Managers that want to incorporate a pre-defined product meaning in a design need to know how consumers relate product properties to product meanings. In past research the proposed relationships between physical properties and meanings are implied to be robust. This study showed that the physical property ‘curvature’ has a positive effect on the perceived meaning ‘modernity’, however only when the prototype of the product category has a strong curved, as opposed to angular, design. Hence, the shape of the prototype of the product category should be taken into account when designing a product meaning in a new product.

Keywords: product-meaning, prototypicality, product-optimization

Track: Innovation and New Product Development
1. Introduction

Product design communicates product meaning to consumers (Vihma, 1995). Orth and Malkewitz (2008) showed that low weight, small size, short bottle-neck wine bottles communicate prestige. Companies that are able to communicate a certain meaning in product design (like prestige) through the appearance of the product may create a competitive advantage in the market and contribute to the product’s success (Lewalski, 1988; Bloch, 1995; Hertenstein, Platt & Veryzer, 2005; Yamamoto & Lambert, 1994). In order to create a market relevant product meaning, companies need to know how consumers derive meaning from product design. Specifically, companies need to know what physical product properties are needed to incorporate a certain meaning in a product design (Bloch, 1995; Mugge, Govers & Schoormans, 2009).

According to Brunswick (1952) consumers derive meanings from a combination of the product’s physical properties (colors, materials, forms). Meanings that are mentioned in the literature are, for example, modern, masculine, mature (Hsu, Chuang, & Chang, 2000), formal, innovative, calm (Henderson, Giese, & Cote, 2004) or daring, intelligent and charming (Orth & Malkewitz, 2008).

To be able incorporate a pre-defined product meaning in a design knowledge is needed about the relationships that consumers identify between product properties and a product meaning. Past research has proposed different relationships between physical properties and product meanings (Hsiao and Wang, 1998; Orth & Malkewitz, 2008). It is often implied that these relationships are quite robust. For example, Hsiao and Wang (1998) found that heightening the body of a car will always result in the car looking more well-bred. Moreover, it is assumed that the same relationships between physical properties and product meanings exist for different product categories, thereby assuming generalizability of the relationship to other product categories. This assumption means in practice that relationships between physical properties and product meanings, like the one that is found for wine bottles, will also apply to bottles of perfume and beer (Orth & Malkewitz).

However, both from a practical and a theoretical point of view this assumption seems questionable. In this study, we aim to show that the relationship between physical properties and appearance attributes are product category dependent and as such are not as generalizable as stated in literature. We believe the relationship between physical properties and appearance attributes depends on the physical properties of the prototype of a specific product category. Specifically, we will investigate the effect of product properties that define the prototypical product in a product category for the product meaning ‘modernity’. We use the meaning modernity because it is an important product meaning to consumers (Hsu, Chuang & Chang, 2000; Creusen & Schoormans, 2005; Carbon & Leder, 2005). A physical property that may affect the modernity of a product is ‘curvature’. Curvature is an important property mentioned in the design literature and is often used in design to differentiate from other products on the market (Fontana, Giannini & Meirana, 1990; Chuang & Ma, 2001). Therefore we choose curvature as the physical property to be investigated in this study.

Perception of the level of modernity of a product seems to be dependent on how prototypical a product seems for the contemporary trend of that product (Creusen & Schoormans, 2005). Prototypicality is a measure of the goodness-of-example of a product category and is one of the design principles that help to “organize perception and govern responses to what is perceived” (Veryzer, 1999). Prototypicality is thus taken as a frame of reference by consumers when deriving meaning from a product. In this light, we argue that the level of curvature of the prototype influences the level of the perceived meaning modernity. In this study, we assume that the relationship of the product property curvature...
with the product meaning modernity depends on what product properties are ‘currently’ seen as prototypical. Specifically, as the prototype may differ between product categories, we propose that this relationship is product category dependent. So, we expect that when the prototype shape of a product category is curved, curvature is seen as modern. When the prototype shape is angular, curvature will not be seen as modern.

2. Method

2.1. Respondents
Respondents (N = 180) from a University consumer household panel in a small European city were included (mean age = 46, SD = 14, 122 men). Each respondent rated one product category resulting in groups of 41 to 50 respondents for each product category.

2.2. Pre-test
In this study we need stimuli that represent products that belong to product categories that differ in prototype shape from curved to angular.
In a pre-test (N = 27, mean age = 25, SD = 9, 16 men), consumers made sketches of, what they felt were, prototypical dinner chairs, wall clocks, coffee-makers and mp3-players. Next, three design experts rated these sketches on the physical properties round and rectangular on 5-point Likert scales (1 = not at all descriptive of the appearance and 5 = very descriptive of the appearance). For the analysis of the pre-test round and rectangular (reversed) were taken together as the property curvature (r = -0.671). Dinner chairs were rated lower on overall curvature from all other three product categories (mean = 1.80, all p’s<0.001), while wall clocks were significantly higher on curvature than the other product categories (mean = 4.30, all p’s<0.001). The mp3-players and coffee-makers were rated around the median of curvature (mean = 2.67 and mean = 2.87, respectively) and did not significantly differ from each other. This means that the prototype shape for dinner chairs is rectangular, for wall clocks the prototype shape is curved, and for the coffee-makers and mp3-players there is no clear prototypical shape with respect to curvature.

2.3. Stimuli
Stimuli consisted of equal-sized pictures of 20 durable products with five products from four product categories (wall clocks, dinner chairs, coffee-makers and mp3-players). Within the categories a range of products were selected to guarantee a representation of the appearances found in the market.
For products for which the brand name was visible, the brand name was removed or made unrecognizable in order to prevent an influence of brand name on assessed appearances.

2.4. Procedure
Respondents received an internet questionnaire that took approximately fifteen minutes to complete. Each respondent judged only one product category. All respondents received an instruction informing them of the task. Subsequently, they were presented all five products of one product category at the same time and were given time to look at the appearances of the products. After that, respondents were asked to rate to which degree they found ‘traditional’, ‘modern’, ‘round’ and ‘rectangular’ descriptive of the appearance of products on a 5-point Likert scale (1=not at all descriptive of the appearance and 5=very descriptive of the appearance). In the analysis round and rectangular (reversed) were taken together as the property curvature (r=-0.54) and modern and traditional (reversed) were taken together to form the attribute modernity (r=-0.42).
Finally, after concluding the experiment the respondents were acquainted with the purpose of the experiment and thanked for their participation. Respondents were given the option to receive a small reward for participation or donate that reward to charity.

3. Results

For each product category separately, a regression analysis was performed with the independent variable curvature on the dependent variable modernity. For the product category with the curved prototype shape (wall clocks) a significant effect of curvature on modernity was found \((F = 31.74, R^2 = 0.124)\) as well as for the product category with the angular prototype shape (dinner chairs – \(F = 5.98, R^2 = 0.029\)). For the product categories without a clear prototype with respect to curvature (coffee-makers and mp3-players) no significant regressions were found \((F = 0.70 \text{ and } F = 0.21, \text{ respectively})\). For the curved prototype shape category the effect of curvature was positive \((B = 0.327, p<0.001)\) and thus curved was perceived as modern. However for angular prototype shape category this effect was negative \((B = -0.171, p<0.05)\) and thus angular was perceived as modern. Additionally, we tested whether the B-values of the different regressions significantly differ to assure that indeed differences in appearance perception can be found between product categories. B-values did significantly differ between the curved and angular product category, between the curved and both unclear prototype shapes and the angular and both unclear prototype shapes, but not between the two product categories without a clear prototype \((t = 5.48, t = 3.24, t = 4.0, t = 2.38, t = 2.27, \text{ respectively, with all } p’s<0.05 \text{ and } t = 0.04)\). These results confirm our expectations.

4. Discussion and Conclusion

Companies can gain a competitive advantage in the market when certain intended product meanings can be translated in a product design (Lewalski, 1988; Bloch, 1995; Hertenstein, Platt & Veryzer, 2005; Yamamoto & Lambert, 1994). For that reason, managers need to understand the relationships between the physical properties and product meanings. Past research suggested that these relationships are robust. However, this study has shown that the relationship between the physical property curvature and the product meaning modernity depends on the shape of the prototype of the product category. Consequently, specific physical properties may be perceived differently between product categories. As expected, for the product category with the curved prototype, curvature had a positive effect on perceived modernity. For the product category with the angular prototype this relationship was negative. No linear relationship existed between curvature and modernity for mp3-players and coffee-makers for which no clear prototype was found with respect to curvature. These findings actually support our theory. For product categories where curvature is not related to prototypicality, curvature does not affect the perception of modernity. The results of this study suggest that the relationships between the physical properties of a product and the product meanings that are perceived by consumers are not robust. Product appearance perception can thus not necessarily be generalized over different products. Therefore, providing managers with guidelines on how to physically incorporate certain product meanings in product design (e.g. Hsiao & Wang, 1998 or Orth and Malkewitz, 2008) is only useful if these guidelines are focused on and used for only one product category. However, a general guideline to managers can be drawn from the results of this study. To create a modern or traditional look, managers need to assess what the prototype is for a certain product.
category. Next, the company should design a product appearance that resembles the prototype or deviates from it depending on the meaning that is pursued.

In this study, only five stimuli per product category were used. This may limit the generalizability of our findings within a product category. However, the stimuli were selected to represent a broad range of products on the market, and therefore, we believe that including more stimuli would have a limited influence on our results.

It should be noted that it is possible that for some product meanings the relationship is less dependent on the product category. For example, a product meaning such as playful, will most likely have some curvature whatever the product category is. More research in the relationships between physical properties and different product meanings would be valuable. Additionally, in this study only the physical property of curvature was researched while, of course, other physical properties such as color and size may also influence perceived product meanings. It is likely that the effects of these physical properties may differ for different product categories as well, dependent on the prototypes for the categories. For example, in the 1980’s music appliances that were black were seen as modern, while now this would be seen as old-fashioned or traditional and now metallic is more modern, whereas for guitar amplifiers the prototype has not changed that much and black is still the color that is the most common and perceived as modern. In future research, the effects of different kinds of physical properties on appearance perception should be attended.

References


