of averaging, but further
studies are necessary to examine the issue more directly.
In particular, experimental designs where information
is presented sequentially are most appropriate.

DISCUSSION

This investigation was concerned with testing the
validity of the theory underlying the Fishbein multi-
attribute model of attitude, in contrast with most previ-
ous research, which has focused on the model as a

measurement device. While the present results are generally supportive of the theory, the question of generalizability is raised. The experimental setting was one with little "mundane realism" (Aronson and Carlsmith, 1968), or immediate applicability to policy formulation. However, the experimental approach used here has achieved remarkable success in psychology, leading to breakthroughs in the measurement of subjective utility (Anderson and Shanteau, 1970), psychophysical judgment (Anderson, 1970), and person perception (Anderson, 1974b). Thus it seems likely that the method may be useful in the study of consumer attitudes as well.

It is clear, however, that the method has limitations. The structure of the factorial task may be such that subjects are simply playing a "guessing game" rather than providing data reflecting true psychological processes. In general, Anderson has not studied the properties of the ANOVA task in this respect; it would seem that a fruitful area for future research would be the investigation of factors influencing the validity of the task. For instance, the impact on the current results of using a "real" product and "real" attributes should be examined.

Other areas worthy of future research include the effects of task or information overload on the "cognitive algebra" of subjects. The specific product class used may influence cognitive algebra, for example. Also, overload and other situational factors may exert considerable systematic influence on the processes under investigation.

Another issue which bears further emphasis is the need for a multimethod approach to the study of consumer behavior. Wright (1974) has argued persuasively for such an approach, and the future of the science would appear to lie in that direction. Every method has its own unique shortcomings and advantages; hopefully, through the use of complementary methods, more accurate insights into the processes underlying consumption can be gained. For instance, the present method has the weaknesses inherent to laboratory experimentation and low-involvement procedures, but offers some distinct advantages as well.

One important feature of the method is that it allows the study of individual differences in information processing, which is virtually impossible under a correlational paradigm. Even if individual level correlations are computed, each respondent "fits" each proposed model to some degree. A poor fit is ascribed to error variance. The problems with this approach were discussed above. Under the current ANOVA approach, however, the data of those subjects not fitting the model can be examined to determine *what they were doing,* rather than being left with a statement about *what they were not doing.* This leads to a second important advantage of the ANOVA approach: the potential for inductive model building.

While the present research was relatively unsuccessful in identifying consistent patterns among the subjects not fitting the assumptions of the Fishbein model, the nature of the data is such that systematic patterns can be identified if they do exist. Through this inductive process, new models or refinements of existing models may be identified which otherwise may have gone undetected. Thus the potential for market segmentation based on cognitive processes is introduced. Rather than assuming that all individuals in the market are engaging in cognitive summation, segments of "cognitive adders," "cognitive averagers," and "cognitive configurals" could be identified.

Few students have investigated the construct validity of the multiattribute model. This and the earlier studies of a single-attribute form of the model (Bettman, Capon and Lutz, 1974, 1975) examined the *attitude formation* process, while Lutz (1975) tested the model under conditions of *attitude change.* In each case, the construct validity of the multiattribute model received relatively strong support, thus providing some degree of confidence in the model's purported diagnostic power. These findings, taken together, begin to build a research base for the use of the multiattribute model for diagnostic purposes. There is an obvious need for further tests in a variety of settings before any conclusions can be reached. Nevertheless, findings from these initial studies are encouraging enough to warrant further research; the multiattribute model has the potential to become one of the more valuable techniques available to the decision maker.

On the basis of the present findings, there are several implications for decision makers interested in applying the Fishbein model. First, both the b_{ij} and a_i components make substantial contributions to Affect; therefore, both terms should be measured in survey applications. Second, the most appropriate coding scheme to use in analyzing the data would appear to be a bipolar one for both components. That is, both b_{ij} and a_i should be scored from -3 to $+3$ rather than 1 to 7 as has often been used in marketing research applications. Finally, there is a fair degree of support for Equation 1 as an accurate reflection of consumers' "cognitive algebra." Therefore, it appears reasonable to move toward the diagnostic use of b_{ij} and a_i components for formulating promotional strategies and other managerial decisions.

With this goal in mind, there are several areas of future research which are important. The first of these is the issue raised by the present findings—i.e., the summation vs. averaging issue. The importance of this issue to the decision maker interested in attitude change cannot be overstated. Attitude change strategies based on a summation assumption could produce results exactly opposite from the intended goal of the strategies if a substantial segment in the market is actually averaging over attributes. It would appear to be desirable

to test the summation-averaging issue with varying numbers of attributes, as the cognitive processing may differ substantially.

Another area of interest is the "nonlinear, noncompensatory" models discussed by Einhorn (1970), Russ (1971) and Wright (1972). To investigate these processes within the current ANOVA framework would necessitate the development of multiple brand stimulus configurations. While this would be a difficult and complex procedure, the potential for valuable insights would seem to be quite high. If nothing else, the introduction of another method into this vital area of inquiry would be beneficial.

In conclusion, the present findings are generally supportive of the theoretical propositions underlying the Fishbein multiattribute model. Moreover, the method employed in this study has suggested an important issue —summation vs. averaging—which needs further investigation before placing heavy reliance on the model's diagnostic power. Finally, it appears likely that other areas of inquiry into consumer information processing can benefit from the application of the current method in conjunction with complementary methods.

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The Journal of Consumer Research

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Mazis, Michael B., Olli T. Ahtola, R. Eugene Klippel, A COMPARISON OF FOUR MULTI-ATTRIBUTE MODELS IN THE PREDICTION OF CONSUMER ATTITUDES

Monroe, Kent B., Joseph P. Guiltinan, A PATH-ANALYTIC EXPLORATION OF RETAIL PATRONAGE INFLUENCES

Peter, J. Paul, Lawrence X. Tarpey, CONSUMER DECISION MAKING: A COMPARATIVE ANALYSIS USING ORTHOGONAL REGRESSION

Wright, Peter, FACTORS AFFECTING COGNITIVE RESISTANCE TO ADVERTISING

Commentaries on Bettman, Capon, and Lutz

JAMES SHANTEAU and C. MICHAEL TROUTMAN, *Kansas State University, Department of Psychology*

Bettman, Capon, and Lutz have addressed many important issues concerning the use of multiattribute models in consumer attitude research. To comment on all these issues would require a rather exhaustive review. Instead, we have decided to focus on those issues with which we are most familiar.

INFORMATION INTEGRATION THEORY

Bettman *et al.* introduce readers of the *Journal of Consumer Research* to information integration theory. Initially proposed by Anderson, this theory has been successfully applied to a wide variety of psychological tasks ranging from perceptual illusions and psychophysics to personality impression formation and psycholinguistics. Further, we have applied integration theory in our research to a variety of decision-making tasks ranging from gambling and utility theory to inference judgments and dating choices. However, there has been no previous application to consumer research. Thus, the work by Bettman *et al.* marks an important new extension of this theory.

Much of the work using integration theory has been directed toward distinguishing between adding and averaging models. The work by Bettman *et al.* raises this important issue in a new context. This distinction is crucial not only to the attitude change process, but also to an understanding of the relation between attitudes and other cognitive processes. In both Anderson's and our research, consistent support has been found for an averaging model. The tentative results of the present authors seem to provide further confirmation of averaging. Because their evidence is speculative and of little empirical value, we strongly urge other researchers to pursue the adding versus averaging issue further. We recommend that some of the previously developed graphical and quantitative techniques be used instead of the procedure used by Bettman *et al.* We also recommend that a more realistic task be used in any future research on adding versus averaging.

Perhaps the key contribution of the information integration approach has been the way it leads investi-

gators to think about problems. This is nicely illustrated by the authors' reformulation of the Fishbein approach to consumer attitudes. Central to integration theory are two assumed psychological operations. The first is a valuation operation by which information comes to have psychological value. Typically a two-parameter representation is assumed with information having both a *weight value* or importance component, and a *scale value* or evaluative component. While these two values correspond to the belief and evaluative components of the Fishbein model, they are more general because they apply to many judgmental situations other than just attitudes.

The second basic operation is the integration rule by which these values are combined psychologically. The combination rule need not be adding (or averaging) as the Fishbein model suggests. With some products, for instance, information about the product's attributes might be integrated multiplicatively. It may well be, for example, that consumers base their attitudes toward gloves on two attributes: protection against cold weather and fashionable style. To the extent that a pair of gloves does not possess either of these attributes, the consumer will have a negative attitude toward the gloves. Such a conjunctive strategy might be well described by a multiplying model.

FUNCTIONAL MEASUREMENT

Of equal importance with integration theory has been the development of functional measurement procedures. These procedures are essential for evaluating the success of various algebraic models. As the authors note, functional measurement does not require that the parameters of the model be measured *a priori*. Instead, subjective values are derived as an integral part of performing goodness-of-fit tests. Validation of the model then permits the simultaneous validation of the subjective values on an interval scale. Thus, functional measurement has led to the development of simultaneous model testing and scaling techniques.

In their paper, Bettman *et al.* have focused primarily on the model testing aspects. Unfortunately, we found their model testing procedures inadequate. The best procedure for evaluating a multiplying process is to look at the linear-by-linear (bilinear) component of

the predicted interaction. The graphical technique used by the authors is an important adjunct, but does not replace the need for an adequate goodness-of-fit test.

While Bettman *et al.* chose to ignore measurement, its importance can be emphasized by considering the symmetric and asymmetric multiplying groups (see Figures 3 and 4). The reader may get the impression that different cognitive algebras were used. In fact, the only difference between these groups is that the subjective values of the b_{ij} and a_i differ. A complete use of functional measurement techniques would have categorized both groups as combining the b_{ij} and a_i multiplicatively, but with different subjective values. Further, the subjective values for each subject would be available on an interval scale. This, it seems to us, would be more informative than the classification scheme used by Bettman *et al.* which placed multiplicative subjects in separate groups.

As the authors imply in their discussion of model testing, functional measurement techniques are more appropriate than correlational techniques. The work by Birnbaum which they cite clearly shows that correlational techniques can often be deceiving, even to the point of favoring an incorrect model. Also, functional measurement in contrast to correlational procedures makes it possible to display results graphically, and this the authors do. Their graphs would be even more informative to a reader, however, if they had plotted the derived subjective values on the abscissa rather than the objective values. A multiplying model then predicts a diverging fan of straight lines which may be easily examined visually.

While avoiding some of the problems of correlations, the statistic ω^2 used by the authors to classify subjects can also be potentially deceiving. Thus, the observed higher-order interactions which suggest configural processing should not be dismissed lightly. As noted by the authors, similarly small but significant interactions were obtained in the initial study on multi-component gambles by Anderson and Shanteau. These interactions, despite accounting for a small percent of the variance, later turned out to be quite important in revealing a *subadditivity effect:* the worth of the complete gamble was consistently less than the sum of the worths of the parts. This suggests a generalized "law of diminishing returns" which has since been found in many nongambling situations including the combination of commodity bundles. In the same way, the small but significant interactions found by the authors may turn out to be quite meaningful, especially if some of the more recently developed functional measurement procedures are applied.

Several possible misconceptions concerning functional measurement also deserve clarification. First, as stated in the paper, the techniques of functional measurement are often used with factorial designs, but this is not necessarily so. Functional measurement has been applied to partial (or incomplete) designs and also to certain types of correlational designs. Second, while interval response scales are typically assumed, this again is not necessary. There are ways of testing and, if necessary, transforming the response scale. However, with proper precautions to avoid scale biases, the response scale will usually provide interval scale data. Finally, functional measurement may be confused with conjoint measurement since both approaches often employ factorial designs and both are based on simultaneous scaling of independent and dependent variables. However, functional measurement allows for a direct statistical goodness-of-fit test of a model, while conjoint measurement lacks a direct test and instead relies on an examination of the axioms underlying a model.

PROCEDURAL COMMENTS

One of the principle lessons of previous psychological research on information integration and functional measurement has been that proper attention must be paid to procedure and methodology. With a moderate amount of care, however, this approach has proved to be very useful in the study of human judgment. While Bettman *et al.* ran their subjects in rather large groups, we have invariably found it necessary to run subjects individually. This gives the experimenter the opportunity to make sure that subjects have an adequate understanding of both the task and the response scale.

While running subjects individually may seem like a great price to pay, the benefits have in our experience far outweighed the costs. This is particularly true when, as in the present study, the analysis is at the level of the single subject. Thus, we would encourage the present authors and other researchers to consider running subjects individually.

CONCLUDING COMMENTS

Although we have been critical, it must be noted that the authors have made a number of important contributions. To start with, they introduced a new task into the study of attitudes. However, since the task is quite abstract, we hope to see the authors follow it up with research on more relevant tasks. In most of our research on decision-making we have avoided such abstract tasks because we question whether decision processes can adequately be studied outside some real and relevant setting.

Another important contribution by the authors concerns the study of individual differences within the integration theory framework. While we cannot endorse their classification scheme, we certainly feel that they have given impetus to an often neglected problem. Perhaps better classification techniques can be developed based on both the individual cognitive algebra and the individual psychological values of each subject.

Perhaps the most important contribution of Bettman

et al. is that they have pointed the way to the study of other important algebraic models in consumer decision-making. The formation of attitudes toward competing brands is only one aspect of a complex decision-making situation. Obviously, consumers do not always purchase their most favored brand. Thus, there may be a trade-off between price and perceived quality. If so, integration theory might be capable of modeling this aspect of the decision situation with a multiplying model. Or it may be feasible to use integration theory to describe consumer preferences between competing brands with a subtracting model.

While these are only speculations about the potential application of integration theory to the study of consumer behavior, we do feel optimistic enough to suggest them. This optimism is based on both the results of Bettman *et al.* and the previous success of integration theory in psychological judgment research.

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The intuitively appealing conception of human information processing that a response such as a choice of, a preference for, or an attitude toward an object depends on the values of the object's attributes times the belief that the object possesses the attributes has been proposed often in psychology, including the basic processes of motivation, learning, and perception, and the applied areas of impression formation, organizational behavior, and consumer choice.

Construct validation for the idea is more difficult to attain than to propose the idea because the model may depend on 1) the coding of the attitude response, attribute value, and attribute probability; 2) the attitudinal and the attribute dimensions; 3) the attitude object; and 4) the judge.

The *Bettman et al* (1975) work follows in the line of research using Anderson's functional measurement methodology on individuals. It overcomes problems 1 and 4 above to gain construct validity support for the multiattribute model. The functional measurement methodology avoids the problem of *a priori* scaling of attributes and the individual level analysis allows one to validate the model for each judge. The validation involves showing that the belief that the object possesses an attribute is multiplied by the value of the attribute and that this product is added for each attribute relevant to an object. The factorial ANOVA methodology associated with functional measurement frames this prediction in terms of particular interaction effects in a design that treats each belief and each value dimension of each attribute as a factor. Also, non-zero interactions for attribute combinations show support for "configural" processing of information.

Previous research has yielded predictive but not construct validity through *a priori* scaling of attributes,

group analysis, and variance explained as a measure of model validation. As the Bettman *et al* work shows, functional measurement and individual analysis yields unambiguous results in consumer research. This paper is a nice application of the theoretical argument Anderson and colleagues have been having with those who advocate variance explained measures for model validation in human information processing. Sometimes this argument is framed in terms of whether one uses regression or ANOVA, and Bettman *et al* tend to cast it in these terms. Whether one scales attributes *a priori*, whether one uses individual analysis, and whether one tests parameters in the model versus using variance explained are issues aside from the general linear model which accommodates choices on either side of each issue (Wolf and Cartwright, 1974).

What about the other two problems in validating the model: the number of attitude and attribute dimensions used in relation to what classes of the attitude object? In principle the factorial ANOVA methodology might be used, also, to deal with these problems. A factor for attitude dimensions and a factor for attitude objects could be added to the factorial design. In practice the number of judgments would be overwhelming.

The variance explained methodology can gain some answers to these problems (Press, 1973). By having subjects judge each object on a set of dimensions or judge similarities among objects one can find the number of dimensions that differentiate the objects. Cluster, factor, or multidimensional scaling analysis of this data would precede the functional measurement approach. After knowing the relevant set of attitude dimensions and objects, one can validate the multiattribute model using factorial design and functional measurement that include objects as factors. One can then, also, test if the value of an attribute is conditional on the attitude object.

If this reasoning is correct, the future research in validating the multiattribute model in consumer research should involve getting sets of consumers to identify the relevant attitude and attribute dimensions for appropriate consumer products or services. Then another group of consumers can be used to identify the kind of processing of attribute information to form attitudes of the consumer products or services.

This validating process has fruitful implications for developing a theory of individual differences and in turn effective marketing and advertising. The present data show that the majority of judges multiply attribute belief and value components. It also shows that some judges are "asymmetric" in the processing of information. Judges are more positive about an object that possesses a valued attribute than they are about an object that does not possess a negative attribute. It would be interesting to know if this holds for the same judge across objects and attitudes. If it does, it would provide an interesting individual difference dimension
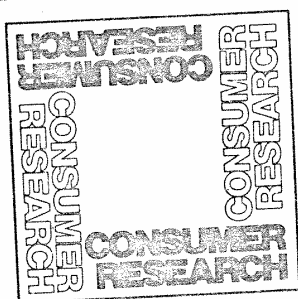
in terms of information processing. I look forward to seeing further research using individual analysis of factorial designed situations. Paradoxically this line of research, rather than correlational design, may shed light on the important problem of cognitive style.

This possibility would be a step beyond the present knowledge in social psychology. To give rather than to receive from theories in social psychology would be a blessing to consumer psychology. Also, to validly identify cognitive styles would have implications for normative theories of multiattribute decision making, which, like Fishbein's empirical theory, says evaluate attributes' desirability and probability of association with a choice, sum over all attributes and choose the one with the highest expected value, à la Edwards. This procedure tends to obscure rather than clarify for the decision maker the reasons for his choice. However, having a decision maker or consumer respond to a set of systematically varied situations does provide the opportunity for the consumer as well as the market manager or experimenter to understand the cognitive process. At least this is the case for a leadership model (Vroom and Yetton, 1973) and should be for a consumer model.

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