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An integrated model of attitude and affect: Theoretical foundation and an empirical investigation

James Agarwal[a,1], Naresh K. Malhotra[b,*]

[a]Haskayne School of Business, University of Calgary, 2500 University Dr NW, Calgary, Alberta, Canada T2N 1N4
[b]DuPree College of Management, Georgia Institute of Technology, Atlanta, GA 30332-0520, USA

Abstract

The affect (feelings and emotions) and attitude (evaluative judgment based on brand beliefs) streams of research are combined to propose an integrated model of attitude and choice. The essence of the proposed model is based on the interaction effect between affect and cognition. The predictive validity of the proposed model is tested and compared to several other nested models using a regression and logit framework. Results indicate that the proposed model is significantly better than the traditional multiattribute model both in terms of percentage correctly classified and predictive validity. The proposed interaction model is also tested using structural equations modeling with gratifying results. Building on the Kenny and Judd [Psychol. Bull. 96 (1984) 201] approach, the interaction term is estimated using both the Ping [J. Acad. Mark. Sci. 22 (4) (1994) 364; J. Mark. Res. 32 (3) (1995) 336] method and Joreskog and Yang [Nonlinear structural equation models: the Kenny–Judd model with interaction effects. In: Marcoulides GA, Schumacker RE, editors. Advanced Structural Equation Modeling: Issues and Techniques, Mahwah, NJ: Erlbaum, 1996] method. Important findings and implications are discussed together with directions for future research.

Keywords: Attitude; Affect; Choice; Multiattribute model; Interaction effect in structural equation model

1. Introduction

The multiattribute model has been used for several years in marketing and has become an established framework for explaining attitude, intention, and choice. Although, its use was widely recognized in the early 1970s in the marketing field, its roots trace back much earlier to the Fishbein–Rosenberg expectancy-value paradigm (Fishbein and Ajzen, 1975; Wilkie and Pessimier, 1973). The multiattribute model has been quite robust in predictive ability due to its inherent compensatory processing mechanism and is useful in diagnosing brand strengths and weaknesses.

In recent years, a separate stream of research on affect (feelings/emotions) has become prominent. In the last two decades, a growing number of scholars acknowledged the importance of considering the emotional or affective aspects of consumer behavior (Burke and Edell, 1989; Hirschman and Holbrook, 1982; Holbrook and Westwood, 1989). Critics argued that attitude was not necessarily formed by the utility paradigm (Zajonc, 1980). The power of feelings and emotions was demonstrated in several studies conducted in the context of advertising and brand attitude (Aaker et al., 1986; Burke and Edell, 1989; Edell and Burke, 1987). By mid-1980s, affect was once again resurrected in its own right as a construct that explained attitude and behavior.

The objective of this paper is to unify the two streams of research and develop an integrated model of attitude and choice. We define "attitude" as a summarized evaluative judgment based on cognitive beliefs and its evaluative aspect, and "affect" is reserved for valenced feeling states and emotions (Cohen and Areni, 1991; Erevelles, 1998). While prior research has established the explanatory power of both cognition and affect on overall attitude (via main effects), the contribution of its interaction effect has not been tested and is, therefore, of particular interest in this study. Incorporating interaction effect in the proposed integrated model is a central theme in our study. The proposed model of attitude is empirically tested and compared with competing models using regression and structural equations modeling. The integrated model is also tested in a choice context using a logit framework.

* Corresponding author. Tel.: +1-404-894-4358; fax: +1-404-894-6030.
E-mail addresses: james.agarwal@haskayne.ucalgary.ca (J. Agarwal), naresh.malhotra@mgt.gatech.edu (N.K. Malhotra).
[1] Tel.: +1-403-220-7302; fax: +1-403-284-7916.

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2. Dimensional attitude model

Over the last several decades, researchers have emphasized the analyses of attitudes—their origins and their modification—by focusing on cognitive aspects of attitude and choice. The different approaches to modeling consumer preference (such as compositional model, decompositional model, subjective expected utility model, Bayesian model, etc.) are based on the inherent assumption of the utility theory and attribute processing. The most popular compositional approach to modeling consumer attitude has been the multiattribute model rooted in the Fishbein–Rosenberg tradition (Fishbein and Ajzen, 1975). Although attention was subsequently directed to Fishbein's extended model, research reveals that purchase behavior is, by and large, under attitudinal control rather than normative control (Sheppard et al., 1988). We, therefore, focus our attention to the multiattribute attitude model. (For an excellent discussion of the multiattribute model, refer to Wilkie and Pessimier, 1973). Dimensional attitude embodies brand evaluative judgment based on belief strength and its evaluative aspect.

3. Holistic affect model

Much research related to affect has been generated in the last two decades. For an excellent review of the literature on affect see Cohen, 1990; Cohen and Areni, 1991; Erevelles, 1998; Isen, 1987. Emotions are responses to causal-specific stimuli that are generally intense and more enduring especially if emotional traces are stored and retrieved (Cohen and Areni, 1991). Feelings are also responses to causal-specific stimuli, yet less intense and more fleeting as compared to emotions. Moods are affective states and they form a part of all marketing situations. However, moods are nonobject specific and may be quite transient and easily influenced by little things.

Holistic affect refers to global affective responses to a stimulus. According to Zajonc (1980), the features of a stimulus or a set of stimuli that determine affective reactions might be "quite gross, vague, and global." Mittal (1988) describes affective responses as holistic, implicating the self, and difficult to explicate. Affective reactions tend to be holistic, automatic, instantaneous, and difficult to verbalize. It uses a template-matching holistic process of comparing the stimulus and the overall prototypical concept (holistic similarity) as opposed to the "unit integrative" process in dimensional processing (Smith, 1989).

Our conceptualization of holistic affect is drawn from category-based affective processing in the categorization literature. Fiske and Pavelchak (1986) distinguish between piecemeal vs. category-based affective processing. Categorization invokes schema stored in memory, which typically consists of a category label at the top level and the expected attributes at the lower level. Each attribute has an "affective tag" that indicates its evaluative value. At the top level, the category label also has an affective tag that may come from a conditioned response to the category label or may be the summation of lower level attribute-based affective tags (Cohen and Areni, 1991). In either case, the top-level affect is holistic and forms the basis of our theoretical domain.

If categorization is successful, the object can be evaluated in a category-based mode (holistic processing). Alternatively, if categorization fails, one would be forced to evaluate in a piece-meal mode (dimensional processing). As a conceptual extension, Fiske and Pavelchak (1986) suggest that the dichotomy, piece-meal vs. category-based processing, is more likely a continuum of concurrent parallel systems.

4. An integrated model of attitude and choice

We propose an integrated model of attitude and choice that is based on dimensional attitude, holistic affect, and the interaction between the two components. The model diagram (Fig. 1) shows that overall attitude is a joint function of dimensional attitude, holistic affect and the interaction term. It should be noted that while the moderating factors are included in the framework, we would limit our discussion and empirical investigation only to the shaded portions of Fig. 1. We next discuss the theoretical aspects of affect–cognition interaction, which is a central proposition in the model.

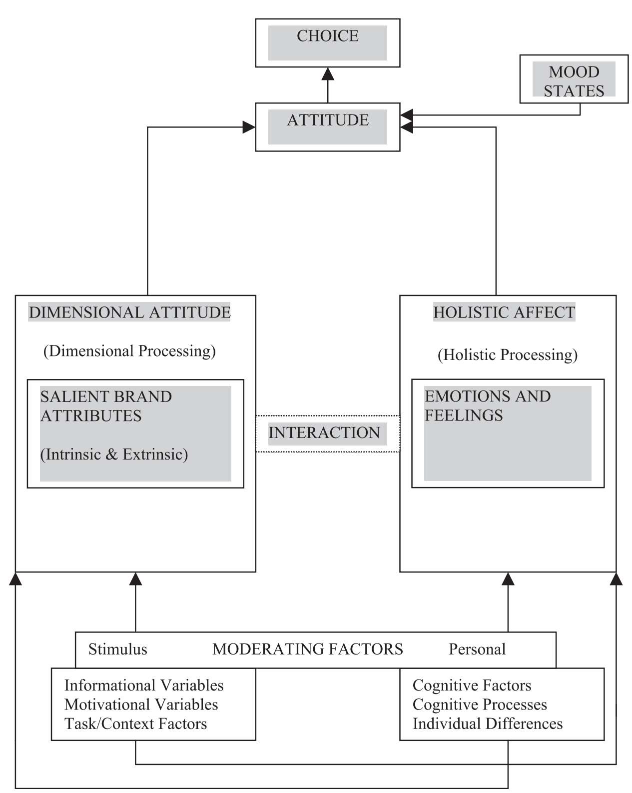

Fig. 1. Proposed interaction model framework.

4.1. Affect–cognition interaction

The modeling of affect–cognition interaction in our framework offers a marked departure from prior attitude-based research. Prior studies incorporating the relationship between feelings and brand attribute evaluations have examined the causal linkages between constructs to estimate direct and indirect effects (Burke and Edell, 1989; Edell and Burke, 1987; MacKenzie and Lutz, 1989; MacKenzie et al., 1986). While we estimate causal linkages in our model (via main effects), the interaction effect between dimensional attitude and holistic affect is of particular interest in this study. We, next, examine the levels of interaction.

4.1.1. Levels of interaction

We discuss the affect–cognition interaction by first examining the levels of interaction and then proposing the appropriate level. According to the categorization literature, there are three levels of generality at which a category may exist: superordinate, basic, and subordinate. The basic level is where the within-category similarity is maximized relative to between-category similarity. Spontaneous categorization tends to occur at the basic level and is generally faster than any other levels (Corter and Gluck, 1992). This is because the basic level optimizes both specificity and distinctiveness and thus possesses more overall differentiation (Murphy and Brownell, 1985).

Although, these levels have been applied at the product classes, product types and brands (Meyers-Levy and Tybout, 1989; Sujan and Dekleva, 1987), we apply it at within-brand level. The dimensional attitude component may be modeled at any of the three possible levels: (a) as a singular construct (superordinate level) as in the traditional multi-attribute case or (b) as multidimensional expectancy value components (basic level) as suggested by Bagozzi (1982) or (c) separate belief items (subordinate level). Based on categorization research, we model dimensional attitude at the basic level (i.e., multidimensional expectancy value components) (Corter and Gluck, 1992). According to the multidimensional expectancy-value components (EVC) model, consumers categorize beliefs and evaluations into separate dimensions of attitude that influence the unidimensional evaluative component (valenced thought) of attitude (Bagozzi, 1982). This becomes pronounced when consumers face a large number of salient attributes and desire a need for reduction in information processing.

Choice process can also be modeled in an attitudinal framework. Based on information processing and attitude research literature (Bagozzi, 1982; Bettman and Sujan, 1987) consumers make choices by using one of the following approaches: (a) comparing beliefs about the consequences of alternative behaviors; (b) by comparing EVCs across alternatives; (c) by comparing attitudes across alternatives; and (d) by comparing intentions to engage in different behaviors (Dabholkar, 1994). Based on the research by Dabholkar (1994), the expectancy comparison model, among other competing models, gave the best fit under conditions such as nonexpert consumers, a large number of salient attributes that can be grouped naturally, and where there is moderate need for reducing information processing. Since these conditions adequately describe our scenario (we use student sample who are casual users of sneakers as opposed to the serious athlete), we model dimensional attitude at the basic level (i.e., multidimensional expectancy value components) for choice as well. Having laid the theoretical and conceptual foundations, next we focus attention on the model formulation.

5. Model formulation

In this section we describe the mathematical formulation for the two major components of the model (dimensional attitude and holistic affect) as well as the integrated model with and without interaction terms.

5.1. Dimensional attitude model

The integrated model of attitude is formulated using the traditional multiattribute framework. The multiattribute model is represented as:

$$Y = a_0 + a_1 A(d) \tag{1}$$

such that: $A(d)=\sum_{i=1}^{N} b_{ijk}e_{ik}$ where i = the attribute or product characteristic; j = brand; k = consumer or respondent, Y = consumer k's overall brand attitude for brand j, $A(d)$ = consumer k's dimensional attitude score for brand j, e_{ik} = the evaluative aspect of attribute i given by consumer k, b_{ijk} = consumer k's belief as to the extent to which attribute i is offered by brand j, N is the number of attributes, and a_0 and a_1 are the weight parameters.

5.2. Holistic affect model

The holistic affect model by itself has the formulation: $A(h) = f(F)$ where holistic affect $A(h)$ is a function of feelings/emotions (F). We use the dimensions of Upbeat (F1), Negative (F2), and Warmth (F3) developed by Edell and Burke (1987). More details on this scale are provided later. Given the robustness of linear models for predictive purposes, we use a linear function of affective variables. The holistic affect is represented as:

$$Y = a_0 + a_1 A(h) \tag{2}$$

5.3. Integrated (main-effects only) model

The combined overall attitude model (main-effects) is represented as:

$$Y = a_0 + a_1 A(d) + a_2 A(h) \tag{3}$$

5.4. Integrated (main-effects plus interactions) model

The combined overall attitude model (main-effects plus interactions) is represented as:

$$Y = a_0 + a_1 A(d) + a_2 A(h) + a_3 A(d) * A(h) \quad (4)$$

The last term denotes the interaction effect and the other notations are same as before. Based on earlier discussion, it should be noted that, the dimensional attitude term is modeled as multidimensional EVCs in this study.

Given that the overall attitude (Y) is measured on an interval scale explained later under measurement, OLS regression will be used to estimate models 1 through 4. To test the interactions model in choice context, a logit framework will be used to assess the choice probabilities.

6. Empirical investigation

6.1. Measurement

The empirical investigation involved a product category. Sneakers were selected because students use them a lot as casual daily footwear and can identify with them. In addition, it was expected that sneakers being a low involvement product would have a relatively moderate affect potential for students. [Based on the 16-item Consumer Involvement Profile (Laurent and Kapferer, 1985), sneakers were perceived as low involvement product with a mean of 3.8 on a six-point scale]. For the dimensional attitude model, a pretest was conducted ($N = 24$) to obtain salient attributes for athletic shoes. The ratings were obtained using a six-point scale with 1 = *not at all important* and 6 = *very important*. The seven attributes generated were brand name, cushioning, weight, type of upper, ventilation, reliability, and durability.

For measuring holistic affect, it was decided to use verbal reports using scales that have been validated and widely used by both academics and practitioners. The Edell and Burke (1987) scale was used to measure feelings/emotions. Burke and Edell (1989) measured feelings generated by an advertisement through an inventory of 56 feeling items. The coefficient alphas for this scale were found to be high indicating acceptable reliability and internal consistency (Edell and Burke, 1987).

Mood was measured at the beginning of the survey using the Peterson and Sauber (1983) Mood Short Form. These following items were measured on five-point scale (strongly agree to strongly disagree): currently I am in a good mood; as I answer these questions I feel very cheerful; for some reason, I am not very comfortable right now; at this moment, I feel "edgy" or irritable. The purpose of measuring mood in our case was not to "vary" the mood of individuals by way of experimental manipulation, but rather to "partial out" its effect on responses by statistically accounting for its effect. Peterson and Wilson (1992) suggest the need to account for mood via post hoc statistical analyses in response ratings in general, and measurement of satisfaction in particular.

Zanna and Rempel (1988) recommend the use of overall attitude scales that are purely evaluative such as favorable/unfavorable instead of scales that overly emphasize either affect (pleasant/unpleasant) or cognition (beneficial/harmful). In this way subjects self-select their attitudes from whichever sources are most personally relevant. Therefore, in keeping with their conceptualization, we used the following seven point semantic differential scales for measuring overall attitude: favorable/unfavorable and good/bad. Evidence on unidimensionality, internal consistency, convergent and discriminant validity of these constructs is presented later.

6.2. Sample and data collection

A sample of 258 undergraduate students from a large southeastern university was selected. A self-administered questionnaire was used for this purpose. Before the start of the survey, respondent's mood was assessed as mentioned earlier. Two versions of the same questionnaire were prepared. The first set had cognitive belief-based questions first followed by affective questions. The second set had the affective questions first followed by the belief-based questions. This was done to counter balance any order effect. For the first set of respondents, respondents filled out belief-based measures for sneaker brand "Asics." Subsequently, respondents were shown a 30-second real TV commercial for "Asics," after which they were asked to fill out the Edell and Burke Feelings Scale [intensity measured on a six-point scale with (1) *not very strong* and (6) *very strong*]. The commercial shown was emotional and upbeat in nature without any informational content. The purpose of showing the ad was to generate ad-based and brand-based affect. For the second set of respondents, the procedure was reversed. The TV commercial followed by the Edell and Burke scale preceded the belief-based measures. Finally, a set of questions on choice measures was asked.

7. Analysis and results

7.1. Estimation of attitude and choice model

The dimensional attitude multiattribute model was tested at the aggregate level. The dependent variable, attitude, was regressed on model 1. The OLS estimation procedure was used in all regression analyses. Mood states of the respondents were statistically controlled. The holistic affect model captured feelings/emotions using the 56-item scale (Burke and Edell, 1989). Since arousal of feelings is stimulus specific, we did not wish to burden respondents by requiring them to generate forced responses on all 56 items. The top 36 items were subjected to principal components analysis with a three-factor solution. Edell and Burke (1987) have also used this method in previous work. The first two factors containing items with factor loading greater than 0.50 are: F1 (Upbeat)—alive, active, inspired, happy, strong, energetic, proud, confident, delighted, convinced, and stimulated; F2 (Negative)—dull, disinterested, bored, skeptical; and the third factor containing items with loading greater than 0.40 are: F3 (Warm)—pensive, and contemplative. A summated index of the three factors was used for subsequent analysis. Factor scores were not used as some items in each of the three factors had low nonsignificant loadings of < 0.40. The dependent variable, attitude, was regressed on feeling factors (F1, F2, and F3) as in model 2.

Finally, the integrated main-effects model and the proposed main-effects plus interactions model was tested as in models 3 and 4. To model interactions, we used the multidimensional EVCs. The dimensional factors (EVCs) in the dimensional attitude model were extracted by performing a principal components analysis with orthogonal rotation on the seven items. Two factors were extracted with eigenvalues greater than unity. The two dimensional factors (DF) contained the following (Belief × Evaluation) item clusters: DF1 (Perceived Quality)—brand name, reliability and durability; and DF2 (Comfort)—cushioning, weight, ventilation and type of upper. All of the items had high loadings in the range 0.70–0.94 except for one item loading of 0.55. Factor scores were therefore saved for subsequent analysis. All six interaction terms were included in the model: DF1 and DF2 separately with F1, F2, and F3.

Similar procedures were employed to test the choice accuracy and predictive validity of the dimensional attitude model, the holistic affect model, the combined main-effects model, and the proposed interactions model using the logit framework. Choice was measured as a binary outcome: 1 if the brand was selected and 0 if not selected. Maximum likelihood estimation procedure was used for all logit analyses.

7.2. Regression analysis

The analysis was run at the aggregate level. The overall brand attitude was regressed against the dimensional attitude model (model 1), the holistic affect models (model 2), the main-effects model (model 2) and the main-effects plus interactions model (model 4). The results are summarized in Table 1.

The figures indicate results after controlling for mood states of the respondents. It can be seen that there is a sharp jump in the adjusted R^2 from .33 for the dimensional attitude model (model 1) to 0.71 for the proposed model (model 4). The main-effects model (model 3) is significantly different from both model 1 ($F = 13.83$ at $P < .001$) and model 2 ($F = 63.00$ at $P < .001$). The proposed model is also significantly different from model 1 ($F = 24.13$ at $P < .001$) and model 2 ($F = 35.22$ at $P < .001$). Finally, the interaction effect is also strongly significant when models 3 and 4 are compared ($F = 23.31$ at $P < .001$). Both DF1 ($t = 6.43$, $P = .000$) and DF2 ($t = 3.05$, $P = .003$) were significant in the dimensional attitude model and F1 (upbeat) ($t = 2.92$, $P = .004$) and F2 (negative) ($t = -2.16$, $P = .04$) were significant in the holistic affect model. Significant upbeat and negative feelings and nonsignificant warm feelings are consistent with the findings of Burke and Edell (1989). Of all the interaction terms, DF1 × F1 was the only term statistically significant ($t = -3.23$, $P = .002$) at $P < .05$. DF2 × F3 was marginally significant ($P < .06$). One curious finding was the negative sign of DF1 × F1. We suspected multicollinearity to be present. However, this was not the case as the variance inflation factors were within control and a subsequent zeta score transformation of the interaction terms revealed similar sign.

7.3. Logit analysis

The results of the aggregate analysis are summarized in Table 2.

A look across the row on percentage correctly classified reveals that the proposed model does better than the dimensional attitude model (estimation sample—about 69 vs. 64 at $P < .10$; validation sample—about 79 vs. 73 at $P < .05$ using McNemar's test). The likelihood ratio test is used to assess whether the models significantly differ from each other. We find that the dimensional attitude model does not differ significantly from the main-effects model

Table 1
Regression models

Dependent variable	Dimensional attitude (multiattribute) model	Holistic affect model (Up-Ng-Wm)	Combined model (main-effects only)	Proposed model (main-effects plus interaction)
Attitude	Model 1	Model 2	Model 3	Model 4
R^2	.34 ($F = 91.04$) *	.28 ($F = 24.29$) *	.46 ($F = 38.01$) *	.73 ($F = 40.86$) *
Adjusted R^2	.33	.27	.45	.71
Difference among models	Models 1 and 3 ($F = 13.83$) *	Models 2 and 3 ($F = 63.00$) *	Models 3 and 4 ($F = 23.31$) *	
	Models 1 and 4 ($F = 24.13$) *	Models 2 and 4 ($F = 35.22$) *		
Predictive validity	0.55	0.60	0.68	0.81

All figures indicate model performance after statistically controlling mood states. Estimation sample ($N = 208$); Validation sample ($N = 50$).

* Statistically significant at $P < .001$.

Table 2
Logit models

Dependent variable	Dimensional attitude (multiattribute) model	Holistic affect model (Up-Ng-Wm)	Combined model (main-effects only)	Proposed model (main-effects plus interaction)
Choice	Model 1	Model 2	Model 3	Model 4
Percentage[a] correctly classified (%)	64*	62	66	69
Percentage[a] correctly classified (%) (Holdout sample)	73**	68	73	79
Akaike information criterion (AIC)	250.15	277.24	251.37	243.47
Model chi-square	($\chi^2=18.21$, $df=1$)	($\chi^2=4.86$, $df=3$)	($\chi^2=19.98$, $df=4$)	($\chi^2=34.88$, $df=11$)
Difference between models (Likelihood ratio test)	Models 1 and 3 ($\chi^2=1.77$)	Models 2 and 3 ($\chi^2=15.12$)***	Models 3 and 4 ($\chi^2=14.90$)**	
	Models 1 and 4 ($\chi^2=16.67$)*	Models 2 and 4 ($\chi^2=30.02$)***		

Estimation sample ($N=208$); Validation sample ($N=50$).
[a] P values mean significant differences in hit ratio when compared to model 4.
* Statistically significant at $P<.10$.
** Statistically significant at $P<.05$.
*** Statistically significant at $P<.001$.

($\chi^2=1.77$ at $P>.05$). However, the difference between the main-effects model and the holistic affect model is significant ($\chi^2=15.12$ at $P<.05$). The proposed model differs significantly from the holistic affect model ($\chi^2=30.02$ at $P<.001$) and marginally from the dimensional attitude model ($\chi^2=16.67$ at $P<.10$). The difference between models 3 and 4 is also significant ($\chi^2=14.90$ at $P<.05$) suggesting significant interaction effect. DF1 was the only significant term in the dimensional attitude model (Wald statistic = 4.93, $P=.03$). None of the feeling factors was significant in the holistic affect model. In the interaction component, DF1 × F3 (Wald statistic = 4.67, $P=.03$) was the only significant interaction term also with a negative sign.

7.4. Estimation of the structural equations model

DF1 and DF2 were included in the dimensional attitude component of the model. On the affective side, Upbeat (alive, active, and inspired), Negative (dull, disinterested, and bored), and Warm (pensive and contemplative) factors were included. Because we use structural equations to model attitude, based on the regression results, DF1 × F1 was included in the model as it was the only statistically significant term at $P<.05$ level. Other interaction terms were not significant at the $P<.05$ level and, therefore, not included.

7.5. Measurement model

The latent variables in the linear terms only (without interaction term) measurement model were tested for unidimensionality and internal consistency. The indicators of all exogenous constructs were mean-centered. The results of the confirmatory factor analysis confirm the unidimensionality of the hypothesized constructs as evaluated by their goodness-of-fit indicators: $\chi^2=124.24_{(df=104,\ P=.08)}$, CFI = 0.99, GFI = 0.94, AGFI = 0.92, and RMSEA = 0.03. All of the indicators had higher than acceptable loading except for the item "contemplative" (Warm) which had a very low loading of 0.21. Based on the earlier results of factor analysis, since we had only two items for the third factor (contemplative and pensive), deleting this item would leave us with only one item. Since this is not a desirable practice, we decided to delete factor F3 (warm) from the model.

The new measurement model (after deleting F3) was reestimated with the following results: $\chi^2=96.90_{(df=80;\ P=.10)}$, CFI = 0.99, GFI = 0.95, AGFI = 0.92, and RMSEA = 0.03. Internal consistency was assessed by Cronbach's alpha, which are: overall attitude 0.96; dimensional factor 1(DF1) 0.92; dimensional factor 2 (DF2) 0.81; upbeat feeling (F1) 0.76; negative feeling (F2) 0.79. The latent variables had construct reliabilities of 0.75 or above and average extracted variances of above 0.50 (Fornell and Larcker, 1981).

Convergent and discriminant validity for the constructs was also evaluated. The shared variance of each construct (average of the squared loadings) in the measurement model is: overall attitude 0.92, dimensional factor 1 (DF1) 0.84, dimensional factor 2 (DF2) 0.58, upbeat feeling (F1) 0.51, and negative feeling (F2) 0.57. All constructs exceed the 0.50 level, which establishes the convergent validity (Fornell and Larcker, 1981). Discriminant validity is established if the shared variance is larger than the squared correlations between constructs (Fornell and Larcker, 1981). All 10 pairs of squared correlations were smaller than the shared variance of the respective constructs. Measurement model results are shown in Table 3.

7.6. Estimating interaction term (a): Ping method

Kenny and Judd (1984) proposed estimation procedures for interaction and quadratic latent variables using indicators that are products of observed variables. For example, the product of two latent variables (ξ_1, ξ_2) with indicators (x_1, x_2) and (x_3, x_4), respectively, can be specified with indicators x_1x_3, x_1x_4, x_2x_3, and x_2x_4. The variance of the product indicator (x_1x_3) depends on Var (ξ_1), Var (ξ_2), λ_{x1}, λ_{x3}, θ_{x1}, and θ_{x3}, where Var (ξ_1) and Var (ξ_2) are the variances of the latent variables ξ_1 and ξ_2, λ_{x1} and λ_{x3} are the loadings of x_1 on ξ_1 and x_3 on ξ_2 and θ_{x1} and θ_{x3} are the variances of the error terms ε_{x1} and ε_{x3}. Specifically, the loading of the indicator (λ_{x1x3}) of the latent interaction variable $\xi_1\xi_2$ is:

$$\lambda_{x1x3} = \lambda_{x1}\lambda_{x3} \quad (5)$$

and the error variance is

$$\theta_{x1x3} = \lambda_{x1}^2 \mathrm{Var}(\xi_1)\theta_{x3} + \lambda_{x3}^2 \mathrm{Var}(\xi_2)\theta_{x1} + \theta_{x1}\theta_{x3} \quad (6)$$

Although, Kenny and Judd (K&J) technique is theoretically sound, its implementation using dummy variable has been rather tedious to implement. Based on the K&J model, Ping (1994) proposed a variation that requires no dummy variables and can be implemented in two steps. First, the measurement parameters for the linear latent variables are estimated in a measurement model. The estimates are used to calculate the loading and error variances for the indicators of the interaction product term as explained in Eqs. (5) and (6). Second, the structural model with interaction variables is estimated by fixing the loading and the error variances for the product indicators. (For a detailed description of the steps, the reader is referred to Ping, 1994, 1995). Based on the measurement model (with linear terms only) estimated, the loading and error variances of the interaction term indicators (Eqs. (5) and (6)) were computed (see Table 3).

Table 3
Measurement model estimates

Parameter (Loading)	Estimate	Parameter (Error variance)	Estimate	Parameter (Construct variance)	Estimate
λ_{Y1}	1.00	ε_{Y1}	0.17	ϕ_Y	1.55
λ_{Y2}	0.99	ε_{Y2}	0.12	ϕ_{DF1}	1.02
λ_{DF11}	0.99	ε_{DF11}	0.45	ϕ_{DF2}	1.10
λ_{DF12}	0.98	ε_{DF12}	0.08	ϕ_{F1}	2.10
λ_{DF13}	1.00	ε_{DF13}	0.12	ϕ_{F2}	0.51
λ_{DF21}	0.81	ε_{DF21}	0.79		
λ_{DF22}	0.62	ε_{DF22}	0.65		
λ_{DF23}	1.00	ε_{DF23}	0.33		
λ_{DF24}	0.86	ε_{DF24}	0.57		
λ_{F11}	1.00	ε_{F11}	1.41		
λ_{F12}	0.95	ε_{F12}	1.49		
λ_{F13}	0.80	ε_{F13}	2.32		
λ_{F21}	0.68	ε_{F21}	0.34		
λ_{F22}	0.95	ε_{F22}	0.28		
λ_{F23}	1.00	ε_{F23}	0.24		
Eq. (6) estimates (Ping method)		Eq. (7) estimates (Ping method)			
$\lambda_{(DF11 \times F11)}$	0.996	$\varepsilon_{(DF11 \times F11)}$	2.999		
$\lambda_{(DF11 \times F12)}$	0.943	$\varepsilon_{(DF11 \times F12)}$	3.034		
$\lambda_{(DF11 \times F13)}$	0.793	$\varepsilon_{(DF11 \times F13)}$	3.982		
$\lambda_{(DF12 \times F11)}$	0.989	$\varepsilon_{(DF12 \times F11)}$	1.680		
$\lambda_{(DF12 \times F12)}$	0.937	$\varepsilon_{(DF12 \times F12)}$	1.762		
$\lambda_{(DF12 \times F13)}$	0.788	$\varepsilon_{(DF12 \times F13)}$	2.600		
$\lambda_{(DF13 \times F11)}$	1.000	$\varepsilon_{(DF13 \times F11)}$	1.871		
$\lambda_{(DF13 \times F12)}$	0.947	$\varepsilon_{(DF13 \times F12)}$	1.948		
$\lambda_{(DF13 \times F13)}$	0.797	$\varepsilon_{(DF13 \times F13)}$	2.816		

7.6.1. Structural model

The structural model was estimated using EQS (Bentler, 1989) and maximum likelihood (ML) estimation by fixing the loadings and error variances for the product indicators at the Table 3 values. The use of product indicators in a structural model renders the model nonnormal and thus chi-square estimates cannot be meaningfully interpreted (Ping, 1994). Therefore, EQS's ML Robust estimator was used to produce more distributionally appropriate chi-square statistics.

The structural model for the proposed interaction model had the following results: Satorra–Bentler Scaled $\chi^2 = 489.82_{(df=263;\ P<.001)}$; Robust Comparative Fit Index (CFI) = 0.98; Bentler–Bonett Normed Fit Index (NFI) = 0.96; Bentler–Bonett Nonnormed Fit Index (NNFI) = 0.96. The results for the alternative models (using ML estimation) were: dimensional attitude (multiattribute) model $\chi^2 = 262.42_{(df=26;\ P<.001)}$, CFI = 0.83, NFI = 0.82, NNFI = 0.77; holistic affect model: $\chi^2 = 26.10_{(df=18;\ P<.09)}$, CFI = 0.99; NFI = 0.97; NNFI = 0.98; and main-effects model: $\chi^2 = 190.53_{(df=86;\ P<.001)}$, CFI = 0.94; NFI = 0.90, NNFI = 0.93.

Overall dimensional attitude, holistic affect as well as the interaction component significantly influence attitude. All of the structural links are statistically significant at $P < .05$. These are DF1 (perceived quality $\gamma 11 = 0.61$), DF2 (comfort $\gamma 12 = 0.11$); F1 (upbeat $\gamma 13 = 0.35$), F2 (negative $\gamma 14 = -0.19$), and the interaction term DF1 × F1 (Perceived Quality × Upbeat $\gamma 15 = -0.27$). The robust structural signs were consistent with the regression results.

7.7. Estimating interaction term (b): joreskog and yang (J&Y) method

Also building upon Kenny and Judd (1984) model, Joreskog and Yang (1996) demonstrated the estimation of interaction effect by using structured means and using one product indicator rather than all possible product indicators used earlier by Kenny and Judd (1984) and later also by Ping (1994, 1995). The matrix notation of the mean structure model could be written as: $x = \tau_x + \lambda_x\xi + \delta$ where τ_x is the

Table 4
Goodness of fit results

Goodness of fit indices	Dimensional attitude (multiattribute) model	Holistic affect model (Up-Ng)	Combined model (main-effects only)	Proposed model (main-effects plus interaction)	
	Model 1 (ML)	Model 2 (ML)	Model 3 (ML)	Model 4	
				(Ping) (ML Robust)	(J&Y) (ML)
χ^2	$\chi^2=262.42$ $df=26$ (P=.001)	$\chi^2=26.10$ $df=18$ (P=.09)	$\chi^2=190.53$ $df=86$ (P=.001)	$\chi^2=489.82^a$ $df=263$ (P=.001)	$\chi^2=107.83$ $df=83$ (P=.04)
Comparative fit index (CFI)	0.83	0.99	0.94	0.98[b]	0.99
Goodness-of-fit index (GFI)	0.72	0.96	0.88		0.93
Adjusted goodness-of-fit index (AGFI)	0.51	0.94	0.83		0.90
RMSEA	0.22	0.05	0.07		0.03
Normed fit index (NFI)	0.82	0.97	0.90	0.96	0.95
Nonnormed fit index (NNFI)	0.77	0.98	0.93	0.96	0.98

[a] Satorra-Bentler scaled χ^2.
[b] Robust CFI.

mean intercept of the observed variable, δ is the measurement error, and other notations are the same as explained earlier. The means of the observed variables are functions of other parameters. For example, two latent variables (ξ_1,ξ_2) with indicators (x_1, x_2) and (x_3, x_4), respectively, would have a product construct ($\xi_1\xi_2$) which can be specified with indicators x_1x_3, x_1x_4, x_2x_3, and x_2x_4. Joreskog and Yang (1996) showed that one product indicator (such as x_1x_3 only) was sufficient to identify the model in terms of the first and second moments of the observed variables. The mean of x_1x_3 is as follows:

$$\mu_{x1x3} = \tau_1\tau_3 + \phi_{21} \tag{7}$$

and the error variance is

$$\theta_{x1x3} = \tau_1^2\theta_3 + \tau_3^2\theta_1 + \phi_{11}\theta_3 + \phi_{22}\theta_1 + \theta_1\theta_3 \tag{8}$$

By expressing the mean and error variance–covariance of x_5 as nonlinear functions of the free parameters (by imposing constraints), the structural model can be estimated.

7.7.1. Structural model

LISREL 8 was run to estimate the model using ML estimation. The structural model for the proposed interaction model had the following results: $\chi^2=107.83_{(df=83;\ P=.04)}$, GFI = 0.93, AGFI = 0.90, RMSEA = 0.03, CFI = 0.99, NFI = 0.95; and NNFI = 0.98. Table 4 contains the fit indexes of the proposed interaction model (Ping and J&Y results) and the alternative models. Based on the fit indexes, the proposed model (model 4) outperforms the alternative models in general and the dimensional attitude (multiattribute) model (model 1) in particular. Although, in general the fit of the holistic model (model 2) is similar to the proposed model and is a parsimonious model, theoretically it is a weaker model since it is inconsistent with cognition–affect interaction theory presented earlier. Rather, the proposed model captures the dimensional attitude, holistic affect, and significant interaction between them and is therefore empirically and theoretically robust.

Table 5 contains the structural coefficient estimates, standard errors, and t values of the proposed interaction model (Ping and J&Y results). Overall dimensional attitude, holistic affect as well as the interaction component significantly influence attitude. These are DF1 ($\gamma11=0.60$), DF2 ($\gamma12=0.09$), F1 ($\gamma13=0.14$), F2 ($\gamma14=-0.20$), and the interaction term DF1 × F1 ($\gamma15=-0.16$). Generally, the signs and magnitudes of the estimates are consistent with the ones derived by using the Ping approach. All of the structural links are statistically significant at $P<.05$ as

Table 5
Structural parameter estimates, standard errors, and t values of the interaction model

Parameter	Estimate (Ping)	Standard error (t value) (Ping)		Estimate (J&Y)	Standard Error (t value) (J&Y)
		ML	Robust		ML
DF1 (γ11)	0.61	0.06 (13.62)	0.07 (12.06)	0.60	0.09 (9.35)
DF2 (γ12)	0.11	0.05 (2.94)	0.05 (3.18)	0.09	0.09 (1.54)
FI (γ13)	0.35	0.05 (6.62)	0.05 (7.22)	0.14	0.06 (2.15)
F2 (γ14)	− 0.19	0.08 (− 4.93)	0.08 (− 4.64)	− 0.20	0.10 (− 3.73)
DF1 × F1 (γ15)	− 0.27	0.01 (− 7.88)	0.01 (− 9.54)	− 0.16	0.06 (− 2.30)

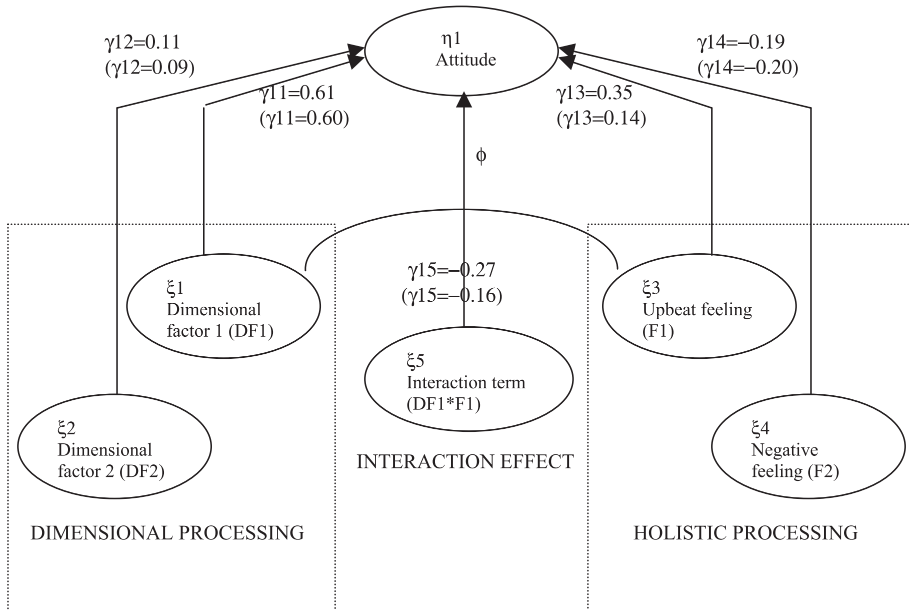

Fig. 2. Structural model estimates of the proposed interaction model. Figures without parenthesis are estimated using Ping method. Figures within parenthesis are estimated using Joreskog and Yang (J&Y) method.

shown in Fig. 2 except for DF2 ($P<.09$) in the J&Y method.

8. Discussion

The different analyses bring us to a consensual focal point. In general, there is consistent evidence of the superiority of the proposed interaction model over competing models (multiattribute model, holistic model, and combined main-effects model) both in terms of model fit and predictive validity. The interaction component of the model, which is the central proposition, offers additional insights. Interaction effect was modeled at the belief cluster level based on theoretical considerations (Dabholkar, 1994). It is evident that EVC formulation yielded significant interaction effect which is consistent with the literature on categorization and attitude. The basic level of interaction optimizes both specificity and distinctiveness thereby enhancing the accessibility and diagnosticity of categories. With a moderately familiar, low involvement product with relatively large number of attributes, consumers want to minimize the cognitive task by activating fewer components rather than many individual belief items.

S.E.M. (and regression analysis) for attitude model indicates presence of significant interaction effect (DF1 × F1). In both the Ping (1994, 1995) and the Joreskog and Yang (1996) methods, the negative sign presents an interesting finding. Similarly, logit analysis for the choice model indicates presence of significant negative interaction effect. This means that consumers' perceived quality of a brand becomes diluted when upbeat feelings vis-à-vis the brand are evoked. From a managerial perspective, marketers need to understand how certain feelings interact with brand attribute evaluations in the context of attitude and choice. This raises important questions about cognitive–affective consistency. For example, will cognitive–affective consistency enhance favorable attitude and choice as compared to cognitive–affective inconsistency? What types and levels of feelings interact positively with brand attributes? Future research should consider the moderating role of product category in determining the magnitude and direction of such interactions.

Finally, another interesting finding was the difference between the antecedents of attitude and choice. S.E.M. and regression analysis indicates the significance of dimensional attitude and holistic affect components as well as the interaction component. However, in the logit choice analysis, only the dimensional attitude component and the interaction component is significant. In our analysis, unlike attitude formation, feelings did not directly enter the choice process. Rather it entered via the interaction effect. However, it would be premature, without further research, to assert this distinction since it could be a function of the product category and other personal and stimulus related factors, which we did not incorporate in our model. Even then, findings strongly indicate that in both attitude and choice situations, interaction had a significant role. This empirically supports the notion that thought and feeling are inseparable (Lazarus, 1982) and that their interaction carries over from attitude to choice.

9. Conclusion

In conclusion this study offers a new theoretical framework of attitude and choice, which builds upon the multiattribute framework. The proposed framework offers a generalized interaction model integrating holistic affective processing with dimensional attribute processing. The proposed interaction model builds on the multiattribute model thereby preserving its earlier contributions, while integrating it with the research tradition in feelings and emotions.

As discussed earlier, the role of interaction effect is significant. We believe that in the area of marketing, the proposed integrated model of attitude and choice is the first of its kind to incorporate, discuss, and empirically test the interaction effect. Likewise from the methodological standpoint, the estimation of interaction effect in a S.E.M. framework in a marketing study has been very sparse. Based on Kenny and Judd (1984) model, two approaches [Ping (1994, 1995) and Joreskog and Yang (1996) methods] for estimating interaction term are discussed and empirically tested. The authors believe that estimating interaction effect using S.E.M. in the traditional area of attitude research offers a new dimension.

Like any other research, this study is not without limitations. First, while we proposed and empirically tested the model framework, we did not frame any specific hypotheses relating to the personal/stimulus/context factors, which would moderate the performance of the model. Several important moderating factors including those identified in Fig. 1 should be studied to assess their impact on model performance. Second, there is a need to test the model in other product and service categories with varying degrees of affect potential. While our intent in this paper was to test the proposed interaction model based on theoretical considerations, more fine-tuning of the model is necessary for future research. We hope our effort will spark more research in these areas.

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