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Product-Design Perception and Brand Strength

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In this article, we present an approach to understanding product design from a cognitive psychologist's view. We show what cognitive processes are involved in perceiving products. Moreover, we discuss how these processes are related to the mental formation of brands and how they affect perceivers' appreciation of a product's design.

"Europa ist nur im Design stark" [1]
Nicholas Negroponte, Founder of the MIT Media Lab in Boston, on Europe's decline, the ambitions of immigrants and the best way towards creativity (in: Welt am Sonntag, January 29, 2006)

The above statement by Nicholas Negroponte concerning the European competitiveness is definitely very skeptical and a bold understatement. However, it implicitly contains an assumption which definitely is not just based on common sense. It stresses the importance of design, which it sees as an important economical factor. Moreover, in this statement design somehow is seen as a factor on its own, not as an attribute of an industry or a certain product. This actually makes that statement sensational.

1. Product design perception and brand strength

There is undoubtedly awareness for the increasing importance of aesthetic elements of product design to make products and brands more appealing than others. However, in the past, there was much smaller investment by marketing and science towards understanding of product design compared with marketing-mix elements such as advertising, sales, price-discounts or other promotional activities. The present article aims to provide a general framework of product design perception in order to better inform strategic design decisions to create brand strength and competitive advantage.

Recent research in consumer behavior science has revealed that there are at least three central factors of how a product's shape or design can lead to brand strength (Kreuzbauer/Malter 2006). First, design facilitates the recognition of a new product as belonging to a certain brand category. This is strongly influenced by brand-typical design attributes, such as, for example, the grill and the typical double-eye lights of a BMW car which ensure that the consumer will unmistakably identify this object as a member of the BMW brand category. Presumably a brand's positive image associations are automatically transferred to any new brand category members, which will lead to a higher overall brand strength (cf. Keller 1993). Second, design elements communicate information about the specific functions of a product and how people can physically interact with and use the product or a specific brand. For example, the organic design of a Logitech mouse somehow communicates "easy to handle", which becomes a strong associative element of the Logitech brand image. Third, a brand's product design can consist of several stylistic or aesthetically appealing elements that lead to positive brand evaluations, e.g. the chrome elements of a Jaguar car that communicate luxury and as such become embedded within the Jaguar brand image. Certain design elements can even play a primary role in creating the identity and value of a brand, as in, for instance, the characteristic color and surface of the Apple iPod or the typical shape of a Volkswagen Beetle.

We believe that a proper understanding of how product design can affect brand value requires the consideration of the per-

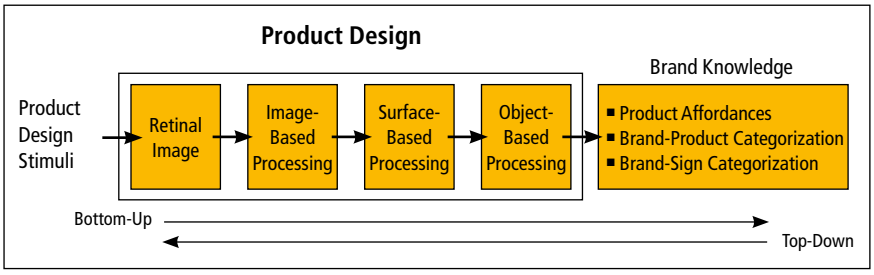


Fig. 1: Framework for product design information processing
Source: Adapted from Palmer 1999.

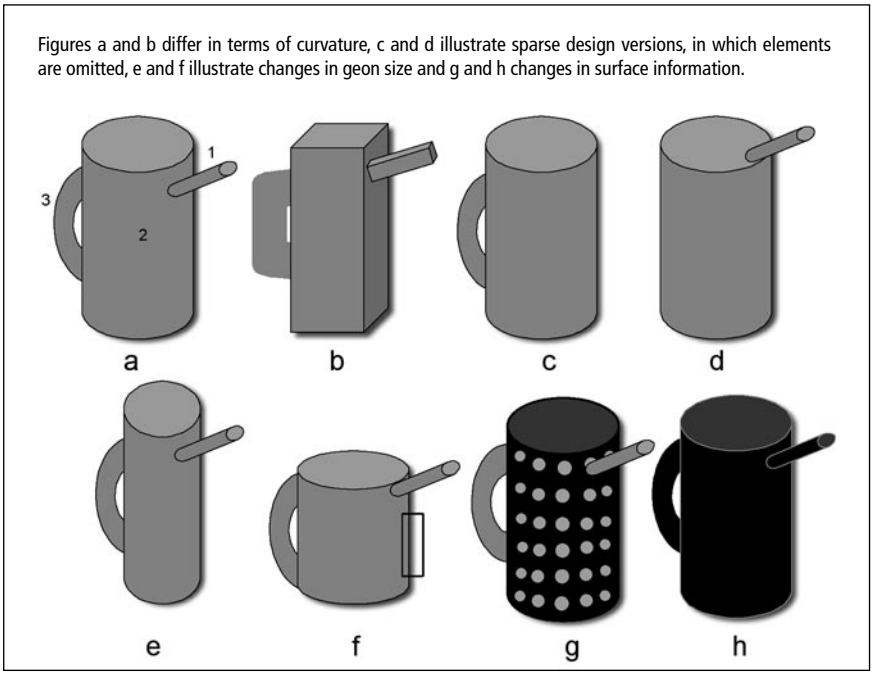
[1] ("Europe is strong in design only", translation by the Authors)

ceptual processes involved in perceiving products. This means understanding how product design information is "picked up" by human sensory systems and integrated into consumer brand memory structures. In Figure 1 we propose a general theoretical framework of consumer perception of product design elements and its effects on how a brand is understood or categorized. That is, whether a brand e.g., is categorized as a luxury or sports item or whether a new product is identified as a member of a given brand category (e.g. Mercedes). This framework provides a basis for assessing possible consumer responses to a company's design strategies as well as to design-extensions of existing brands.

2. A framework of product design perception

All perceivers share a common visual system. Initial perception can be understood in terms of a 4-stage model of object perception (cf. Palmer et al. 2003; Kreuzbauer/Malter 2006). According to that model perception of a product passes four stages until it becomes categorized with respect to the consumer brand memory. In a first stage a 2-D *retinal image* is derived which corresponds to the first impression of visual product stimuli. This is formed without the consumer's attention, and the information is unstructured and uninterpreted (Julesz 1984; Treisman 1993). In the second (*image-based stage*), the retinal image is further processed in order to extract elements such as lines and edges of the stimulus. Object boundaries are most likely at locations in the image at which abrupt changes in light intensity can be observed (Marr 1982).

In the third *surface-based* stage, surface and spatial information is recovered. The visual system does not waste information so surface information is extracted and used to solidly keep object structures together (Leder 1996). Surface attributes are color, shininess, hue, texture etc. Objects often share such attributes at all their constituting surfaces. Consequently, an object's coherence is stronger when the surface is similar in all its parts. Figure 2 gives an example. In Figure 2g the variation in texture (pattern applied here) makes it harder to recognize the object.



Figures a and b differ in terms of curvature, c and d illustrate sparse design versions, in which elements are omitted, e and f illustrate changes in geon size and g and h changes in surface information.

Fig. 2: Examples of different versions of one object (mug) composed of the same geons

Surfaces reveal much about an object. Closer parts tend to be perceptually larger, so we learn about spatial extension, even more so due to changes in texture density (see the sizes of the dots in Fig. 2g). Importantly, a significant part of our brain is responsible for color processing. Color signals many qualities of objects. For example, from a biological perspective, colors reveal which fruits are edible or rotten.

True 3-D processing only occurs at the fourth *object-based stage*. It is assumed that during perception visual representations are related to general stored knowledge about the intrinsic nature of the 3-D object (Marr 1982; Palmer 1999; Kreuzbauer/Malter 2006). An example would be aspects of a product that are occluded from the current viewpoint, such as the back of a camera, TV, car, bottle, etc. Thus, by simply perceiving the curved surfaces of a bottle, one is able to make clear predictions regarding the probable appearance and properties of the back of the bottle. Therefore, hidden assumptions about the nature of the visual world are also required to enable the inclusion of information about unseen surfaces or parts of surfaces. These processes are possible since objects are matched with 3-D representations from memory during the object-based stage of perception (cf. Biederman 1987; Marr 1982; Hoffman/Singh 1997; Palmer 1999; Tversky/Hemenway 1984).

Biederman (1987) introduced the recognition-by-components (RBC) theory of object perception and recognition, whereby objects can be specified as a spatial arrangement of so-called "primitive" or primary volumetric components, which he called *geometric icons*, or *geons*. The idea behind geons is analogous to speech perception, in which all kinds of words can be coded using a relatively small set of primitive elements, or phonemes. In visual perception, geons are a modest number of geometric components such as cylinders, blocks, wedges, and cones. A major assumption of RBC theory is that the mental representation of an object (including products) is a volumetric structural description composed of geons. Depending on the size and type of a geon, as well as the relationships between them (see Fig. 2), any object can be represented by the human cognitive system.

Figure 2 also illustrates some of the changes that designers can apply without changing the belongingness to a certain "basic" level class. We have chosen a stylized mug (Fig. 2a), which consists of only three basic geometrical shapes (1, 2, 3). A drastic change is shown in Figure 2b. The constituting elements are now in angular rather than round shape and give the object a very different appeal. The way that the constituting elements are designed is very much an aesthetic question, though

technical aspects might also be involved. Figures 2c and d illustrate the more challenging cases for product designers. Trying to make the object as simple as possible might result in versions with constituting elements reduced to the minimum or even omitted. According to Biederman (1987) the resulting objects might initially not be classified as mugs anymore, but nonetheless provide solutions to a design challenge. Figures 2e and f show examples in which the elements are preserved but changed in size. Figure 2g reveals a change in surface information, which strongly affects the coherence of the objects, Figure 2h illustrates that the same object might look different with an altered surface. Interestingly, dark objects often tend to look smaller (compare Figs. 2a and h).

Fig. 3: Perceptual grouping of a BMW car front

These levels of product design perception can affect brand knowledge structures and brand value in several ways:

(1) Product Affordances. Some visually observable characteristics (shape, features, size) of products can communicate functional properties to the user. According to the theory of ecological perception (Gibson 1979; see also Brunswik 1952) a product's shape directly signals affordances, or what the consumer is able to do with it. For example, the handle of a mixer affords "grasping" it by the observer's hand, or a chair affords "sitting on". Product affordances that result from design characteristics may be ascertained in the surface-based as well as object-based stages, such that a smooth touch or an appropriate geonorganization of a handle can facilitate "grasping". In a further step these product affordances are embedded into brand knowledge structures and become part of the brand image. Despite the communicative power of product affordance, in many products affordances may remain on an abstract level so that they might not be directly perceivable, e.g. an MP3 player affords "listening" only to a small extent. Under these conditions information from other sources (product manual, advertising) is required to comprehend all the product's "affordances".

(2) Brand-Product Categorization. Consumers acquire brand specific as well as product specific knowledge. Brand-product categorization is mostly determined by geonstructures in the object-based process. Toyota very successfully integrated a brand-product categorization strategy with its US low-price brand Scion. The *Scion xB* model, which is a combination of a station wagon and a minivan, contains shape elements that refer to the overall shape of a truck and has appealed to a lot of young male college students. How brand-product categorization based on geonstructures can be used to reposition a brand has also been experimentally tested. For example, Kreuzbauer and Malter (2005) investigated an extension from an off-road motorbike into the street-motorbike segment.

(3) Brand-Sign Categorization. In addition to purely generic product information, branded products also contain visual elements that are characteristic of a particular brand in that they make the brand's appearance unique and distinctive from competing brands (e.g. the characteristic lights and grill of a BMW car front which is highly distinctive from other car 'faces'). As suggested by semiotics and cognitive semiotics (Kreuzbauer 2002; Mick 1986; Peirce 1931-1958) brand-sign categorization can be more specifically divided into brand-symbolic categorization processes and brand-iconic categorization processes. The former occur when a brand has abstract product design elements that do not refer to any major external knowledge units except those within the brand concept. For example, the Sony brand logo does not refer to any inherent meaning by itself but simply represents the Sony Corporation. Brand-iconic categorization instead derives from design elements that originally refer to non-brand specific concepts, for instance the typical 'face' of a BMW car that resembles a predator (see Figure 3).

How does brand-sign categorization depend on various perception levels? Surface-based processing can lead to brand-sign categorization. A characteristic product's surface like the smooth surface of Apple products becomes embedded within the Apple brand concept and determines a brand-iconic categorization process with associations such as "good to hold" – or "clean". Aside from surfaces brand-sign categorization is also determined by geonstructures. The geonstructure of a Volvo station wagon is very unique and becomes embedded within the Volvo brand concept. To ensure brand category membership of new car models, Volvo designers consistently transferred this particular geonstructure to all Volvo cars.

Brand-sign categorization processes are of particular strategic relevance for the product and brand line extension strategies. For a discussion of the innovativeness that is involved in this transition see the contribution by Carbon and Leder in this issue of *THEXIS*.

(4) Brand-Style Categorization. Styles are determined by various combinations of surface- and object-based perception processes. For example, the cognitive concept of "luxury-style" may include design attributes such as *chrome, shiny surface, ornaments,* etc. Attaching these attributes to branded products, such as a Jaguar car, produces the conceptual combination between both concepts "luxury" and "Jaguar" and ensures that the consumer will consider the Jaguar brand a luxury brand.

3. Practical Implications

We have presented a description of processing stages in visual perception, which deliver different representations of products. Moreover, we have shown how the representations of these different processing stages contribute to the formation of visually derived brand characteristics. Consequently, designers need to consider these different levels of how an object´s appearance can be changed in order to shape consumers' representation of a specific brand. The described levels of brand-product design perception are of particular relevance for both designers and brand managers; especially when it comes to defining a unique brand-design that clearly distinguishes the appearance of a brand's products from those of its competitors. Brands that have unique and aesthetically appealing designs can be remembered much more easily and facilitate recognition of strong and positive associations. When brand managers plan to design a strong and unique brand-design they have to ensure that the design allows for enough flexibility to extend the brand-design to other product categories. Therefore, it is essential that the brand-design allows innovative combinations of existing brand-typical elements with designelements from the new product category. Moreover, it is also important that a brand's unique design allows the introduction of new models of an already existing product series. For brand renewal strategies it is important that a new model of an existing brand is recognized as a member of the respective brand category, while also containing new elements to avoid boredom. The innovative combination of the described brand-product-design relationships derived from product design perception presents a useful tool to better achieve these brand strategic goals.

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