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AN INVESTIGATION OF THE STRUCTURE OF EXPECTANCY-VALUE ATTITUDE AND ITS IMPLICATIONS

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Abstract

The purpose of this study was to investigate the structure of expectancy-value attitude and the implications of its representations. Expectancy-value attitude was represented as a cognitive network of vertically and horizontally interconnected judgements, using a structural equation modeling. Results suggested that a structural representation of expectancy-value attitude gave a better fit with the data than existing representations. Two implications of this representation were tested: (1) for understanding the effects of expectancy-value attitude, and (2) for predicting the dynamics of attitude change. The estimated effects of expectancy-value attitude were not affected by its representations. However, the expectancy-value structure was useful for predicting attitude change since an ad mentioning one belief affected other beliefs connected with the mentioned belief.

An Investigation of the Structure of Expectancy-Value Attitude and Its Implications

1. Introduction

The traditional expectancy-value (EV) model represents EV attitude as the sum of belief-times-evaluation products ($\sum B_i a_i$): where B_i is a person's belief that an act will lead to outcome i; a_i is the evaluation of outcome i (Ajzen and Fishbein (1980), and Fishbein and Ajzen (1975)). Individual beliefs and evaluations of the person are hypothesized to map into a single summary representation through a process of aggregation. Recently, however, several researchers have challenged this aggregated, unidimensional representation on several theoretical grounds (e.g., Bagozzi (1982, 1985), and Burnkrant and Page (1988)).

One criticism might be that it does not consider the possibility that some of expectancy-value judgments may be interdependent; in fact, interrelationships among product attribute beliefs have often been observed (Bagozzi (1982)). It can also be argued that cognitive elements regarding the consequences of a particular behavior may be qualitatively different, variable in significance, and not necessarily organized into a single, coherent cognitive unit (Shimp and Kavas (1984)). Research in cognitive psychology suggests that cognitive judgements are stored in memory in the form of a network, with the nodes in this network corresponding to word concepts, and the associative links to conceptual relationships among these concepts (Collins and Loftus (1975), and Anderson (1983)).

What are the implications of interrelationships and structures of cognitive elements for EV representation? Beliefs are likely to exist as a network of interconnected elements forming EV, and their relationships will differ according to one's experience. The traditional EV model, wherein EV is obtained simply by adding the expectancy-value

elements, does not capture such interdependence. This points to a need for an alternative EV model and raises the question: What is an alternative representation of EV?

The first purpose of this study is to suggest a structural representation of EV that can account for interdependences among attributes. An interdependence EV (int-EV) model is proposed for this purpose. This model represents EV as a cognitive network by exposing interrelations and substructures among attributes. We will examine various types of interdependence and compare the proposed EV model with existing EV models.

What are the implications of such structural representations of EV? Why is EV interdependence relevant to the marketing theory and practice? While some recent studies focused on the structure of EV attitude (e.g., Bagozzi (1981, 1982), and Oliver and Bearden (1985)), they did not fully explore the consequences of such representations. The second purpose of this study is therefore to draw out and test the implications of EV representation for understanding attitude formation and change.

Two implications of EV representation are examined: (1) static implications for understanding the relationships of EV with other concepts and (2) dynamic implications for predicting changes in EV components. Specifically, the study examines how EV representations affect the observed relationships between EV and behavioral intentions (BI), and what insights EV representations provide for predicting effects of a persuasive attempt.

2. Existing EV models

We can identify three types of expectancy-value (EV) models in previous research: the traditional EV model, the modified unidimensional EV model, and the multidimensional EV model. These models are briefly reviewed in this section.

2. 1. The traditional EV model

The traditional EV model has dominated past studies (Fishbein and Ajzen (1975), and Lutz (1975, 1977)). As Fig. 1A indicates, this model defines EV to be $\sum B_i a_i$, a unidimensional representation of aggregated beliefs about and evaluations of the consequences of an act. Individual beliefs or evaluations lose their meaning to a certain extent, since different beliefs and evaluations can give the same overall sum. Measurement errors are not modeled explicitly, and reliability cannot be assessed (except for test-retest reliability). Furthermore, it is difficult to assess the construct validity of the traditional EV model, and most validations have been done through examination of only predictive validity (Wilkie and Pessemier (1973)).

Fig. 1 about here

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2. 2. The modified unidimensional EV model

The modified unidimensional EV (mod-EV) model, suggested by Bagozzi (1981, 1982, 1983), regards EV attitude as unidimensional, but it retains the identity of individual belief-times-evaluation products. In this model, EV is treated as a unidimensional latent variable, and all belief-times-evaluation products are treated as its indicators. As shown in Fig. 1B, each expectancy-value measure ($B_i a_i$) is a function of measurement error as well as a latent variable (EV), where we have assumed that there are eight $B_i a_i$ products for the sake of illustration. In this model, various forms of reliability can be computed, and construct validity can be assessed.

2. 3. The multidimensional EV model

The multidimensional EV (mul-EV) model treats each expectancy-value measure as a separate indicator of a single latent variable (EV), but it permits multidimensionality so that different subsets of belief-times-evaluation products serve as indicators of subdimensions (EV_i) (Bagozzi (1982, 1983)). In Fig. 1C, for example, B_1a_1 and B_2a_2 are measures of

the same construct (EV_1). Each subdimension (EV_i), which is a latent variable, is also construed as an indicator of a higher-order latent variable (EV).[1]

The multidimensional EV model incorporates the interdependence information by using a hierarchical structure, but it permits only one type of interdependence (i.e., measures of the same concept). It is argued herein that this model is not complete since it does not consider other types of interdependence such as causal relationships, ecological correlation, and sharing a common antecedent, which will be discussed in the next section.

3. An interdependence EV model and hypotheses

The basic motivation for this study is a view that there may be interdependences (or perceived correlations) among product attributes. In order to understand sources of interdependence, let us examine several types of interdependence among attributes: causally related attributes, attributes measuring the same concept, ecologically correlated attributes, and attributes sharing a common antecedent. Fig. 2 illustrates these types of interdependence among attributes.

Fig. 2 about here

The first type of interdependent attributes consists of causally related attributes. If, for example, consumers believe that reliability of a car will reduce maintenance costs, "reliability" and "maintenance costs" will be negatively associated in a causal sense. Correlations among attributes due to causal relations among them have often been mentioned (Bagozzi (1982), and Srinivasan, Abeele, and Butaye (1982)), but their effects on the representation of EV have seldom been studied.

A second type of interdependence comprises semantically correlated attributes, which measure the same concept or super-ordinate attribute. This type of interdependence provides a basis for representing a hierarchy of attributes or vertical structure. A hierarchy

of attributes may occur because people abstract information from several definitionally correlated attributes. Suppose attributes 3 and 4 in Fig. 2 are "gas mileage (mpg)" and "fuel economy." Then, EV responses to these attributes will be correlated since they are likely to mean the same thing to the consumer. Note that the multidimensional EV model uses this type of interdependence to describe correlations among attributes.

Another type of interdependence is ecological correlation (see Type III in Fig. 2). In this case, responses to attributes are not causally related, nor do they represent the same underlying concept, but rather they happen to be correlated by environmental characteristics. For example, "European" and "prestigious" are likely to be associated with each other, since many European cars (e.g., Rolls Royce, Mercedes, Volvo, etc.) have been prestigious over the years.

Still another type of interdependence comes from sharing a common antecedent. In Type IV of Fig. 2, reactions to attributes 7 and 8 (comfort and safety) have a common antecedent (size) that is exogenous to the EV attitude. For example, the size of a car might not be considered important by consumers by itself, and consequently may not be among the salient attributes of an automobile. Yet, the size of a car might influence one's perceptions of overall comfort as well as safety. In this case, perceptions of "overall comfort" and "safety" are interdependent because of their dependence on a common antecedent.

It is asserted in this paper that a model of EV attitude should take into account such interdependence among product attribute judgments. *An interdependence EV model* will be used to refer to a model that explicitly incorporates these various types of interdependence and represents expectancy-value judgments as a network-like structure. Thus, EV judgements in an interdependence EV model are vertically interrelated via a hierarchy of attributes, and horizontally connected among elements at the same level of abstraction. Then, the questions is: How valid is this representation? To answer the question, we will look at the convergent validity of the interdependence EV model.

3. 1. Validity of interdependence EV representation

The interdependence EV (int-EV) model looks deeply into the EV construct and exposes the underlying substructures. Strictly speaking, the traditional EV model is not a cognitive *structure* , since it maps onto a single value and thus fails to reveal the structure of attitude. The interdependence EV model is indeed a cognitive *structure* in that it contains information about substructures and their relationships. This representation of EV is consistent with an associative network model of memory (Anderson (1983)). In the associative network model, nodes represents concepts, and links are associations among the concepts. Analogously, in the int-EV model, nodes correspond to attributes or factors, and links correspond to interdependences among attributes or factors. Since the interdependence EV model provides a more explicit representation of the cognitive structure, it should achieve higher convergent validity than existing EV models. Convergent validity in this study is assessed by examining convergence among multiple measures (Bagozzi (1982)). Since it is difficult to assess the convergent validity of the traditional EV model which uses a single measure without any measurement error, no direct comparison is made with the traditional EV model.

H1: The interdependence EV model will achieve higher convergent validity than the modified unidimensional EV or multidimensional EV models.

3. 2. Implications of EV representation

What are the implications of representing EV as a cognitive network? What can we gain by using such structural representations of EV attitude? These questions are addressed in two aspects: 1) understanding EV effects on behavioral intentions and 2) predicting dynamics of belief change.

3. 2. 1. Effects of EV on behavioral intention (BI)

What would be the consequences of using traditional representation of EV, when EV in fact exists as a cognitive network? It has been claimed that treating measures of multidimensional constructs as if they are unidimensional representations can lead to invalid

predictions (Bagozzi (1983)). This study will empirically test such possibilities in the context of understanding EV effects.

What are the effects of EV on behavioral intentions (BI)? Existing findings as to the effects of EV on BI are mixed. Traditional EV researchers have viewed that EV (cognition) influences BI (conation) only indirectly though its effects on A-act (affect) especially in the high involvement situations, which has been supported in many studies (Fishbein and Ajzen (1975), and Lutz (1977)). An alternative view is that affect does not completely mediate the effects of cognitions (EV) on intentions; this may occur because cognitions are frequently too complex, and the cognitive processing capacities too imperfect for cognitions to be completely processed into affect (Schlegel and DiTecco (1982) and Liska (1984)). This view suggests that EV cognitions can affect intentions directly; the direct effects of EV have been supported by some researchers (e.g., Bagozzi (1982)).

How can one explain these conflicting findings? A possible answer comes from considering EV representations. Since many traditional EV researchers have adopted a single summary representation of EV, one can attribute the insignificant direct effect of EV found by them to the coarse-grained representation of EV. The traditional EV model also assumes that measurement error in $\sum B_i a_i$ is negligible. To the extent this assumption is violated, the observed relationship between EV and BI will be generally attenuated. As a result, a direct path from EV to BI is less likely to be observed under a traditional EV representation. In contrast, the int-EV model, which provides a richer and more reliable description of EV cognitions by considering measurement errors and interdependence, should reveal the direct path from EV to BI better than the traditional EV model.

H2: EV attitude is less likely to show direct effects on behavioral intention (BI) under the traditional EV representation than under the interdependence EV representation.

3. 2. 2. Belief change

What are the implications of interdependence among EV elements for predicting attitude change? Since EV is construed as a interconnected network, a change in one element

would induce changes in other elements. Hence, when an ad changes one belief, other interdependent beliefs are also likely to change. Suppose, for example, an ad emphasizes reliability of a car. The audience's beliefs about reliability will be affected by the ad. But they might also infer beliefs about other attributes such as maintenance costs (Huber and McCann (1982)). As a result, an ad mentioning a belief may indirectly change other beliefs not mentioned in the ad.

Theoretical support comes form the spreading-activation theory positing that when one concept is activated, the activation is likely to spread to other concepts connected with the concept via associative linkages (Collins and Loftus (1975)). When ad recipients are exposed to an ad mentioning an attribute, other connected attributes are likely to be activated as well through the associative network. As a result, people are likely to make inferences about these interdependent attributes (made accessible through spreading activation in cognitive structure), and there will be changes in beliefs about these attributes. Thus, it is hypothesized:

H3: A persuasive communication mentioning a belief will induce changes in other beliefs that are interdependent with the mentioned belief.

4. Method

4. 1. Subjects and test product

The subjects for this study were 120 MBA students and business school staff at a West Coast university in the United States. Each subject was paid $ 5.00 and was given a chance to win $ 100.00.

A product category should be highly involving to subjects, since this study assumes a learning hierarchy of effects so that subjects would give much thought to product attributes (Batra and Ray (1985)). Automobiles were chosen since they were considered important by these subjects, and thus provide the motivation to respond deeply. The test brand was the Hyundai Excel, an imported car from South Korea.

A focus group interview was administered to 20 MBA students (who were not included in the main study) to identify salient beliefs about the product. Eight beliefs that were mentioned by at least 30 % of the individuals were selected as modally salient beliefs underlying attitudes. These include dependability, riding comfort, repair costs, sportiness, ease of maintenance, roominess, style, and durability. These beliefs are similar to those found in previous studies of automobiles (e.g., Farley, Katz, and Lehmann (1978)).

4. 2. Procedure .

Each subject was told a disguised purpose of the study consisting of the evaluation of print ads in pre-production form. After signing a consent form, each subject was given an envelope with four booklets. Each subject was told to complete the booklets in order; once the subject finished a booklet, he or she was asked to move on to the next, and not to refer back to booklets as they were completed.

In the first booklet, subjects were asked for general background information such as their attitude, experience and knowledge about cars in general. They were then asked about pre-exposure attitudinal responses, including beliefs (B_i), evaluations (a_i), attitude toward the act (A-act), subjective norm (SN), and behavioral intention (BI). Next, they filled out questions on several personality variables, which served as filler tasks between the pre-test and post-test to reduce memory effects.

In the next booklet, each subject saw an ad with messages emphasizing either dependability or repair costs. This booklet also contained measures of familiarity, and experience with the test brand. In the final booklet, subjects filled out a post-exposure questionnaire on attitudinal responses, including expectancy-value measures (B_i and a_i). Subjects were then asked to guess the purpose of the study and to write down their guesses.

4. 3. Data collection instruments.

To assess beliefs (B_i) about the consequences of buying the Hyundai Excel, subjects were asked, "Assuming you bought the Hyundai Excel, a new import car, how likely or

unlikely would the following consequence be?" Subjects were asked to estimate the probability that each consequence would occur using 11-point scales, ranging from "very unlikely" (0) to "very likely" (10). Evaluative component (a_i) corresponding to the salient beliefs was measured by asking subjects to evaluate the consequence of each belief item on 11-point bipolar scales ranging from "very bad" (-5) to "very good" (+5).

Attitude toward the act (A-act) was measured on 7-point bipolar scales; they were good/bad, unpleasant/pleasant, harmful /beneficial, and foolish /wise. Subjective norm (SN) was measured with the standard "Most people who are important to me think I should/should not buy" item (Fishbein and Ajzen (1975)). Behavioral intentions (BI) to buy the Hyundai Excel were measured on three-item scales following the question, "What are your chances of buying the Hyundai Excel the next time you need to purchase a car?" The responses were measured on 11-point scales anchored with unlikely /likely, improbable /probable, and impossible /possible.

4.4. Reducing the threats to internal validity.

A number of precautions were taken to protect the validity of the results throughout this research. First, multiple-item measures were taken for the key variables, whenever possible (e.g., attitude toward an act, behavioral intentions, etc.). This allowed us to correct for measurement errors in assessing the theoretical relationships and gave an opportunity to average out random errors. Second, the purpose of the study was disguised to reduce any demand characteristics. Subjects were also asked about the perceived purpose of the study after the experiment to discover any demand characteristics. These results showed that no subjects guessed the real purpose of the study.

Third, half of the multiple response questions were reversed in their direction to eliminate any yea- or nay-saying biases from the responses. This step was especially important since the present study used several multiple-item measures. Fourth, the effects of subjective norm, another antecedent of BI, were controlled for in assessing the effects of EV on BI (Ajzen and Fishbein (1980)). Finally, the data were collected from subjects in

stages, and subjects were not allowed to refer back to their earlier responses. This step was taken to eliminate any contamination due to response consistency biases from test and retest administrations.

5. Results

The hypotheses implied by the interdependence EV model were tested using a structural equation modeling framework. The LISREL VI program was used to analyze the data, and the maximum likelihood fitting function was used to estimate the model (Joreskog and Sorbom (1984)).

5. 1. Interdependence EV structure.

It was hypothesized that EV has an interdependent structure in that subsets of these attributes form distinct dimensions and some dimensions might be associated with others. Preliminary analysis of this possibility suggested that there may be four dimensions underlying the attribute set chosen for this study; they are (1) reliability (i.e., durability and dependability), (2) maintenance costs (i.e., ease of maintenance and repair costs), (3) convenience (i.e., riding comfort and roominess), and (4) appearance (i.e., style and sportiness). That is, attributes within one dimension are interdependent as measures of the same concept (see Type II in Fig. 3); for example, riding comfort and roominess are interdependent as measures of convenience according to the above formulation. Furthermore, two dimensions are likely to be interdependent; i.e., reliability is likely to be causally related to maintenance costs. Thus, four measures of these two dimensions are expected to be interdependent.

The interdependence EV model examined herein is illustrated in Fig. 3A. The interdependence EV model was specified by a set of equations, which are given in Fig. 3B. Each expectancy-value ($B_i a_i$) measure, designated as Y1 to Y8, was a function of an underlying factor (subdimension) and a measurement error. The EV model was estimated

by employing a modified version of higher-order factor analysis.[2] The interdependence EV was represented as a second-order factor, whereas the dimensions of interdependence EV (EV_1 to EV_4) were represented as first-order factors. It was ascertained that the model is identified.

Fig. 3 about here

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5. 1. 1. Convergent Validity.

H1 concerns the convergent validity of the interdependence EV model. Convergent validity was assessed by checking whether the specified EV model provides a satisfactory fit with the observed data (cf. Bagozzi (1983), and Burnkrant and Page (1988)). The fits of the model were assessed with the maximum likelihood ratio X^2 tests, and satisfactory fits were based on the .05 level of significance. Results showed that the int-EV model achieved convergent validity; specifically, the chi-square statistic was X^2 (15) = 22.84, p = .09. Other measures of the overall fit of the model also suggested that the model was satisfactory; the goodness-of-fit index (AGFI)=.92, and the root mean square residual (RMR)=.05.

But is the convergent validity of the int-EV model higher than that of existing EV models? To answer this question, similar analyses were conducted with existing EV representations. Results suggested that existing EV models did not achieve convergent validity: X^2 (20) =207.01, p=.00 (the modified unidimensional EV model); X^2 (16)= 40.46, p <.00 (the multidimensional EV model).

The above analysis suggested support for H1, but a more rigorous test was conducted by a hierarchical model comparison (Joreskog and Sorbom (1984)). Since existing EV models are nested models of the interdependence EV model, a model comparison was made by a X^2 difference (X^2_d) test.[3] First, the interdependence EV model was compared with the multidimensional EV model; the X^2_d was 17.90 with one as the difference in degrees of

freedom, which was significant at the .001 level. Second, the interdependence EV model was compared with the modified EV model; the X^2_d was 184.21 with 5 as the difference in degrees of freedom, which was also significant at the the.001 level. Overall, the findings provide strong support for H1; the interdependence EV model provide significant improvement over existing models in convergent validity of EV measures.

5. 1. 2. Reliability of Measures

In addition to convergent validity, we computed the reliabilities of individual EV items, composite reliabilities of the EV scales, and average variance extracted (AVE) (Werts, Linn, and Joreskog (1974), and Fornell and Larcker (1981)). Table 1 summarizes the results. Although some individual item reliabilities were low, all composite reliabilities were higher than .60, the usual cut-off level, and the average composite reliability is .71. All the AVE measures were greater than .5, which is considered adequate (Fornell and Larcker (1981)). The average AVE was .61, suggesting that approximately more than 60% of variance in the constructs were accounted for by the measures. All factor loadings exceeded .5, a level considered high by researchers (e.g., Green (1978)). Overall, the EV measures were found to be reliable.

Table 1 about here

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5. 2. Implications of EV representation

The second research issue pertains to the impact of EV representation on understanding attitude formation and change. What are the implications of EV representation for predicting the effects of EV on BI? What are the implications of EV representation for predicting belief changes? Results for the hypotheses addressing these questions are reported next.

5. 2. 1. EV effects on BI

H2 predicts that the EV representation will influence the estimate of the direct effect of EV on BI; that is, the direct effect will be underestimated under traditional EV models .

This prediction was tested by comparing the direct effect estimates observed under alternative EV models. In assessing the effects of EV on BI, another important antecedent, SN, was included as a covariate. Table 2 summarizes the findings for testing the impact of the EV representation on the estimates of EV effects. First, the estimates of EV effects on BI were examined under an int-EV model. The direct effect of EV on BI was .16, which was significant at the .05 level. Consistent with the usual predictions, EV had significant indirect effects on BI via A-act; EV had significant effects (.32 with t=3.0) on A-act , which in turn had significant effects (.28 with t=3.6) on BI.

Second, the effects of EV were examined under the traditional EV model. The direct path from EV to BI was significant (.17 with t=2.2). The indirect effects of EV were also significant, with .27 (t=3.5) for the path from EV to A-act and .46 (t=5.1) for the path from A-act to BI. For completeness, similar analyses were done with the modified unidimensional EV model and the multidimensional EV model. As Table 2 shows, all the direct effects were quite similar in their magnitude and significance under different EV representations; different EV representations did not lead to different conclusions as to the direct effects of EV. It can be noted that the effect of SN on BI was also invariant across EV representations, ranging from .51 to .53. In sum, both direct and indirect effects of EV are significant and invariant under alternative EV models, and H2 is not supported.

Table 2 about here

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5. 2. 2. Predicting belief changes

Prior to testing H3, it was necessary to identify interdependent beliefs. The standardized estimate for the interdependence link between EV_1 (reliability) and EV_2 (low maintenance costs) dimensions was .54 (t=4.73, p<.001); suggesting that reliability is causally associated with low maintenance costs as hypothesized in the interdependence EV model. As a result, the four attributes (i.e., dependability, durability, ease of maintenance,

and low repair costs) measuring these two dimensions were found to be interdependent (see Fig. 3A).

The dynamic implications of the network-like EV representation for belief changes were tested by examining the effects of a persuasive attempt on interdependent beliefs. The belief change scores were calculated by the post- minus pre-exposure beliefs for all attributes ($\Delta Bi=B_i^{t2}-B_i^{t1}$, where t1 and t2 indicate pre- and post-exposure occasions, respectively). The results are summarized in Table 3.

Table 3 about here

Recall that subjects saw one of the two types of print advertisements, half of the subjects (n=60) saw the ad emphasizing high dependability, whereas the other half (n=60) saw the ad claiming low repair costs. First, belief changes were examined for the group that saw the ad mentioning dependability. Subjects' beliefs about the mentioned attribute (dependability) were changed significantly after ad exposure ($\Delta B_i=1.25$, $p<.01$). In addition, there were also significant changes in the subjects' beliefs about other attributes (i.e., durability, ease of maintenance, and low repair costs) which were interdependent with the mentioned attribute. Specifically, the belief changes were 1.28 (durability), .68 (ease of maintenance costs), and 1.35 (low repair costs), all of which were significant at the .01 level. There was an unexpected finding as well; there were changes in subjects' beliefs about roominess which was neither mentioned nor interdependent with the mentioned attribute ($\Delta B_i=.48$, $p<.05$). This unexpected finding could be explained by a halo effect (Holbrook (1983)).

Next, belief change scores were assessed for the group that saw ads emphasizing low repair costs. The belief changes for the four interdependent attribute were all significant at the .01 level. Specifically, the belief change scores were .80 (durability), .63 (dependability), .78 (ease of maintenance costs), and 1.58 (low repair costs). Overall, H3 is supported; an ad designed to change a belief influenced clusters of interconnected beliefs.

6. Discussion

In this section, the findings are interpreted in the light of the proposed theoretical framework, and compared with those of other researchers. Their implications for marketing theory and practice are also discussed.

6. 1. EV representation

A structural EV representation, the interdependence EV model, received strong support from the empirical results. An investigation of people's EV reactions provided support for the basic premise of the model that there are interdependences among attributes. It was found that cognitive structure in the EV representation exists as a network of interdependent elements. The interdependence EV model retains information about the structure of EV attitude, rather than collapsing it into a single summary value as has been typically done in the past (Ajzen and Fishbein (1980)). The interdependence EV model achieved convergent validity, which was higher than those of existing EV models such as the modified unidimensional EV model and the multidimensional EV model.[4]

The interdependence EV model is consistent with the associative network model of memory by describing the associations among EV elements as interdependence (Anderson (1983), and Anderson and Bower (1973)). But the interdependence EV model offers an advantage over the associative network model in that it makes different types of associations explicit, whereas the associative network model does not. The types of associations include causal interdependence, semantic interdependence, ecological interdependence, and interdependence from sharing a common antecedent.

This representation is similar to the recent findings that EV has a hierarchical structure with subdimensions (Oliver and Bearden (1984), and Shimp and Kavas (1984)). But the interdependence EV model extends such findings by delineating horizontal structure as well as vertical structure of EV; vertical structure is represented by using superordinate attributes

(or higher-order factors) and subordinate attributes (or lower-order factors), whereas horizontal structure is represented by the interdependence among EV elements at the same level of abstraction.

6. 2. Implications of EV representations

6. 2. 1. Effects of EV on BI

How does EV representation affect the way EV attitude influences behavioral intentions (BI)? This study hypothesized that the representation of EV would affect estimates of these effects. To test this, we compared the effects of EV under various EV models: the traditional EV model, the modified unidimensional EV, multidimensional EV, and interdependence EV models. EV had both direct and indirect effects on BI, but the EV effects did not differ across EV representations. There was no support for the moderating role of EV representation.[5] Even when EV, which in fact existed as a network-like structure, was represented as a single summary value, estimates of and conclusions about the effects of EV on BI were not affected. This finding does not support what researchers predicted as to the consequences of misrepresenting multidimensional EV constructs (Bagozzi (1983)); that is, treating measures of multidimensional constructs as unidimensional did not lead to different predictions of EV effects than otherwise.

Past research specifies that EV (cognition) influences BI (conation) through its effect on A-act (affect) (Fishbein and Ajzen (1975), Ajzen and Fishbein (1980), and Lutz (1977)). But are the effects of EV on BI *all* mediated by A-act? Are there any direct effects of EV on BI?[6] Answers can be found in the present study. This study shows that EV has not only indirect effects on BI through A-act, but also direct effects unmediated by A-act , which has some precedents (e.g., Bagozzi (1982)).

6. 2. 2. Belief changes

A persuasive communication indirectly influenced other beliefs which were not mentioned in the ad but connected with the mentioned belief. This finding fits with out representation of EV. Since EV is a cognitive network of interconnected beliefs, an ad

effect on one belief is expected to bring about changes in other related belief. This is consistent with the spreading-activation theory predicting that when one node is activated, the activation will spread to other nodes through the associative network via linkages (Collins and Loftus (1975)). That is, when subjects are exposed to an ad, clusters of interdependent beliefs, not just mentioned beliefs, change together.

Advertisers might use an understanding of the interdependence in designing ad messages. In general, some beliefs are more difficult to change through external attempts than others. In such cases, it may be useful to focus on beliefs that are easier to change change yet are related to the intended beliefs. The ad will induce the change in the mentioned (more vulnerable) beliefs, which will in turn induce changes in the originally intended beliefs.

6. 3. Contributions and future directions

This study extends past attitude theory in several respects. It deepens our understanding of attitude formation by identifying the EV substructures underlying attitudes. The traditional EV model is not suitable for accommodating observed interrelations among attributes. The interdependence EV model proposed in this study takes into account such interrelations, and helps us understand how an attitude is formed from expectancy-value judgments. Also, the interdependence EV model is broad in that it can represent various EV structures. We can see that existing EV models are special types of the proposed interdependence EV model.

By using the EV structure as a basis for understanding the processes of advertising effects, this study links attitude formation and attitude change within a single framework. Recent studies of attitude formation have found the existence of substructures especially in EV attitudes (Bagozzi (1981, 1982), Oliver and Bearden (1985), and Shimp and Kavas (1984)), but implications of this structure for attitude change have not been fully investigated. This study has shown that an understanding of attitude structure can be useful for predicting advertising effects on belief changes.

By providing an understanding of the interdependence among attitudinal elements, this study gives useful insights as to how to maximize communication effects with minimum ad repetition. For example, if consumers perceive that several attributes (riding comfort and safety) are caused by a common antecedent (the size of a car), then concentrating ads on that antecedent may be more efficient in early stages of a campaign than repeating messages about each attribute. Later, as wearout occurs, the advertiser can shift its focus to one or more of the second-order attributes.

There are also several directions for future research. This study used multiple measures of key concepts, but all of them were based on one method, self-report. There might have been a method bias in the observed relationships since all measures shared the same method. Future replication of the study might use multiple methods to account for method variance and eliminate the rival explanation of shared method variance. It should be noted that this study was conducted in high involvement situations (with print ads for an automobile), and future research can test whether the findings are generalizable to low involvement situations.

The rationale for the direct path from EV to BI would be that human information processing is not perfect, and thus not all cognitions in EV can be processed into A-act, a unidimensional affect (Liska (1984)). Since the uncaptured cognitions are still likely to have effects on BI, direct effects may exist. The above arguments suggest that the direct path will depend upon both the complexity of cognitions and the information processing capacity, which can be tested in future research.

In this particular study, we have found an interdependent EV structure. However, it is unlikely that every EV has an interdependent structure. For some acts, especially with a small number of consequences or relatively independent consequences, simpler representations such as the traditional EV or modified EV model might constitute enough means for representing the EV structure. Future research can examine the conditions when the interdependent EV structure might or might not occur.

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[1] This representation of a multidimensional construct is somewhat different from the one used in some studies (e.g., Oliver and Bearden 1985; Shimp and Kavas 1984) in that it adopts a higher-order factor.

[2] Note that a second-order factor has no direct measures but rather achieves meaning through first-order factors which do have direct measures. General discussion of a higher-order factor analysis can be found elsewhere (e.g., Gerbing and Anderson 1984; Bagozzi 1985). The proposed EV model is similar to the second-order factor analysis model (e.g., Joreskog and Sorbom 1984; I.10-11), but different in that first-order factors are allowed to be interdependent.

[3] This can be illustrated with the interdependence EV model used in this study (see Fig. 3). If one constrains the causal path between EV_1 and EV_2 to be zero in the interdependence EV model, it becomes a multidimensional model. A modified unidimensional model results from this zero constraint between EV_1 and EV_2 and equality constraints for the loadings from a second-order factor (EV) to first-order factors (EV_i's). Hence, the modified unidimensional, and multidimensional EV models are nested models of the interdependence model.

[4] In fact, the existing EV models did not achieve convergent validity.

[5] But one could argue that since the modified unidimensional EV and multidimensional EV models were invalid (did not achieve convergent validity), the predictive validity tests for these models were not appropriate.

[6] This is one of the challenges to the sufficiency assumptions of the Fishbein model (Bettman 1986).

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Table 1
Factor loadings and reliabilities for the expectancy-value (EV) measures

EV item	Standardized factor loading	Individual item Reliability	Composite reliability	Average variance extracted
Highly durable	.90	.75	.80	.77
Highly dependable	.81	.59		
Easy to maintain	.88	.61	.73	.57
Requires low repair costs	.84	.53		
Provides riding comfort	.92	.63	.60	.57
Provides enough room	.78	.30		
Has an appealing style	.97	.78	.68	.67
Has a sporty appearance	.67	.30		

Table 2

EV effects under different models

EV model	Direct effect	Indirect effect	
	EV → BI	EV → A-act	A-act → BI
Int-EV	.16[a] (1.8)[b]	.32 (3.0)	.28 (3.6)
Tra-EV	.17 (2.2)	.34 (3.7)	.27 (3.5)
Mod-EV	.18 (2.1)	.42 (3.9)	.25 (3.1)
Mul-EV	.18 (1.9)	.44 (4.1)	.25 (3.0)

[a] These are standardized parameter estimates.

[b] Critical ratios are in the parentheses.

Table 3

Comparison of belief change scores (ΔB_i) after ad exposure

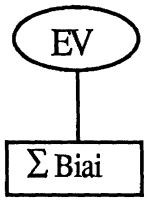
Belief	Belief change scores (ΔB_i) after ad exposure [a]	
	Ads claiming high dependability (n=60)	Ads claiming low repair costs (n=60)
Highly durable	1.28**	.80**
Highly dependable	1.25**	.63**
Easy to maintain	.68**	.78**
Requires low repair costs	1.35**	1.58**
Provides riding comfort	.17	-.38
Provides enough room	.48*	-.20
Has an appealing style	-.45	-.17
Has a sporty appearance	-.12	-.23

[a] Post-exposure beliefs minus pre-exposure beliefs

* $p < .05$

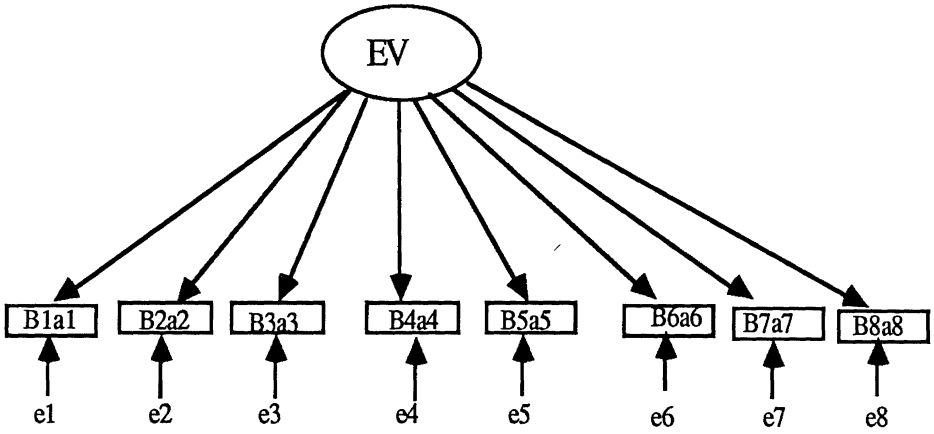
** $p < .01$

A. Traditional EV model

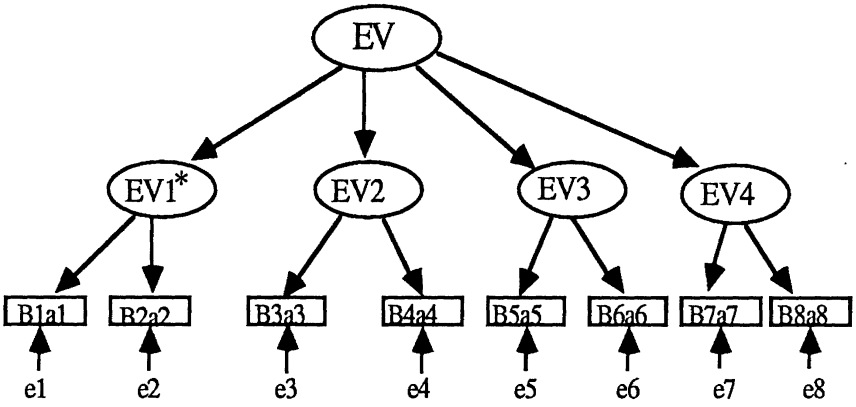


$$EV = \sum_{d} Biai$$

B. Modified unidimensional EV model



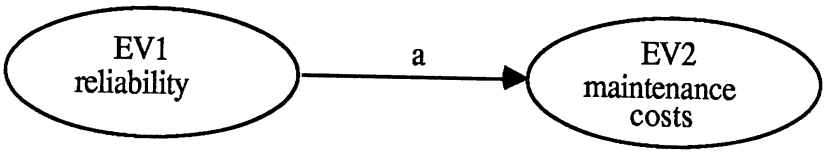
C. Multidimensional EV Model



* EVi's indicate subdimensions of the EV construct.

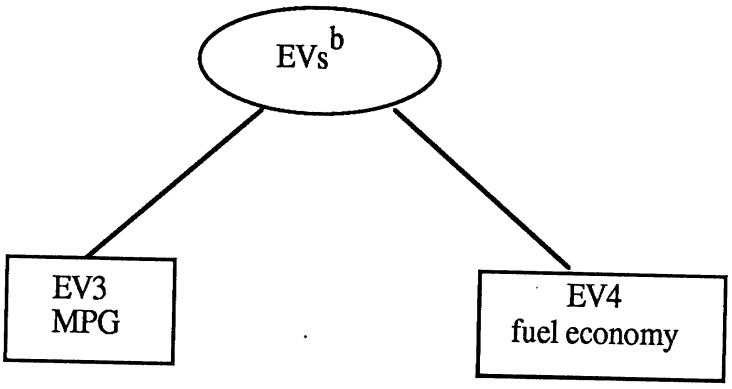
Fig. 1. An illustration of the three types of existing EV models

Type I: Interdependence by a causal relation



a. The arrow indicates a causal relationship.

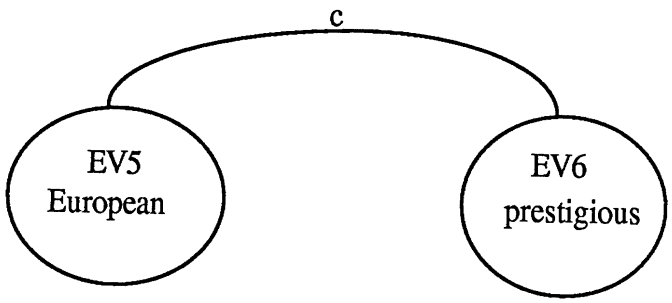
Type II: Interdependence by measuring the same concept



b. EVs indicates a subdimension of EV.

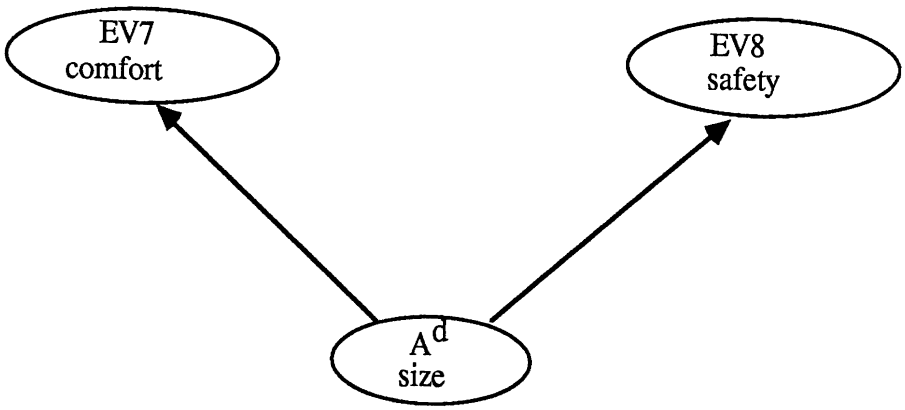
Fig. 2. An illustration of several types of interdependence

Type III: Interdependence by an ecological correlation



c. The curved line indicates an ecological association.

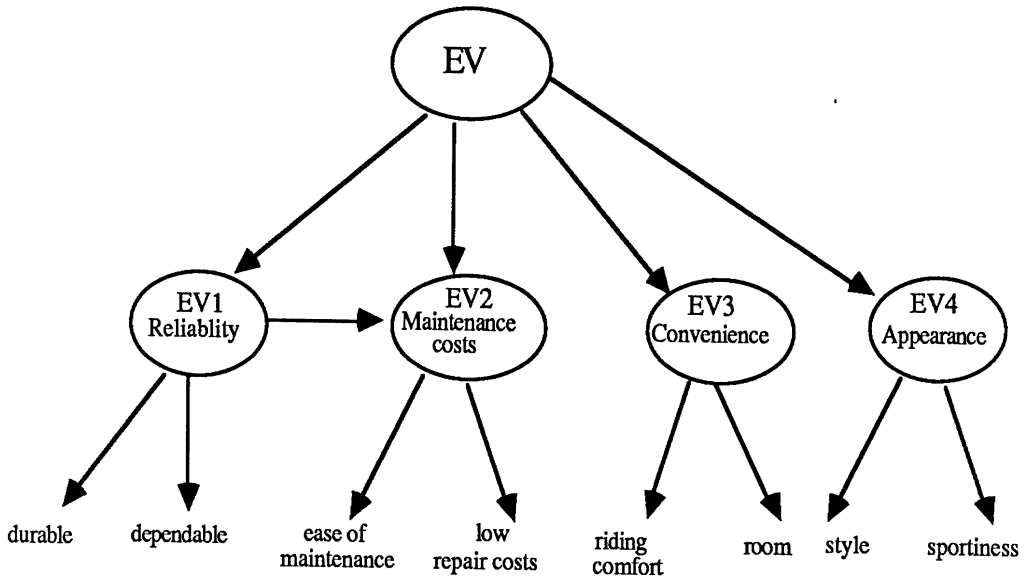
Type IV: Interdependence by sharing a common antecedent



d. A indicates a common antecedent.

Fig. 2. continued.

A. Representation (For simplicity, measurement errors are not shown.)



B. Specification

$$\begin{pmatrix} Y_1 \\ Y_2 \\ Y_3 \\ Y_4 \\ Y_5 \\ Y_6 \\ Y_7 \\ Y_8 \end{pmatrix} = \begin{pmatrix} \lambda_{y1} & 0 & 0 & 0 \\ \lambda_{y2} & 0 & 0 & 0 \\ 0 & \lambda_{y3} & 0 & 0 \\ 0 & \lambda_{y4} & 0 & 0 \\ 0 & 0 & \lambda_{y5} & 0 \\ 0 & 0 & \lambda_{y6} & 0 \\ 0 & 0 & 0 & \lambda_{y7} \\ 0 & 0 & 0 & \lambda_{y8} \end{pmatrix} \begin{pmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \\ \eta_4 \end{pmatrix} + \begin{pmatrix} \epsilon_1 \\ \epsilon_2 \\ \epsilon_3 \\ \epsilon_4 \\ \epsilon_5 \\ \epsilon_6 \\ \epsilon_7 \\ \epsilon_8 \end{pmatrix}$$

$$\begin{pmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \\ \eta_4 \end{pmatrix} = \begin{pmatrix} 0 & 0 & 0 & 0 \\ \beta_{21} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix} \begin{pmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \\ \eta_4 \end{pmatrix} + \begin{pmatrix} \gamma_1 \\ \gamma_2 \\ \gamma_3 \\ \gamma_4 \end{pmatrix} (\xi) + \begin{pmatrix} \zeta_1 \\ \zeta_2 \\ \zeta_3 \\ \zeta_4 \end{pmatrix}$$

where ξ is the Inter-Dependence EV

and η_i is EVi, for i=1, 2, 3, and 4.

Fig. 3. Representation and specification of the interdependence EV model