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BEHAVIORAL INTENTION FORMATION: THE INTERDEPENDENCY OF ATTITUDINAL AND SOCIAL INFLUENCE VARIABLES

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AUTHOR'S FOOTNOTE

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Behavioral Intention Formation: The Interdependency of Attitudinal and Social Influence Variables

ABSTRACT

Fishbein and Ajzen have proposed a theory in which behavioral intention formation is a function of the separable effects of attitude and the social norm. From their writings is deduced a variable network that explicitly models complex variable interdependencies not previously subjected to empirical testing. The findings from an experimental test using structural equation methodology support a model in which normative variables affect behavioral intentions primarily through the mediating effects of attitudinal beliefs and overall attitude. The major implication is that the theory's richness is enhanced when its central equations are replaced by a more complex model that explicitly considers attitudinal and normative variable interdependencies.

Behavioral Intention Formation: The Interdependency of Attitudinal and Social Influence Variables

INTRODUCTION

Fishbein's (1967) model of behavioral intentions has spawned extensive research investigating both the theory and its applications (see reviews by Farley, Lehmann, and Ryan in press; Azjen and Fishbein 1973). While research in this area has been conducted in a number of disciplines, a good deal of it has appeared in the consumer behavior literature. An extensive review has been provided by Ryan and Bonfield (1975), and more recent work continues to appear (Ahtola 1976; Carnegie Mellon Seminar 1978; Dickson and Miniard 1978; Fishbein 1976; Glassman and Fitzhenry 1976; Lutz 1977, 1978a, 1978b; Miniard and Cohen 1979; Miniard and Dickson 1979; Ryan 1978; Ryan and Bonfield 1980; Ryan and Etzel 1976; Ryan and Holbrook in press; Ryan and Peter 1976). A major concern of recent work has been that earlier regression testing did not capture the theory's richness (Carnegie Mellon Seminar 1978; Dickson and Miniard 1978; Lutz 1978a 1978b; Ryan and Bonfield 1980; Ryan and Peter 1976). In this spirit, the present research expands the theory's behavioral intention paradigm in order to explicitly model variable interdependencies not previously examined. The following sections of the paper outline the basic theory and discuss its empirical support and conceptual underpinnings; propose a more complex model; and report a behavioral intention formation experiment in which information about attitudinal and normative beliefs is manipulated.

FISHBEIN AND AJZEN'S THEORY

In relating attitudes to behavior, Fishbein copes with the traditional attitude-behavior discrepancy by arguing that this gap is due to inadequate conceptualization and measurement and the need to consider "other variables" in addition to attitudes. Fishbein addresses the issue of "other variables" by combining attitude with a variable described as the "subjective norm" (Fishbein and Ajzen 1975, Ch. 7), which is designed to capture the social influences of relevant others. The basic Fishbein paradigm is that behavior is affected by behavioral intention which, in turn, is affected by attitude and the subjective norm.

The central equations in the theory appear as follows:[1]

$$\underline{B} \sim \underline{BI} = (\underline{Aact})\omega_1 + (\underline{SN})\omega_2, \qquad (1)$$

$$\underline{Aact} = \sum_{\underline{i}=\underline{1}}^{n} \underline{B}_{\underline{i}}\underline{a}_{\underline{i}}, \qquad (2)$$

$$\underline{SN} = \sum_{\underline{j}=\underline{1}}^{k} \underline{NB}_{\underline{j}}\, \underline{MC}_{\underline{j}}, \qquad (3)$$

where:

$\underline{B}$ = overt behavior,

$\underline{BI}$ = behavioral intention,

$\underline{Aact}$ = attitude toward behavioral act,

$\underline{B}_{\underline{i}}$ = the expectation (i.e., the probability or improbability) that the performance of a specific behavior will lead to an ith outcome,

$\underline{a}_{\underline{i}}$ = the positive or negative evaluation of the ith outcome,

$\underline{n}$ = the number of salient outcomes,

$\underline{SN}$ = the subjective norm (i.e., overall perceptions of what relevant reference groups or individuals think the actor should do),

$\underline{NB}_{\underline{j}}$ = the expectation (i.e., the probability or improbability) that the performance of a specific behavior is expected by a jth group or individual,

$\underline{MC}_{\underline{j}}$ = the motivation to comply or not to comply with the expectation of the jth group or individual,

$\underline{k}$ = the number of salient groups or individuals, and

$\omega_0 \omega_1$ = empirically determined standardized regression coefficients.

The predictive ability of Equation 1, incorporating normative structure ($\Sigma \underline{NB}_j \underline{MC}_j$) instead of $\underline{SN}$ as the second predictor variable, has received empirical support in a number of studies reviewed by Ajzen and Fishbein (1973) and Ryan and Bonfield (1975). The parameter estimates for Equation 1 were also found to be consistent across 37 studies conducted in a variety of situations (Farley, Lehmann, and Ryan in press). The relationship between $\underline{Aact}$ and $\Sigma \underline{B}_i \underline{a}_i$ has been empirically supported (Ajzen and Fishbein 1972; Jaccard and Davidson 1972), as has the need to include $\underline{Aact}$ as a moderator of the $\Sigma \underline{B}_i \underline{a}_i$ and $\underline{BI}$ relationship (Lutz 1973; Ryan 1974, 1978). One experimental study (Lutz 1977) manipulated the interaction of $\underline{B}_i$ and $\underline{a}_i$ and demonstrated subsequent changes in $\underline{Aact}$ and $\underline{BI}$. In contrast to the amount of research investigating these issues, the variable network has not been tested in its entirety and only two studies (Glassman and Fitzhenry 1976; Miniard and Cohen 1979, 1981) have investigated $\underline{SN}$. One attempt (Ryan 1978) has also been made to specify a social influence variable somewhat different from $\underline{SN}$. The results from these studies are reported in the following discussion of the theoretical network within which $\underline{Aact}$ and $\underline{SN}$ occur.

In terms of both change and formation processes, Fishbein and Ajzen (1975) have consistently argued for a chain of effects that proceeds from stimulus to $\Sigma \underline{B}_i \underline{a}_i$ and $\Sigma \underline{NB}_j \underline{MC}_j$, that respectively influence $\underline{Aact}$ and $\underline{SN}$. $\underline{Aact}$ and $\underline{SN}$, in turn, effect $\underline{BI}$. A schematic representation of their formation paradigm is shown in Figure A. Whereas Fishbein and Ajzen have not

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Insert Figure A About Here

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furnished an explicit conceptual discussion of the relationships among attitudinal and normative variables, or the lack thereof, a literal interpretation of Equation 1 and Figure A has led others (Ryan 1978; Miniard and Cohen 1979, 1981; Ryan and Bonfield 1975) to assume complete independence. However, a close scrutiny of Fishbein and Ajzen's earlier writings together with their more recent positions (Fishbein and Ajzen 1981) suggests that the schema may have served as a paramorphic representation for the sake of elegance, or as a point of departure.

THE INTERDEPENDENCY OF ATTITUDINAL AND NORMATIVE VARIABLES

A number of statements by Ajzen and Fishbein about specific portions of the model imply more complex variable relationships than those shown in Figure A. Belief formation and change processes are considered to be the main force driving the model (1975, Ch. 5). These antecedents, described as prior subjective probabilities that determine attitudes, are called primary beliefs. The general definition given to beliefs, as incorporated in Equations 2 and 3, involves an individual's perceived link between any two concepts or objects. There are three types of beliefs: (1) descriptive beliefs, derived from direct experience; (2) information beliefs, formed by accepting information from some source; and (3) inferential beliefs, derived through a process of inference from descriptive, informational, or other inferential beliefs (Fishbein and Ajzen 1975, pp. 131135). The notion of inferential beliefs opens the possibility that attitudinal beliefs (B_i) may be formed from normative beliefs (NB_j), and vice versa. Fishbein and Ajzen are consistent in acknowledging this possibility in terms of the formation of normative (1975, pp. 304, 306, 314) and attitudinal beliefs (1975, p. 304):

> Not only may an item of information to which a person is exposed during an influence attempt affect one of the determinants of the intention--say, the attitude toward the behavior--but it may also have an impact on the second determinant of intention, the subjective norm. Consider, for example, a person who observes that his best friend receives $5 for tutoring a student. Formation of this descriptive belief may lead him to infer that tutoring a student is financially rewarding, and this belief may in turn increase his attitude toward tutoring a student. At the same time, the descriptive belief may also lead the person to infer that his best friend thinks he should tutor the student. This inferential belief may increase the subjective norm that most important others think he should tutor a student. Alternatively, once the person has changed his attitude in a favorable direction, he may also infer that most important others also hold a favorable attitude toward tutoring a student and then make the further inference that these referents think he should perform this behavior. An influence attempt can thus have an impact effect even if it provides information that is directly relevant for only one determinant of intentions. The strength and direction of this kind of impact effect will depend on the extent to which the two components are related and the direction of the relationship. (Fishbein and Ajzen 1975, p. 402)

Yet, Fishbein and Ajzen continue to maintain the separability of attitudinal and normative variables, despite the possibility that one may be reinterpreted in the form of the other. For example: "...It is useful to maintain the distinction between beliefs about the consequences of performing a behavior and beliefs about expectations of relevant referents" (1975, p. 304).

<u>Previous Evidence and Criticisms of Attitudinal-Normative Independence</u>

On the basis of the high correlations reported between attitude and social influences and <u>Aact</u> changes that occurred following either $\underline{B_i}$ or $\underline{NB_j}$ manipulations, Ryan and Bonfield (1975) addressed the problem of developing a social influence variable independent of attitude. Borrowing Kelman's (1961) three processes of social influence--compliance, identification, and internalization--they reasoned that an actor, under the influence of another person or group, may play a role that is not congruent with his or her own attitudes towards a behavior. The motivation for playing the role would be the attainment of rewards under the other's control (compliance) or a desire to meet the other's own role expectations (identification), rather than because it is compatible with the actor's value system (internalization). They identified this construct as social compliance (SC); however, attempts to operationalize it and show its independence from Aact were equivocal (Ryan 1978). Miniard and Cohen (1979) reported that manipulations of attitude were sensitive to variations in normative social influence and that both SN and MC were affected by manipulations of normative influence and attitude. They criticized the theory for failing to separate expertise as a source of informational social influence which, taken as evidence about reality, would be incorporated in attitudes. Interestingly, their position is consistent with Fishbein and Ajzen's inferential belief notion, namely, that a primary attitudinal belief may be inferred from other beliefs arising from a variety of external sources. Fishbein and Ajzen (1981) have also argued that Miniard and Cohen's findings are consistent with their theory.

Fishbein (1976) has acknowledged that the social influence variables are underdeveloped. The conceptual framework provided is sufficiently vague, for the theory serves its heuristic function quite well.[2] However, the acknowledgement of complex attitudinal and normative variable interdependencies suggests that Equations 1, 2, and 3 may have outlived their usefulness. Fortunately, structural equation methodologies such as those developed by Jöreskog and Sörbom (1978) allow more complex modeling than do the three central equations. Further steps in this direction, along with the research setting used in this study, are discussed below.

A REFORMULATED OPERATIONAL MODEL

Marketing researchers have long recognized social influences on behavior (Bourne 1957) as well as on expected attitudinal outcomes (Haley 1971). Attitude is a central concept in buyer behavior models (cf. Howard and Sheth 1969), and it is common to segment individuals on the basis of attitude similarity within and dissimilarity between groups (Wind 1978). Based on a large body of communication research (McGuire 1973), attempts to influence attitude formation are often made through the use of "expert" informants. For example, an endorsement of flouride from a dental association was used to enhance the belief that decay prevention would result from the use of Crest toothpaste (Shuchman and Riesz 1975). Ryan (1974, 1978) found that attitude and social influence predicted intentions to purchase toothpaste brands quite well. Although attitudinal outcomes varied across brands and situations (Ryan and Etzel 1976), "dentist" consistently emerged as a referent. The aforementioned arguments, together with these findings, suggest that when intentions toward a previously unknown phenonomen are formed, and there is a key referent, variable relationships would appear as shown in Figure B. With the exception

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Insert Figure B About Here
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of the crossover relationships among attitudinal and normative variables (β_{12}, β_{21}, and β_{42}), the model is true to the Fishbein and Ajzen intention formation paradigm suggested by their writings rather than as shown in Figure A. More specifically, informational impact on behavioral intentions occurs only through belief formation and the mediating effects of attitude and the social norm (γ_{11}, β_{41}, β_{54}, and γ_{22}, β_{32}, β_{53}). Furthermore, information, through the process of secondary and inferential beliefs, may affect beliefs other than those toward which it is directed. Hence, cognitive information (CI) aimed at attitudinal beliefs (B_i) and normative information (NI) directed toward normative beliefs (NB_j) would effect both normative and attitudinal belief structure formation (γ_{11}, γ_{21}, γ_{12}, γ_{22}). The γ_{12} crossover effect is likely to be strong where a normative referent, say, a dentist, may serve as a source of information in forming an attitudinal belief about, say, decay prevention.

At one extreme, perhaps normative beliefs should merely be included as additional beliefs (B_i) in attitudinal structure. The position taken here is that they are related (β_{12}, β_{21}) but separable. Whereas attitudes are formed on the basis of a small amount of information that includes an expert referent, the referent information should influence overall attitude formation (McGuire 1973). Thus, normative beliefs ($\Sigma NB_j MC_j$) should influence Aact formation. Previous research on toothpaste purchase intentions also found stronger Aact than social influence beta weights ($\omega_0 > \omega_1$ in Equation 1) (Ryan 1978) and a joint attitudinal social influence effect (Ryan and Peter 1976). Consequently, it is hypothesized that Aact has a stronger direct link than SN to BI ($\beta_{54} > \beta_{53}$), but that social influences do have a strong impact through Aact mediation, which is reflected in both the direct (β_{53}) and the indirect (β_{42}) links. Finally, there is no direct link between Aact and SN. The relationship between Aact and SN is to be found in their belief relationships. Once formed, there is no compelling reason to think an internal overall effect (Aact) is related to an externally oriented notion of others' behavioral expectations (SN).

In addition to the arguments supporting the theoretical model shown in Figure B, this model has pragmatic advantages over the Fishbein and Ajzen approach, which relies on beta weights from Equation 1 to determine the relative influence of Aact and SN on behavioral intentions. For example, using this criterion, Ajzen and Fishbein (1970) have shown that the relative influence varies across situations. The use of the beta weights in this fashion assumes that an interaction effect, which has been demonstrated to exist (Ryan and Bonfield 1980; Ryan and Peter 1976), is not present. In addition, the beta weight analysis does not provide very rich insights. For example, a small SN beta weight may be intepreted as indicating weak social influence effects on BI, when in fact it may have a strong influence through the mediating effects of Aact.

METHOD

Sample and Intention Object

Data were collected at two points in time, the first to determine salient outcomes from which measures and an experiment could be designed, the second to administer the experiment. The panel constructed for use in this study was composed of 80 members of various church groups located in the Tuscaloosa, Alabama, SMSA. The panel members were white, Anglo-Saxon, Protestant housewives who were married, had children living at home, and were predominantly middle-aged members of the lower-middle social stratum. All subjects volunteered to serve in the experiment in return for monetary donations to their respective churches.

The product chosen to represent the intention object was toothpaste. A fictitious new brand, designated as Brand O, was used so that attitudes and norms could be formed solely from information provided in the experiment. Operationalization of the model involved the identification of salient outcomes and referents, the construction of measuring instruments, and the design of written communications to formulate more positive attitudinal and normative variables for experimental versus control groups.

Salient Outcomes and Referents

Salient outcomes and referents were determined with an elicitation technique common to this type of research (Ryan and Etzel 1976). The technique employed nondirective questions to obtain free responses, which were then analyzed as to content and separated into groups on the basis of common meanings. Questioning referred to outcomes and referents relevant to the purchase and usage of toothpaste generally; Brand O was not mentioned to these subjects. Natural breaks in the frequency of mentioned items were used to separate salient items, shown in Table 1, from nonsalient items. Consistent with Haley's (1979) benefit segmentation research, these housewives sought decay prevention. The dentist referent also recurred.

Insert Table 1 About Here

Measures

The elicited outcomes and referents were used to construct Brand O measures. A set of belief (B_i and NB_j), evaluation (a), attitude toward the act (Aact), and behavioral intention (BI) measures was constructed. The single-item scales commonly used in this type of research were modified to create multiple-item scales, in order to obtain reliability estimates and avoid bias from adjective specificity. The bipolar adjectives used in the B_i, NB_j, and BI scales included the single set of objectives commonly used in previous research (likely-unlikely) (cf. Jaccard and Davidson 1972) and two additional sets (probable-improbable and possible-impossible). For example:

($\underline{B_3}$) Brand O toothpaste usage would lead to decay prevention:

possible ___ : ___ : ___ : ___ : ___ : ___ : ___ impossible

($\underline{NB_1}$) With respect to Brand O toothpaste, my dentist would expect me to purchase and use it:

probable ___ : ___ : ___ : ___ : ___ : ___ : ___ improbable

($\underline{BI}$) When it is introduced, I intend to buy Brand O toothpaste:

likely ___ : ___ : ___ : ___ : ___ : ___ : ___ unlikely

The adjectives used in the $\underline{a_i}$ scales included good-bad and two pairs taken from the Fishbein and Raven (1962) AB scale (wise-foolish and beneficial-harmful). For example:

($\underline{a_1}$) For me, low-priced toothpaste is:

good ___ : ___ : ___ : ___ : ___ : ___ : ___ bad

<u>Aact</u> was measured by the same adjectives as those used in the $\underline{a_i}$ scales plus a a fourth pair, rewarding-punishing. For example:

(<u>Aact</u>) My purchase and use of Brand O toothpaste is:

rewarding ___ : ___ : ___ : ___ : ___ : ___ : ___ punishing

Although use of the same adjectives to measure different constructs can possibly result in common method variance, a previous study (Schwartz and Tessler 1972) provided evidence indicating that this possible artifact has not favorably biased the evidence supporting this model. Consequently, although major deviations from accepted practice were avoided, statements using the same adjectives were separated from one another and some scale directions were reversed in order to lower the possibility of response-set bias.

Motivation to comply (MC_j) and the subjective norm (SN) were operationalized with single-item measures, following Fishbein's procedures (Fishbein and Ajzen 1975), as follows:

(MC_1) With respect to toothpaste purchase and usage:

I want very much to ___ : ___ : ___ : ___ : ___ : ___ : ___ I want very much not to

do as my dentist expects.

(SN) Most people who are important to me would think:

I should ___ : ___ : ___ : ___ : ___ : ___ : ___ I should not

purchase Brand O toothpaste when it is available.

Bipolar (+3 to -3) summative scoring was used for all scales. In order to maintain scale perspective, each of the summative scores was divided by the number of scale items employed, and attitudinal and normative structural scores ($\Sigma B_i a_i$ and $\Sigma NB_j MC_j$) were divided by the number of salient items (four and three, respectively). Thus, BI, Aact, and SN scores ranged from -3 to +3 and $\Sigma B_i a_i$ and $\Sigma NB_j MC_j$ scores ranged from -9 to +9. Similarly constructed B_i, a_i, Aact, and BI measures had been previously shown to have internal consistency and concurrent validity (Ryan 1978).

It should be noted that the measures confound purchase and usage. In this operational setting the purchase act would be performed by the housewife, whereas the expected outcomes would accrue from family usage. While the distinction between purchase and usage intentions is interesting in its own right, purchase is necessary to obtain usage in the present situation and this confounding does not mitigate testing of the relationships shown in Figure B. A similar criticism can be made concerning the specificity level of the outcomes and referents which were derived at the product level. In fact, Ryan and Etzel (1976) have shown that outcomes change across existing toothpaste brands aimed at different market segments. However, previous experience (Ryan 1974) revealed that laboratory procedures were not able to produce strong belief changes for existing brands for which, as a result of usage and advertising, belief structures were strongly in place. The procedures used here attempt to overcome this methodological limitation by perceptually constructing an artificial brand that varies in its ability to deliver expected outcomes and in its referent expectations. Consequently, the research investigates attitude formation, not change (Carnegie Mellon Seminar 1978). Such procedures, commonly used to evaluate new brands prior to their manufacture, are referred to as concept testing (Tauber 1977).

Experimental Procedures

Booklets were designed to produce two levels each of cognitive and normative information as the result of persuasive information, after which the various measures were presented. Subjects were told verbally that the elicitation session, which had taken place one month earlier, had determined that they were typical in terms of what they sought in a toothpaste. In addition to standard instructions, the first page of the booklet contained the following statement of purpose:

> Many of today's shoppers have called for more objective product information in advertisements. The purpose of this study is to examine how shoppers like yourself use information from an impartial source.
>
> This booklet contains information from the testing of a new brand of toothpaste. The information is accurate and unbiased, having been derived solely for the company's use. In granting permission to use this information, the company has requested that it and the brand name be anonymous. Consequently, the brand will be referred to as "Brand O."

The booklet contained a page of text followed by a summary of information about Brand O. Four forms of the booklet, identical in appearance but each containing a different description of Brand O, were randomly distributed to subjects. The purpose was to produce a 2 x 2 factorial design with 20 subjects in each cell by varying the information pertaining to price and dentist expectations. It was expected, on the basis of the above discussion of inferential beliefs and previous research findings (Lutz 1975), that the manipulation of the most frequently elicited attitudinal outcome and normative expectation would produce changes in the same direction in other beliefs, thus influencing the entire structure ($SB_i a_i$ or $NB_j MC_j$). The control group received the following:

In summary, "Brand O" is:

1. The same price as competitive brands.
2. Average in taste and flavor appeal.
3. Average in cavity prevention.
4. Average in breath freshening and tooth brightening.
5. Endorsed by about 50% of dentists.

The following change was made for the cognitive information experimental group:

1. Priced much lower than competitive brands;

and for the normative information control group:

5. Endorsed by 90% of dentists.

No information was given about children and husband referents.

The next part of the booklet was the questionnaire. Measures were grouped in the following order: a_i, MC_j, B_i, NB_j, Aact, SN, and BI. While the ordering follows the conventional wisdom of proceeding from specific to general construct measures, there is evidence that reversing this procedure does not influence goodness-of-fit tests (Miniard and Dickson 1979).

Method of Analysis

The path coefficients shown in Figure B were estimated with LISREL IV (Jöreskog and Sörbom 1978). The primary advantage of the structural equation methodology over the traditional central equations (1, 2, and 3) is that it simultaneously estimates the path coefficients, including the crossover paths, which are ignored in the regression approach. (The structural equations are shown in the appendix.) In essence, it uses a maximum likelihood procedure to test if the proposed model (with the derived β and γ estimates and constrained 0 values for paths not shown in the figure) reproduces the variance-covariance matrix from the original data.

The presented model, as derived from the theory, is underidentified. Whereas the identifying conditions for the LISREL model generally differ from the classical rank and order conditions, in this case they are identical. An unidentified model presents a problem in that unique parameter estimates may not be obtainable. In order to remove this problem, β_{12} and β_{21} were constrained to be equal. Although other paths could have been removed, this solution was chosen on the grounds that it would obtain an identified model at the cost of losing the least amount of useful theoretical information.

LISREL also has an advantage over the more traditional procedures in that it estimates measurement error and, because of its simultaneous estimation procedures, allows explicit incorporation of such error in the structural model. The measurement model for the endogenous variables is shown in Figure C.[3]

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Insert Figure C About Here
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Since a one-item measure was used to indicate SN, λ_8 and ε_8 must be constrained to be equal to one and zero, respectively. (The equations are shown in the appendix.) Like the structural model, the measurement model was specified a priori from the theory.[4] More specifically, Fishbein's contention that his is an unweighted additive model (Fishbein and Ajzen 1975, pp. 229-235) implies that the λ_i elements in Figure 3 be constrained to equal 1. This is an empirical question. Consequently, the model using estimated λ_i values will be compared to one with all λ_i equal to 1.

Data Check

Before proceeding to the experiment, these data were examined to see if they produced results consistent with those from the extensive body of correlational evidence. Correlational results adjusted for experimental effects are shown in Table 2. The within-cell correlation matrix shows considerable

Insert Table 2 About Here

pairwise covariation. The within-cell regression using Equation 1 (Aact and SN to predict BI) produced results (R^2 = .51) consistent with previous correlational studies (see reviews by Ajzen and Fishbein 1973; Ryan and Bonfield 1975; Farley, Lehmann, and Ryan in press). The prediction of BI from $\Sigma B_i a_i$ and $\Sigma NB_j MC_j$ produced an R^2 of .29 which suggests that, consistent with the theory, Aact and SN are better predictors. Whichever set of predictors (Aact and SN or $\Sigma B_i a_i$ and $\Sigma NB_j MC_j$) were used, the beta weights suggest that the social influence variable predominates. When all four predictors were used, R^2 increased to .72 and, consistent with the theory, b_2 and b_3 became nonsignificant, thus supporting Equation 1 as producing a more parsimonious fit. These findings suggest that these data are typical--for example, that nonsalient beliefs were not included and salient beliefs were not excluded--and that further tests are appropriate.

RESULTS

Measurement Model Fit

A correlation rather than a covariance matrix was analyzed because these data are cross-sectional, no comparisons are made across populations, and the matter of interest is the relative strengths of the paths, not the predicted value of BI. Model testing began by comparing the overall goodness-of-fit statistic for the model when λ_i was estimated ($\chi^2_{114} = 198.16$) to the fit obtained when λ_i was constrained to equal 1($\chi^2_{124} = 216.28$). Following the procedure suggested by Bentler and Bonett (1980), the difference between these two χ^2 values ($\chi^2_{10} = 18.44$), adjusted for differences in degrees of freedom, was statistically significant ($p < .05$). This finding suggests that the model utilizing estimated λ_i values is superior. Consequently, the detailed results, shown in Table 3, are for the model using unequally weighted construct indicators.

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Insert Table 3 About Here

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Since the measurement errors (ε_i) and structural disturbance (ζ_i) estimates have little absolute meaning, they were used to calculate more familiar reliability estimates (Werts, Linn, and Jöreskog 1974) and shared variance proportions (Stewart and Love 1968). Measures fixed to unit variance, in order to serve as reference indicators, do not have critical ratio values. The critical ratios are distributed normally, and hence any values greater than 1.65 (one-tailed) are statistically significant at the .05 level.

The measurement model results indicate that the constructs are well specified. The reliability estimates for each endogenous construct, which are identical to Cronbach's (1951) alpha, exceed acceptable values. The more conservative proportions of variance extracted, which indicate the percentage of variance in the constructs accounted for by the measures, are more revealing. Whereas the majority of measurement variance is accounted for by each of the four variables for which multiple measures were available, the multiplicative variables ($\Sigma \underline{B}_i \underline{a}_i$ = .63, $\Sigma \underline{NB}_j \underline{MC}_j$ = .62) explained a smaller amount of measure variance than did the others (Aact = .88, BI = .81). While the individual measure reliabilities and loadings (λ_i) are uniformly high for the Aact and BI indicators, there is more variation among the multiplied variable indicator reliabilities and loadings. This result is to be expected, as the bipolar adjectives composing the Aact and BI instruments are meant to be parallel form items. On the other hand, the weighted beliefs that compose $\Sigma \underline{B}_i \underline{a}_i$ and $\Sigma \underline{NB}_j \underline{MC}_j$, while meeting the consistency presumption of the latent variable technique, are composites based on distinct outcomes and referents. It is interesting to note that the price belief, which was directly manipulated, was the least reliable and contained the smallest measure variance accounted for by cognitive structure ($\Sigma \underline{B}_i \underline{a}_i$).

Causal Model Fit

Turning to the causal model results, the proportions of shared variance are separated into those for the structural model, which assume perfect measurement, and those for the total model, which reflect the inclusion of measurement error. These proportions, which are goodness-of-fit indicators, show the amount of variance in the variables accounted for by their respective predictors contained in Equations 4 through 8 (see Appendix). The dichotomous scoring of the exogenous variables (CI, NI) may account for the lower predictive ability of Equations 1 and 2 when perfect measurement is assumed. The differences in shared variance attenuations for the total model are a direct reflection of the differing amounts of measurement error.[5] In each case the explained variance is large enough to suggest that the data fit the model very well.

With the exception of the path from Cognitive Information to $\Sigma B_i a_i$ (γ_{11}), all path coefficients were statistically significant. An overall goodness-of-fit was obtained for a model with γ_{11} constrained equal to zero (χ^2_{115} = 199.25), which was not statistically different (χ^2_1 = 1.09) from the full model. This indicates that dropping γ_{11} does not produce a better fit. Given the strong prior theory and weak empirical disconfirmation, γ_{11} was retained in the model.

Having decided that unequally weighted measures and all estimated path coefficients best represent the model proposed in Figure B, attention now turns to how well the total model fits the data. The overall goodness-of-fit statistic, shown in Table 4, suggests the model does not sufficiently explain

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all observed sample covariances (χ^2_{114} = 198.16, $p < .001$). However, the use of the χ^2 as an absolute index of fit is open to question, and there is some agreement that it be used as a guide rather than as a rule (see review by Bentler 1980). For example, the present laboratory study uses a typically small sample, whereas the χ^2 probability value is more appropriate for large samples. In fact, there are two considerations that indicate the proposed model is adequate. First, following the precedent set by Maruyama and McGarvey (1980), the mean absolute value of the differences between the data and model-reproduced correlation matrix (excluding diagonal elements) was .051, whereas the mean correlation was .541. Thus, the discrepancies between observed and predicted relations are small. Second, following Bentler and Bonett's (1980) suggestions and the precedents set by Bentler and Speckart (1979, 1981), data fit comparisons (shown in Table 4) were made for competing theoretical models. In essence, the less restricted models (1a, 1b, and 1c) removed the crossover paths to produce models more in line with that represented in Figure A. In all three cases, the χ^2 values became larger, suggesting poorer fits than the proposed model. The differences were also statistically significant. On the other hand, more restricted models (1d, 1e, and 1f), which added more crossover paths to the proposed model while lowering the χ^2 values, did not produce statistically significant fit differences. Thus, theoretical competing models are ruled out.

Findings Concerning Variable Relationships

Since the proposed model, represented in Figure B, was supported, the standardized path coefficients for the causal model (Table 3) are of interest. The low weight estimated for γ_{11} (.10) indicates that the exogenous variable Cognitive Information had a small effect on Cognitive Structure ($\Sigma B_i a_i$) relative to the effects of Normative Information (γ_{12} = .29) and Normative Structure (β_{12} = .50). Thus, the manipulation of Normative Information (NI) and formation of Normative Structure both had stronger effects on Cognitive Structure than did the manipulation of its direct antecedent, Cognitive Information

(CI). On the other hand, Normative Structure ($\Sigma NB_j MC_j$) had approximately equal relationships with its hypothesized causes (γ_{21} = .33, γ_{22} = .29, and β_{21} = .22), with Cognitive Information (γ_{21} = .33) having a slightly stronger effect. Thus, the expected crossover effects were present and, surprisingly, the largest role of Cognitive Information was its influence on Normative Structure ($\Sigma NB_j MC_j$), whereas Normative Information equally influenced Cognitive Structure ($\Sigma B_i a_i$) and Normative Structure. These findings are tempered by the unreliable measure of the price belief, which was the directly manipulated belief in attitudinal structure.

The standardized weights involving exogenous variables ($\overline{\gamma}_{ii}$ = .25) are generally smaller than those representing endogenous variable relationships ($\overline{\beta}_{ii}$ = .48). These differences may be due to the attenuating effects of the CI and NI binary scoring. The weights involving the exogenous variables (γ_{ii}) also serve as an experimental manipulation check (Bagozzi 1977). The fact that the best-fitting model contained all γ_{ii} paths provides strong evidence that main and interactive experimental effects were present.

Turning to the endogenous variables, the relationship between the attitudinal variables (β_{41} = .31) is weaker than that obtained for the normative variables (β_{32} = .75). In addition, Normative Structure more strongly affected attitude (β_{42} = .63) than did Cognitive Structure (β_{41} = .31). Thus, Aact appears to be more strongly related to normative than to attitudinal variables. On the other hand, SN was not related to attitudinal variables, as the addition of paths indicating such relationships (model le in Table 4, β_{31} critical ratio = .74) did not improve the fit. Whereas the normative variables were expected to predominate the prediction of Behavioral Intention (BI), both Aact and SN weights were approximately equal (β_{54} = .45, β_{53} = .48).

However, viewing the latter result in isolation is misleading. When taken together, the results from the entire model suggest that CI and NI influence BI, and that the effects of both are mediated to a greater extent by normative than by attitudinal variables.

CONCLUSION

It seems clear from the findings that behavioral intention is a function not of parallel and independent sets of attitudinal and normative variables but of a rather complex set of interdependencies. The complex influences that were found are consistent with Ajzen and Fishbein's writings. The specific finding--that normative variables were stronger mediators than attitudinal variables of the experimental effects of cognitive and normative information on intentions--is of minor importance by itself. The result follows the expectation that an expert informant's endorsement would influence subjects' organization of new information about an unfamiliar brand. More to the point, this finding is apt to be situation-specific and will take on important meaning when it can be viewed with the results from studies conducted in different situations (cf. Bentler and Speckart 1981). What is important is that this first test of the complete Fishbein and Ajzen intention formation paradigm reveals complex interdependencies among attitudinal and normative variables. Three important implications emerge.

First, previous methods used to test aspects of this theory, based on independent ordinary least squares tests of models derived from Equations 1, 2, and 3, do not provide the depth of analysis necessary to explore the theoretical network. Given the availability of techniques such as the one used in this paper, the central equations seem to have outlived their purpose. In addition to the demonstrated advantages of path analytic procedures (see also Dickson and Miniard 1978), LISREL also explicitly accounts for measurement error which, if present and not acknowledged, can bias the structural model. Few of the previous studies investigating this theory have reported reliability estimates or used multiple-item measures, much less incorporated measurement error into the test. In the few exceptions where reliabilities have been reported (e.g., Ryan and Bonfield 1980), they have been high. Yet, despite the high reliabilities reported in this study, measurement error did influence the structural model results. An investigation of the effects of measurement error on SN awaits the development of multiple indices.

The second implication follows directly from the first--namely, past studies which supported the theory either by manipulating the situation (e.g., Ajzen and Fishbein 1970) or by a priori predicting attitudinal or normative variable predominance (e.g., Wilson, Mathews, and Harvey 1975) should be called into question. Ryan and Bonfield (1980) found that fewer respondents who scored low on normative and high on attitudinal beliefs or vice versa performed an overt behavior than those who scored either high or low on both measures. It seems there is much we do not know about the complex effects of attitudinal and normative variables. Previous studies, using simpler methods that did not account for simultaneous relationships, should be used as points of departure by future researchers.

Third, once the attitudinal-normative variable interdependencies are acknowledged, the question arises as to whether or not they should have been considered as separate variables in the first place. Perhaps attitudinal and normative beliefs, since they are both perceptual, should be considered as elements comprising a single cognitive structure. The distinct but related position taken in this paper has more to do with type of data and a priori model specification than with the findings. The test for discriminant validity, that the proportion of variance accounted for by the construct exceeds the shared variance in the structural model (Fornell and Larcker 1981), is barely met ($\Sigma \underline{B_i a_i}$ - .63 > .60; $\Sigma \underline{NB_j MC_j}$ - .62 > .47; Aact - .88 > .78; BI - .81 > .71). However, the variables themselves were operationalized in a situation where they were not expected to be independent; thus, more relevant evidence should be expected in situations where independence is theoretically appropriate (see discussion by Fishbein and Ajzen 1981). Holbrook (1981) has used techniques such as conjoint analysis in conjunction with path analysis, to which the present data are not amenable, as a way of exploring the mediating effects of beliefs. Such techniques, when combined with structural methods that incorporate measurement error, may shed additional light on the nature of attitudinal and normative belief interdependency.

The present study did not include behavior, although three studies which employed structural modeling did include it (Bentler and Speckart 1979, 1981; Bagozzi in press). Bentler and Speckart (1980) found that behavior was directly influenced by attitudes and previous behavior, in addition to being mediated by intentions. Their study did not include attitudinal or normative beliefs. Bagozzi (in press) found that intentions did mediate the attitude-behavior relationship and that past behavior attenuated the attitude-intention relationship. His study did not include normative variables. The previously cited Ryan and Bonfield (1980) study did not employ simultaneous estimation procedures, nor did it include SN. Each of these three studies, together with the present research, has attempted more complex modeling of the basic theory proposed by Fishbein and Ajzen. In addition, Bentler and Speckart (1979) have shown, consistent with Fishbein and Ajzen's theory, that the effects of attitude and intention on behavior may depend on the substantive domain under consideration. However, a simultaneous test of the relationships among all of the theory's major variables has yet to be carried out. Continued research along these lines is needed for both the development of the basic theory and its applications to other research areas which are currently appearing in the literature (e.g., Mitchell and Olson 1981; Crosby and Taylor 1981).

FOOTNOTES

[1]Fishbein and Ajzen (1975) have recently changed their algebraic symbols. Although some of their new notation appears in recent research (e.g., Miniard and Cohen 1979), it is inconsistent with the notation used in the majority of published empirical studies. The new notation also equates attitudinal (B_i) and normative (NB_j) beliefs by using the same notation (B_i) for both. Since a conceptual distinction is maintained between these beliefs and their respective outcomes and referents, consistency suggests that they also be distinguished symbolically. For these reasons the new notation appears confusing, and the original model symbols were used in this paper.

[2]For a discussion of the role of vagueness and ambiguity in theory construction, see Kaplan (1964).

[3]Since the exogenous variables (_CI_ and _NI_) are merely dichotomous levels of information, each produced by an experimental manipulation, they have no measurement model (see Appendix).

[4]Fishbein and Ajzen view belief structure as a composite and allow for inconsistent beliefs, whereas the latent variable specification presumes consistency. The present operationalization does produce consistent beliefs.

[5]For an interesting discussion of the relationships among reliability, extracted variance, and goodness-of-fit, see Fornell and Larcker (1981).

Table 1

Elicited Outcomes and Referents

B_i Outcomes		
	B_1	Price or Economy
	B_2	Taste or Flavor
	B_3	Cavity or Decay Prevention
	B_4	Fresh, Pleasant Breath
NB_j Referents		
	NB_1	Dentist
	NB_2	Children
	NB_3	Husband

Table 2

Correlational Results

Pooled Within-Cell Correlation

	BI	$\Sigma B_i a_i$	Aact	$\Sigma NB_j MC_j$
$\Sigma B_i a_i$	.42			
Aact	.57	.66		
$\Sigma NB_j MC_j$	.51	.52	.69	
SN	.68	.40	.60	.55

Pooled Within-Cell Regression

BI	Aact	$\Sigma B_i a_i$	SN	$\Sigma NB_j MC_j$
R^2	b_1^*	b_2^*	b_3^*	b_4^*
.51 $p<.001$	.25 $p<.001$		.53 $p<.001$	
.29 $p<.001$		.22 $p<.001$		.40 $p<.001$
.72 $p<.001$	.51 $p<.001$	.06 $p<.46$	.51 $p<.001$	.09 $p<.44$

*standardized regression coefficients.

Table 3

Parameter Estimates, Critical Ratios, Reliabilities, and Variance Proportions

Causal Model

Exogenous Paths	Standardized Weights	Critical Ratios
γ_{11}	.10	1.03
γ_{21}	.33	3.45
γ_{12}	.29	2.62
γ_{22}	.29	2.92
Endogenous Paths		
β_{12}	.50	5.10
β_{21}	.22	5.10
β_{32}	.75	7.81
β_{41}	.31	2.47
β_{42}	.63	4.98
β_{53}	.45	4.74
β_{54}	.48	4.88

Proportions of Shared Variance

	Structural Model	Total Model
1. $\Sigma B_i a_i$	.60	.36
2. $\Sigma NB_j MC_j$	.47	.29
3. SN	.67	
4. Aact	.78	.69
5. BI	.71	.50

Measurement Model

		Standardized Factor Loadings	Critical Ratios	Reliabilities	Proportions of Variance Extracted
$\Sigma B_i a_i$				.87	.63
	Price	(λ_1) .57		.32	
	Taste	(λ_2) .89	5.49	.79	
	Decay	(λ_3) .75	5.00	.56	
	Breath	(λ_4) .91	5.55	.83	
$\Sigma NB_j MC_j$				.83	.62
	Dentist	(λ_5) .86		.74	
	Children	(λ_6) .67	6.69	.68	
	Husband	(λ_7) .82	8.92	.66	
Aact				.97	.88
	foolish-wise	(λ_9) .93		.83	
	good-bad	(λ_{10}).98	19.00	.96	
	harm-beneficial	(λ_{11}).94	15.79	.88	
	reward-punishing	(λ_{12}).91	14.30	.83	
BI				.93	.81
	likely-unlikely	(λ_{13}).83		.69	
	improbable-probable	(λ_{14}).94	11.38	.91	
	possible-impossible	(λ_{15}).90	10.56	.83	

Table 4

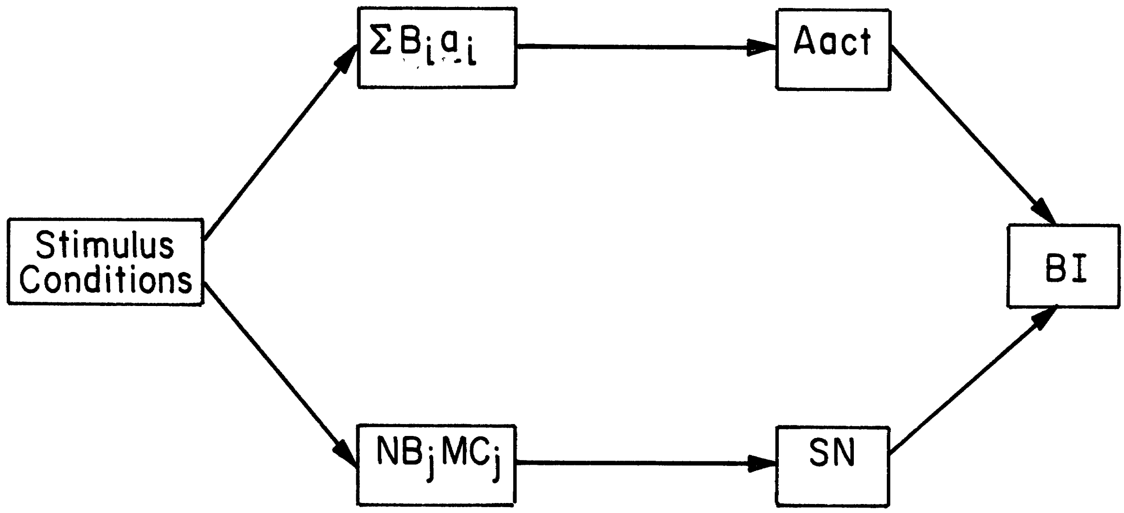
Chi-Square Goodness-of-Fit Tests for Variants of the Proposed Model

Model	d.f.	χ^2
1. Proposed (Fig. B)	114	198.16***
Less restricted:		
1a. Without β_{42}, β_{12}	116	259.91***
1b. Without β_{42}	115	219.68***
1c. Without β_{12}	115	226.77**
More restricted:		
1d. With β_{43}, β_{31}	112	194.22***
1e. With β_{43}	113	195.20***
1f. With β_{31}	113	197.71**
Parameter significance tests		
1 vs. 1a.	2	61.75***
1 vs. 1b.	1	21.52***
1 vs. 1c.	1	28.61***
1 vs. 1d.	2	3.94
1 vs. 1e.	1	2.96
1 vs. 1f.	1	.45

*$p < .05$

**$p < .01$

***$p < .001$



Stimulus Conditions
ΣB_i a_i
NB_j MC_j
Aact
SN
BI

FIGURE A

FISHBEIN'S INTENTION FORMATION PARADIGM

Note: Adapted from Ajzen and Fishbein (1975, p. 334)

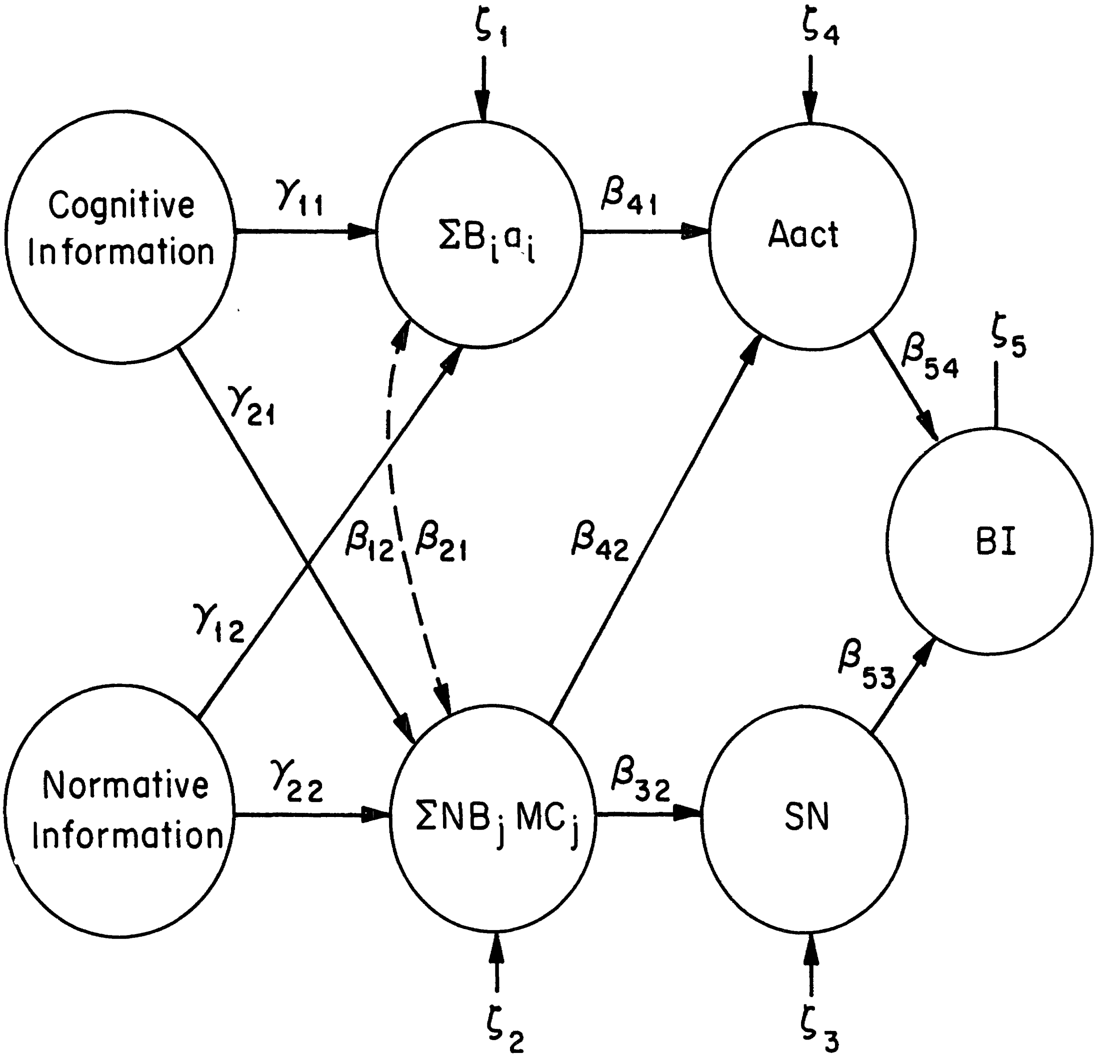
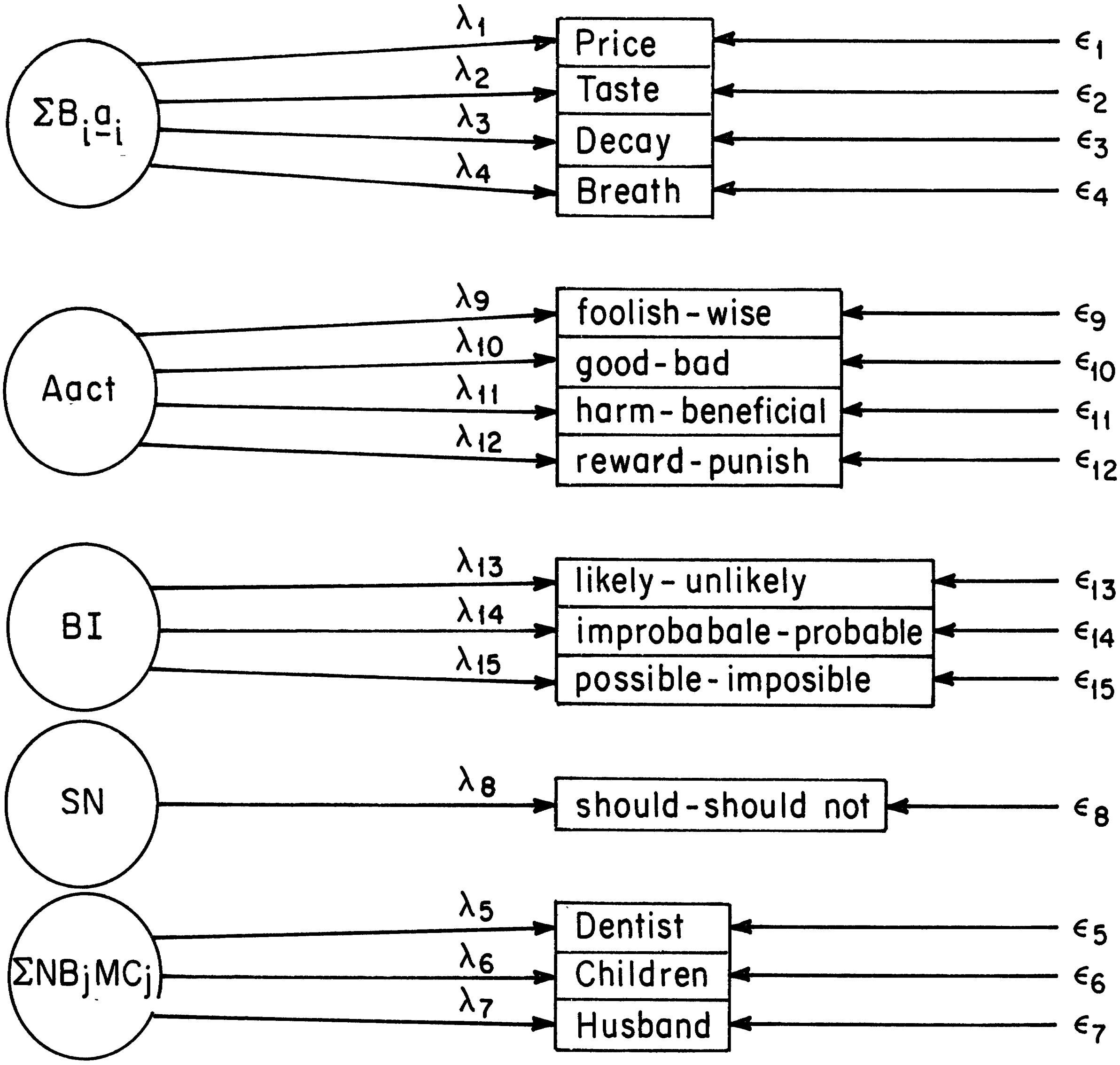

ζ1
ζ4
Cognitive Information
γ11
ΣBiai
β41
Aact
γ21
β54
ζ5
β12
β21
β42
BI
γ12
β53
Normative Information
γ22
ΣNBj MCj
β32
SN
ζ2
ζ3

FIGURE B

PROPOSED INTENTION FORMATION STRUCTURAL MODEL

Where: γ_{ii}, β_{ii} = standardized path coefficients, and

ζ_i = error terms (residual variances).



$\Sigma B_i \underline{a}_i$
Aact
BI
SN
$\Sigma NB_j MC_j$
λ_1
λ_2
λ_3
λ_4
λ_9
λ_{10}
λ_{11}
λ_{12}
λ_{13}
λ_{14}
λ_{15}
λ_8
λ_5
λ_6
λ_7
Price
Taste
Decay
Breath
foolish - wise
good - bad
harm - beneficial
reward - punish
likely - unlikely
improbabale - probable
possible - imposible
should - should not
Dentist
Children
Husband
ϵ_1
ϵ_2
ϵ_3
ϵ_4
ϵ_9
ϵ_{10}
ϵ_{11}
ϵ_{12}
ϵ_{13}
ϵ_{14}
ϵ_{15}
ϵ_8
ϵ_5
ϵ_6
ϵ_7

FIGURE C

INTENTION FORMATION MEASUREMENT MODEL

Where: ε_i = endogenous variable measurement errors, and

λ_i = standardized path coefficient between an observed indication and respective endogenous variable.

APPENDIX

The equations from Figure 2 appear as follows:

4. $\underline{\Sigma B_i a_i} = f(\underline{CI}, \underline{NI}, \underline{\Sigma NB_j MC_j})$

5. $\underline{\Sigma NB_j MC_j} = f(\underline{CI}, \underline{NI}, \underline{\Sigma B_i a_i})$

6. $\underline{SN} = f(\underline{\Sigma B_i a_i})$

7. $\underline{Aact} = f(\underline{\Sigma B_i a_i}, \underline{\Sigma NB_j MC_j})$

8. $\underline{BI} = f(\underline{SN}, \underline{Aact})$

and in matrix form as:

$$\begin{pmatrix} \underline{\Sigma B_i a_i} \\ \underline{\Sigma NB_j MC_j} \\ \underline{SN} \\ \underline{Aact} \\ \underline{BI} \end{pmatrix} = \begin{pmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{pmatrix} \begin{pmatrix} \underline{CI} \\ \underline{NI} \end{pmatrix} + \begin{pmatrix} 0 & \beta_{12} & 0 & 0 & 0 \\ \beta_{21} & 0 & 0 & 0 & 0 \\ 0 & \beta_{32} & 0 & 0 & 0 \\ \beta_{41} & \beta_{42} & 0 & 0 & 0 \\ 0 & 0 & \beta_{53} & \beta_{54} & 0 \end{pmatrix} \begin{pmatrix} \underline{\Sigma B_i a_i} \\ \underline{\Sigma NB_j MC_j} \\ \underline{SN} \\ \underline{Aact} \\ \underline{BI} \end{pmatrix} + \begin{pmatrix} \zeta_1 \\ \zeta_2 \\ \zeta_3 \\ \zeta_4 \\ \zeta_5 \end{pmatrix}$$

Through algebraic manipulation, the equations assume the familiar form of the simultaneous equation model, as follows:

$$\begin{pmatrix} 1 & -\beta_{12} & 0 & 0 & 0 \\ -\beta_{21} & 1 & 0 & 0 & 0 \\ 0 & -\beta_{32} & 1 & 0 & 0 \\ -\beta_{41} & -\beta_{42} & 0 & 1 & 0 \\ & & -\beta_{53} & -\beta_{54} & 1 \end{pmatrix} \begin{pmatrix} \underline{\Sigma B_i a_i} \\ \underline{\Sigma NB_j MC_j} \\ \underline{SN} \\ \underline{Aact} \\ \underline{BI} \end{pmatrix} = \begin{pmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{pmatrix} \begin{pmatrix} \underline{CI} \\ \underline{NI} \end{pmatrix} + \begin{pmatrix} \zeta_1 \\ \zeta_2 \\ \zeta_3 \\ \zeta_4 \\ \zeta_5 \end{pmatrix}$$

$$\beta \qquad \eta \quad = \quad \Gamma \qquad \xi \quad + \quad \mu$$

Where: β = matrix of endogenous weights,
η = vector of endogenous variables,
Γ = matrix of exogenous weights,
ξ = vector of exogenous variables, and
μ = vector of structural model error terms.

APPENDIX (continued)

The equations for the measurement model appear as:

9. $\underline{\Sigma B_i a_i}$ = f(price, taste, decay, breath)

10. $\underline{\Sigma NB_j MC_j}$ = f(dentist, children, husband)

11. $\underline{SN}$ = f(should)

12. $\underline{Aact}$ = f(wise, good, beneficial, rewarding)

13. $\underline{BI}$ = f(likely, probable, possible)

and in matrix form as:

$$\begin{pmatrix} \text{price} \\ \text{taste} \\ \text{decay} \\ \text{breath} \\ \text{dentist} \\ \text{children} \\ \text{husband} \\ \text{should} \\ \text{wise} \\ \text{good} \\ \text{beneficial} \\ \text{rewarding} \\ \text{likely} \\ \text{probable} \\ \text{possible} \end{pmatrix} = \begin{pmatrix} \lambda_{y11} & 0 & 0 & 0 & 0 \\ \lambda_{y21} & 0 & 0 & 0 & 0 \\ \lambda_{y31} & 0 & 0 & 0 & 0 \\ \lambda_{y41} & 0 & 0 & 0 & 0 \\ 0 & \lambda_{y52} & 0 & 0 & 0 \\ 0 & \lambda_{y62} & 0 & 0 & 0 \\ 0 & \lambda_{y72} & 0 & 0 & 0 \\ 0 & 0 & \lambda_{y83} & 0 & 0 \\ 0 & 0 & 0 & \lambda_{y94} & 0 \\ 0 & 0 & 0 & \lambda_{y104} & 0 \\ 0 & 0 & 0 & \lambda_{y115} & 0 \\ 0 & 0 & 0 & \lambda_{y125} & 0 \\ 0 & 0 & 0 & 0 & \lambda_{y136} \\ 0 & 0 & 0 & 0 & \lambda_{y146} \\ 0 & 0 & 0 & 0 & \lambda_{y156} \end{pmatrix} \begin{pmatrix} \underline{\Sigma B_i a_i} \\ \underline{\Sigma NB_j MC_j} \\ \underline{SN} \\ \underline{Aact} \\ \underline{BI} \end{pmatrix} + \begin{pmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \\ \varepsilon_5 \\ \varepsilon_6 \\ \varepsilon_7 \\ \varepsilon_8 \\ \varepsilon_9 \\ \varepsilon_{10} \\ \varepsilon_{11} \\ \varepsilon_{12} \\ \varepsilon_{13} \\ \varepsilon_{14} \\ \varepsilon_{15} \end{pmatrix}$$

$$y = \Lambda_y \eta + \varepsilon$$

Where: y = vector of measurement scores,
Λ_y = matrix of weights,
η = vector of endogenous variables, and
ε = vector of endogenous measurement errors.

APPENDIX (continued)

There is no measurement model for the exogenous variables because they involve only 0 or 1 weighted experimental manipulations and errors set at 0, as follows:

14. CI = f(cognitive belief manipulation)

15. NI = f(normative belief manipulation)

and in matrix form as:

$$\begin{pmatrix} \text{cognitive belief manipulation} \\ \text{normative belief manipulation} \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} \underline{CI} \\ \underline{NI} \end{pmatrix} + \begin{pmatrix} 0 \\ 0 \end{pmatrix}$$

$$X = \Lambda_x \quad \xi + \delta$$

Where: X = vector of two experimental treatments,
Λ_x = matrix representing the presence or absence of the two treatments,
ξ = vector of exogenous variables, and
δ = vector of exogenous measurement errors.

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