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The Effects of Design Attributes on Other Attributes and Product Evaluation

SANG-HOON KIM*
Seoul National University
Seoul, Korea

SO YUN SIM**
Seoul National University
Seoul, Korea

YOUNG EUN HAHM***
Seoul National University
Seoul, Korea

Abstract

This study examines how consumers' perceptions of a product's design attributes influence their perceptions on other product attributes, and attitudes toward the focal product. This study explored image-related adjectives in order to analyze product attributes, which are categorized into design, symbolic, and functional factors. The empirical test results confirmed the mediating role of attitudes toward design, which indicate the overall preference about product design, between design attributes and attitudes toward product, while the hypothesis of the moderating role of design sensitivity was not supported. These findings revealed that design attributes have influences beyond the aesthetic value, as product design rouses symbolic value and delivers information about functions. Therefore, in the context of product development process, it would be effective to distinguish design elements that can strengthen advantages and

* Corresponding author, Professor of Marketing, College of Business Administration, Seoul National University, #58-612, 1 Gwanak-Ro, Gwanak-Gu, Seoul 151-916, Korea. Email: profkim@snu.ac.kr, Phone: +82-2-880-6934
** Doctoral candidate, College of Business Administration, Seoul National University, Email: muse710@naver.com
*** Master student, College of Business Administration, Seoul National University, Email: yehahm@gmail.com

supplement weaknesses and to measure attitudes toward design that can be an important index of product evaluation.

Keywords: Design, product development, high-tech marketing, attitudes toward design

INTRODUCTION

The recent changes in consumption trend establish product design as a key strategic tool that unlocks innovation. Prior studies have confirmed that product designs have significant influences on consumers' behaviors such as decision making and purchasing. A product's design is an important factor in consumers' first impressions of the product, delivers strengths of the product, and allows consumers to predict specifications (Bloch 1995). Furthermore, the product's appearance itself can produce values, thereby leading consumers to purchase products with better design (Creusen and Schoormans 2005). Product designs play a critical role in attracting consumers' immediate attention, thus increasing profitability and market share of the company (Noble and Kumar 2010).

Aesthetic design has generally been described to be related to the pleasure of observing a product, but not with its utility per se (Holbrook 1980). However, since aesthetic values have become closely related to the functions of all product categories (Holbrook 1980; Holbrook and Anand 1992; Holbrook and Zirlin 1985), it is now expected that aesthetic values also affect consumers' evaluations on product functions, particularly in the case of high-tech products. Therefore, this study looks into how consumers' perceptions of a product's attributes are affected by the product outlook when consumers form attitudes toward a product. In this study, product attributes are classified into three categories: 1) "design attributes" which refer to aesthetic and formal features that constitute the appearance of the product, 2) "symbolic attributes" which indicate the means and values associated with the product outlook, and 3) "functional attributes" which are regarding the technical performance and usefulness of the product.

The objective of this study is to explore the relationships among three types of product attributes, and the influence design attributes

have on attitudes toward product and purchase intention. Also, this study aims to identify the mediating role of attitudes toward design in the relationship between design attributes and attitudes toward product. In addition, this study examines the moderating effect of individual variables such as design sensitivity.

THEORETICAL BACKGROUND AND HYPOTHESES

Product Attributes

Design attributes such as product form and appearance are important as they serve as messengers that deliver information to consumers (Nussbaum 1993). When deciding between two products with similar prices and functions, consumers tend to choose the more "aesthetically attractive" one (Creusen and Schoormans 2005; Kotler and Rath 1984; Nussbaum 1988). Furthermore, the preference of a particular product's design has a substantial impact on customer's evaluation on a product and purchase decision. A product's form can also be a powerful tool in attracting more consumers, especially in a highly competitive market (Berkowitz 1987; Dumaine 1991). New products with unique designs can immediately make existing products look old-fashioned and less attractive (Midgley 1977).

Every product possesses symbolic meaning (McCracken 1986). A product's symbolic attributes play a vital role in consumer choices (Hirschman and Holbrook 1982) because the product outlook delivers a message (Murdoch and Flurscheim 1983). Moreover, the product outlook expresses and strengthens the brand image (Schmitt and Simonson 1997). Therefore, many companies attempt to maintain uniformity in using design elements such as color, form, and style (Creusen and Schoormans 2005).

The product's functional attributes are also delivered through product outlook, and they supplement the information and help consumers form attitudes. A product's functional values are associated with the utility of the product (Veryzer 1995), and consumers form impressions about the functions and qualities of the product based on its outlook (Bloch 1995). In other words, the physical outlook of the product signals its quality to the consumers

(Dawar and Parker 1994).

Creusen and Schoormans (2005) explained the roles of product outlook with six elements: aesthetic value, symbolic value, functional value, ergonomic product information, attention attractions, and product categorization. According to their empirical research, 65% of the respondents selected aesthetic factors as the reason for choosing a certain product. The next two responses were the symbolic factors and functional factors. They also found out that there is a strong association between aesthetic values and symbolic values. This was because, as Vihma (1995) revealed, the subjects mentioned symbolic associations while explaining why the products they selected were more aesthetically attractive.

Thus, this study explores the factors that constitute product's symbolic and functional values and the impact design attributes have on them. More specifically, by examining whether responses on certain design elements have positive or negative relationship with symbolic and functional attributes, this study will provide implications on consumers' product design perception. Therefore, the following hypotheses can be established.

H1: Product's design attributes are correlated with (a) symbolic; (b) functional attributes.

Attitudes toward Design and Product Evaluation

Consumers' psychological responses to product designs can be divided into cognitive and affective responses (Bloch 1995). Cognitive responses are usually associated with product-related beliefs such as utility and categorization, while affective responses lead to simple positive or negative feelings or evoke stronger aesthetic responses. Veryzer and Hutchinson (1998) also found that unity and prototypicality positively affect aesthetic responses. In a study on customers' reactions to product designs, Sung and Jung (2003) conceptualized the reaction process with design perception, design evaluation, attitude toward design, product evaluation, and attitude toward product. Design perception refers to a consumer's perception of a product's appearance when he or she first sees the product, whereas design evaluation means a cognitive and subjective evaluation of the perceived design, a more elaborate response than design perception.

Based on these sequential relationships, the attitude toward design is considered as the overall emotional preference of the product design, and it is highly related to the aesthetic responses. Also, Orth and Malkewitz (2008) suggested that the overall effect of the package comes not from any individual element (e.g., color, shape, size) but rather from the gestalt of all elements working together as a holistic design. According to previous studies, responses to aesthetic form and related values are expected to evoke overall evaluation toward product design. Therefore, hypotheses can be established that product attributes have positive impact on attitudes toward design.

> **H2:** Perception on (a) design; (b) symbolic; and (c) functional attributes affects attitudes toward design.

In this context, it is needed to examine the relationship between these aesthetic responses and product evaluation (Bagozzi, Gürhan-Canli, and Priester 2002; Veryzer and Hutchinson 1998). An examination of consumers' responses to design reveals that product design not only arouses simple aesthetic feelings but also induces cognitive inferences about the product's specifications. Based on these aesthetic feelings and presumptions about specifications, consumers form the overall preferences for certain products.

Noble and Kumar (2010) suggested that rational, kinesthetic, and emotional design value are associated with positive behavioral and psychological consumer responses such as choice and attraction. In other words, consumers generate attitudes toward product based on their attitudes toward the product's design. Based on the arguments mentioned above, this study also hypothesizes that attitudes toward design is expected to have influence on the product evaluation.

> **H3:** Attitudes toward design have a positive effect on attitudes toward product.

Yamamoto and Lambert (1994) revealed that consumers tend to increase their expectations on the aesthetic factors of a product when their evaluations must include various factors. As Bloch (1995) mentioned, responses to design attributes are based on cognitive responses of design elements and thus do not include personal preferences. In other words, consumers are expected to form holistic

judgment on certain design before making an evaluation on the product. Therefore, it can be assumed that attitudes toward design will play a role as a mediator in the relationship between design attributes and consumers' attitudes toward product. Furthermore, because it can easily be predicted that positive attitudes toward a product would lead to higher purchase intention, the following hypotheses can be established.

H4: Attitudes toward design play a mediating role in the relationship between design attributes and attitudes toward product.

H5: Attitudes toward product have a positive effect on purchase intention.

Individual Characteristics and Product Type

Previous researches have confirmed that product evaluation is likely moderated by several factors related to individual tastes and preferences of the consumer (Bloch 1995; Bloch, Brunel, and Arnold 2003; Noble and Kumar 2010). Holbrook (1987), for example, contends that those who value visual elements when evaluating designs tend to pay more attention to product design and thus have a clearer preference when selecting products. Further, design preferences are often influenced by the consumer's desire for uniqueness. That is, consumers who have a strong desire for uniqueness prefer more sophisticated or unordinary products. In this sense, design plays a crucial role in differentiating products (Snyder and Fromkin 1980).

According to Csikszentmihalyi and Robinson (1990), consumers with high design sensitivity, which is very innate, tend to seek for more innovative designs than consumers with low design sensitivity. In this study, the moderating role of design sensitivity will be examined in the relationship between consumers' attitudes toward design and their attitudes toward products.

H6: Higher design sensitivity strengthens the relationship between attitudes toward design and attitudes toward product.

Holbrook and Hirschman (1982) divided the product type into two categories: utilitarian and hedonic. Kempf (1999) discovered that

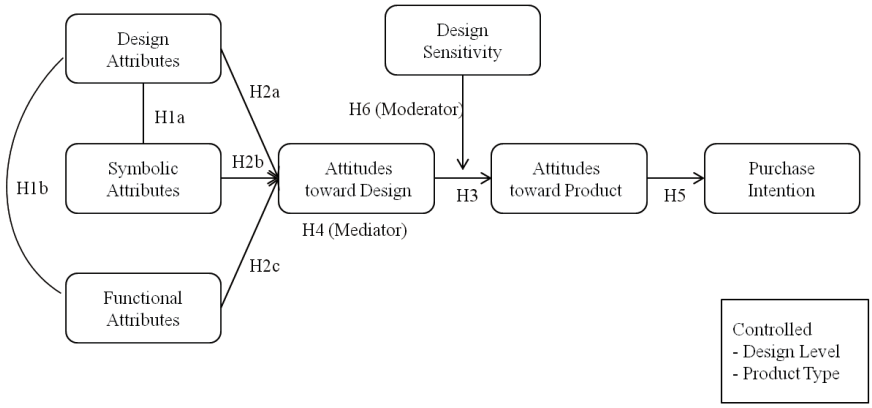

Figure 1. Research Model

consumers tend to depend on product specifications when evaluating utilitarian products, while they depend on their feelings about the product when evaluating hedonic products. Furthermore, Batra and Ahtola (1990) emphasized that consumers' attitudes toward product have two-dimensional properties, including utilitarian and hedonic properties. These properties can be high or low, or there could be differences in these properties for each product. Generally, high-tech products can be categorized as utilitarian products because of their technological value. However, when considering the fact that recent digital technologies with emotional designs produce more pleasant responses, and designs have more influence on choice behavior, high-tech products now have both utilitarian and hedonic properties rather than only utilitarian properties. Therefore, this study selected experiment stimuli, one with high hedonic properties and one with low hedonic properties.

RESEARCH METHODS

Stimuli Selection

In this study, a preliminary survey with high-tech products was conducted in order to select the experiment's stimuli. With the considerations of product type and price, an mp3 player, a digital camera, and a home-theater audio system were proposed as

products with hedonic properties, while a camcorder, a laptop, and a hard disk were proposed as products with utilitarian properties. A pre-survey with 37 respondents was conducted for each product to measure hedonic and utilitarian properties respectively. The pre-survey included items such as "This product makes me feel pleasant" and "This product makes my life easier" (Babin, Darden, and Griffin 1994; Chaudhuri and Holbrook 2001).

As a result, this study selected 2 types of products (i.e., mp3 player and camcorder), and in order to differentiate design level, 2 stimuli for each product were selected with normal or superior design. The same descriptions for the specifications were inserted in the survey to assume that both products would have the same qualities regardless of design level. The pictures in the questionnaire were printed in color, and were distributed randomly to 231 respondents. Finally 424 observations (for the mp3 player and the camcorder) were used for the analysis.

Measurement

For the survey, the respondents were asked to examine the images of a product, read the specifications, and then rate 32 adjectives that were selected through a pre-survey. The respondents then were asked to answer questions on design evaluation, product evaluation, hedonic values, and also demographic questions. This study used a 7-point Likert scale ranging from 1=extremely unlikely to 7=extremely likely.

Product Attributes. To collect properties that are conjured up based on a product's appearance, a pre-survey on 55 adjectives or descriptive words was conducted. Using factor analysis, subordinate properties for aesthetic, symbolic, and functional attributes were induced. Finally, a total of 32 questions were used. In detail, there were 12 questions about design attributes that were regarding aesthetic elements such as color, size, and decorations, 12 questions about symbolic attributes considering products' appearance such as uniqueness, and 8 questions about functional attributes for utility features such as convenience and safety.

Attitudes toward Design. "Attitudes toward design" is defined as emotional preference for particular products' design. Sung and

Jung (2003) used "It is good," "It is cool," and "It is sophisticated" to measure attitudes toward design, and Veryzer and Hutchinson (1998) asked the respondents to rate the attractiveness of visual features to measure their aesthetic responses to product design. In this study, with the addition of "The design is sensible," which was a frequently used expression among consumers when evaluating design, a total of 3 items (i.e., design is cool, design is sophisticated, and design is sensible) were measured.

Product Evaluation. "Attitudes toward product" was measured with 3 items drawn from the questions previously used by Mackenzie, Lutz, and Belch (1986) such as "It looks good," "It is satisfying," and "It is interesting." To measure the purchase intention, 2 items such as "I am willing to purchase the product" and "I am willing to recommend this product to my friends" were developed referring to previous studies.

Design Sensitivity. After examining the variables used in ATSCI (Attention to Social Comparison Information) scale (Lennox and Wolfe 1984), Holbrook (1987), and Csikszentmihalyi and Robinson (1990), a total of 6 items, including the level of design sensitivity in the process of product purchase, an interest in design, and the importance of design were developed.

RESULTS

Reliability and Validity Analysis

In order to ensure the reliability and validity of the variables, the Cronbach's alpha coefficients were checked and the factor loadings in the principle component analysis with varimax method were examined. The results show the alphas were 0.94 for attitudes toward design, 0.92 for attitudes toward product, 0.94 for purchase intention, and 0.89 for design sensitivity and the factor loading were statistically significant for each construct. As shown in the table 1, 2, and 3, alpha coefficients for all attributes were more than 0.6 and the factor loadings for the questions on each construct were over 0.7, thus confirming reliability and validity of the variables.

First, for design attributes, after 3 items were eliminated from total

Table 1. Analysis of design attributes factor

Question	Factor Loading (Design Attributes)			
	Color	Strength	Thinness	Simplicity
It is bright	.858			
It is brightly colored	.823			
It attracts attention	.748			
It is strong		.951		
It is firm		.944		
It is slim			.892	
It is small			.872	
It has many decorations®				.869
It is simple				.735
Eigenvalue	3.452	1.910	1.884	1.493
% of variance	28.764	15.194	15.698	12.442
Cumulative % of variance	28.764	44.678	60.376	72.818
Cronbach's α	0.853	0.912	0.808	0.600

®indicated questions with reverse coding

Table 2. Analysis of symbolic attributes factor

Question	Factor Loading (Symbolic Attributes)		
	Unique	Modern	Familiar
It is unique	.863		
It is exclusive	.857		
It is fun	.825		
It is cheerful	.734		
It is urban		.827	
It is modern		.792	
It is intelligent		.726	
It has familiar			.850
It is warm			.843
Eigenvalue	3.517	3.253	1.929
% of variance	29.312	27.110	16.077
Cumulative % of variance	29.312	56.422	72.499
Cronbach's α	0.904	0.801	0.737

12 questions through reliability analysis, the remaining items were categorized into 4 factors: color, strength, thinness, and simplicity. Color measures whether the product looked bright or clear, strength is associated with the product materials, thinness relates to the product's form and size, and simplicity deals with the decorations or

Table 3. Analysis of functional attributes factor

Question	Factor Loading (Functional Attributes)		
	Durability	Innovativeness	Performance
It is durable	.813		
It is safe	.771		
It is new		.891	
It is advanced technology		.856	
It has various functions			.882
It has high quality			.709
Eigenvalue	2.429	2.113	1.521
% of variance	30.367	26.417	19.011
Cumulative % of variance	30.367	56.783	75.794
Cronbach's α	0.819	0.908	0.703

the simplicity of design.

Next, for symbolic attributes, excluding 3 items from the total of 12 questions, a group of 3 factors was created: unique, modern, and familiar. Uniqueness refers to the distinction of the product from others, modernity is associated with how much the product can induce the cosmo, and familiarity measures the warmth of the product.

Lastly, durability, innovativeness, and performance factors were chosen as functional attributes. Durability is associated with whether the product looks solid and safe, innovativeness captures whether the product looks new, technological, or trendy, and performance is related with specifications and qualities.

Manipulation Check

In order to examine the respondents' awareness of design levels, a t-test analysis was conducted. The results show that for a product with superior design, the scores of attitudes toward design were higher (4.519 vs. 3.248, t=-10.572, p<.001), and the scores were also higher for attitudes toward product (4.410 vs. 3.370, t=-7.873, p<.001) and purchase intention (3.891 vs. 2.290, t=-6.908, p<.001). As a result, it is confirmed that even when products have the same specifications, the ones with better designs are evaluated more positively, and therefore, for the empirical analysis, the design level was controlled.

Table 4. Relationship among sub-attributes

Factor	1	2	3	4	5	6	7	8	9
1. Color									
2. Strength	-.137[b]								
3. Thinness	.375[a]	-.085							
4. Simplicity	.019	.203[a]	.213[a]						
5. Uniqueness	.738[a]	-.108[c]	.311[a]	.013					
6. Modernity	.507[a]	.132[b]	.311[a]	.266[a]	.541[a]				
7. Familiarity	.395[a]	.062	.148[b]	-.004	.389[a]	.315[a]			
8. Durability	-.104[c]	.632[a]	-.019	.127[b]	-.079	.187[a]	.148[b]		
9. Innovativeness	.552[a]	.076	.290[a]	.073	.634[a]	.571[a]	.242[a]	.164[b]	
10. Performance	.167[b]	.188[a]	.013	-.129[b]	.147[b]	.252[a]	.206[a]	.276[a]	.381[a]

a: p<.001, b: p<.01, c: p<.05

Results

Relationship between Design Attributes and Other Attributes. The correlation among sub-attributes was analyzed using factor analysis to examine the relationship between product's design attributes and other attributes. As the table 4 shows, a relationship exists for most of the 10 factors. The 'color', for example, has positive correlation with 'uniqueness,' 'familiarity,' and 'innovativeness' but negative correlation with 'strength' and 'durability'. Hypothesis 1, which introduced the relationships among sub-attributes, is important in verifying the relationships among sub-factors. This study provides further explanations for the test result in discussion part.

Product Attributes' Influence on Attitudes toward Design. A multiple regression analysis was performed to verify the influence of product attributes on attitudes toward design, and control variables such as design level and product type regarding hedonic properties were included. Before the analysis, a multicollinearity test for independent variables was conducted, and as a result, VIF was very low at 0.9, and the condition index was also at a normal level.

As the table 5 shows, for the hypothesis 2a, which is regarding the relationship between design attributes and attitudes toward design, it was verified that all of the design attributes have a positive impact on attitudes toward design: color (β=0.655 p<.001), strength (β=0.120 p<.01), thinness (β=0.078 p<.05), and simplicity (β=0.101 p<.01).

Table 5. Relationship between Design/Symbolic/Functional Attributes and Attitudes toward Design

Product Attributes	Dependent Variable: Attitudes toward Design		Non-Standard Coefficient		Standard Coeffic-ient	T	R/R²/F
			B	S.E	Beta		
Design Attributes	Predictor	Color	.662	.047	.655[a]	14.099	R .553 R².546 F 85.936[a]
		Strength	.148	.044	.120[a]	3.368	
		Thinness	.077	.037	.078[c]	2.046	
		Simplicity	.140	.048	.101[b]	2.918	
	Controlled	Design Level	.226	.121	.082	1.865	
		Product Type	-.004	.101	-.002	-.043	
Symbolic Attributes	Predictor	Uniqueness	.413	.044	.394[a]	9.301	R .683 R².679 F 180.110[a]
		Modernity	.532	.042	.433[a]	12.746	
		Familiarity	.100	.039	.078[b]	2.585	
	Controlled	Design Level	.357	.092	.128[a]	3.884	
		Product Type	.033	.085	.012	.393	
Functional Attributes	Predictor	Durability	.017	.046	.013	.377	R .546 R².542 F 100.629[a]
		Innovativeness	.557	.039	.560[a]	14.385	
		Performance	.087	.048	.067	1.806	
	Controlled	Design Level	.804	.102	.290[a]	7.885	
		Product Type	.166	.093	.060	1.782	

a: p<.001, b: p<.01, c: p<.05

Moreover, for the hypothesis 2b, which proposed the relationship between symbolic attributes and attitudes toward design, it was also verified that all of the symbolic attributes have a positive impact on attitudes toward design: uniqueness (β=0.394 p<.001), modernity (β=0.433 p<.001), and familiarity (β=0.078 p<.01). Further, in the case of the relationship between functional attributes and attitudes toward design, although innovativeness (β=0.560 p<.001) showed a positive influence on attitudes toward design, durability and performance had no statistically significant impacts on attitudes toward design.

Influence of Attitudes toward Design on Attitudes toward Product. Validations of hypothesis 3, regarding the relationship between attitudes toward design and attitudes toward product and of hypothesis 6, considering the moderating effects of design

Table 6. Moderated Regression Analysis: Design Sensitivity

Variables on each step		Dependant Variable: Attitudes toward Product			
		Step 1	Step 2	Step 3	Step 4
Predictor	Attitudes toward Design (P)		**.928**[a]	.927[a]	.766[a]
	Design Sensitivity (Mo)			-.025	-.140
	P*Mo				**.030**
Controlled	Design level	1.035	-.140	-.140	-.147
	Product Type	.483	.075	.076	.076
R^2		.156	.757	.758	.758
ΔR^2		.156	.602	.000	.001
F		38.823[a]	436.897[a]	327.397[a]	262.540[a]

a: p<.001

sensitivity, were also carried out. As the table 6 shows, the results revealed that attitudes toward design have statistically significant influence on attitudes toward product (β=0.928, p<.001), thus confirming the hypothesis 3. However, no empirical support was found as the interaction term between attitudes toward design and design sensitivity was not statistically significant. Therefore, the hypothesis 6, which assumes that higher design sensitivity strengthens the relationship between attitudes toward design and attitudes toward product, was not supported.

Mediation Effects of Attitudes toward Design. The hypothesis 4 predicted that attitudes toward design would play a role as a mediator in the relationship between design attributes and attitudes toward product. In order to verify this hypothesis, a regression analysis was conducted (Baron and Kenny 1986). The analysis steps were as follows: 1) an independent variable has a significant influence on the mediating variable, 2) an independent variable has a significant influence on the dependent variable, 3) a mediator has a significant influence on the dependent variable during multiple regression analysis with independent variables and mediator, and 4) if the effect of the independent variable on the dependent variable in step 2 is greater than that of the independent variable on the dependent variable in step 3, the role of the mediator is verified. If the effect of the independent variable on the dependent variable in step 3 is not statistically significant, there is a full mediation effect,

Table 7. Mediated regression analysis: Attitudes toward Design

Step	Dependant Variable: Attitudes toward Product			
	Color	Strength	Thinness	Simplicity
1	.710[a]	.225[a]	.283[a]	.212[a]
2	.769[a]	.222[a]	.323[a]	.231[a]
3(P)	**.175[a]**	**.014**	**.067b**	**.036**
4(Me: attitudes toward design)	**.837[a]**	**.926[a]**	**.905[a]**	**.923[a]**
R	.767	.757	.761	.758
ΔR^2	.611	.602	.605	.602
F	345.173[a]	327.076[a]	333.088[a]	327.934[a]
Mediating effect	Partial	Complete	Partial	Complete

a: p<.001

while there is only a partial mediation effect when the effect is statistically significant.

For example, the mediating effect of attitudes toward design in the relationship between color and attitudes toward product was analyzed. The result of the regression analysis with color as an independent variable and attitudes toward design as a dependent variable turned out to be statistically significant (β=0.710, p<.001), and there was also significance in the regression analysis in which color predicted the attitudes toward product (β=0.769, p<.001). Furthermore, in step 3, where both color and attitudes toward design were inputted simultaneously to the regression model, attitudes toward design had a statistically significant influence on attitudes toward product (β=0.837, p<.001), and because the independent variable had statistically significant influence on the dependent variable (β=0.175, p<.001), the result proved the partial mediation effect.

Similarly, the same steps applied to strength, thinness and simplicity, respectively. These results confirmed the complete mediation effect of attitudes toward design between strength/ simplicity and attitudes toward product. Therefore, as the table 7 summarizes, the hypothesis 4 was supported.

Influence of Attitudes toward Product on Purchase Intention. At last, the hypothesis 5 was tested and found a statistically significant influence of attitudes toward product on purchase intention

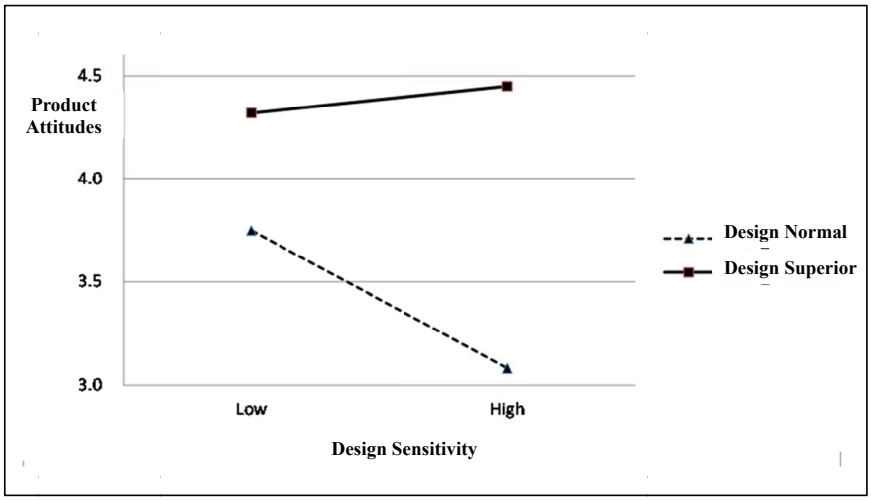

Figure 2. Interaction Effect between Design Sensitivity and Design Level on Attitudes toward Product

(β=0.895, p<.001), thus supporting the Hypotheses 5.

Additional Analysis. Design sensitivity measured how much individual emphasizes design when purchasing products and how much the design matched with the consumer. Although hypothesis 6 was rejected, in order to extend findings, two-way ANOVA with design sensitivity (H/L) and design level (superior/normal) as the independent variables and attitudes toward product as the dependent variable was conducted. The mean value of design sensitivity was high at 5.25 (SD=0.99), and a statistically significant interaction effect between design level and design sensitivity was found (F=9.134, p<.01). Also, the main effects were statistically significant: design sensitivity (F=4.571, p<.05) and design level (F=57.519, p<.001). For products with low design level, the high design sensitivity group showed a lower score (M Sensitivity H=3.07<M Sensitivity L=3.75) than the low design sensitivity group. On the other hand, for products with high design level, the high design sensitivity group displayed a higher score (M Sensitivity H=4.47>M Sensitivity L=4.35) than the low design sensitivity group. This results show that design sensitivity and design level have interaction effect on attitudes toward product, and consumers who

are more interested in design reacted more sensitively based on design level. Therefore, it would be interesting to carry out a further study that seeks for individual differences in those situations.

DISCUSSION

This study examined the impact of product designs on product evaluations by employing variables such as design attributes and attitudes toward design. Through the expressions used by consumers, the study categorized elements of product properties and analyzed relationships among design attributes, symbolic attributes, and functional attributes. This result provides several findings as follows. First, the "color" was shown to have a positive relationship with "uniqueness," "familiarity," and "innovativeness" but a negative relationship with "strength" and "durability." It means that high-tech products that are brighter and clearer produce more differentiated, familiar, and warm feelings but signal low safety. This trend, in fact, can be found in product strategies for high-tech products for which various colors and soft gloss are used to not only supplement cold feelings but also strengthen innovative images. Second, "strength" has a positive relationship with "durability" and "performance" but a negative relationship with "uniqueness." This reveals that the products that look firmer and stronger are more related to safety. Third, a positive relationship between "thinness" and "uniqueness," "modernity," and "innovativeness" shows that more consumers form symbolic values through product form as more ultra-thin or ultra-light models are developed in the high-tech products market. Finally, "simplicity" has a positive relationship with "modernity" and "durability" but a negative relationship with "performance." In other words, simple designs introduce modern feelings; but on the other hand, they signal that the product would not have various functions. These results can be explained by the fact that while design attributes and symbolic attributes can be immediately perceived through a product's appearance, it is difficult to predict functional attributes by looking at images and noting simple specification descriptions.

It was also revealed that attitudes toward design have a positive influence on attitudes toward product. Furthermore, the hypothesis that assumed attitudes toward design as a mediator in the

relationship between design attributes and attitudes toward product was also supported. Therefore, it was theoretically proved that consumers' perception of product design plays an important role in evaluating the product or forming attitudes toward the product. Finally, attitudes toward product had a statistically significant influence on purchase intention.

Implications and Further Research

A few noteworthy points can be made on the implications of these findings. First, this study provides implications on effective design strategy. As this research revealed, design attributes, beyond aesthetic and formal aspects, induce symbolic attributes and deliver signals about the functions of the product. Therefore, it is needed to explore which feelings or images each design element provides to consumers, categorize them, and then apply them for product development process. Creusen and Schoormans (2005) revealed that even if consumers prefer a product's design aesthetically, when the symbolic attributes do not match with the consumer, there is a high possibility that he or she would not purchase the product. Therefore, companies should conduct market research to select design elements that would match the characteristics of targeted consumers and also try to interlock product concept establishment and design development to have design as a strong product value.

Next, this study recommends that attitudes toward design should be measured as an important index of product evaluation in new product development. As the empirical analysis showed, because attitudes toward design play a mediating role in the relationship between design attributes and attitudes toward product, though consumers subjectively evaluate designs, product evaluation can be predicted based on attitudes toward design. Therefore, companies should develop products with designs that can attract consumers or provide positive feelings even if they are already innovative and creative to ultimately arouse purchase intention.

Lastly, this study establishes the foundation for the emotional process in which designs of high-tech products may strengthen the advantages of the product or supplement its disadvantages. According to the results of this study, for high-tech products, brighter and clearer products produce more familiar and warm feelings. It shows that high-tech products can use pastel colors or

glossy materials to supplement the cold feelings conjured up by technology. Moreover, the study also found that slimmer and smaller products induce more modern and innovative characteristics. In other words, a slim and minimal design strengthens the values of innovative technology that high-tech products have.

Although our research offers valuable implications for researchers and practitioners, it also has limitations. First, this study examined only two types of products and collected data using survey questionnaire. There is a possible gap between imagining and evaluating products through pictures and experiencing real products. Studying design is intrinsically difficult because important design elements and dimensions depend to some extent on the product and context. Therefore further research is needed to improve the understanding of design's influence on consumer responses.

Finally, because our research shows that product with less decoration evoke more modern feelings but give negative signals about performance, future studies could apply and extend the findings to trade-offs issues in choice problem between the form and the function of high-tech products. A better understanding of consumer choice factors enables designers to achieve managerial objectives and improve brand management.

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