
Xiaoyan Deng, University of Pennsylvania
Wes Hutchinson, University of Pennsylvania

Building on Norman’s (2004) three-level model of how consumers respond to product design, we divide product design into three relatively independent design levels: visceral, behavioral, and reflective design. Drawing from McQuarrie and Mick’s (1999) research on visual rhetoric in advertising, and seeing product design as a form of persuasive communication, we posit that a visual metaphor increases the product’s persuasiveness via its effects on the three levels. Two experiments support these claims. Our paper is the first research that empirically tests Norman’s theory, which also extends McQuarrie and Mick’s work from advertising design to product design.

[to cite]

[url]
http://www.acrwebsite.org/volumes/13480/volumes/v35/NA-35

[copyright notice]
This work is copyrighted by The Association for Consumer Research. For permission to copy or use this work in whole or in part, please contact the Copyright Clearance Center at http://www.copyright.com/.
SYMPOSIA SUMMARY

Consumer Response to Aesthetic Aspects of Product Design: 1-, 2-, and 3-Dimensional Perspectives

Wes Hutchinson, University of Pennsylvania, USA

SESSION OVERVIEW

The aesthetic responses of consumers to product designs (and their effects on purchase, usage, and satisfaction) are issues of considerable interest to both consumer researchers and managers of new product development. The objective of this session was to present a collection of research projects that have drawn from both areas for theory, method, and data. Thus, it should be of interest to both academics and practitioners.

Most of the existing work on product design has been concerned with visual aesthetics or how consumers respond to a product’s aesthetic aspects (Veryzer and Hutchinson 1998, Block, Brunel, and Arnold 2003; Chitturi, Raghu Nathan, and Mahajan 2007; Hoegg and Alba 2005). Building on previous research, our session revisits product aesthetics from several new angles. More importantly, our session aims at examining product design from more comprehensive perspectives including, but not limited to, aesthetic inquiry. Product design is defined as “the professional service of creating and developing concepts and specifications that optimize the function, value and appearance of products and systems for the mutual benefit of both user and manufacturer” (the Industrial Designers Society of America). The three papers in this session investigate how consumers respond to a product’s appearance (or form) differently (Brunel and Swain), how they respond to a form-function entity as a semantic unity (Luchs et al.), and how they respond to a synergy or gestalt of form, function, and value as these elements being reintegrated by a visual metaphor (Deng and Hutchinson), respectively. Our 1-, 2-, and 3-dimensional inquiries generate contributions to the consumer literature and insights for design management.

Prior research on product aesthetics emphasized variations on the part of products. Variations on the part of consumers have been largely ignored. Although Block, Brunel, and Arnold (2003) explored individual differences in the centrality of visual product aesthetics (CVPA), they treated this variation as a stable, trait-like construct (the Industrial Designers Society of America). The three papers in this session investigate how consumers respond to a product’s appearance differently (Brunel and Swain), how they respond to a form-function entity as a semantic unity (Luchs et al.), and how they respond to a synergy or gestalt of form, function, and value as these elements being reintegrated by a visual metaphor (Deng and Hutchinson), respectively. Our 1-, 2-, and 3-dimensional inquiries generate contributions to the consumer literature and insights for design management.

Prior research on product aesthetics emphasized variations on the part of products. Variations on the part of consumers have been largely ignored. Although Block, Brunel, and Arnold (2003) explored individual differences in the centrality of visual product aesthetics (CVPA), they treated this variation as a stable, trait-like construct. Extending this line of research, our first paper, by Brunel and Swain, investigates how consumers’ aesthetic evaluations of products are influenced by a dynamic interaction between their individual characteristics and their aesthetic perceptions of the product’s categorical stereotype and ideal. In one laboratory and two national field studies, they found that aesthetic evaluations arise from (1) the perceptual distance between the product and the stereotype (novelty) and (2) the perceptual distance between the product and the ideal (concinnity). Moreover, the relative weight that consumers place on each distance is moderated by their aesthetic “expertise,” as measured by the CVPA. While focusing on one dimension (aesthetics) their paper discovers the hidden “meaningful heterogeneity” ignored by previous research on this dimension.

Our second paper, by Luchs, Raghu Nathan, and Mahajan, examines the semantic unity of form and function of a product, extending previous research (e.g., Veryzer and Hutchinson 1998) in an important way. Moreover, they generalize “form” to visual representations such as abstract shapes, concrete product forms, and brand logos; and “function” to verbal representations including words, product functionality, and brand positioning. Their experiment shows that shape-word pairings that are semantically more unified are preferred to pairings that lack such a semantic match. They plan to replicate this finding in product design and corporate identity design contexts. They expect that a semantic match between a product’s visual design and its functional description would lead to higher product evaluations. By the same vein, semantically unified logo design and brand tagline would contribute to more favorable brand attitudes. Their research extends the concept of unity from 1-dimensional to 2-dimensional domain of product design.

Norman (2004) developed a three-level model of how consumers respond to product design basing on empirical evidences that human brain enables three levels of processing, namely the visceral, behavioral, and reflective level. He proposed that the design of human artifacts should be concerned with these levels. Drawing upon Norman’s theory, our third paper, by Deng and Hutchinson, focuses on a product’s visceral design (which is about the initial impact of a product; about its appearance, touch, and feel), behavioral design (about the pleasure and effectiveness of use; about its function, understanding of function, and usability), and reflective design (about how a product evokes meanings and remembrances in users and how it defines the user’s self-image). In light of McQuarrie and Mick’s (1999) work on visual rhetoric, and seeing product design as a unique form of persuasive communication, they posit that a visual metaphor increases the product’s persuasiveness via its effects on the three levels. Two experiments (the second one was conducted in two countries) support their claims. This is also the first consumer research to empirically tests Norman’s theory and, as such, complete the progression across the papers with a 3-dimensional inquiry into consumer responses to product design.

EXTENDED ABSTRACTS

“A Moderated Perceptual Model of Product Aesthetic Evaluations”
Frédéric F. Brunel, Boston University
Scott D. Swain, Boston University

Researchers in marketing and consumer behavior have begun to develop a theoretical base and a body of evidence pertaining to consumers’ evaluations of product aesthetics. However, statistical effects that are generalizable across products or settings have proven elusive. Although it could be argued that this reflects a pervasive idiosyncrasy in aesthetic evaluations, it may also be the case that existing models have not yet identified or accounted for “meaningful heterogeneity” in design evaluations (Holbrook 1986). We examine the potential for interactions between product and consumer characteristics to capture such meaningful heterogeneity.

In this research, we take a contingency perspective, where aesthetic preferences are seen as the result of systematic interactions between consumers’ and product designs’ characteristics. We propose that consumers hold mental models for each product category they consider and that products share aesthetic features that individuals can interpret in fairly consistent ways. For example, most consumers would tend to agree that an Apple iPod has a “unified, balanced and simple look,” yet they may disagree on how
desirable each of these aesthetic properties is, and how much variation around each one they may enjoy or tolerate. We develop and test an integrative model that provides a more comprehensive account of how aesthetic evaluations are formed.

The model is built on four vectors of data: (1) consumers’ perceptions of a target product’s aesthetic characteristics, (2) consumers’ perceptions of the aesthetic characteristics of the self-identified “stereotypical” product in the category, (3) consumer’s perception of the aesthetic characteristics of their “ideal” product in the category, and (4) consumers’ own characteristics (in particular as measured by the Centrality of Visual Product Aesthetics, CVPA, Bloch, Brunel and Arnold 2003). Extending the existing conceptualization of the first three elements (Coates 2003), we undertake algebraic formalization of the relationships therein. Through the model, we build an aesthetics perceptual space for the product and category at hand. For a given product in a specific category, we can measure perceptual evaluations (using semantic differential scales) for a relevant series of aesthetic dimensions for the product, the category stereotype, and the category ideal. We can use these vectors of data to compute several perceptual distances and then locate each object in a perceptual space. The first distance of interest is the perceptual distance between the object and the stereotype (DSi), and it can be conceptualized as a measure of novelty. The second measure of interest is the perceptual distance between the object and the ideal (DIi), and can be conceptualized as a measure of design concinnity (i.e., harmony, beauty). Further, we can conceptualize the distance between the stereotype and the ideal as a measure of design potential.

Although previous conceptualizations have struggled to explain why different consumers place different weights on design characteristics that evoke stereotypicality versus novelty, we suggest that much of the variation arises from differences in CVPA. Briefly, the Centrality of Visual Product Aesthetics scale (CVPA; Bloch, Brunel, and Arnold 2003) measures the salience of visual design in a consumer’s relationships with products, specifically, it captures the extent to which a consumer (1) values design, (2) responds to design, and (3) evaluates design with skill (acumen). CVPA has been shown to moderate the effect of product design on aesthetic evaluations, product attitudes, purchase intentions, and willingness to pay (Bloch et al. 2003), yet no research has yet examined skill-related outcomes of CVPA.

To assess our conceptualization, we analyzed two national field experiments as well as a controlled laboratory experiment. The field experiments were carried out in conjunction with a major automobile manufacturer and involved nationally representative samples of sport utility drivers. The lab experiment involved university students who participated in return for course credit. Across these three studies, we find consistent empirical support for the notion that product aesthetic evaluation systematically varies with DSi and DIi, and interacts with CVPA. This suggests that consumers’ aesthetic evaluations are not purely idiosyncratic but rather are a function of previous exposure to the category (as represented by the perceived category stereotype) as well as idealized notions of the category (as represented by the perceived category ideal).

Additionally, we find that the visual information conveyed in product a design is differentially available to consumers and that CVPA scores are predictive of this heterogeneity. Of course, it is important to keep in mind that consumers’ ability to recognize and categorize designs can be (but are not necessarily) independent of their design attitudes and preferences. Still, variation in skill leads to variation in the informational inputs to attitudes and preference, and we can expect consumers with greater skill to have greater attitude certainty, lower attitude ambivalence, more precisely defined preferences. An important area for future research is to determine the reasons for differences in design evaluation skill. Candidate factors include differences in the way product shapes are stored in memory (e.g., verbal, visual), in knowledge structure (e.g., quantity, density, accessibility), and in visual acuity (e.g., bandwidth, resolution, resources).

“Form-Function Unity: Understanding the Interactive Relationship between Product Form and Function”
Michael Luchs, University of Texas at Austin
Raj Raghunathan, University of Texas at Austin
Vijay Mahajan, University of Texas at Austin

While past research has demonstrated the importance of product form and product function as independent antecedents of consumers’ evaluations of products, the focus of the current research is on examining the interdependent relationship between form and function on consumers’ product evaluations. Specifically, we examine product evaluations based on the degree to which a given product’s form and function are perceived to be “unified,” which we define and operationalize as the degree to which they share common associations or meanings. Our research addresses the following questions.

1. Do consumers prefer products when form and function elements are unified?
2. What factors moderate consumers’ preferences for form-function unity?
3. What factors mediate consumers’ preferences for form-function unity?
4. Is the preference for form-function unity conscious?

There are several reasons that could lead one to conclude that consumers will, in general, prefer products whose form and function are unified. According to Gestalt theory, people delight in order. As such, product preferences may be guided by holistic features such as unity. For example, Veryzer and Hutchinson (1998) demonstrated that consumers prefer products whose visual elements are perceived to be unified. Also, to the degree that unified products are processed more easily (Banks, Clark and Lucy, 1975), we would expect them to be preferred over disunified products given that objects that are processed more easily tend to be preferred in general (Reber, Schwarz and Winkielman, 2004). Another reason to expect that consumers will prefer unified products is based on the notion of psychological essentialism (Medin and Ortony, 1989). According to psychological essentialism, people assume that objects have an underlying essence or nature. This underlying nature manifests itself in both how the object appears as well as what the object does (i.e., its function). We would expect, then, that unified products will be perceived to make more sense given that form and function share an underlying essence and that, therefore, they will be preferred over disunified products.

While there are several reasons to expect that consumers will prefer products whose form and function are unified, there are also reasons to expect just the opposite, i.e. that consumers might prefer products whose form and function are disunified. Berlyne (1971, 1974) argued that there is an ideal balance between Gestalt preferences for unity, for example, and a need for some optimum level of arousal due to factors such as complexity. As such, consumers might prefer products whose form and function are disunified as long as they are not so extreme as to be incredible or overly complex. In addition, it is possible that under certain conditions, some consumers will base their evaluations on atomistic properties
(e.g., individual features) vs. holistic properties such as unity (Hoegg and Alba, 2005). As such, it is plausible that a disunified product will be perceived as offering greater value given its potential for providing value along more than one dimension (e.g. a “disunified” car that looks powerful and that is described as fuel efficient may be seen as providing both benefits). Evaluations based on atomistic properties require greater elaboration than do evaluations based on holistic properties, and prior research suggests that greater elaboration is likely among consumers with higher product knowledge (Sujan, 1985) and felt involvement (Celsi and Olson, 1988). Thus, we would expect the relative preference for unity (vs. disunity) to be moderated by product knowledge and felt involvement.

In study 1 we demonstrated, using abstract stimuli (shape-word pairs), that people prefer objects whose elements are unified (M=5.07) relative to objects that are disunified (M=3.17), (F(1, 241)=16, p<0.0001). Specifically, participants preferred objects whose shapes connoted “strength” when paired with synonyms of “strength,” and preferred shapes that connoted “flexibility” when paired with synonyms of “flexibility.” This result was statistically significant even when a comprehensive set of potential covariates was included in the analysis.

In study 2, we replicated the main effect of unity in a consumption context, across two product categories. Specifically, participants liked non-alcoholic beverages more when form and function were unified (M=3.98) vs. disunified (M=3.15), (F(1, 55)=26.34, p<0.0001); they also liked air purifiers more when form and function were unified (M=6.46) vs. disunified (M=6.12), (F(1, 55)=6.62, p=.01).

The objective of Study 3 was to examine whether product knowledge and felt involvement moderate the effect of unity on product liking. While neither product knowledge nor felt involvement had a significant effect on their own, (F(1, 127)=0.30, p=.58) and (F(1, 127)=1.02, p=.32) respectively, results revealed a significant interaction between product knowledge and felt involvement, (F(1, 127)=6.63, p=.01). As predicted, participants with relatively higher product knowledge who were also relatively higher in felt involvement preferred the disunified pairs to the unified pairs.

Collectively, our studies demonstrate that consumers do, in general, prefer products whose form and function are unified. We argue that this result is primarily due to consumers’ desire for order in the world around them. Importantly, the unity effect is qualified by product knowledge and felt involvement such that, when both are high, a relative preference for disunity emerges. Because consumers’ qualified preference for form-function disunity (when knowledge and felt involving are sufficiently high) could be mediated by perceptions of greater complexity and/or by perceptions of higher value, a proposed experiment will be examine whether these processes underlie the preference for disunity. In another experiment, we intend to examine whether consumers are aware of their preference for unity and disunity, i.e. whether they realize that the form-function interaction is influencing their preferences.

Xiaoyan Deng, University of Pennsylvania
Wes Hutchinson, University of Pennsylvania

Product design is increasingly being recognized as an important strategy that firms use to create a substantial competitive advantage. A well-designed product sells more, enlarges market share, gains wider distribution, increases margins and carves out new opportunities. For example, by launching a series of groundbreaking products such as iMac, iBook, iPod and the forthcoming iPhone, Apple has revolutionarily revitalized itself and reinforced its status as a legend in the history of business. By harnessing the power of design, Apple has cemented a unique position as a force in computing, consumer electronics (via iPod, iPhone), music (iPod again) and movie industry (Pixar).

However, compared to other areas, surprisingly little experimental work has been done to study product design, either by scholars in design field or by researchers of adjacent disciplines such as marketing that share a stake in design. An empirically based, “design science” has yet to emerge—particularly from the perspective of consumer responses to design variables. The goal of the present research is to contribute to the foundation of such a design science.

Product design is defined as “the professional service of creating and developing concepts and specifications that optimize the function, value and appearance of products and systems for the mutual benefit of both user and manufacturer” (the Industrial Designers Society of America). Norman (2004) proposes a three-level (namely visceral, behavioral, and reflective) model of how consumers respond to product design. Building on practitioners’ wisdom and Norman’s framework in the present research, we divide product design into three relatively independent design levels: visceral, behavioral, and reflective design. We further postulate that visual metaphor as a design component can integrate the three levels in a fashion that increases the persuasiveness of a design. Drawing upon McQuarrie and Mick’s (1999) work on visual rhetoric in advertising, and seeing product design as a form of persuasive communication, we posit that a visual metaphor increases the product’s persuasiveness via its effects on the three levels. Two experiments reported here lend supports to these claims. To our knowledge, this is the first research that empirically tests Norman’s theory of design. Moreover, this work extends McQuarrie and Mick’s visual rhetoric research from two-dimensional advertising design to three-dimensional product design.

The essence of metaphor is to understand and experience one thing in terms of another (Lakoff and Johnson 1980). At visceral level, because of this “seeing as” or “aspect seeing” nature (Hester 1966), metaphorical experience is akin to mental imagery and aesthetic perception (Aldrich 1958). At behavioral level, because metaphor is meant to communicate an unfamiliar target concept (e.g., a product’s function) in terms of a familiar base concept (e.g., the product’s “metaphoric” form) via structural mappings between the two (Gentner 1997), it facilitates the understanding of product function. Such understanding further enhances the product’s functionality and usability. Finally, at reflective level, because metaphor (and rhetorical figures in general) is an “artful deviation” in the form taken by a statement (McQuarrie and Mick 1999), it “deviates” from the expectations held by a communication encounter, therefore it elicits elaboration. Because such a deviation is “artful,” metaphor (and rhetorical figures in general) produces pleasure. Considering its effects on all three levels, but especially its “elaboration” and “pleasure” effects on the reflective level, we expect visual metaphor to render a product more persuasive in the sense that it induces a more favorable attitude and a higher purchase intention in consumers.

In study 1 (N=185), we selected “metaphoric” designs from existing products in the market. We then removed the visual metaphor from the design to create a non-metaphoric, baseline design while keeping other design elements (shape, color, texture, etc.) unchanged (cf. Veryzer and Hutchinson 1998). Our data show that, comparing to the baseline, metaphoric designs were systematically rated higher across nine measures of the three levels as well as
the two dependent measures (product attitude and purchase intention). However, although visual metaphor has a significant effect on the reflective level, its effects on the other two levels were not significant. Nor was its effect on product attitude and purchase intention. In retrospect, we realize that our experimental procedure informed subjects about product function and might have compromised the communication function of metaphor and its effects. Another limitation of study 1 was how we prepared product stimuli. That is, because we constructed baseline design by removing visual metaphor from an existing product, any observed effect of visual metaphor might due to the fact that the “baseline” might have been made “worse” in ways that professional designers would never do.

In study 2, in contrast to study 1, we chose non-metaphoric, baseline designs from actual products available in the market. We then added a visual metaphor to the original design to create a metaphor version of product while holding other design elements constant. We improved our study procedure so subjects were blind to the function of each product stimulus throughout the study. Based on what we found in study 1, that is, visual metaphor’s effects disappear when a product’s function is known, we hypothesize that visual metaphor is advantageous only for poorly designed products. When a (non-metaphoric) product is well-designed in the sense that it is functionally unambiguous and aesthetically attractive, adding a visual metaphor cannot offer too much help. In order to test this hypothesis, a pretest (N=163) was conducted from which eight product stimuli, spanning the range of “functional ambiguity” and “visual attractiveness,” were selected to be used in study 2. In study 2 (N=441, conducted in the U.S. and Australia), we confirmed that, when a non-metaphoric, baseline product is functionally ambiguous and visually unattractive, adding a visual metaphor to it significantly increases its ratings on product aesthetics (visceral level); understandability, functionality, and usability (behavioral level); reflectivity, imagistic and discursive elaboration (reflective level); as well as product attitude and purchase intention (persuasiveness). Regression analyses also show that responses to visceral, behavioral, and reflective design significantly predict a product’s persuasiveness, providing empirical support for Norman’s model.

References


