

**Nonconscious Factors Influencing Attitude/Behavior/Judgment of
Products and Sequences**

by

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ABSTRACT

Researchers had previously tended to pay more attention to aspects of judgment and behavior that are deliberative and conscious. Only in the past decade or so has research emerged that gives due importance to factors that play a role in influencing attitude and behavior but may lie outside the realm of conscious awareness. In a review paper Fitzsimons et al (2002) posit that consumer choice behavior is a mix of conscious and nonconscious influences, and the role of nonconscious influences may be quite significant. They define nonconscious influences to include stimuli that are not consciously perceived by the consumer, downstream effects of consciously perceived stimuli, and decision processes that occur entirely outside of awareness.

In my dissertation I study the effects of stimuli that are consciously perceived but have a nonconscious influence on attitude, behavior or judgment in two domains- evaluation of products and evaluation of hedonic sequences.

In the first essay I examine whether aesthetically appealing packaging plays a role in the evaluation and experience of products. Do products truly benefit from aesthetically appealing packaging? Do all types of products benefit equally? I firstly provide empirical evidence demonstrating the influence of aesthetically appealing packaging on product valuation and product attitude. I find that aesthetically appealing packaging positively impacts product valuation and attitude for hedonic products but offers no such benefits for utilitarian products. I further propose and test a conceptual model of packaging. Particularly, I propose a dual cognitive-affective route of how aesthetically appealing packaging may positively impact product attitude and valuation, which produces differential effects for utilitarian and hedonic products. I find that for familiar brands, affective reactions play a greater role than cognitive reactions in mediating the impact of packaging on product attitude and behavioral intent, suggesting that the influence of aesthetically appealing packaging may be at a more nonconscious automatic level. I present this work as a significant first step toward a fuller understanding of the conceptual role of packaging appeal in the entire product experience, for which there currently exists little to no research.

In the second essay, I study the two context effects that have arguably been the most reliably demonstrated in psychology and marketing: assimilation and contrast, in the realm of sequential hedonic judgment. Most judgments consumers make are parts of sequences and are

hence unlikely to be context-free (Dato-on and Dahlstrom 2003; Stapel and Winkielman 1998). The literature in marketing is replete with examples of how the context in which a stimulus is embedded can have a significant impact on people's judgment of that stimulus, without their conscious awareness. *Assimilation* refers to a positive relationship between the value people place on the contextual stimuli surrounding a target and the value they place on that target itself. *Contrast* refers to a negative relationship between these two values (Martin, Seta, and Crelia 1990; Sherman et al. 1978). A general presupposition for much of the work on assimilation and contrast is that one or the other takes place, and that characteristics of the context such as domain match, product knowledge, availability of cognitive resources, and context set range dictate which one occurs. In this paper, I propose that both assimilation and contrast can co-occur within a sequence of experiences and present a hierarchical Bayesian model separating these effects within a unique, real world data set. I find that assimilation effects are prominent and contrast effects, which may be masked by assimilation, emerge only after the latter has been adjusted for. To the best of my knowledge, this work is the first empirical demonstration of hedonic contrast using real-world data where stimuli are presented in random or non-monotonic sequences, and the only work thus far to identify and separate assimilation and contrast effects within the same sequence of evaluations.

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1. The Role of Aesthetically Appealing Packaging in Product Valuation

1.1 Introduction

It appears that marketers consider the potential of a package to be much more than a medium of distribution, storage and protection of a product, which is supported by the multitude of attractive shapes, sizes and colors one sees in any store one enters. Manufacturers of food and other consumer packaged products spend large sums of money developing "easy-to-open" packages that are more convenient for quick meals or for easy dispensing, and visually appealing packages which appear to communicate more than mere information about the product inside (figure 1a). Apart from the realm of consumer packaged goods, in which the packaging is visible at the time of purchase (and hence may play a role in the purchase decision process), we also see significant and creative innovations in packaging for situations in which the packaging is *not* visible before or at the time of purchase. For example, Apple invests significantly in developing simple, uncluttered, easy to use and visually appealing packages, even for its internet computer orders, in which the package does not affect the purchase decision. Figure 1b shows a comparative presentation of the delivered products for a Lenovo Thinkpad and an Apple MacBook Pro. The simple packaging for the Thinkpad, while fully functional, may only be characterized as "ordinary" when compared to the sleek and attractive packaging for the MacBook- packaging which appears to transcend beyond the simple functions of storage and protection during transit. Even retailers nowadays are investing considerable amounts of money in the packaging of their private label merchandise, where one of the goals is to signal the high quality of their products¹. These examples indicate that packaging is viewed by industry to have an influence on consumers- either in terms of their product choice or on their product usage experience,

¹ "Paying the Price", *Progressive Grocer* (2006) describes how national organic retailer Wild Oats is realizing the importance of all elements of the marketing mix (especially packaging) in communicating a message of high quality for their line of products.

depending on whether the visibility of the packaging applies before, during or after the purchase. However, there are certain brands like Lenovo who refrain from using attractive packaging for their products. Does this put their product at a disadvantage?



Figure 1a: Superior packaging: Evian bottled water (left); XM Satellite Radio (right)



Figure 1b: Apple Packaging stands out... Thinkpad box (left) versus the MacBook box (right)

Academic researchers reiterate the importance of product design and aesthetics as an opportunity for differential advantage in the marketplace (Creusen and Schoormans 2005, Bloch 1995), but where does packaging fit into the whole product design schema? Though intrinsically associated with a product, but most often discarded after opening, often not even visible before purchase, the role of packaging in the product evaluation process, if any, is likely to be special and subtle. For long the marketing literature had largely relegated the role of packaging to another medium of advertising, especially at the point of purchase. It is important to distinguish the roles of packaging and advertising. On the one hand, packaging may indeed be treated as a

specific form of advertising because it can be used as a tangible medium of communication to convey valuable information about the product inside. However, consider that the packaging may not actually be visible before or during the purchase decision for a large number of purchase situations. Also, consider that it is “part and parcel of” the delivered product and is hence more inherently linked to the product before (and possibly during) actual use or *consumption* as compared to advertising. A consumer interacts with a package through the powerful sense of touch, even if it is to simply open the package, take out the product inside and then discard the container. Engaging in touch can create positive attitudes and ultimately lead to positive behavior (Peck and Wiggins 2006). Moreover, unwrapping the packaging is typically the consumer’s first point of contact with the product. All this argues for examining the role of packaging in particular. There are comprehensive academic theories of how advertising impacts brand attitudes, the emotions it evokes and how that impacts brand/product perceptions (e.g. Edell and Burke 1987, 1989; Holbrook and Batra 1987), but there is no such systematic study of packaging. For example, do different kinds of packaging evoke different reactions in consumers? Are there external manifestations of these reactions in terms of their purchase behavior? Are consumers willing to pay more for products presented in aesthetically appealing packaging (AAP)? Does AAP benefit different types of products in the same manner? Is there a differential effect of AAP based on brand familiarity? We seek to answer these questions in this paper.

Note that in this research we are specifically concerned with the impact of aesthetically (visually) appealing packaging on product evaluations, and not with the impact of package shape, size and specific graphics on product perceptions, of which there is substantial empirical evidence (Wansink 1996, Yang and Raghurir 2005, Garretson and Burton 2005). In summary, we aim to study whether and how AAP impacts product valuation and to develop a theory of

how this interaction works. We postulate that the role of packaging may be more subtle than other product-related stimuli (product design, advertising etc), yet the impact on attitude to product may be substantial. Our results show that a) AAP does indeed positively impact product valuation for hedonic products but not for utilitarian products for both familiar and unfamiliar brands. In three separate studies, it was found that AAP led to increased selling price or choice/purchase price for a hedonic product as compared to the same product in an ordinary package. Attitude toward the product was also superior when it was presented in the appealing packaging. b) Affective reactions evoked by the appealing packaging were stronger and significantly more positive than those evoked by the ordinary packaging; however, this effect was restricted only to hedonic products. c) Through a series of analytical models we propose a dual cognitive-affective theory of how AAP may positively impact product valuation and attitudes (figure 2), and find that for familiar brands, the role of affective reactions is more significant than the role of cognitive reactions.

We present this research as a significant first step toward a full understanding of the conceptual role of packaging in the whole product experience, and toward giving packaging its due importance in the academic literature. We posit that packaging is much more than a short-term advertising medium which only influences point-of-purchase decisions, and instead postulate it to be a medium that may help form and maintain a long-lasting relationship between a consumer and a brand or product.

The rest of the paper is organized as follows: we first present the theoretical background for this research including a detailed review of the two most relevant streams of literature in consumer behavior- packaging and emotions, and position our work and build our theory in this context. We then present three studies to test our hypotheses and all the relevant analyses, and

derive a conceptual model of the role of packaging. Finally we discuss the limitations of the current work, and discuss the practical implications of our research.

1.2 Literature review and theoretical model

1.2.1 Packaging and Consumer Behavior

The bulk of the packaging literature to date focuses on size, shape, and graphics and their impact on product perceptions. Indeed, for the most part, marketing literature has relegated the role of packaging to primarily an advertising medium. As early as in the 1960s, marketing practitioners had called out to industry to pay more attention to packaging. Twedt (1968) urges that "the potential contribution of a superior package to profitability is simply too great to be ignored." He proposed a simple framework for the industry to evaluate a potential new package which he called "VIEW" (Visible, Informative, Emotionally appealing, Workable). While arguing that packaging is even more powerful than advertising because of the sheer exposure the package receives at the time of purchase, Light (1980) does, however, relegate packaging to be a tangible medium of information for the buyer, "the last incentive or obstacle to purchase (or, the 'Silent Salesman')." While he suggests that packaging does increase perceived value of the product he posits that it does so by providing tangible information about the attributes of the product (strength etc.) and calls for a clear theory to study exactly how packaging affects product valuation.

The literature on package sizing (and shape) is more evolved and has seen a lot of interest in recent times. Wansink (1996) showed that larger package sizes do accelerate usage volume when attention is drawn to unit prices. In fact, Wansink has a series of research studies observing the patterns of consumption when the size of the package is varied, all establishing that larger

package sizes lead to increased consumption. There have also been studies on how particular shapes may affect perceptions of product quantity. For example, Yang and Raghurir (2005) demonstrate that people perceive elongated beer bottles to contain more beer than squat beer cans. In a similar vein, Wansink and Ittersum (2005) show how even experienced bartenders pour more alcohol into long glasses as opposed to shorter glasses. Folkes and Matta (2004) find that unusually shaped containers that attract attention are perceived to contain more product than containers that do not attract attention. Raghurir and Greenleaf (2006) find that the ratio of the sides of rectangular packages can influence preferences and they show how that may be related to market demand.

In the domain of package graphics research, Bone and France (2001) show that graphics have a more lasting impression on customers than words. Underwood, Klein, and Burke (2001) find that images on the package increase attention drawn to the brand, but that this favors lesser known brands and works less well for well known brands. Garretson and Burton (2005) find that “spokes characters” on packages induce more favorable attitudes to the brand, although they may distract from the primary message of the communication campaign or the package. Deng and Kahn (2010) show how the location of the product image on a package façade influences consumers’ perceptions of the visual heaviness of the product and evaluations of the package.

Two pieces of work particularly relevant to the current research look at the influence of the type of packaging on perceptions of the product inside. In an informal study, McDaniel and Baker (1977) find that customers perceive chips in a polyvinyl bag to be fresher than chips in an easy-to-open wax bag. In a recent working paper Batra and Brunel (2009) find that attractive wrappers may signal better quality of the enclosed product (chocolate).

Our research is fundamentally different from most of the extant research on packaging because we specifically address the role of aesthetically appealing packaging. Note that we do not attempt to dissect the impact of the individual elements of packaging like shape, color or texture, but use an overall measure of visual attractiveness to differentiate between the packaging options used. We do not use any unusual, visually arousing or attention-grabbing packaging (Folkes and Matta 2004), so based on the findings of previous research on packaging size and shape (Wansink 1996; Wansink and Ittersum 2005; Yang and Raghurir 2005; Raghurir and Greenleaf 2006), we expect that the processing of the packaging stimulus would be largely nonconscious. The literature in product design and aesthetics (Creusen and Schoormans 2005, Bloch 1995) has typically used an overall measure of product attractiveness without dissecting individual elements, and we similarly expect package aesthetics to have a holistic impact and do not expect individual elements like color, texture etc to have differential impacts on attitude and behavior.

1.2.2 Emotions and Consumer Behavior

“Of the different affective states like emotions, feelings, moods, sentiments and passions, emotions are the most relevant for product experience because they imply a one-to-one relationship between the affective state and a particular object” (Frijda, 1986, quoted in Desmet and Hekkert, 2002). Only over the last couple of decades or so has the role of emotions in consumer decision processes begun to emerge as one of interest. Most of the emotions based literature in Marketing had previously been restricted to the study of emotions elicited by advertising, and this literature covers a) what specific emotions are primed by different kinds of advertising, b) what are the best methods to measure these emotions and c) what kind of impact

do emotions primed by advertising have on attitude toward the featured product or brand. Batra and Ray (1986) review some of this literature on affective responses (moods and feelings) evoked by advertising and identify 13 major categories of affective responses- interest, authenticity, control, pride, security etc. They propose that affective responses should supplement the cognitive (logical) responses studied most often in communications research and show that such responses have a significant impact on both attitudes toward advertising as well as toward the brand. In a similar vein, Edell and Burke (1987) distinguish between feelings generated by the ad and thoughts or judgments about the ad, and demonstrate that they independently and uniquely contribute to evaluation of the product. Many authors have since revised the different categories of emotions in different consumption experiences (Richins 1997). More recently, product designers too have begun to realize the need to understand what kind of messages and emotions are conveyed by their products in order to design more effective products (Desmet and Hekkert 2002, Demirbilek and Sener 2003, Boatwright and Cagan 2010).

In the above stream of research, the focus is on emotions that are evoked by the specific context or stimulus, or “integral affect. Note that even “incidental affect”- affect that is unrelated to the decision at hand- can have a significant impact on judgment and choice (Loewenstein and Lerner 2003). Recent papers have looked at the impact of visceral emotions on decision behavior (Loewenstein 1996, Peters et al 2006), the impact of specific emotions like anger and regret on decision-making (Lerner and Tiedens 2006, Connolly and Butler 2006) and how manipulating emotion or mood affects product valuation. Lerner, Small, and Loewenstein (2004) demonstrate how priming emotions like sadness and disgust using video clips can influence economic decisions, such as selling prices for highlighter sets.

While we measure and control for incidental affect and mood, in this work our goal is to understand whether there is a difference in emotions (along with cognitive reactions) evoked in a product evaluation situation (integral affect) which may be attributed to manipulations of packaging appeal. We also wish to study whether these emotions (and cognitive reactions) can be shown to be mediators in the relationship between aesthetically appealing packaging and product valuation. This would take packaging beyond the simple notion of a short-term advertising medium which only influences point-of-purchase decisions and instead postulate it to be a medium that helps form and maintain a long-lasting relationship between a consumer and a brand or product.

1.2.3. Hypotheses

Packaging of hedonic versus utilitarian products

Researchers identify two major dimensions of product relevance- the first being the notion of instrumental or utilitarian performance whereby the product is seen to perform a useful function, and the second being that of hedonic or aesthetic performance (Mano and Oliver 1993, Hirschman and Holbrook 1982). Utilitarian benefits refer to the functional, instrumental and practical benefits (example, fuel economy and safety for a car), while hedonic benefits refer to the aesthetic, experiential, and enjoyment-related benefits of consumption offerings (example, sunroof and luxurious interior for a car; Chitturi, Raghunathan and Mahajan 2008). Despite having two dimensions, products may be classified as primarily hedonic versus utilitarian (Batra and Ahtola 1990, Dhar and Wertenbroch 2000, Okada 2005). For utilitarian products, packaging may be considered to be a utilitarian benefit- merely functional for protection and storage of the product. However, for hedonic products, aesthetically appealing packaging (AAP) may be

considered to be a hedonic benefit in that it adds to the complete hedonic experience of the product (Batra and Brunel 2009). Thus, AAP is more likely to impact evaluation of hedonic products as opposed to utilitarian products. Hence we hypothesize:

H₁: When a hedonic product is presented in aesthetically appealing packaging, the valuation for the product will be higher as compared to when it is presented in ordinary packaging.

H₂: When a utilitarian product is presented in aesthetically appealing packaging, the valuation for the product will be no different from when it is presented in ordinary packaging.

The subtle role of packaging

Although packaging is intrinsically associated with a product, but most often discarded after opening, often not even visible before purchase, we expect that the role of packaging in the product evaluation process, if any, is likely to be subtle. Indeed, researchers studying package sizing and shape (Wansink 1996, Wansink and Ittersum 2005, Yang and Raghubir 2005, Raghubir and Greenleaf 2006) have found that the processing of the packaging stimulus is nonconscious. Since we do not use packaging that is significantly superior or significantly inferior on aesthetic appeal in this research, we do not expect packaging to be consciously acknowledged or have a frontal verbal impact on product evaluation. Therefore, even though we expect a (hedonic) product to benefit from AAP, we posit that ordinary packaging may not necessarily detract from the base valuation of the product evaluated without any form of packaging.

H₃: When a product is presented in ordinary packaging, the valuation for the product will be no different from when it is presented without packaging.

The mediating role of cognition and affect

We posit that both affect (emotions) and cognition (judgments) will play a mediating role in the impact of packaging on product attitude and valuation (based on Edell and Burke 1987, Burke and Edell 1989; see Bloch 1995). Since affective reactions are automatic and occur “without effort” as opposed to cognitive reactions (Zajonc 1980), we hypothesize that in the case of AAP, affect would play a stronger role than cognition in influencing attitude toward the product. This is based on the preceding discussion about how the processing of the packaging stimulus is likely to be nonconscious, hence more likely to be sustained at the more automatic level of affect rather than cognition. Further, Kempf (1999) while studying the roles of affect and cognition in product trial found that affect played a greater role for a hedonic product than for a utilitarian product. Based on this we particularly expect that AAP would evoke greater positive affect for the hedonic product than for the utilitarian product. Our hypotheses are:

H₄: Aesthetically appealing packaging will evoke higher positive affective reactions (emotions) for hedonic products as compared to utilitarian products.

H₅: Cognitive reactions (judgments) and affective reactions (emotions) will act as mediators between attitude toward packaging and attitude toward product.

H₆: The contribution of affective reactions (emotions) in explaining product attitude will be greater than the contribution of cognitive reactions (judgments).

Brand familiarity and packaging

We expect that prior ownership or experience with a brand may dwarf the impact of packaging, which we posit to be subtle, particularly in the study of willingness-to-pay (Strahilevitz and Lowenstein 1998). In advertising research we see that attitude toward an ad can influence attitude toward the concerned brand (Edell and Burke 1987), however, we do not expect that attitude toward packaging can be studied in isolation without bringing packaging into a

conscious realm of evaluation, as in advertising. We expect that the role of prior experience with a brand would be significant, and would have to be controlled for before we attempt to isolate the effect of packaging. For an unknown or new brand we also expect that AAP would have a positive effect on valuation for hedonic products but would have no effect for utilitarian products. However, since prior experience with the brand is absent, we posit that for unknown brands the role of cognition would be more significant than the role of affect in the mediation process between packaging and attitude to product. Consumers are more likely to use signals like brand name, price, product appearance, advertising etc. as signals of product quality when objective quality is unknown or too complex to assess (Dawar and Parker 1994). Hence in the absence of other information about a product, packaging may play a more conscious role in the evaluation of the product, and “signal” quality, enhancing valuation. We hypothesize:

H₇: Aesthetically appealing packaging will positively impact valuation for an unknown brand hedonic product but will have no effect for an unknown brand utilitarian product.

H₈: For unknown brands, the contribution of cognitive reactions (judgments) in explaining product attitude will be greater than the contribution of affective reactions (emotions).

1.2.4 A Conceptual Model for Packaging

The ultimate goal of this paper is to understand the conceptual role of packaging in the whole product experience. Figure 2 depicts our proposed model of the role of packaging in influencing attitude toward product and product valuation. This model is adapted from Holbrook and Batra (1987) which itself draws upon numerous results from the literature on advertising and its influence on product and brand perceptions. Holbrook and Batra (1987) were the first to present the missing link of the intervening role of emotions in the standard model of advertising effectiveness and attitude, and we use a similar basis for proposing our conceptual model of the

role of packaging. Exposure to packaging elicits a reaction toward it (“attitude toward packaging”) which in turn evokes specific thoughts/judgments (cognitive reactions) and feelings/emotions (affective reactions) that elicit an overall reaction toward the featured product (“attitude toward product”), which finally impacts behavior in terms of valuation or willingness-to-pay. The key is that both cognitive as well as affective reactions mediate the impact of packaging on attitude toward the product. This also follows Edell and Burke (1987) and Burke and Edell (1989)’s characterization of attitude to advertising as consisting of “cognitive and affective elements”². In our model we will also attempt to determine the relative contributions of judgments and emotions in impacting attitude and behavior. In the spirit of Zajonc (1980), we hypothesize that the more spontaneous, faster affective reactions may predominate over the more involved, slower judgment or cognitive reactions, particularly for a subtle element like packaging. We go a step beyond the traditional attitude model and also demonstrate the impact of product attitude on behavioral intent, in terms of product valuation (selling prices) and willingness-to-pay (WTP).

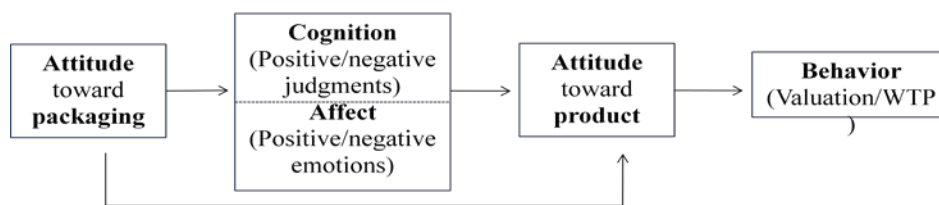


Figure 2: A conceptual model of how packaging impacts product valuation via a dual cognitive-affective process

² Note that while this stream of Marketing literature in the 80s-90s has traditionally used the term “cognitive” to represent thoughts and judgments, which are distinctly different from “affect” or emotions, current research in judgment and decision theory refer to cognitive processes as comprising both logical thoughts as well as emotions. We stick with the conventional interpretation of cognition to mean judgments/thoughts/logical reactions, and differentiate it from affect or emotions. We also recognize that affect comprises emotions, moods, sentiments etc (Frijda 1986), however, since we are focusing on the emotions aspect of affect in this research, throughout the document we use the terms “emotions”, “feelings” and “affective reactions” interchangeably.

1.3 Overview of studies and results

In three studies using different hedonic and utilitarian products presented in both appealing and ordinary packaging, we show that AAP offers benefits only for the hedonic product. Subjects indicate higher selling prices/higher willingness-to-pay and more positive attitude toward the product for a hedonic product when it is presented in appealing packaging as opposed to ordinary packaging. There is no such differential impact for the utilitarian product. In the second experiment we additionally study the emotions (affect) and judgments (cognition) elicited by the products and find that AAP evokes significantly higher positive emotions for the hedonic product but not for the utilitarian product. We also test our proposed conceptual model of packaging and find that cognition and affect mediate the impact of packaging on attitude toward the product, and that the role of affect is more significant, which contributes to the differential effect of packaging on hedonic versus utilitarian products. In the third study we investigate the impact of AAP on an unknown brand product, to account for the effect of prior experience with the brand. We also keep product design constant by manipulating the positioning of the same product once as utilitarian and once as hedonic and find that the same results hold, in that AAP enhances WTP for an unknown brand hedonic product, but has no impact for an unknown brand utilitarian product. We also find that cognitive reactions play a more significant role than affect in mediating the impact of packaging, in the absence of brand information.

1.4 Study 1: impact of packaging on product valuation

The purpose of the first study was to evaluate the impact of aesthetically appealing packaging (AAP) on the valuation of hedonic and utilitarian products. We used a 2 (product nature: hedonic versus utilitarian) X 2 (packaging: ordinary versus appealing) between-subjects design. Four

sections of an MBA marketing class ($N = 180$) of a leading North American university participated in the study and were assigned to one of the four conditions.

Stimuli Description

The hedonic product used was a mug with the school logo and the utilitarian product was a flash drive (figure 3a). In a pretest of 22 undergraduate students, the school logo mug was characterized as more hedonic ($M_{\text{mug}} = 3.8$, $M_{\text{fd}} = 1.7$; $p < .01$) and the flash drive as more utilitarian ($M_{\text{mug}} = 4.3$, $M_{\text{fd}} = 5.7$; $p < .01$), using single-item measures of hedonism and utilitarianism (Dhar and Wertenbroch 2000, Okada 2005). Four types of packaging were pretested among a different group of 16 undergraduate students who made comparative evaluations of four boxes, the two extremes of which were used for the main study. A corrugated box was rated the least desirable ("ordinary"), and a black gift box was rated the most desirable ("appealing"); $M_{\text{cor_box}} = 2.1$, $M_{\text{black_box}} = 5.2$; $p < .01$; (figure 3b).



Figure 3a: The products used in Study 1: flash drive (utilitarian) and school logo mug (hedonic)



Figure 3b: The two types of packaging used in Study 1 (left: "Ordinary", right: "Appealing")

Procedure

Participants were each given an open box containing either a mug or a flashdrive and informed that the product was theirs to keep in exchange for answering some questions about it. Subjects first evaluated the product on different aspects including appeal and perceived usefulness to allow them to spend some time thinking about the product before indicating a monetary value (adapted from Mano and Oliver 1993). They were then informed that they now had a chance to sell back their product for a predetermined price, which would be randomly picked later. They had to indicate for each of a list of prices whether they would keep or sell the product at that price (appendix 2). This incentive-compatible technique for eliciting selling prices is formally equivalent to the "Becker-DeGroot-Marschak" or BDM elicitation method (Becker, DeGroot, and Marschak 1964) and was carefully explained to subjects (appendix 1) since they had been informed that the study was an exercise to understand the application of the BDM technique, as part of a lecture on pricing. Subjects were also asked to explain their reason(s) for their indicated selling price and for their overall evaluation of the product, to see whether anyone would consciously acknowledge the (influence of) packaging at this stage. The second section of the questionnaire specifically drew subjects' attention to the packaging and asked them to what extent they thought they and others had (not) been affected by it (appendix 3). The goal of this was to make the packaging salient to the subjects and to make them aware that packaging may have been a possible influencing factor. In case the impact of packaging had been at a nonconscious level, at this stage we wanted to bring that evaluation into the conscious zone. After the questionnaires were collected, the product exchange price was revealed and the product-cash exchange was conducted.

Analysis and Results

The average selling price of the mug in the appealing packaging condition (APC) was \$5.55 and the average selling price in the ordinary packaging condition (OPC) was \$4.73; $p < .05$, establishing that AAP had a positive impact on the valuation of the hedonic product, and confirming H₁. There is actually a reversal of the effect of AAP on the valuation of the utilitarian product, although not significant- the average selling price of the flash drive in the APC was \$4.46 and \$5.02 in the OPC; $p > .1$, confirming H₂ (figure 4).

There were some additional interesting findings with respect to the influence of packaging on people's evaluation of the hedonic product. Firstly, not a single participant mentioned the box when asked to list reasons for their evaluation and selling price of the mug. However, when asked directly about how much they felt their evaluation had been impacted by packaging, people in the APC claimed to have been *significantly* more affected by packaging than those in the OPC ($M_{\text{appealing}} = 2.1$; $M_{\text{ordinary}} = 1.7$; $p < .01$). Further, in both conditions subjects felt that packaging *should* impact product valuation in general, and this was significantly higher than how much they claimed packaging had actually impacted their evaluation of the mug. Similarly, all subjects thought that *others* had been significantly more impacted by packaging (while evaluating the product in question) than they themselves had. All this suggests that though the impact of packaging may be subtle, the conscious understanding and beliefs of people is that the impact is actually significant. Interestingly, there were no such differences in the evaluation of packaging for the flash drive, leading us to postulate that packaging may not have played any role at either a conscious or nonconscious level for the utilitarian product.

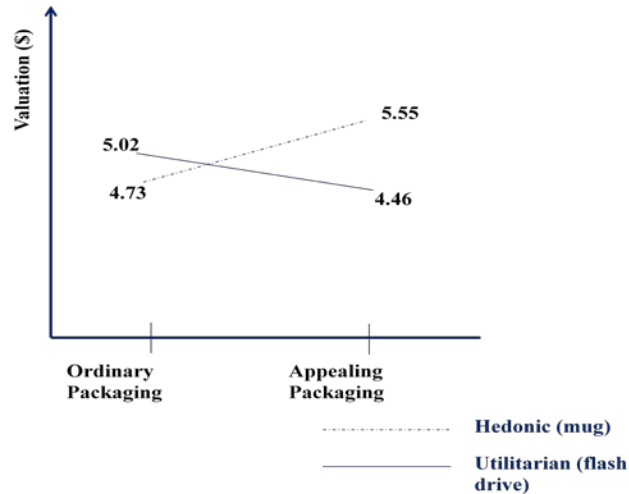


Figure 4: Packaging and product valuation: Study 1

Discussion

The first study cleanly demonstrated that packaging manipulations affected product valuations for a hedonic product but not for a utilitarian product. The study also yielded some initial insights into how packaging may work in influencing product perceptions for the hedonic product, which will be tested in detail in the next study. Note that the appealing box cost 50 cents more than the ordinary box to manufacture, yet generated an additional value of about 82 cents (more than its own worth) for the product over and above the same product in the ordinary box. This shows that investment in creating more appealing packaging can be quite profitable for certain types of products.

A limitation of this study could be that the packaging (particularly the appealing box) may have been perceived to be of future use, which could have influenced the overall valuation of the hedonic product, however, that logic may not hold given that there was no difference in valuation for the utilitarian product presented in the same two boxes. In the second study we seek

to replicate these results in a different product category, and in a scenario in which the packaging would be “disposable” or not considered to be of future use.

1.4 Study 2: Understanding the role of packaging in impacting product valuation and attitudes

Objectives of study

The main objective of this study was to measure the judgments (cognitive reactions) and emotions (affective reactions) evoked by hedonic and utilitarian products presented in appealing and ordinary packaging, and to test our proposed conceptual model of packaging. We also sought to replicate our initial findings in a different product category, particularly in one where the true value of the product is known to the subjects. Further, in order to ensure that the incremental valuation for the product in the appealing packaging did not derive from any perceived additional benefit of reusability of packaging, the packaging used in the second study was “disposable” and hence unlikely to be considered for reuse.

Findings from the first study suggested that it could be that packaging becomes more salient the more appealing it is, and less noticeable when it is ordinary, since people in the appealing packaging condition thought they had been more affected by packaging than people in the ordinary packaging condition. In other words, it may not necessarily be that the ordinary packaging *detracts* from the base valuation of the product, but it could be that the appealing packaging *enhances* the base valuation of the product. In this study we hence explicitly test the directional impact of the two kinds of packaging by having a third condition in which the hedonic product is evaluated without any kind of packaging.

Stimuli Description and Design

As before we had a 2 (product nature: hedonic versus utilitarian) X 2 (packaging: ordinary versus appealing) between-subjects design. There was an additional fifth condition only for the hedonic product which was administered without any packaging. Undergraduate students (N = 269) of a major North American university participated in the study in exchange for course credit and were randomly assigned to one of the five conditions. The hedonic product was a pre-paid retail card charged with \$25 from a café, Panera Bread, a popular hangout place for undergraduate students of the university. The utilitarian product was a pre-paid retail card charged with \$25 from Giant Eagle, the leading grocery chain of the city. In a pretest of 22 undergraduate students, the Panera Bread card was characterized as more hedonic ($M_{\text{PBcard}} = 4.2$, $M_{\text{GEcard}} = 1.9$; $p < .01$) and the Giant Eagle card as more utilitarian ($M_{\text{PBcard}} = 4.2$, $M_{\text{GEcard}} = 4.9$; $p < .05$). The packaging was a combination of a backing card and an envelope. The two packaging options- appealing and ordinary- were selected on the basis of pretest studies in which another set of undergraduate students (N = 40) evaluated 4 different packaging options for the retail card. The least liked and the second-most liked packaging options were selected for the main studies (figure 5a, 5b)³.



Figure 5a: The stimuli used in Study 2 (left: Hedonic product/ordinary packaging, right: Hedonic product/appealing packaging)

³ The most liked packaging was a more expensive option, and we did not get the desired effect in terms of the positives evoked with the second-best packaging. Moreover, we felt it would be more efficient to be able to show that even with a minor additional investment in packaging marketers could significantly increase valuations for their products.



Figure 5b: The stimuli used in Study 2 (left: Utilitarian product/ordinary packaging, right: Utilitarian product/appealing packaging)

Procedure

Participants first recorded their current overall mood and baseline emotion levels (adapted from the PANAS scales, Watson et al 1988) after which they were handed the product in the appropriate packaging for evaluation. They were informed that the card was charged with \$25 and that they could be used just like cash at any Panera Bread (or Giant Eagle) outlet in the United States and were valid for a lifetime (see Appendix 4 for the actual instructions to subjects). They were asked to indicate from a list of prices ranging from \$1 to \$30⁴ how much they would pay for the product in front of them. The elicitation method is similar to the choice price method used by Lerner, Small and Loewenstein (2004) in that the subjects knew that the card was charged with \$25 cash and were in a sense making a tradeoff between different amounts of cash and \$25 on a store card. Their explanations below their selected price (examples: “It’s just like \$25 cash”, “Would rather have \$25 cash than \$25 cash that can be used only at ___” etc.) indicated that they were indeed making a tradeoff between cash and \$25 “store cash”. They also had the option of saying that they would not buy the card at any price.

⁴ The upper-end of the range was set higher than \$25 to see whether any subject would choose a higher price on account of the packaging and presentation of the card. Only two subjects indicated a price higher than \$25 and mentioned that it was due to the convenience of the card being presented to them at that point, rather than their having to get it from the store.

Apart from choice prices or willingness-to-pay (WTP), they were also asked to indicate how satisfied or dissatisfied they would be if they were to purchase the card from us for \$25 and indicate reasons why. Open-ended statements for likes and dislikes were also taken. Other measures taken were overall “attitude toward the product” which included how much they like or dislike the product and how favorably or unfavorably they react to the product on a scale of 1 to 7. These measures for overall attitude toward the product were adapted from previous literature (Holbrook and Batra 1987, Richins 1997).

Subjects also rated a set of 18 judgment measures and 30 emotions (Appendix 5) on a 5-point scale (“Not at all” to “Very Strongly”). Cognitive reactions consist of subjects’ judgments of the characteristics of the product (descriptions of the product such as “ordinary, nice to touch, cute, exciting...”) whereas affective reactions consist of feelings subjects experience during exposure to the product (example, “bored, curious, creative, happy, excited etc”). As per Edell and Burke (1987), this distinction is important because although a subject may consider a product to be of “good quality”, they may not be “impressed” by it. Our final selection of measures for judgments was adapted from Burke and Edell (1989). While affective responses to advertising have been studied in great detail, Richins (1997) argues why the relevance of the advertising measures to consumption situations (such as ours) is marginal by saying that emotions elicited by advertising are vicarious rather than directly experienced and are hence likely to be of lower intensity. Further, the typically dramatic executions of advertising may be capable of eliciting the entire gamut of emotions, while the range of emotions elicited by consumption is likely to be more limited. For this reason, we adapted our working set of emotions from Richins (1997)’s 16 dimensions of consumption emotions which we felt were more relevant for our study.

The order of judgments and emotions were varied in two rotations- one in which the negative judgments and emotions appeared first, and the second in which the positives appeared first⁵. The third part of the questionnaire was a section on opinion, attitude and behavior regarding the concerned store. The questionnaire concluded with a section in which the packaging was made salient and subjects were asked how much they thought they had been influenced by packaging and were also asked to rate the packaging of the product presented to them. The 7-point likeability measure represented subjects' "attitude to packaging." This part additionally served as a manipulation check to ensure that the appealing packaging was indeed considered superior to the ordinary packaging.

Analysis and Results

Since the entire sample was not uniformly disposed to the concerned store, we restricted the comparative analysis of the willingness-to-pay (WTP) to subjects who visit the store at least a few times per year (those who indicated their frequency of visiting as "Few times a week/Few times a month/Few times a year" and excluding subjects who indicated "Never/Hardly ever"). WTP is also more accurately obtained when the product holds personal relevance for the subjects (Strahilevitz and Loewenstein 1998, Derbaix 1995). Note that in terms of initial disposition to the store, the samples in the different conditions were equivalent in their frequencies of visiting⁶,

⁵ Measures were randomized and presented in blocks rather than individually randomized in order to prevent respondent fatigue.

⁶ We did not explicitly measure initial disposition to the store in order to get subjects' unbiased first reactions to the product. The likeability measure of the store was taken later, after exposure to the product, so that could not be used as an unbiased indicator of subjects' disposition to the store (since exposure to the product may have biased this estimate). This is a measure of post-exposure attitude toward brand. Hence, as a surrogate for pre-exposure attitude toward brand, we use subjects' frequency of visiting the store, assuming that there would be a positive correlation between how much they like the place and how much they frequent it.

and also in terms of their initial moods and base emotions, so that any differences may be purely attributed to the packaging manipulation.

(i) Impact of packaging on the hedonic product

The average WTP or choice price in the appealing packaging condition (APC) was \$21.28 and the average WTP in the ordinary packaging condition (OPC) was \$18.98 ($p < .05$), establishing that appealing packaging had a positive impact on the valuation of the Panera card, and confirming H₁; (figure 6; see Table 1). The average WTP for the no-packaging condition (NPC) was \$19.34, which is significantly lower than in the APC but not significantly different from the OPC. This establishes that the impact of the appealing packaging is positive with respect to no packaging, but we cannot claim that the ordinary packaging (that was used in our study) significantly detracts from the valuation of the product evaluated without packaging, confirming H₃. Note that for all the other measures as well, the values for the NPC are not statistically different from the OPC, but are significantly lower than the APC. Since the purpose of the NPC was mainly to check the direction of impact of the two kinds of packaging, which we have now established, we restrict the rest of the analysis only to the two packaging conditions.

In terms of attitude to product, likeability of the product was significantly higher in the APC compared to OPC. The collective positive emotions elicited by the product were also significantly higher, and individually on the dimensions of contented, confident, calm, happy, excited, energetic, playful, romantic, thankful and sentimental. Positive judgments were directionally superior for the APC on the whole; significantly higher ($p < .05$) than OPC on appealing, exciting, special and authentic⁷. An interesting observation was that for the open-

⁷ There was no difference in the scores by order of presenting negatives first versus positives first.

ended responses to the description of a typical visit to Panera Bread (“What would a typical trip to a Panera Bread café look like for you? For example, “I would first purchase ... then I would do ...”), a significantly higher proportion of the sample in the APC used affect-rich or hedonic words and phrases (“cozy ambience/enjoy/good mood/nice music/relax/chat/smell of food/yummy pastries” etc.). It could be that the appealing presentation of the product primes more spontaneous affect than in the other conditions. See Table 1 for a summary of key results.

Just as in Study 1, there were few subjects (only two, both in the APC) who mentioned packaging/presentation as a reason for liking the product or for paying their stated WTP. Unlike in Study 1 however, when asked to rate how much packaging influenced their evaluation, the score was not higher for the APC in this study, which could have been a function of the disposable nature of the packaging. On the other hand, the actual evaluation of the packaging and presentation (serving as a manipulation check, administered at the end of the survey) showed that subjects did think the packaging was significantly better in the APC. Interestingly, people in the NPC had a significantly higher score than either of the two packaging conditions on how much they thought packaging “should affect” people’s evaluations of products in general! These results again suggest that the impact of packaging is in reality more subtle than people actually believe it to be.

Table 1: Impact of packaging on the hedonic product; key results

	Appealing Packaging (APC)	Ordinary Packaging (OPC)
Average frequency of visiting store	2.5	2.3
<i>Valuation and Attitude</i>		
Average WTP (\$)	21.28 [*]	18.98
Satisfaction if purchase for \$25	4.0 ^{ms}	3.6
Like the product	5.4 [*]	4.9
<i>Judgments and Emotions</i>		
Average negative judgments	1.8	1.7
Average positive judgments	2.6	2.4
Average negative emotions	1.3	1.4
Average positive emotions	2.1 [*]	1.8
# “affect-rich” responses to Panera experience (% of sample)	53% [*]	27%
<i>Packaging manipulation check</i>		
Like presentation of product	5.0 ^{**}	3.8

^{*} $p < .05$; ^{**} $p < .01$; ^{ms} $p < .07$

ii) Impact of packaging on the utilitarian product

Once again we find that appealing packaging does not have a significant positive impact for the utilitarian product. The average WTP or choice price in the APC was \$20.78 and the average WTP in the OPC was \$20.17 ($p > .1$; figure 6). Neither is there any advantage for the product in the APC in terms of attitude to product (likeability) or other measures. Unlike for the hedonic product, the collective positive emotions elicited by the product were no different ($M_{APC} = 1.9$; $M_{OPC} = 1.8$; $p > .1$). Thus we find that that appealing packaging evokes higher positive affective reactions only for the hedonic product and not for the utilitarian product, supporting H₄.

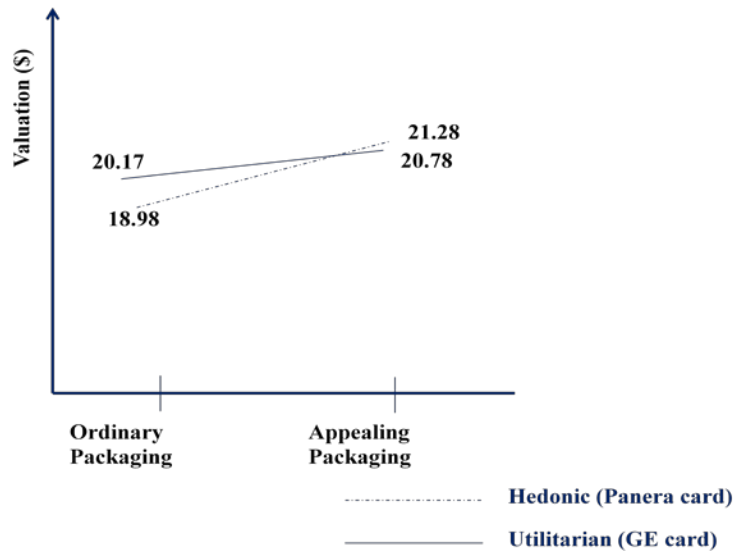


Figure 6: Packaging and product valuation: Study 2

1.6 Toward a Conceptual Model of Packaging

The role of affect/cognition in product evaluation

Previous factor-analytic reductions of consumption-related emotions (Watson et al 1988, Richins et al 1992) have yielded two major dimensions of consumption-related affect- positive and negative. When we ran a factor analytic reduction of the emotions (judgments) specifying two factors, all the negative emotions (judgments) loaded onto one factor while all the positive emotions (judgments) loaded onto the other. The two emotions factors explained 44% of the total variance, while the two judgment factors explained 46% of the total variance.⁸ The two dimensions should be viewed as a simple summary of judgments and emotions rather than a complete characterization of the entire cognitive and affective experience (Richins 1997). We

⁸ Running an unrestricted factor analysis for the emotions we obtained 6 factors explaining 64% of the variance. Since the objective of the paper is to establish that emotions play a mediating role in packaging impacting product attitude and valuation, and not to determine the “best” set of emotions that are evoked by a particular kind of packaging, we perform the analyses using only the two-factor results. Given that the impact of packaging appears to be particularly subtle, we expect the 2-factor positive-negative approach to suffice for the present analysis. The Cronbach alphas for the positive/negative judgments/emotions dimensions were respectively .89/.69 and .91/.85. The complete factor analysis output is available from the authors on request.

use the four factor output by the factor analysis as variables in our conceptual model analysis below.

Figure 2 shows our model of packaging in which we propose the mediating role of judgments and emotions. We now establish these directions of influence as proposed in our model through a series of linear models (figure 7). Since our proposed model of packaging effects is fully recursive, we can easily apply a straightforward OLS estimation (Holbrook and Batra 1987) to estimate the relationship between packaging and attitude to product. The fourth model in this series would additionally help us determine the relative contribution of cognitive versus affective reactions. To investigate if judgments/emotions mediate the effect of packaging on product attitude, we assess the following four potential conditions (adapted from Holbrook and Batra 1987):

1. A significant effect of attitude toward packaging on judgments/emotions; in simple correlation.
2. A significant effect of judgments /emotions on attitude toward product; in simple correlation.
3. A significant effect of attitude toward packaging on attitude toward product; in simple correlation.
4. A disappearance or diminution of the effect of attitude toward packaging on attitude toward product when controlling statistically for judgments /emotions; via multiple regression.

The final link to be estimated is the direct impact of attitude toward product on product valuation. A fifth model assesses this final link between attitude and behavior (Figure 7).

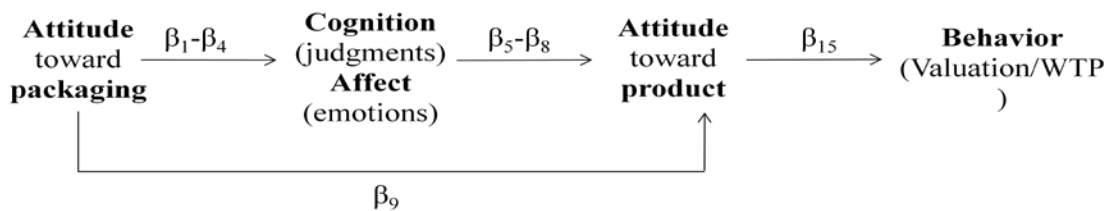


Figure 7: Testing the conceptual model through a series of linear models

Model Estimation

As before, the model estimation was restricted to the sample of subjects who claimed to frequent the respective stores at least a few times per year. Frequency of visit was also modeled as a covariate, since “ownership history” is likely to be a key factor in determining attitude toward a product (Strahilevitz and Loewenstein 1998). The other covariate was a dummy variable controlling for nature of the product (utilitarian versus hedonic).

Models 1a through 1d establish a significant effect of attitude toward packaging (likeability of packaging) on positive and negative judgments and emotions, establishing condition 1. A multiple regression in model 2 establishes a significant effect of positive and negative judgments and emotions on attitude toward product (likeability), establishing condition 2. A simple regression for model 3 shows that a positive attitude toward packaging is correlated with a positive attitude toward the product, and hence establishes condition 3. After controlling for frequency of visit and nature of product, when emotions and judgments are included in a multiple regression (model 4), attitude toward packaging no longer has a significant effect on attitude to product, thus establishing condition 4.

The correlation patterns as established in models 1 through 4 (see Table 2 for all results) fulfill conditions 1 through 4, establishing that emotions and judgments appear to act as mediators between packaging and attitude toward product, supporting H₅ and thus verifying our proposed conceptual model.

We also find a positive and weakly significant Pearson correlation ($r = .13, p < .06$) between attitude toward product (A_{pdt}) and behavior (valuation of product or WTP) which provides the final link of our conceptual model. The relationship between A_{pdt} and behavior is significant ($\beta_{15} = .62, p < .05; R^2 = .20, F = 16.89, p < .01$) when the analysis is not restricted to

subjects who visit the respective stores several times a year, and after controlling for frequency of visit.

Note that in models 2 and 4 incremental R^2 is the highest for the factor for positive emotions (.26) followed by the factor for negative judgments (.14). In other words, affective reactions (particularly, positive emotions) explain a higher proportion of the variance in attitude toward product, as compared to cognitive reactions, confirming H_6 .

Table 2: Summary results, Models 1-4

	Coeff.	Sig	Model sig.	R²	Incremental R²
Model 1: Effect of attitude toward packaging (A_{pkg}) on judgments (J_{pos}, J_{neg}) and emotions (E_{pos}, E_{neg})					
Model 1a (A_{pkg} on E_{pos})	$\beta_1 = .14$	$p < .01$	$F=4.76; p<.01$	.08	-
Model 1b (A_{pkg} on E_{neg})	$\beta_2 = -.11$	$p < .05$	$F=3.47; p<.05$	.06	-
Model 1c (A_{pkg} on J_{pos})	$\beta_3 = .14$	$p < .01$	$F=7.83; p<.01$	.13	-
Model 1d (A_{pkg} on J_{neg})	$\beta_4 = -.13$	$p < .05$	$F=4.00; p<.01$	.07	-
Model 2: Effect of judgments/emotions on attitude toward product (A_{pt})					
Positive emotions E_{pos}	$\beta_5 = .50$	$p < .01$	$F=19.23; p<.01$	.43	.26
Negative emotions E_{neg}	$\beta_6 = -.07$	$p > .5$			-
Negative judgments J_{neg}	$\beta_7 = -.44$	$p < .01$			.14
Positive judgments J_{pos}	$\beta_8 = .16$	$p > .1$			.02
Model 3: Effect of attitude toward packaging on attitude toward product					
Attitude toward packaging A_{pkg}	$\beta_9 = .23$	$p < .01$	$F=9.34; p<.01$	.15	-
Model 4: Effect of attitude toward packaging and judgments/emotions on attitude toward product					
Positive emotions E_{pos}	$\beta_{10} = .49$	$p < .01$	$F=17.03; p < .01$	.44	.26
Negative emotions E_{neg}	$\beta_{11} = -.06$	$p > .5$			-
Negative judgments J_{neg}	$\beta_{12} = -.42$	$p < .01$			.14
Positive judgments J_{pos}	$\beta_{13} = .14$	$p > .1$			.02
Attitude toward packaging A_{pkg}	$\beta_{14} = .09$	$p > .1$			-

Discussion

Study 2 demonstrates that aesthetically appealing packaging (AAP) evokes positive product attitudes and behavioral intent (WTP) for a hedonic product that are significantly higher than when the product is presented in ordinary packaging. However, while AAP adds value over and above the base valuation of the product presented without packaging, ordinary packaging does not significantly detract from the base valuation, suggesting that packaging may have an (positive) impact only when it is noticeably more attractive, and ordinary packaging may not have a detrimental effect on valuation. Note that the appealing packaging cost about \$.40 more than the ordinary packaging, yet created an additional value (in terms of WTP) of almost \$2.00 for the hedonic product! Just as in the first study, this reinstates the claim of AAP as a sensible economic investment on the part of marketers of hedonic products. Also like in Study 1 we find no benefit of AAP for the utilitarian product in terms of increased valuation.

Appealing packaging evoked significantly higher positive emotions (for the hedonic product only) than the ordinary packaging, however, it may be noted that the ordinary packaging was not found to evoke higher negative reactions (in terms of judgments and emotions). The appealing packaging also appeared to prime more affect-rich statements about Panera Bread. Note that for the utilitarian product the appealing packaging did evoke some superior positive cognitive reactions related to visual appeal of the product (“nice to touch, attention-grabbing, imaginative and cute”), which suggests that AAP may play a role in attracting visual attention even for utilitarian products, which would need to be further researched.

Our series of linear models establishes all the links in our proposed conceptual model as depicted in Figure 7. We found that a positive attitude toward packaging evokes positive emotions and judgments which in turn create a favorable attitude toward the product. Emotions and judgments thus appear to mediate the relationship between packaging and attitude toward the

product as our model proposes. We also saw that the contribution of affective reactions, particularly positive emotions, is greater than the contribution of cognitive reactions in driving attitude toward the product. This further supports our initial conjecture that the impact of packaging is more at a subtle automatic level, the level at which emotions work, and provide an explanation for why so few of our subjects spontaneously mentioned packaging as an influencing factor in their product evaluation.

After the respondents had indicated a choice price, we had asked them how satisfied or dissatisfied they would be if they were to buy the card for its face value (\$25) from us. The intention of this question was to see whether there was any indication that appealing packaging could cause higher post-purchase satisfaction, although the purchase situation was hypothetical. We found that the mean satisfaction for the hedonic product in the APC was higher (marginally significant; $p < .07$) than in the OPC. This is in line with Mano and Oliver (1993)'s findings that product satisfaction is strongly linked to positive affect, which we find to be higher for the hedonic product in the APC. Although our measure for satisfaction is not perfect, this result does provide preliminary support for the notion that AAP can result in higher post-purchase satisfaction. Again, this would have to be researched further.

An alternative potential explanation for our findings could be that the more appealing packaging caused subjects to evaluate the hedonic product in "gift" mode thereby causing them to value it higher than subjects who evaluated the product in the ordinary packaging ("utilitarian mode"; Mano and Oliver 1993, Dhar and Wertenbroch 2000). However, in the open-ended explanations for their choice prices for the hedonic product, only 4 subjects mentioned that the card could be given as a gift, out of which two were from the OPC, one from the NPC and only one from the APC. Almost all the responses were about how they themselves would utilize the

card at a restaurant that most of them frequented habitually. Further, after their first exposure to the product, when asked how they would react if they were to receive this product as a gift, the mean response on a 7-point scale was actually higher for the hedonic product in the OPC (“I would dislike/like receiving this product as a gift”: $M_{OPC} = 5.4 > M_{APC} = 4.6$; $p < .05$). All this evidences that the appealing packaging in this study did not evoke stronger gift perceptions than the ordinary packaging. Hence this explanation does not appear to be plausible in our case.

1.7 Study 3: Impact of Packaging on Unknown Brand

The objective of the last experiment was to study the impact of AAP on hedonic and utilitarian products with no brand information, since in both the previous studies the role of prior experience with the brands in question were significant. While we expect a differential effect of AAP on unknown brand hedonic versus utilitarian products as before, we also posit that the role of cognition may be more significant than the role of affect in the mediation process between packaging and attitude to product, as packaging may be used as a signal of quality for an unknown brand product and thus play a more conscious role.

Note that the hedonic and utilitarian products used in previous studies were visually different from each other while the set of packaging remained the same, which may have caused the superior “visual appeal” based judgments for the utilitarian product presented in AAP in Study 2. Therefore in this study we manipulated the positioning of a *single* product once to be hedonic and once to be utilitarian in nature. In this manner the physical appearance of the product (product design) remained the same, and any difference in the two conditions may thus be attributed in entirety to a main effect of the appearance of packaging (and no interaction effects between product design and packaging). As before we used a 2 (product: hedonic versus

utilitarian) X 2 (packaging: ordinary versus appealing) between-subjects design. This study was administered to an online panel of subjects consisting of a mix of students of a major North American university and members of the general population.

Stimuli Description

The product used was a candle in a coconut shell frame (figure 8). The description of the product was manipulated so as to be perceived as either hedonic or utilitarian (Appendix 6). The corrugated and black boxes from Study 1 were used as the ordinary and appealing packaging options respectively.



Figure 8: The product (candle) and packaging (left: “Ordinary”, right: “Appealing”) used in Study 3

Procedure

An online panel of subjects was requested to participate in a brief “product evaluation study” which would be administered online, in exchange for being entered into a lottery for an Amazon gift card of \$25. After an initial evaluation of their current mood, participants were shown an image of either the ordinary or appealing box, which would “open” after they clicked on it, and revealed the product inside. This was done to simulate the physical act of removing the product from the packaging. On the subsequent screens, as they answered questions looking at the product including willingness-to-pay, a reduced image of the original packaging was also present

at the side, to act as a subtle reminder of the packaging. Again, this was done to simulate the actual physical studies in which subjects had evaluated the product while the packaging lay to one side. A much reduced set of cognitive reactions (judgments) and affective reactions (emotions) was administered, along with manipulation checks for product positioning (hedonic or utilitarian; see Appendix 6) and a conscious evaluation of the packaging at the end of the study.

Analysis and Results

280 subjects took the study over a period of 5 days. The average time taken to complete the study online was 4 minutes and 45 seconds. The Utilitarian – Hedonic score (Dhar and Wertenbroch 2000) for the utilitarian manipulation was +1.35, and -1.59 in the hedonic condition; $p < .01$, so the positioning manipulation was effective. In the hedonic condition, the average purchase price of the candle in the appealing packaging condition (APC) was \$11.85 and the average selling price in the ordinary packaging condition (OPC) was \$9.13; $p < .01$. In the utilitarian condition, the average purchase price of the candle in the APC was \$9.90 and the average selling price in the OPC was \$8.85; $p > .1$. Hence even for an unknown branded product we see a positive impact of appealing packaging on product valuation for a hedonic product but not for a utilitarian product, confirming H₇. There was, however, no significant difference on any of the other measures. While our selection of cognitive and affective measures was limited, we again find support for the mediation analysis of our conceptual model⁹. Notably, in this analysis, we find that in model 4 ($R^2 = .35$, $F = 30.75$, $p < .01$); the incremental R^2 for the combined cognition factor ($\beta_{\text{cognition}} = .90$, $p < .01$) was .34 versus .01 for the combined emotions factor ($\beta_{\text{affect}} = .22$, $p < .05$). This indicates that the role of cognition may be more significant than the

⁹ The complete analysis is available from the authors upon request.

role of affect in the mediation analysis for products without brand information, supporting H₈. In other words, in the absence of other information, appealing packaging may play a more conscious role in signaling product quality.

Discussion

This study was a clean demonstration of the differential effect of aesthetically appealing packaging (AAP) on the identical product when viewed as hedonic versus utilitarian, and showed how AAP positively impacts valuation for a hedonic product even in the absence of brand information. We also find that the more conscious thought process (cognition) appears to play a greater role as compared to the more automatic thought process (emotions) in the mediation analysis, for an unknown brand product. A key limitation of this study was that the product and packaging were not physically present before the subject, so the absence of touch (as compared to the previous administrations) could have caused the lack of difference on some of the other key measures. Moreover, a limited set of judgments and emotions were used for this study, to prevent subject dropouts which are harder to control for online administrations. However, our current findings do provide a valuable insight for marketers of new products- it appears that they may be able to charge a significant price premium for their product if they are able to present their product in marginally more attractive packaging and communicate the benefits of the product as hedonic rather than functional.

1.8 General Discussion

1.8.1 Summary and future research

Our research links packaging appeal to product valuation, and shows that the impact is differential based on the hedonic or utilitarian nature of the product. Table 3 summarizes all the major findings of this research. In particular, it was found that an appealing box led to an increased selling price for a hedonic product as compared to the same object in an ordinary box, and an appealing presentation increased willingness-to-pay for a hedonic product of known cash value as compared to the same product in an ordinary presentation. There was no such impact for utilitarian products presented in the same packaging. Upfront, few subjects indicated packaging as a factor that influenced their evaluation of the product, although, when prompted, those in the appealing packaging condition (APC) felt that the role of packaging in influencing product perceptions in general was more important than those in the ordinary packaging condition (OPC; study 1), lending support to our conjecture that the impact of aesthetically appealing packaging (AAP) may be at a subtle automatic level, despite deliberate manifestations. In Study 2, the appealing presentation elicited more favorable attitudes toward the hedonic product and higher scores on many key positive emotions, while there was no such effect for the utilitarian product. Further, our conceptual model suggests that while AAP does impact product attitude, emotions (particularly, positive emotions) and judgments act as a mediator between the two. The explanatory power of the more automatic affective reactions appears to be higher than that of the more deliberate and conscious cognitive reactions, when brand information is available. Even in the absence of brand information (study 3), AAP is found to positively impact valuation for a hedonic product only- in this case, however, the role of cognitive reactions appear to be more

significant in mediating the impact of packaging. Our findings from the last study suggest that AAP may be employed by marketers of new/unknown branded products to command a price premium (that may far outweigh the incremental cost of packaging), simply by emphasizing the hedonic attributes of the product, or by positioning a product as hedonic versus utilitarian.

Future research might replicate these results for a broader variety of products, possibly studying the influence of packaging appeal as a function of perceived functional complexity of a utilitarian product. Boundary conditions could also be tested with extremely appealing packaging which we expect would bring packaging into the conscious realm of evaluation. It would be interesting to study whether extremely appealing packaging may backfire for more functionally complex products, and reduce perceived functional competence of the product. Future work could also empirically examine the influence of packaging on behavior and product choices in a real world setting, and finally future work could examine the influence of packaging on post usage product satisfaction, retention or re-purchase probabilities.

Table 3: Summary of findings, Studies 1-3

	FAMILIAR BRAND	UNFAMILIAR BRAND
HEDONIC PRODUCT/ POSITIONING	<ul style="list-style-type: none"> • AAP positively impacts attitude and behavioral intent • Affective reactions play a significant role in mediating impact of AAP on attitude 	<ul style="list-style-type: none"> • AAP positively impacts behavioral intent • Cognitive reactions play a significant role in mediating impact of AAP on behavioral intent
UTILITARIAN PRODUCT/ POSITIONING	<ul style="list-style-type: none"> • AAP has no impact on attitude or behavioral intent 	<ul style="list-style-type: none"> • AAP has no impact on attitude or behavioral intent

1.8.2 Managerial Implications

This research is a significant first step toward a full understanding of the conceptual role of aesthetically appealing packaging (AAP) in the entire product experience. We have proposed a

theory and conceptual framework of how packaging impacts product valuation and attitudes. The framework is of importance to both manufacturers and marketers of products, who spend significant amounts of money to make their packages cosmetically appealing. Our research shows that it may not be prudent for manufacturers of utilitarian products to go beyond functional packaging. Lenovo may have it right with their simple effective packaging, saving them unnecessary expenditure. However, for hedonic products this investment may not be in vain, and they may be able to extract more surplus from consumers with even a small additional investment in packaging. A gift card for a restaurant or spa should be packaged beautifully but a gift card for a grocery or convenience store need not. Bottled water need not resemble a perfume bottle, but superior presentation of the satellite radio package may positively impact the total experience of a predominantly hedonic product. A new product could fare better by being presented in AAP and having its hedonic attributes emphasized. Our framework may also be able to guide manufacturers and help them control the judgments and emotions they want their products to evoke in consumers even with something like packaging, which is neither an integral part of the core product, nor an external influence like advertising. Our research suggests that for companies (like Apple) who are known for their superior packaging, it may make sense to have the package subtly displayed along with their product in their stores (for instance, a corner of the Apple store could display one iPod in its acclaimed cubic box, and one iBook displayed in its entire packaging; or in retail stores which have exceptionally attractive bags, these bags could be displayed in a corner of the store etc.). Conventionally for products like these, the consumer is exposed to the packaging only after purchase (or after receipt) of the product, while we show that exposure to AAP before purchase may actually enhance WTP. Further, the ability of AAP to evoke positive cognition and affect and to enhance product satisfaction that we found in our

research suggests that packaging may also play a key role possibly even in influencing the nature of the lifelong relationship with the brand, even after the purchase decision has been made. This may be one explanation for the high levels of loyalty and customer satisfaction typically seen with Apple products. Apple's high investments in packaging may be one of the reasons they form lifelong relationships with their consumers via the positive emotions and thoughts evoked on exposure to the exceptional packaging and presentation of their products, even after purchase. We present here some more anecdotal evidence for the rich and emotional experience consumers have with their Apple products, particularly due to the superior packaging. Consumers say: "There is something about unwrapping Apple products that just gives you this warm feeling inside- remember when you opened your first iPod?"; "I can't imagine throwing them (the package) away- it's more than a record of a serial number, it's a record of a good event that happened in my life;" "There's this ballet of unwrapping that is clearly intentional- it prolongs your excitement about finally owning the product" (Judge at the *I.D. Magazine Annual Design Review* at which Apple is a regular award winner, while discussing the iPod packaging). These statements evidence that Apple's packaging creates a positive sensory experience that evokes strong emotions in consumers, which is likely to be the foundation of a long-term relationship.¹⁰

In summary, for primarily functional products there is still no evidence that attractive packaging can be beneficial either in terms of increased valuation or improved attitude to product, so it may be more prudent for manufacturers of functional products to cut costs on packaging and to focus on the functionality of the product itself. However, for hedonic products, if it is not possible for marketers to expose their packaging to consumers before the purchase decision (in order to extract more surplus), they may still rest assured that investing in packaging

¹⁰ Further recall that in our second study, the appealing packaging appeared to elicit many more affect-rich or hedonic comments about Panera Bread than the ordinary packaging. Future research would more carefully examine the role of AAP post product purchase.

could enable the consumer's relationship with their brand post-purchase to be strengthened, which is also a highly desirable outcome. Our research depicts the significance of packaging in the brand-customer relationship process, and we hope that this aspect of the product experience will inspire more research in time to come.

2 Uncovering the Coexistence of Assimilation and Contrast Effects in Hedonic Sequences

2.1 Introduction

According to wine enthusiasts, a wine's quality assessment is more objective when performed alongside several other wines, in what are known as tasting “flights.” Wines may be deliberately selected for their vintage (“horizontal” tasting) or proceed from a single winery (“vertical” tasting), but most often both the vintage and winery are masked to promote a purportedly “unbiased” analysis. But how unbiased is it to taste several wines in sequence? Wine, beer, whiskey, and other spirits are often tasted and judged in flights. Most judgments that consumers make everyday are also part of sequences. Whether test driving cars, evaluating courses of a menu, dating (in particular, speed-dating), or completing a customer satisfaction survey, it is difficult to imagine how the results from one evaluation would not affect the next.

It is widely known that judgments are not context-free (Dato-on and Dahlstrom 2003; Stapel and Winkielman 1998). The literature in marketing is replete with examples of how the context in which a stimulus is embedded can have a significant impact on people’s judgment of that stimulus. The two context effects that have been most reliably demonstrated in psychology and marketing are assimilation and contrast. *Assimilation* refers to a positive relationship between the value people place on the contextual stimuli surrounding a target and the value they place on that target itself. *Contrast* refers to a negative relationship between these two values (Martin, Seta, and Crelia 1990; Sherman et al. 1978).

Many factors have been shown to be responsible for determining whether assimilation or contrast effects occur. For example, if the evaluation of the target is at more of an automatic, spontaneous, or holistic level, assimilation is assumed to result, while if the evaluation is in a

more deliberative mode where cognitive resources are both available and expendable, contrast effects are more likely (Martin 1986; Myers-Levy and Tybout 1997; Bickart 1993). The general conclusion is that assimilation is the “default” outcome in contextual influence and that the natural tendency is for people to assimilate while contrast is the outcome of a more effortful process in high-involvement situations.

Other work has focused on the specificity and typicality of the target stimuli as determinants of whether assimilation or contrast occurs. When the target is ambiguous, then the context information is more likely to be used as an interpretative frame and the result is assimilation (Stapel and Koomen 1997; Stapel and Winkielman 1998). Research examining the relationship between the target and the contextual information has found that if items are perceived to be similar (domain match), contrast effects are enhanced, while if they are perceived to be dissimilar (domain mismatch), assimilation effects are more likely to occur (Sherif and Hovland 1961). Schwarz and Bless (1992) similarly argue that the way in which a target stimulus is categorized will determine whether assimilation or contrast occurs. They argue, in general, that if a target is included in a mental representation of the category, assimilation effects are more likely to occur. Conversely, if the target is excluded, contrast effects are more likely. Their work argues that either assimilation or contrast effects will manifest themselves, as stimuli cannot be both similar and dissimilar or simultaneously exist both within and outside of a category.

A more recent stream of research focuses on characterizing context effects in sequences of hedonic experiences (i.e., incidents of pleasure or pain). The results have been mixed. For example, Raghunathan and Irwin (2001) document contrast effects in respondents’ evaluations of descriptions of vacation spots and cars when there is a domain match but assimilation effects in cases of a domain mismatch, consistent with the early work by Sherif and Hovland (1961). Yet

Novemsky and Ratner (2003) find that although individuals expect and predict contrast effects, evaluations provided at the time of the actual experience provide no evidence of contrast effects. Their work conflicts with research by Zellner and colleagues who find contrast effects not only in the retrospective evaluation of gourmet versus ordinary coffee and specialty versus regular beer (Zellner, Kern, and Parker 2002), but in actual tasting experiences of fruit juices of varying concentrations (Zellner et al. 2003). Our work sheds light on why some researchers might observe hedonic contrast while others do not, which we explain below.

What has been consistent with respect to the previous research on assimilation and contrast across sequences of experiences is that it is always assumed that one or the other takes place and that characteristics of the context, such as domain match (Meyers-Levy and Sternthal 1993, Raghunathan and Irwin 2001), product knowledge (Bickart 1993), or context set range (Lynch, Chakravarti, and Mitra 1991) dictate which one occurs. We propose that within a sequence of evaluations, specifically comparisons, both assimilation and contrast can co-occur and that previous analyses focusing and thus testing for one or the other exclusively may have failed to pick up one or the other. More specifically, if these effects co-occur, controlling for one (e.g. assimilation) may reveal the other (contrast) where it was not observed before.

In this research, we demonstrate how assimilation and contrast can co-occur in the same sequence and we separate these effects with the aid of two models. We find that assimilation effects are prominent in our data set, as suggested in work by Bickart (1993) and others, and that contrast effects, which we find to be masked by assimilation, emerge only when we adjust for assimilation effects. Therefore, contrary to Novemsky and Ratner (2003), we are able to document contrast effects in real-time sequential hedonic evaluations. By documenting how assimilation and contrast effects can co-occur, and how controlling for one reveals the other, our

work contributes to numerous research streams including work on sequential evaluation, taste, and the evaluation of hedonic experiences.

The remainder of this paper is organized as follows. First, we describe the rich, real-world data set that will allow us to simultaneously test for assimilation and contrast. Next, we present our hypotheses, which are based on the relevant research in sequential evaluation, taste, and context effects involving hedonic experiences. We then present the preliminary data analysis that guided us in the formulation of the model before proceeding to our discussion of the formal model. We present the results and conclude by discussing managerial implications and opportunities for future research.

2.2 Data Description

The objective of this paper is to study context effects in a real-world application of sequential hedonic evaluation. We obtained eight years of judging data from the Bluebonnet Brew-off, a national beer brewing competition held annually in the Dallas/Fort Worth Metroplex. From 2000 to 2007, more than 900 brewers entered a total of 5,060 beers in 23 style categories (consisting of 107 subcategories). In order to judge such a large number of beers and to avoid judges experiencing taste or “palate fatigue,” beers were grouped into “flights” ranging from five to 13 beers. There are 688 flights in our data. Within a flight, all beers belonged to the same style category, but many flights contained beers from more than one subcategory. For example, Brown Porter, Robust Porter, and Baltic Porter are all subcategories of the Porter style and could appear within the same flight. All the beers within a flight that belong to the same subcategory form a “sub-flight,” and beers from the same category are randomly assigned to flights. Table 1 contains summary statistics describing the flights and sub-flights in our dataset.

Table 1: Summary Statistics of Flight and Sub-flight Length

	<i>Total number</i>	<i>Mean length</i>	<i>Modal length</i>	<i>Minimum length</i>	<i>Maximum length</i>
Flights	688	9.6	10	5	13
Sub-flights	1756	3.8	2	1	12

Each flight is rated by two independent judges who sample each of the beers within the flight in the same order, progressing from lighter to darker subcategories in order to preserve palate integrity and allow judges to fairly evaluate each beer. Judges in our sample have one of four levels of certification, which consist of (in ascending order): Apprentice, Recognized, Certified, and National, depending on the level of the Beer Judge Certification Program (BJCP) they have completed. In the current BJCP scoring system, each beer is evaluated on a 50-point scale comprised of 20 points for flavor, 12 points for aroma, 3 points for appearance, 5 points for mouthfeel, and 10 points for overall impression, which is an evaluation of the overall drinking pleasure of the entry (Appendix 7)¹¹. Judges are advised to rinse their mouths and to cleanse their palates with bread or salt-free crackers between each evaluation of consecutive beers. Each score is recorded while tasting the specific beer and written down prior to moving on to the next beer in the flight.

The concurrent scoring of each beer during tasting ensures that the evaluations in our sample are actual real-time experience data and not recalled experience or retrospective evaluation data. After all beers in a flight are judged, each beer is assigned a final rank within the flight, which resolves any ties. Judges confer in cases where there are extreme differences between their two judgments; however, this recalibrating of judge scores is uncommon. The judging experience is an integral part of establishing and maintaining a judge's level of certification. In other words, judges take the tasting very seriously, attending to those factors

¹¹ The data recorded and retained by the organization, the same that has been provided to us, contain the summary score out of 50 for each beer rather than the points on each individual component.

they are trained to discern, which results in very little discrepancy between judges on the score of a beer that they both rated, with the correlation between judges averaging 0.92. The top beers of each flight move into a medal round where they are again judged in category flights. The highest ranking beers in medal round scoring are declared the winners of their respective categories.

This dataset is ideal for studying assimilation and contrast effects for hedonic experiences in a real-world setting because it contains multiple sets (688 flights across the seven years) of sequential evaluation processes in random sequences. The judges are experts, trained to be observant of satiation and fatigue (Strong and Piatz 2007). Finding assimilation and/or contrast effects in this data would speak to the pervasiveness and strength of these effects.

2.3 Theory and Conceptual Model

In the literature on sequential evaluation, perhaps the most well-known result is Loewenstein and Prelec's (1993) demonstration that people prefer improving sequences. These authors asked respondents to choose their preferred sequence among a series of events that included, for example, eating at home, eating at a fancy French restaurant, and eating an exquisite lobster dinner. Their conclusion is that people are farsighted and often wish to postpone better outcomes until the end. We should point out that all of their results are based on stated preferences for known sequences and not judgments of actual experiences. Raghunathan and Irwin (2001) found that for cases of domain match, improving (decreasing) sequences of the stimuli reduce (increase) the prospective happiness with the target, revealing that the nature of sequences might also induce contrast effects. The results are reversed for cases of domain mismatch. Like Loewenstein and Prelec (1993), their results were based on predicted preferences and not actual experiences. However, the work by Novemsky and Ratner (2003) has cast doubt on whether

context effects, particularly hedonic contrast, found in prospective and retrospective evaluations occur during actual experience. They found that people recall contrast effects unless prompted to provide ratings of experiences during the consumption episode. Respondents' evaluations of jelly beans while tasting them tended not to exhibit contrast. Also note that the above stream of research has looked at deliberately pre-arranged increasing or decreasing sequences; less is known about how hedonic events experienced in unanticipated, non-monotonic, or random sequences (such as in our data) are evaluated.

In terms of relative position in the sequence, work by Carpenter and Blackwood (1979) documented anomalous ratings for the first in a series. These authors had respondents rate various wildlife practices- for example, the acceptability of six different ways of killing coyotes (traps, slow poisons, etc.) on a 10-point scale. They found that when a method was presented first, it received either the highest or lowest rating and posited that the lack of an evaluative reference point before the first item was the reason for these extreme evaluations; prior items acted as a "norm" for items appearing later. Similarly, Welch and Swift (1992), in tests of monadic sequences of four beverages, observed that the product in the first position received a higher rating. Although they did not test for or document a mechanism, they posited that taster fatigue may be driving this effect. Other research suggests that stimuli characteristics help determine sequence effects. For example, de Bruin and Keren (2003) showed participants sequences of potential blind dates or dorm rooms such that each option either had unique positives or unique negatives. When choosing from a group of options with unique negatives, the option presented first was most often preferred, but for a group of options with unique positives, the option presented last was most often preferred. Given that the goal of the judges in our data set is to compare each beer tasted to the "perfect beer" exemplar of that subcategory (i.e. they

presumably start off with the “perfect beer” score of 50, and subsequently deduct points for flaws), they may be “primed” to look for differences and thus focus on negatives. We therefore posit that the first beer may have a distinct advantage and be evaluated more favorably than successive beers. Stated more formally:

H₁: Ratings of the stimulus in the first position will be higher on average than ratings of subsequent stimuli.

Based on the evidence suggesting that the natural tendency is to assimilate (Martin 1986; Martin, Seta, and Crelia 1990; Myers-Levy and Sternthal 1993) and that assimilation is a more spontaneous process, we expect assimilation effects to be prevalent in our data. In particular, we expect that the rating of the very first beer will act as an anchor (Tversky and Kahneman 1974; Chapman and Johnson 1999) and thus serve as a point of reference. In turn, we expect the remaining beers in the flight to assimilate to this value (Stapel and Koomen 1997; Stapel and Winkielman 1998). This leads to our second hypothesis:

H₂: Across a sequence of trials, ratings assimilate to the first stimulus.

Observing assimilation effects across sequences seems reasonable and probable because all of the beers within a flight belong to the same category, which brings similarities among the group to the forefront (Mussweiler 2003). However, this is not necessarily what happens across beers within a sequence. Stapel and Koomen (1997) predict that contrast effects should occur whenever context information provides a standard of comparison. In beer judging, each beer tasted is compared directly against every preceding beer in order to select a winner from each flight. Thus, it seems likely judges who are comparing individual beers relative to one another would contrast a beer they are tasting to other beers within the sequence,.

In addition, if we consider the results of Myers-Levy and Tybout (1997) and Bickart (1993) as illustrative, we would expect to find contrast effects in our data. Our respondents (expert judges in a national competition) are arguably in a deliberative mode of evaluation, as opposed to casual or spontaneous, and both possess and are willing to expend substantial cognitive resources in making their evaluation. Further, for a beer that is especially good or especially bad (extremes) we expect to see contrast effects (Herr 1986; Herr, Sherman, and Fazio 1983). Accordingly, we expect to see evaluations of a focal beer contrasted to extremely good preceding beers that judges may be holding as the standard for future beers to beat, and to extremely bad beers that have appeared earlier in the flight. This leads to our third hypothesis:

H₃: Ratings within a sequence will contrast to extreme stimuli.

It is important to point out that documenting the effects predicted by Hypotheses 2 and 3 would be the first demonstration of the coexistence of assimilation and contrast effects within the same sequence of hedonic experiences.

Subcategory effects and domain match is another area in the literature that sees conflicting results. The general conclusion regarding context effects and domain match/mismatch in psychophysics and tasks of impression-formation is that assimilation to the context occurs when the target and context are viewed to be similar, while contrast occurs when the target and context are viewed to be dissimilar (Schwarz and Bless 1992; Myers-Levy and Sternthal 1993; Damisch, Mussweiler, and Plessner 2006). However, for hedonic contrast, the results appear to be reversed such that contrast occurs when the stimulus and target belong to the same category, and assimilation occurs when they belong to different categories (Fechner 1898; Raghunathan and Irwin 2001; Zellner et al. 2002). Because our data consists of sequences of hedonic judgments, the results of this second stream of literature hold more relevance. In our

data, all beers within a flight belong to the same category (e.g. Porter), yet within that category, there are frequently beers from two or more “sub-categories” (e.g. Brown Porter, Robust Porter, and Baltic Porter). For the first beer of a new subcategory, the preceding beer, which was the last beer of the previous subcategory, might be considered to be a stimulus from a “different domain.” Hence, we hypothesize that contrast effects, if present, will be stronger within a subcategory and may be diminished across subcategories. Additionally, we posit that similar to Hypothesis 1, a first position effect will occur when judges switch from one subcategory to the next.

H_{4a}: Ratings will contrast more strongly with stimuli within the same subcategory.

H_{4b}: Ratings of the stimulus in the first position of a new subcategory will be higher on average compared to the stimulus in the last position of the preceding subcategory.

In order to test our hypotheses, we needed to better understand the data before attempting to fashion a model that would control for many different factors while isolating the proposed contrast effects from the effects of assimilation. Unlike much of the previous work in this area that has documented these effects utilizing separate tests, we set out to test for these effects simultaneously. In what follows, we present our initial analysis of the data, which guided us as we developed our formal model.

2.4 Preliminary Data Analysis

Each record in our data contains a unique beer ID, the year, name and ID of the brewer, the specific category and subcategory of the beer, the round (Round 1 or Round 2) in which it was judged, the flight number, date, the name and certification level of the two (or three) judges who rated the beer, the placement of that beer in that particular round (only if it was in the top three),

the position of the beer in the flight (order), and the total points out of 50 awarded to the beer by each of the two (or three) judges who rated it. Prior to formally investigating our hypotheses, we conducted a preliminary analysis of the data in order to test for anomalies (e.g. differences across rounds, years, or beer types) and any systematic judging patterns that may need to be accounted for in the main model. For example, judges may tend to assign scores in a much narrower range (central scoring) as time progresses simply because palate fatigue causes the beers to taste more and more similar over time. In addition, as judges become fatigued during long tasting flights, they may assign the darker beers that occur later in the flight much higher scores than earlier beers simply because they stand out as being much more flavorful (positive drift). Alternately, preference for lighter beers or even satiation could affect the hedonic enjoyment of later beers and result in judges assigning progressively lower scores to beers as time progresses (negative drift). In order to more accurately measure the effects of interest (contrast and assimilation), the model should account for these types of scoring patterns if they are present (Wolfe 1996; Wolfe and Wolfe 1997).

Differences across Rounds, Years, and Types of Beers

Overall, scores in both rounds are widely dispersed, with values ranging from 10.5 to 49.5 in the preliminary round (Round 1) and from 16.0 to 48.5 in the medal round (Round 2). The average score in Round 1 is 32.4. The Round 2 beers are comprised of the top beers in Round 1 and, not surprisingly, the average Round 2 score is higher at 33.2 ($p < 0.01$). However, this Round 2 average is lower than the average score of these very beers when they were judged in Round 1 ($M = 38.6, p < .01$). This difference in the medal round scores can be attributed to the judges' natural scale recalibration in order to prevent ceiling effects. In addition, we expected there to be less variation for scores in Round 2 because the tail consisting of all the really "bad"

beers has been eliminated ($\sigma^2_{\text{Round1}} = 39.7$ vs. $\sigma^2_{\text{Round2}} = 30.2$; $F = 1.28$, $p < .01$). It is critical to point out that a sizable percentage of winning beers (33%) are decided by one (1) point or less and that a difference of up to two (2) points decides 58% of the winners in our data. Hence, small changes in evaluations due to assimilation or contrast effects can have a very meaningful impact on the outcomes at the Bluebonnet Brew-off, one of the largest homebrew competitions in the U.S.

Table 2: Average Ratings (Standard Deviations) by Year and Round

	2000	2001	2002	2003	2004	2005	2006	2007	Average
Round 1	32.0 (6.7)	32.5 (7.0)	31.9 (6.0)	31.9 (6.0)	32.3 (6.3)	32.3 (5.6)	32.9 (5.8)	33.1 (6.2)	32.4 (6.3)
Round 2	31.5 (6.3)	33.6 (5.5)	33.6 (5.2)	33.6 (5.3)	34.4 (5.6)	32.9 (5.3)	33.0 (5.1)	33.1 (5.4)	33.2 (5.5)
Average	31.9 (6.6)	32.7 (6.7)	32.3 (5.9)	32.3 (5.9)	32.8 (6.2)	32.5 (5.6)	32.9 (5.6)	33.1 (6.0)	32.5 (6.1)

There appears to be a slight upward trend for average scores of beers across years. On average, scores increase by 0.12 points every year ($p < .01$; see Table 2). This pattern was discussed with the organizers of the competition, and this yearly drift is believed to be caused by the greater craftsmanship and expertise exhibited by the participating brewers as time progressed.

Mean scores for 107 sub-categories of beer range from 29.4 to 37.3 ($F = 2.56$; $p < .01$), showing that certain subcategories on average receive much higher scores than other subcategories. A follow-up interview conducted with the competition organizers and beer judges revealed why certain subcategories may receive higher scores on average. Organizers stated that the list of higher scoring beers agreed with their a priori beliefs that certain beer styles are more difficult to produce (e.g. Classic American Pilsner and Gueuze/Geuze-Style Ale) and only the more proficient brewers tend to enter beers in those categories. The subcategories with higher

mean scores consist of both light and dark beers and therefore appear both early and late in the flight sequences. In other words, while some subcategories stand out, there is no systematic pattern regarding where these subcategories appear within flights.

Central Scoring

If palate fatigue, or a decline in the ability of judges to discriminate as they consume more and more beer, existed in our dataset, we would expect the variance in scores to decrease with flight position (Wolfe and Wolfe 1997). However, a regression of flight position on score standard errors, a test that ignores the uncertainty in the standard error estimates and thus more likely to yield test results deemed to be “statistically significant,” reveals a marginally increasing trend (+.02; $p < .01$; see Table 3). Consequently, we observe no evidence supporting palate fatigue.

Positive Drift and Negative Drift

Although beers are randomly assigned to flights, the order of beers within the flight is not completely random. Judges are advised to taste beers that belong to lighter, less-flavorful subcategories before beers belonging to stronger, more-flavorful sub-styles. This is done to diminish the potential effects of palate fatigue as well as help prevent stronger beers from overpowering the flavor distinctions of milder beers. The systematic sub-flight ordering could influence the scoring in two potential ways – if heavier beers are preferred over lighter beers, then beers occurring in sub-categories appearing later in the flight would receive higher ratings. This preference for more extreme flavors could manifest in a positive drift of overall scores as the flight progresses. On the other hand, if lighter beers are preferred over stronger beers, then

beers occurring earlier in the flight would receive higher ratings, manifested in a negative drift of overall scores as the flight progresses.

In addition, there is another potential source for a systematic negative drift in scores appearing in the data. If judges satiate as they taste each beer (Coombs and Avrunin 1977; Rolls et al. 1981, 1984), each subsequent beer should be less enjoyable than the prior, and we would expect a decrease in a flight’s average ratings as the length of the flight increases. Further, we felt it was necessary to test for satiation at both the flight and sub-flight (beers belonging to the same subcategory within a flight) level as changes in subcategories of beer may be significant enough for judges to combat satiation (Redden 2008).

The average ratings by position within a flight and within a subcategory are shown in Tables 3a and 3b. The means do not reveal any discernible positive or negative drift or trends in our data at the flight or sub-flight level. First, a regression of flight position on scores is not significant. Second, while a regression of sub-flight position reveals a negative trend ($-.18; p < .01$), a dummy variable regression shows that this result is driven purely by a significant spike in the first position of a sub-flight (Table 3b). The regression results provide initial support for Hypothesis 4b in which a beer in the first position of a new subcategory was predicted to be rated higher than the beer in the last position of the preceding subcategory.

Table 3a: Average Rating (Standard Deviation) by Position in Flight

1	2	3	4	5	6	7	8	9	10	11	12
33.5 (5.30)	32.1 (5.63)	32.0 (5.88)	32.3 (6.37)	32.1 (6.29)	32.6 (6.25)	32.8 (6.40)	33.0 (6.24)	32.9 (6.27)	32.7 (6.17)	32.1 (6.56)	32.3 (6.00)

Table 3b: Average Ratings and Regression Estimates of Subflight Position on Scores

	<i>Average ratings(standard deviations) by position in subflight</i>	<i>Subflight position regression coefficients (standard error)</i>
Intercept	--	29.1 (2.15)**
Position 1	33.4 (5.97)	4.26 (2.16)*
Position 2	32.6 (6.09)	3.47 (2.16)
Position 3	32.2 (6.11)	3.06 (2.16)
Position 4	32.1 (6.22)	3.01 (2.16)
Position 5	31.7 (6.13)	2.56 (2.17)
Position 6	32.3 (6.11)	3.22 (2.17)
Position 7	32.2 (6.12)	3.11 (2.18)
Position 8	32.4 (6.29)	3.33 (2.20)
Position 9	32.6 (6.14)	3.46 (2.24)
Position 10	32.5 (5.49)	3.37 (2.38)
Position 11	30.4 (6.29)	1.32 (2.61)
Position 12	29.1 (6.03)	--

** $p < .01$; * $p < .05$

2.5 Model

Actual beer quality is expected to vary across entries and across years in a fashion similar to what has been found with respect to wine quality (Ashenfelter, Ashmore, and Lalonde 1995).

Because beers are randomly ordered within their respective subcategory structure, objective characteristics that affect beer quality (e.g. ingredient quality or brewing technique) would not be associated with sequence effects. Our model, which focuses on beer scores as a function of their order within a sequence, therefore measures what is of primary interest: the scoring behavior of judges.

From the raw data, we were able to create additional variables of interest to incorporate in our model in order to test our hypotheses and to control for effects we detected during our preliminary data analysis. All analyses were done at the flight level. In order to simultaneously test the effects of preceding beers and extremes such as the running maximum and minimum

scores, our model effectively estimates coefficients for beers in the third position and later in the sequence. Hence, we are unable to test Hypothesis 1 within the purview of the model, and therefore we proceed by first testing it separately.

Sequence Position Effects

In order to test Hypothesis 1, we compare the average score of the beers in the first position to the average score of all beers in subsequent positions. As expected, the mean of the ratings of beers in the first position of the sequence, $M_{\text{position1}}$, is rated significantly higher than the mean of the ratings of beers in subsequent positions, M_{rest} ($M_{\text{position1}} = 33.5$; $M_{\text{rest}} = 32.4$; $p < .01$), supporting Hypothesis 1. Similarly, the beer in the first position of a new sub-flight (or subcategory) sequence is rated significantly higher than beers in subsequent positions ($M_{\text{position1}_s} = 33.4$; $M_{\text{rest}_s} = 32.2$; $p < .01$), supporting Hypothesis 4b.

2.5.1 Model 1: Hedonic Context Effects across Flights

As discussed earlier, we expect that within a group of beers being judged together in a single flight, assimilation effects would be prominent. Our dependent measure for this model is the score of a beer averaged across judges (RATING). In the judging setup, the judges sample the same flight together in the same room, are exposed to each other's reactions and can, in theory, influence each other's scoring. Additionally, there is a high correlation of scores across judges reflecting widespread agreement between the judges regarding a beer's evaluation. Cronbach et al. (1972) showed that averaging across two raters halves each rater's error component while leaving the true variance component unchanged, effectively increasing the proportion of true variance in the rating. As such, we model the single score (i.e., the averaged score) for the set of

judges evaluating each beer rather than using individual judge's scores as independent ratings. However, all analyses reported below hold independently for individual judges.

To allow for the subcategory differences evident from our preliminary data analysis, we include 106 subcategory dummy variables (SUBCATEGORY) that indicate the subcategory to which the focal beer belongs. As a test of Hypothesis 4b in the model, we define a dummy variable (SUBCATCHANGE) that equals 1 if the preceding beer (the beer just before the focal beer) was in a different subcategory than the focal beer. This coefficient will measure the impact of a subcategory change within a flight, whether it affects the score for the subsequent beer in any way.

We include the score of the first beer in the flight directly as an independent variable (RATING_1ST) in order to test Hypothesis 2. In this way, we assess whether the first beer impacts scores for the rest of the beers in the flight (i.e. an anchoring or assimilation effect). Given that past research has demonstrated assimilation or contrast among adjacent stimuli, we include the score of the beer immediately preceding the focal beer (PREV_RATING). We also include the maximum score leading up to the focal beer (only if it is not the score of the first beer in the flight) as MAX_TILL_NOW; this is to test whether an "extremely high" value would have an impact on subsequent evaluations. Positive coefficients reflect positive correlation, indicating assimilation; negative coefficients reflect negative correlation, indicating contrast. If this coefficient is positive, it means subsequent ratings assimilate to this value. If it is negative, it implies that subsequent ratings contrast to this value. We analogously define MIN_TILL_NOW for the minimum score (other than the first beer) leading up to the focal beer. For an example of contrast, as predicted by Hypothesis 3, if the coefficient on MIN_TILL_NOW were negative, the lower the minimum beer, the higher would be the expected score of the focal beer. Taken

together, these variables enable us to test for assimilation and contrast effects between extreme and adjacent beers.

In order to determine whether context effects are enhanced or diminished at the points of subcategory change and thus test Hypothesis 4a, we include the interaction terms between the SUBCATCHANGE dummy with the rating of the previous beer (PREV_RATING). The interpretation of this interaction term will be subject to the sign of the parameter estimates for the main effect. For example, if SUBCATCHANGE is positive as hypothesized, and if PREV_RATING is negative (contrast effect), and if SUBCATCHANGE X PREV_RATING is negative, this would imply that a subcategory change decreases the intensity of the contrast effect. In other words, contrast effects may be exacerbated by domain match and alleviated by domain mismatch.

Because our analysis is within flights rather than across time, parameter estimates will not be influenced by annual trends. Consequently, we do not include any variables in the model to control for the annual improvement trend pointed out earlier. Table 4 provides a succinct list and description of the variables included in the model.

Our model is as follows:

$$(1) \textit{SCORE} = \beta_0 + \sum_{k=1}^{106} \beta_k \textit{STYLE} + \beta_{107} \textit{SUBCATCHANGE} + \beta_{108} \textit{FIRST} + \beta_{109} \textit{MIN} + \beta_{110} \textit{MAX} + \beta_{111} \textit{PREVIOUS} + \beta_{112} \textit{SUBCATCHANGE} * \textit{PREVIOUS} + \varepsilon$$

where β_i ($i = 1, \dots, 112$) represent vectors of unknown fixed-effects parameters and ε represents an unknown random error vector.

Table 4: Variables Used in Model 1

<i>Variable</i>	<i>Type</i>	<i>Interpretation/reason for inclusion</i>
SCORE	Continuous; score of an entry; range 10.5-49.5	Dependent variable
STYLE	Dummy variable; 106 to account for 107 subcategories (styles)	Control for subcategory differences evident from preliminary data analysis
SUBCATCHANGE	Dummy variable = 1 if preceding beer in different subcategory; 0 otherwise	Test Hypothesis 4b; whether subcategory change causes upward shift in score
FIRST	Continuous; score of first beer of flight	Test Hypothesis 2; whether ratings assimilate to first beer score
MAX	Continuous; score of running maximum leading up to focal beer; only included if it is not the first	Test Hypothesis 3; whether there is contrast effect versus extremes
MIN	Continuous; score of running minimum leading up to focal beer; only included if it is not the first	Test Hypothesis 3; whether there is contrast effect versus extremes
PREVIOUS	Continuous; score of predecessor beer	To test whether ratings assimilate or contrast to adjacent beers
PREVIOUS X SUBCATCHANGE	Interaction of score of predecessor beer and subcategory change dummy	Test Hypothesis 4a; whether contrast effects are diminished or enhanced by subcategory changes

Results. The regression parameters from the model ($R^2 = .08$; $F = 3.82$, $p < .01$) are presented in Table 5a. Note that since we are not modeling the actual attributes that measure or contribute to objective beer quality, we are in essence modeling the “noise” around scores. In this context, an R^2 of .08 is not trivial and speaks to the significance and pervasiveness of the context effects. Several of the subcategory dummy variables were significant; the names and coefficients of the significant categories are presented separately from the other fixed effects in Table 5b. Please note that the base subcategory, Special/Best/Premium Bitter in the English Pale

Ale category, was a particularly low-scoring subcategory, which explains why the significant subcategories (presented in the table) are all positive relative to this subcategory.

Assimilation effects. The coefficients on PREV_RATING, RATING_1ST, and MAX_TILL_NOW are all significant and positive, indicating assimilation effects. On average, when the score of the first beer of the flight is higher (lower) by 1 point, the score of the focal beer is higher (lower) by .14 points, which supports Hypothesis 2. Similarly, when the score of the previous beer is higher (lower) by 1 point on the rating scale, the score of the focal beer is higher (lower) by .09 points. Also, a positive (negative) shift in the maximum score leading up to the focal beer yields a shift of magnitude .03 points in the same direction as the maximum. The coefficient for the minimum score leading up to the focal beer was, however, not significant.

Contrast effects. Although we see significant assimilation effects at the level of the flight, we find no evidence for contrast effects in this model.

Subcategory effects. The coefficient for the SUBCATCHANGE variable is significant and positive. When there is a change in subcategory within a flight, the score of the first beer of the subcategory is higher on average by .94 points, supporting Hypothesis 4b. In Hypothesis 4a, we predicted contrast effects would be stronger within the same subcategory. Note that we find no contrast effects in this model. Also, the interaction between the previous beer score and the subcategory change variable was not significant, so we cannot say whether context effects (in this case, assimilation) are either enhanced or diminished by a subcategory change. We tried alternative specifications as additional checks to see whether context effects are enhanced or diminished within the same subcategory. For example, we included interactions of all the assimilation variables with a new “SAME_SUBCAT” variable, which equaled 1 if the focal beer belonged to the same subcategory as the preceding beer. However, none of these coefficients

were significant, and were ultimately dropped from the final version of the model. Thus, our results fail to support Hypothesis 4a.

Table 5a: Regression Estimates: Model 1

<i>Parameter</i>	<i>Estimate (Standard Error)</i>
INTERCEPT	22.65 (.94) *
SUBCATCHANGE	.94 (.24) *
PREV_RATING	.09 (.02) *
RATING_1 ST	.14 (.02) *
MIN_TILL_NOW	-.0003 (.009)
MAX_TILL_NOW	.03 (.005) *

* $p < .01$

Table 5b: Subcategory Effects; significant ($p < .05$) estimates only

<i>Subcat ID</i>	<i>Category name</i>	<i>Subcategory</i>	<i>Estimate</i>
66	Lambic and Belgian Sour Ale	Gueuze/Geuze-Style Ale	5.93
21	Belgian and French Ale	Biere de Garde	5.33
25	Wheat Beer	Weizenbock	5.04
81	Pilsner	Classic American Pilsner	3.90
47	English Pale Ale	Standard/Ordinary Bitter	3.63
45	English IPA	English IPA	3.44
99	Strong Belgian Ale	Dubbel	3.07
73	Light Hybrid Beer	Blonde Ale	3.05
97	Strong Belgian Ale	Belgian Strong Dark Ale	2.96
75	Light Lager	Dortmunder Export	2.93
55	European Pale Lager	Northern German Pilsner	2.87
77	Light Lager	Munich Helles	2.79
28	Bock	Eisbock	2.56
2	Amber Hybrid Beer	Dusseldorf Altbier	2.55
27	Bock	Doppelbock	2.44
40	English and Scottish Strong Ale	Old Ale	2.35
65	Lambic and Belgian Sour Ale	Fruit Lambic-Style Ale	2.33
94	Stout	Foreign Extra Stout	2.07
60	Koelsch and Altbier	Duesseldorf Altbier	1.98
9	American Lager	Classic American Pilsner	1.84
16	Barleywine and Imperial Stout	American-Style Barleywine	1.79

Discussion. Our model establishes significant assimilation effects at the level of the flight. Scores of a focal beer assimilate to the score of the first beer in the flight, the score of the beer immediately preceding it, and the score of the running maximum. However, we are unable to detect contrast effects in this model. While we find that a subcategory change within a flight causes an upward spike in ratings, we are unable to establish whether context effects (in this case assimilation) are enhanced or diminished within a subcategory.

Recall that we had a priori expected to find contrast effects against the running maximum and minimum scores. Although the coefficient on the running minimum score was not significant, we instead found significant assimilation effects to the running maximum score. Thus on average, the assimilation effects inflate the mean scores of a flight, so a particular beer could benefit or suffer by its random assignment to a particular flight. If we could control for the variation in flight scores and make the flights more comparable, we would expect assimilation effects to be less evident, *ceteris paribus*. This would enable us to better analyze within-flight variations in ratings. In our second model, we do just that and consequently expect contrast effects that may have previously been masked by assimilation effects to now emerge.

2.5.2 Model 2: Hedonic Context Effects within Flights

In this model, we include 687 additional dummy variables (FLIGHT) that indicate the flight to which the focal beer belongs. As described above, flights are disparate in terms of scale usage by the judges based on the score received by the first beer and extremes in the sequence. Average score differences for the 688 flights would hence be accounted for by these dummies, since each flight will have its own model intercept. Because assimilation effects in Model 1 were estimated from variation in scores across flights, we now account for assimilation in this model

with the individual dummy variables, which allows previously overshadowed contrast effects to become more prominent. The other independent variables and the dependent variable remain the same as before.

The results for this model ($R^2 = .29$) are presented in Table 6. The model's higher R^2 when compared to the first model reflects the substantial variation in across flight scores, variation accounted for by flight dummy variables in Model 2. As expected, many of the flight dummy variables were significant, as were several of the subcategory dummy variables (not reported separately for this model). Similar to the first model, a subcategory change causes an upward spike in the ratings. More importantly, the assimilation effects that were significant in the previous model now disappear completely, establishing that those effects occur at the flight level. After accounting for variation across flights, beers within a flight are more directly compared to each other and contrast effects emerge.

Contrast effects. We now observe contrast effects in relation to the previous beer and the maximum score leading up to the focal beer. An increase (decrease) of 1 point in the score of the previous beer is associated with a decrease (increase) of the score of the focal beer by .1. Similarly, an increase (decrease) of 1 point in the maximum score leading up to the focal beer is associated with a decrease (increase) of the score of the focal beer by .04. In other words, these variables which had previously exhibited assimilation effects now exhibit contrast effects. As before, the minimum score leading up to the focal beer is not significant. The results from our second model, which adjusts for differences across flights, establish that assimilation occurs at the overall (flight) level, but within the flight there are significant contrast effects not only

against extremes of quality (the running maximum score) but also between adjacent beers in the flight.^{12 13}

Table 6: Regression Estimates: Model 2

<i>Parameter</i>	<i>Estimate (Standard Error)</i>
INTERCEPT	39.17 (2.29) *
SUBCATCHANGE	.53 (.24) *
PREV_RATING	-.1 (.02) *
MIN_TILL_NOW	-.0003 (.01)
MAX_TILL_NOW	-.04 (.008) *

* $p < .01$

Discussion. In our second model, we “adjust” for the variation in scores across flights by incorporating individual flight dummies. We now find contrast effects not only against extremes of quality (in particular, the running maximum score), but also between adjacent beers in all positions of the flight. The assimilation effects that were significant in the previous model disappear completely, establishing that those effects occur at the flight level as a result of the overall differences between flights. Once flight differences are accounted for, the effects of beers being pitted (directly compared) against each other are visible and hence contrast effects emerge. With this model we were able to isolate contrast effects that had previously been masked by assimilation, and posit an explanation for the coexistence of assimilation and contrast within the same sequence of hedonic experience.

¹² Note that even in this model the interaction between the previous beer score and the subcategory change variable was not significant. Again we cannot say whether contrast effects are enhanced or diminished by a subcategory change. This variable was therefore dropped from the final version of the second model.

¹³ The first beer score is not identified in this model and cannot be estimated since first beer scores vary by flight and influence flight averages, and thus are accounted for by the flight dummy variables.

2.5.3 A Hierarchical Bayesian Random Effects Model

We also present a random-effects modeling framework to model the determinants of the score of a beer as follows. Our hypotheses involve variables at two levels- an individual entry or beer in a particular position in the flight, and the flight to which it is assigned. We wished to account for beer style or subcategory-specific, flight-specific as well as judge-specific heterogeneity (to be incorporated in the future version of the model). We formulate and estimate a flexible hierarchical Bayesian random parameters regression model as follows.

We consider k beers; $k \in (1, 5244)$ arranged in i flights; $i = 1, \dots, I$; $i \in (1, 688)$; evaluated by judges $j = 1, \dots, J$; $j \in (1, 3)$; across the eight years. We therefore use y_{ijk} to represent the score (out of 50) of the k^{th} beer in the i^{th} flight as assigned by the j^{th} judge.

$$y_{ijk} \sim N(\mu_{ijk}, \varepsilon_{ijk})$$

$$y_{ijk} = \beta_{0i} + \beta_{1i}y_{ijk-1} + \beta_{2i}FIRST_{ij} + \beta_{3i}MAX_{ijk} + \beta_{4i}MIN_{ijk} + \beta_{5i}SUBCATCHANGE_{ik} \\ + \beta_{6i}SUBCATCHANGE_{ik}X y_{ijk-1} + \beta_{7i}STYLE_{ik} + \varepsilon_{ijk}$$

where

$$\varepsilon_{ijk} \sim N(0, \sigma_i^2)$$

$$\beta_i \sim N(\Delta'z_i, V_\beta)$$

The variables in the model are as defined before in Table 4. Note that the intercept term β_{0i} represents flight-level intercepts, which would represent flight-level assignment effects, a proxy for the flight-level dummy variables in our previous model 2.

Priors

Following Rossi, Allenby and McCulloch (2005), the priors on the collection of β s are specified through a two-stage process. First, a normal prior is specified on β and then a second-stage prior on the parameters of this distribution.

$$\beta_i = \Delta' z_i + v_i$$

$$\Delta = [\delta_1 \dots \dots \delta_k], v_i \sim N(0, V_\beta)$$

$$\sigma_i^2 \sim \frac{v_i s_{0i}^2}{X v_i}$$

$$V_\beta \sim IW(v, V)$$

$$\text{vec}(\Delta) | V_\beta \sim N(\text{vec}(\bar{\Delta}), V_\beta X A^{-1})$$

For the preliminary estimation, we use uninformative priors but we will impose some meaningful restrictions on the β estimates in the future version of the model.

MCMC Estimation

The model can be written out as a sequence of conditional distributions which the Gibbs sampler cycles through:

$$y_{ijk} | X_{ijk}, \beta_i, \sigma_i^2$$

$$\beta_i | z_i, \Delta, V_\beta$$

$$\sigma_i^2 | v_i, s_{0i}^2$$

$$V_\beta | v, V$$

$$\Delta | z_i, V_\beta, \bar{\Delta}, A$$

The regression in equation (1) is estimated 688 times for 688 flights, for 5244 beers. For the preliminary analysis, the Markov chain was run a total of 5000 iterations. Figure 1 indicates that

the parameters converged after about 3000 iterations. The posterior estimates in figure 2 are plotted for the final 1000 iterations after convergence.

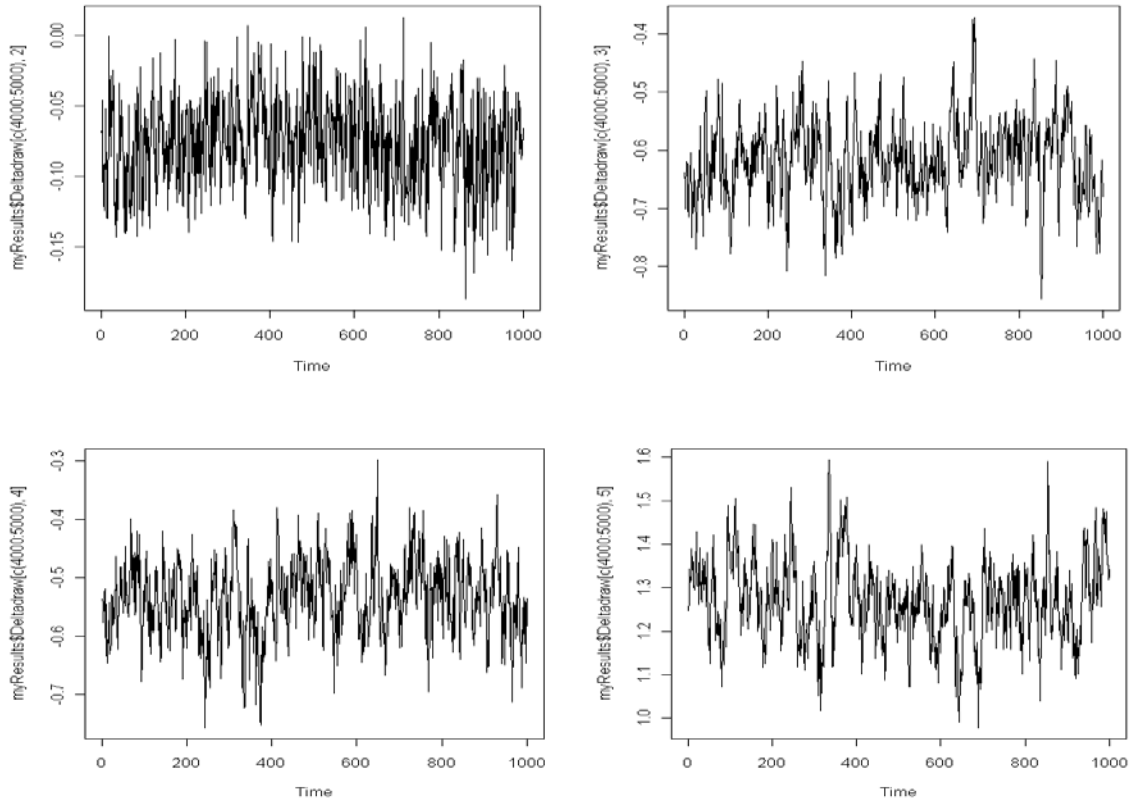


Figure 1: Posterior estimates; time series plots to assess convergence

Preliminary Results

Analysis of the histograms for score of the previous beer, the score of the running maximum and score of the running minimum (figure 2a) indicates that >99% of the mass is on the negative side. This suggests that the dependent variable is negatively correlated with these measures- in other words; the score of the focal beer is negatively correlated with the score of the predecessor beer, as well as to extreme scores like the running maximum and minimum scores, indicating contrast effect.

On the other hand, the histogram of the score of the first beer (figure 2b) indicates that the mass is on the positive side; in other words, the score of the focal beer is positively correlated with the score of the first beer of the flight, indicating assimilation or anchoring effects. A distribution of the flight-level intercept estimates also indicates that flight assignment effects are substantial, and that there are likely significant assimilation effects at the level of the flight.

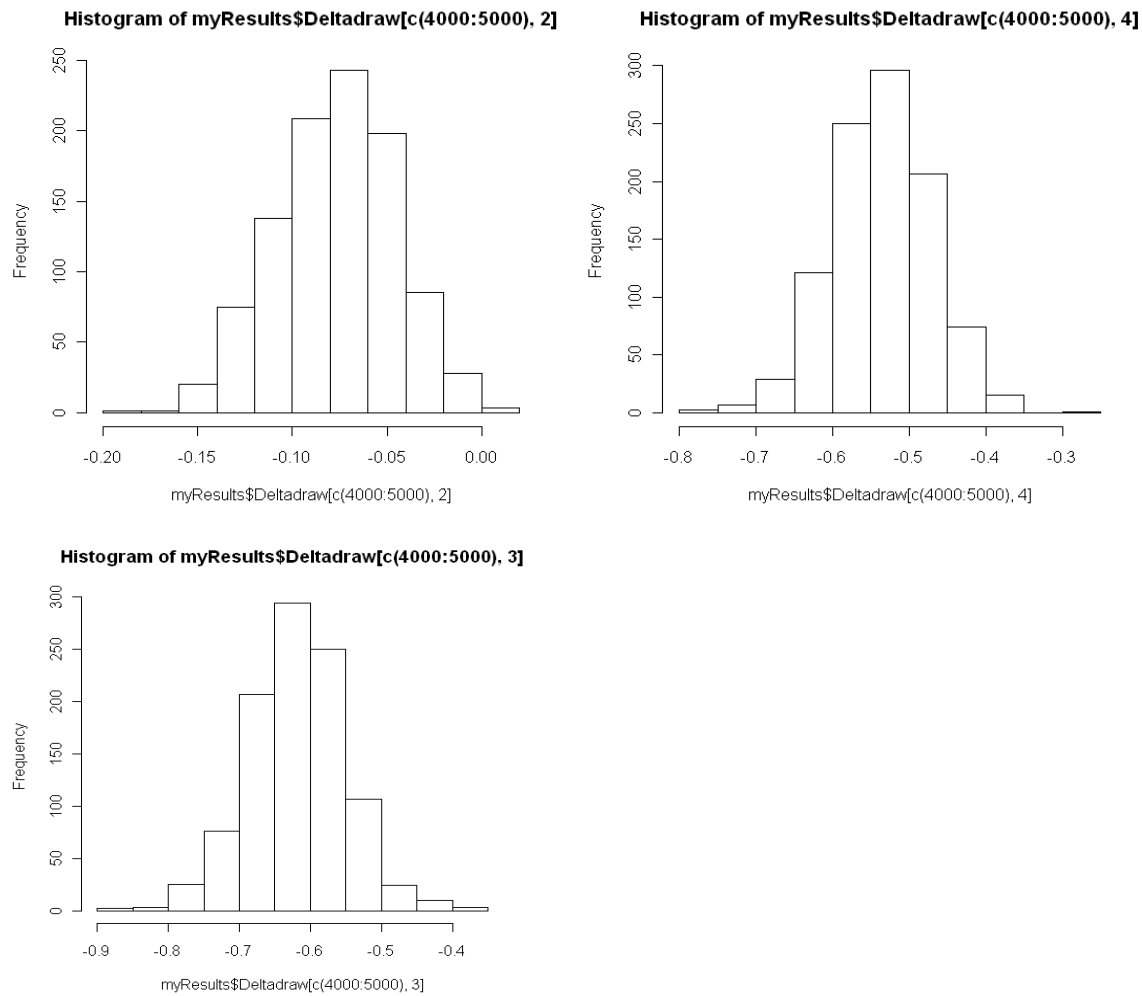


Figure 2a: Marginal posterior estimates (PREVIOUS, MAX and MIN); Contrast effects

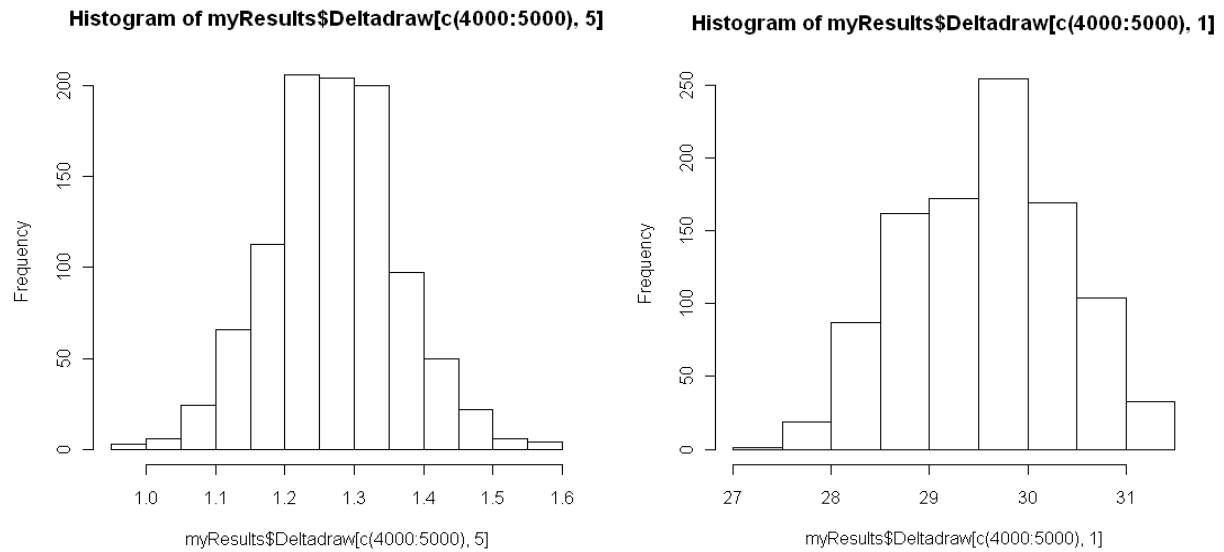


Figure 2b: Marginal posterior estimates (*INTERCEPT* and *FIRST*); Assimilation effects

Discussion and ongoing work

The Bayesian estimation also reveals assimilation effects at the level of a flight, and assimilation/anchoring effects to the first beer of the flight. We also find significant contrast effects between adjacent beers, and to extremes (maximum and minimum scores). Again, we are able to separate assimilation and contrast in the same sequence of hedonic experiences.

We are currently in the process of estimating the full model. The following would be the next steps:

- (i) Separating the data for the individual judges and model multiple (repeated) measures of the scores of individual beers
- (ii) Using informative priors on β
- (iii) Running the MCMC chain for 20000 iterations.

2.6 General Discussion

In this research, we successfully isolate both assimilation and contrast effects in the same sequence of hedonic experiences. The fact that we can identify and separate simultaneous assimilation effects and contrast effects in our dataset is unique with respect to the extant literature. For example, while beer scores within a flight assimilated to the score of the previous beer, beers tasted in the flight contrasted against the previous beer as well, although these effects are not measured simultaneously in our data. We do not believe that this is an artifact of our data but posit that previous researchers either did not look for simultaneous effects or did not have data that would allow them to uncover such effects. In our data, it appears that at the overall flight level, assimilation effects are prominent and beers in the same flight appear to serve as frames of reference for each other. When we adjust for variation in scores across flights, we find contrast effects previously masked by assimilation. To the best of our knowledge, this is the first time that these two effects have been shown to coexist and been isolated in the same dataset.

Our results are important for marketing managers and consumers alike. Recall we pointed out that at the Bluebonnet Brew-off, one of the largest homebrew competitions in the U.S., for 33% of the flight contests, the first place beers won by one (1) point or less, and a difference of up to two points decides 58% of the winners. Given the magnitude of the effects we find in our model, these statistics suggest that a sizeable proportion of the outcomes may be influenced by assimilation and contrast effects. Further, it is well known that experiences judged jointly provide different outcomes than evaluations made separately (Hsee et al. 1999). The conventional wisdom is that sequential evaluation of randomly ordered items provides more objective measures of comparative quality and thus is preferred when assessing preferences and judging products. Our results contribute to a growing literature documenting the psychological

ramifications inherent in how one constructs choice sets or sequences for trial. Unbeknownst to many wine enthusiasts or even those of us who believe we randomly begin watching one specific TV show before flipping channels, what we have experienced and the order in which we experience it is impacting our evaluation in numerous subtle ways. Our research reconfirms that judging one experience can unduly influence our judgment of subsequent events and thus “color” the entire sequence of experiences and highlights that randomization is not the panacea it appears to be.

Consider an experience of tasting successive samples randomly in a food court in a mall. While one particularly tasty sample may improve the average evaluation of the food as a whole (assimilation), it may also create strong contrast effects for the samples tasted directly following that extreme in quality. In other words, while the entire experience at that mall may compare favorably against a sampling experience at another mall (or at the same mall on another day), individual samples tasted that day may be rated above or below their objective quality due to within-sequence contrast effects.

Or consider a consumer shopping experience with more profound implications. One author went to test drive the new 2009 Jaguar XF. He began with the “Supercharged” top-of-the-line version before progressing downward by subsequently driving the “Luxury” version and concluded by moving up and driving the “Premium Luxury” version. His perception of Jaguar’s new sport sedan was likely influenced by the first car he drove, the Supercharged model that comes equipped with all of the premium features standard. Consequently, the Jaguar XF in general (assimilation) was very well-regarded. It compared extremely favorably to the BMW 5 series and Mercedes E-class. However, while evaluating the experience of driving each model FX, the difference between the 420 horsepower Supercharged model and the 300 horsepower

luxury versions became evident, as did the contrast between the ultra-premium Bowers and Wilkins 440-watt stereo and the Jaguar 320-watt Jaguar-branded standard stereo. In other words, within the sequence, contrast effects emerged. Like the results of our model, the evaluations that emerge from test driving different models within a new line of vehicles is likely to be impacted by both assimilation and contrast simultaneously. In addition, to fully comprehend the effect of different features, it would be necessary to first control for assimilation.

This begs the question of what marketing managers might do to diminish these effects. One suggestion may be to encourage repeat trials in new sequence orders. In the Bluebonnet Brew-off, each judge could sample a flight multiple times in different sequences, or, more cost-effectively, the two judges could each sample the same flight in a different order. Similarly, after driving the luxury model, the author could try the supercharged version again to see if it really feels that much faster. While we have no evidence to confirm that revisiting the experiences in a different order would moderate the assimilation and contrast effects we observed (it may create a number of new effects), we suspect that a greater sampling both in number and duration would help judges form more objective evaluations.

2.7 Conclusion

In this research, we show that individuals' evaluations of sequences of hedonic experiences exhibit contrast effects (thus empirically demonstrating real-time, experienced hedonic contrast) as well as assimilation effects simultaneously. While our research reveals how individual experiences impact each other, as mentioned above, we neither posit nor test methods to attenuate or eliminate these effects. One expects, however, normatively speaking, that marketers and consumers would prefer to know how an experience rates independent of context. Future

research should investigate methods that either measure or control these effects such that practitioners, be they the firm or judges or even consumers might remove them to obtain “purer” measures.

In addition, while many of the contrast and assimilation effects documented in the literature have been ascertained without simultaneous tests, it may be worth selectively re-investigating certain phenomenon to see whether the effects withstand such testing. We do not call any specific effects into question, as we do not have any reason to expect specific results to change. However, it may be the case that researchers who did not observe contrast effects may have if they had accounted for assimilation and those who did observe contrast effects may have also observed assimilation, which might have suppressed the size of the effect. Our hope is that in the future, researchers who test for these types of effects utilize methodologies that allow them to test for both simultaneously. One obvious limitation of our work is that our analysis is constrained to a single data set. While the data are rich and appropriate for such testing, we cannot speak to whether researchers might find similar patterns of effects in other sequences of hedonic experiences. We believe other researchers reflecting upon this work will be inspired to test for the simultaneity of these effects.

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APPENDICES

Appendix 1: Instructions for Study 1

Hello! Thank you for participating in this study to demonstrate different methods of Value elicitation.

We are going to ask you some questions about what you think of products that are sold in the ___ (school) Bookstore. There are no right or wrong answers, we are asking only for your opinions.

You have been given a mug, and the mug is now yours to keep. Please take a few moments to look at the mug that you have been given and then answer some questions about it.

After that we will give you an opportunity to sell back your mug to us for cash. You will be asked to indicate from a range of prices at what price you would sell the mug for. We will randomly pick one price from the range indicated in the questionnaire (through a random drawing), and if you indicated that you would sell for that price (or less), we will take the mug back and give you the cash amount for the price that is drawn. If your indicated price is higher than the price drawn then you keep the mug.

Please note that if you indicate a price that is lower than what the mug is worth to you, and if a price higher than that is drawn, you would be required to give up the mug in exchange for the likely low price drawn. On the other hand, if you indicate a price that is higher than what the mug is actually worth to you, and if a price lower than that is drawn, you lose the opportunity to exchange the mug for the likely decent price drawn. So it is in your best interests to indicate the price that is reflective of what the mug is TRULY worth to you.

Once again, thank you for participating in this survey.

Appendix 2: Elicitation Selling prices in Study 1 (BDM method)

Now you will have an opportunity to sell back your mug for cash if a price, which has already been randomly determined, is acceptable to you. For each of the possible prices below, indicate whether you wish to sell your mug and receive this price, or keep your mug and take it home with you. For each price indicate your decision by marking an X in the appropriate column. The predetermined price will be revealed and all participants will actually make the exchange of the mug for the cash amount drawn, IF they have indicated they will sell for that price.

	Keep	Sell		Keep	Sell
\$.25			\$4.25		
\$.75			\$4.75		
\$1.25			\$5.25		
\$1.75			\$5.75		
\$2.25			\$6.25		
\$2.75			\$6.75		
\$3.25			\$7.25		
\$3.75			\$7.75		

Appendix 3: Impact of Packaging

Sometimes packaging and presentation are responsible for people's evaluations of products. Take a look at the packaging of this product- in terms of the envelope, the backing card inside and the presentation overall.

Please answer the following questions based on the packaging of this product.

a) To what extent was your evaluation of this product affected or unaffected by the packaging?

Totally unaffected by packaging/ Somewhat unaffected by packaging/ Somewhat affected by packaging/ Totally affected by packaging

b) To what extent do you think OTHERS' evaluation of this product was affected or unaffected by the packaging?

Totally unaffected by packaging/ Somewhat unaffected by packaging/ Somewhat affected by packaging/ Totally affected by packaging

c) To what extent do you think that evaluation of a product should be affected or unaffected by the packaging?

Should be totally unaffected by packaging/ Should be somewhat unaffected by packaging/ Should be somewhat affected by packaging/ Should be totally affected by packaging

Appendix 4: Elicitation of WTP in Study 2

Please look at the product that has been handed to you. It is a **card from Panera Bread** which has been charged with **\$25**.

These cards may be used anytime at any Panera Bread café anywhere in the United States on a single or ongoing basis. One may keep adding value to these cards by charging it with any amount of dollars. These cards are equivalent to cash in the amount loaded on them, and the cards never expire.

If we were selling this card to you in this experiment and asked you to pay money for this card, how much would you be willing to pay for it? Remember that it is charged with **\$25** which can be used just like cash at Panera Bread, and you could use it and add value to this card as you wish over a lifetime.

You don't have to pay any money to us for this card. We are simply showing this \$25 Panera card to you, and want to know how much you would pay for it if we were selling it to you.

Please check (✓) the MAXIMUM value (select only ONE value) that you would be willing to pay for this card from the following table.

	<i>I would pay</i>		<i>I would pay</i>		<i>I would pay</i>
\$30		\$20		\$10	
\$29		\$19		\$9	
\$28		\$18		\$8	
\$27		\$17		\$7	
\$26		\$16		\$6	
\$25		\$15		\$5	
\$24		\$14		\$4	
\$23		\$13		\$3	
\$22		\$12		\$2	
\$21		\$11		\$1	
				I would definitely not want a Panera card (check here →)	

Please explain your response. Why would you not pay more/less, or why would you not want the card at all?

Appendix 5: SELECTED QUESTIONS, STUDY 2

Judgments/thoughts elicited by product

We will now ask you to consider this product in some detail. Please look carefully at the product in front of you before answering the next few questions.

We are interested in your **thoughts** about this product. Please tell us how well you think each of these words/phrases listed below describes this product by marking a response 1 through 5. If you think the word/phrase describes this product..... Extremely well...mark 5; Very well...mark 4; fairly well...mark 3; not very well...mark 2; Not at all well...mark 1.

Selection of judgments used in Study 2:

Ordinary	Good quality	Attention-grabbing	Exciting
Cold	Nice to touch	Appealing	Cute
Irritating	Warm	Imaginative	Serene
Pretentious	Meaningful to me	Energetic	Authentic
Terrible			Special

Emotions elicited by product

Now we would like you to tell us how this product makes you **feel**. We are interested in your **reactions** to this product and **not** how you would **describe** it.

Please tell us how much you feel each of these feelings while looking at this product. If you feel the feeling Very strongly...mark 5; strongly...mark 4; somewhat strongly...mark 3; not very strongly...mark 2; not at all...mark 1.

Selection of emotions used in Study 2:

Unimpressed	Disgusted	Lonely	Involved	Romantic
Discontented	Irritated	Scared	Desirous	Playful
Sad	Guilty	Curious	Proud	Calm
Bored	Skeptical	Energetic	Excited	Thankful
Embarrassed	Tense	Confident	Surprised	Contented
Confused	Distracted	Creative	Happy	Sentimental

Appendix 6: STUDY 3

Utilitarian description of product:

This is a candle designed to be used in the kitchen, bathroom or heavy-traffic areas of the home. This half coconut candle is first sanded, then pedestaled and filled with pure beeswax. The pure wax contains a proprietary blend of activated charcoal which when burnt absorbs and effectively eliminates unpleasant odors like smoke/cat litter/sweat/urine/musty smells. The candle will last for up to 40 hours.

Hedonic description of product:

This is a candle designed to be used in the bedroom or in your personal space in the home. This half coconut candle is first sanded, then pedestaled and filled with pure beeswax. The pure wax is blended and scented with the wonderful essences of coconut, and is presented in a natural, organic setting for the most enjoyable, relaxing and therapeutic experience. The candle will last for up to 40 hours.

Hedonic/Utilitarian manipulation check (adapted from Dhar and Wertenbroch, 2000):

Please read carefully the following descriptions of two kinds of consumer products.

Hedonic products: Products and experiences that are pleasurable, fun, enjoyable and appeal to the senses. Examples: alcohol, jewelry, going to the movies.

Utilitarian products: Products and experiences that are useful, functional, practical and beneficial. Example- vacuum cleaner, diapers, visiting the dentist.

Now please evaluate the following product on how hedonic and/or utilitarian you consider the product to be. Please note that the product could have both hedonic and utilitarian dimensions, or may be primarily one more than the other.

Not at all utilitarian/hedonic Extremely utilitarian/hedonic

Selection of judgments used in Study 3: Useful Good quality Attractive design Will enhance the ambience of my home Worth my money Reliable Will work as promised (C-alpha = 0.86)

Selection of emotions used in Study 3: Happy Pampered Relaxed Invigorated Romantic (C-alpha = 0.89)

Appendix 7: Beer Scoring Sheet Used by Judges; Note Scoring Guide on Bottom Left



Bluebonnet Brew-off 2006

19th Annual—March 17-18, 2006

Beer Score Sheet

Judge Name (print): _____
 Judge BJCP ID: _____

Entry # _____ Category # _____ Subcategory (a-f) _____

Subcategory (spell out) _____

Judge Qualifications/BJCP Rank :

- Apprentice Recognized Certified
- National Master Grand Master
- Honorary Master Professional Brewer
- Novice (non-BJCP) Experienced (but not in BJCP)

Special Ingredients: _____

Bottle Inspection Appropriate size, cap, fill level, label removal, etc.

Comments: _____

Aroma (as appropriate for style) _____ /12
 Comment on malt, hops, esters, and other aromatics

Descriptor Definitions (Mark all that apply) :

- Acetaldehyde** - Green apple-like aroma and flavor.
- Alcoholic** - The aroma, flavor, and warming effect of ethanol and higher alcohols. Sometimes described as "hot".
- Astringent** - Puckering, lingering harshness and/or Dryness in the finish/aftertaste; harsh graininess; huskiness.
- Diacetyl** - Artificial butter, butterscotch, or toffee Aroma and flavor. Sometimes perceived as a slickness on the tongue.
- DMS (dimethyl sulfide)** - At low levels a sweet, cooked or canned corn-like aroma and flavor.
- Estery** - Aroma and/or flavor of any ester (fruits, fruit flavorings, or roses.)
- Grassy** - Aroma/flavor of fresh-cut grass or green leaves.
- Light-Struck** - Similar to the aroma of a skunk.
- Metallic** - Tinny, coin, copper, iron, or blood-like flavor.
- Musty** - Stale, musty, or moldy aromas/flavors.
- Oxidized** - Any one or combination of winy/vinous, cardboard, papery, or sherry-like aromas and flavors.
- Phenolic** - Spicy (clove, pepper), smoky, plastic, plastic adhesive strip, and/or medicinal (chlorophenolic).
- Solvent** - Aromas and flavors of higher alcohols (fusel alcohols). Similar to acetone or lacquer thinner aromas.
- Sour/Acidic** - Tartness in aroma and flavor. Can be sharp and clean (lactic acid), or vinegar-like (acetic acid).
- Sulfur** - The aroma of rotten eggs or burning matches.
- Vegetal** - Cooked, canned, or rotten vegetable aroma And flavor (cabbage, onion, celery, asparagus, etc.)
- Yeasty** - A bread, sulfury or yeast-like aroma or flavor.

Appearance (as appropriate for style) _____ /3
 Comment on color, clarity, and head (retention, color, and texture)

Flavor (as appropriate for style) _____ /20
 Comment on malt, hops, fermentation characteristics, balance, finish/aftertaste, and other flavor characteristics.

Mouthfeel (as appropriate for style) _____ /5
 Comment on body, carbonation, warmth, creaminess, astringency, and other palate sensations

Overall Impression _____ /10
 Comment on overall drinking pleasure associated with entry, give suggestions for improvement

Total _____ /50

SCORING GUIDE	Outstanding (45 - 50):	World-class example of style
	Excellent (38 - 44):	Exemplifies style well, requires minor fine-tuning
	Very Good (30 - 37):	Generally within style parameters, some minor flaws
	Good (21 - 29):	Misses the mark on style and/or minor flaws
	Fair (14 - 20):	Off flavors, aromas or major style deficiencies
Problematic (0 - 13):	Major off flavors and aromas dominate	

	Stylistic Accuracy			
Classic Example <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Not to Style
	Technical Merit			
Flawless <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Significant Flaws
	Intangibles			
Wonderful <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> Lifeless