
The significance of form elements: A study of representational content of design sketches

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ABSTRACT. *The purpose of this paper is to understand the significance of form elements through the interpretations of design sketches. These interpretations are provided by designers themselves interpreting expressive characteristics of car images, and by students interpreting the sketches of designers' morphing sequences. In the experimental investigation of the sketching process through morphing sequence exercises, designers used individually driven styles and approaches when creating product form. These approaches produce characteristically different form ideas, which differ (but also show consistency) with respect to type of car category, expression, identity, recognition, format, composition, complexity, etc. Typically, assessment of generated sketch work and ideas is done using relative heuristic evaluation in a comparative design review. Given a large set of automotive sketches, general patterns of styling emphasis can be identified. The paper concludes that perceptions of designers are varied due to the representation format of the ideas as visual hand sketches. The visual hand sketches point out certain meaning and can be categorized with respect to perceptual characteristics according to the Product Perception Framework (PPE framework) and suggest that a tool to support evaluation and generation of early design concepts can be developed, and to support the generation of form ideas with desired characteristics for a brand, product category and market.*

KEYWORDS: *Aesthetics, Categorization, Form, Perception, Visual*

1. Introduction

In mature markets, where the functionality and performance of products are often taken for granted, attention is increasingly focused on the visual characteristics of products (Crilly, Moultrie, & Clarkson, 2004). Hereby, design offers a potent way to position and differentiate products as competition intensifies, product complexity increases, and technological

differentiation becomes more difficult (Cova & Svanfeldt, 1993). Significant efforts in recent literature have focussed on investigating specific approaches to innovation and design. The most known approaches are User-centred Design Innovation (Chayutsahakij & Poggenpohl, 2002; Vredenburg, Isensee, & Righi, 2002; Veryzer & Borja de Mozota, 2005), Context-based Design Innovation (Hekkert & Van Dijk, 2003) and Design-driven Innovation. Design-driven Innovation, which plays such a crucial role in the innovation strategy of design intensive firms, has still remained largely unexplored (Verganti, 2008). One explanation for why Design-driven Innovation has largely remained unexplored is that its processes are hard to detect when one applies the typical methods of scientific investigation in product development, such as analyses of phases, organizational structures, or problem-solving tools (Brown & Eisenhardt, 1995; Shane & Ulrich, 2004).

Unlike user-centred processes, Design-driven Innovation is hardly based on formal roles and methods such as ethnographic research. It may be considered as a manifestation of a *reconstructionist* (Kim & Mauborgne, 2005) or *social-constructionist* (Prahalad & Ramaswamy, 2000) view of the market, where the market is not “given” a priori, but is the result of an interaction between consumers and firms. Hereby, users need to understand the radically new languages and messages, to find new connections to their socio-cultural context, and to explore new symbolic values and patterns of interaction with the product.

When targeting competitive advantage using design, Cagan and Vogel (2002) concluded that one of the key attributes that distinguishes breakthrough products from their closest followers is the significant value they provide for users. Several categorisations of value have been suggested. Boztepe (2007) has categorised user value according to utility, social significance, emotional and spiritual value. Utility value refers to the utilitarian consequences of a product. Social significance value refers to the socially oriented benefits attained through ownership of and experience with a product. Emotional value refers to the affective benefits of a product for people who interact with it. Similarly, Sanders and Simons (2009) identified three types of values related to co-creation, which are inextricably linked. These values are monetary, use/experience, and societal.

In most cases, Design-driven Innovation influences value creation of products and services from a cultural and emotional perspective. Explicitly, the social significance value is then being embodied by semantic, syntactic and pragmatic characteristics, which are inherently related to its respective product or service. Re-addressing “Monetary Value”, price positively influences the perception of quality, and willingness to buy. Hereby, the interaction of brand name and price caused subjects to perceive the semantic, syntactic and pragmatic characteristics to be higher in quality and value, and to be more willing to purchase the product than when brand name is absent (Dodds & Monroe, 1985). Within this context of “Value Creation” and “Design-driven Innovation”, it is therefore necessary to introduce a framework of product experience (Crilly, Moultrie, & Clarkson, 2004), in order to better understand the significance of form elements and how these form elements can enhance the development of brand attributes.

2. Representational issues with respect to car design

A car’s design character is typically obtained by sequentially modifying a neutral car according to the designer’s tastes and objectives. Considering the car as a 3D volume and the size of the wheels as a unit for measuring of volumes, the designer normally focuses on some typical entities and moves them away from the average. In the designing process, wheels are the first entities designers focus upon, before drawing the whole car around them (Tovey, Porter, & Newman, 2003). This structured approach in the overall development of a car is common practice, because the product is constrained to strict

engineering/technological requirements. From a design practice perspective, all curves successively created in the two-dimensional (2D) sketch are then aimed at defining a specific volume that is rendered a second time, adding lights and shades, enforcing the curvature effects, and so on to express the stylist's intent and character of the car. For instance, designing and sketching practice in collaboration with Pininfarina Ricerca e Sviluppo team (see Catalano, 2004) showed that there are three aspects in the automotive field, which play a decisive role in product synthesizing and judgment. They are:

- Graphics, i.e., some details of the car or the color;
- Treatment, i.e., the character of surfaces and leading lines;
- Volume, i.e., proportions and the mass distribution (Cheudet et al., 2005).

The following design examples below illustrate what is meant by "Treatment" and "Volume" in the profile view.

Curves encompass the roof line, the waist (or belt) line, and the front and rear panel overhangs. By definition, the waist line is the curve dividing the side windows and the body side, while the overhang is the distance between the front or rear end of the car and the centre of the front or rear wheel, respectively. In practice, it is the curve (accent line), rather than the waist line, that is considered for character evaluation. Actually, the accent line may be a light line; a curve only perceived when light is reflected.

However, initiatives to consciously introduce representational issues in the design and brand development have been limited. Although some line work and surface generation in certain car designs has proven to be effective and meaningful in the development of brand identity and explanation of semantic (meaning carrying) and syntactic (structure establishing) qualities (see Figure 1) (Karjalainen, 2007; Warell, 2001), the need for connecting car features to representations to gain greater awareness in car designing and branding has not yet been thoroughly established.

The aim of this study is to develop consciousness among designers when they generate car designs in terms of recognition, comprehension and association.

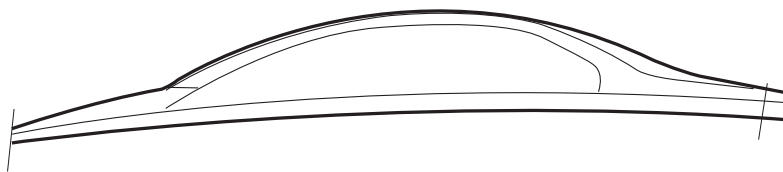


Figure 1. The side-shoulder, also known as the 'catwalk,' carries semantic and syntactic functionality of the Volvo form language (see Warell, 2001).

3. Perceptual experience

The human experience of visual space includes knowledge relating to the size, shape, location, and distribution of entities in stable three-dimensional (3D) environment. In the 3D environment, it seems the perceptual system and processes facilitate the sense-perceptory and brain mechanisms that process perceptual information, giving rise to spatial experience. According to Evans and Chilton (2009), perception consists of three stages: i) *sensation*, ii) *perceptual organization*, and iii) *identification and recognition*. Sensation concerns the way in which external energy, such as light, heat, or (sound) vibrations are converted into the *neural codes* which the brain recognizes. Perceptual organization concerns the way in which this sensory information is organized and formed into a perceptual object, a percept. Identification and recognition relates to the stage in the process whereby past experiences and conceptual

knowledge are brought to bear in order to interpret the percept. For example, a spherical object might be identified and recognized as a football or a coin, or a wheel, or some other 'circular' object.

According to Dewey, experience is not something that is totally internal to the individual. Rather, *"an experience is always what it is because of a transaction taking place between an individual and what, at the time, constitutes his environment"* (p.43) (see Cooper, 2001). Experiences are context- and situation-specific; which means they change from one set of immediate circumstances, time, and location to another. In a similar way, value changes as cultural values and norms, and external contextual factors, change (Boztepe, 2007). Focussing on the product, Hekkert (2006), claims that its function can very well be experiential; for instance to enjoy, enrich, inspire, and strengthen one's identity, and many believe such experiences are nowadays more decisive in people's buying behavior than the product's primary or utilitarian function. Therefore, making all the sensory messages congruent with the intended, overall experience is an important task for designers. In line with Crilly (2005), it is assumed that communication through product design occurs through the embodiment of designer intent in the form of products, and through the subsequent interpretation of meaning by the public.

Product experience is subjective and specific to each perceiver, and depends on personal factors (experiences, background, cultural values and motives), product related factors (type of product, properties and characteristics, brand), and external factors (environmental, social and economic context). A variety of aspects of product experience, as well as frameworks, have been proposed by a range of authors (Crilly, Moultrie, & Clarkson, 2004; Lewalski, 1988; Jordan, 2000; Heufner, 2004; Norman, 2004; Desmet & Hekkert, 2007).

In this work, we have adopted the framework of Perceptual Product Experience, the PPE framework (for more detail, see Warell, 2008), as a model for analysis. This framework considers modes of product experience, and dimensions for representing the product. Perceptual product experience is described as being composed of three core modes; the sensorial, the cognitive, and the affective modes of experience, and two dimensions; the dimension of presentation and representation (see Figure 2). In the following sections, the modes and dimensions of the PPE framework are briefly described.

The three core modes recognize all possible types of perceptual experience; including initial impression and recognition of product existence and specific perceptual characteristics (the sensorial mode); making sense of the product, its manifestation, structure, use, origin and purpose (the cognitive mode); and the affective response, attribution of value to, and judgment of the product (the affective mode).

The dimension of presentation is concerned with the direct, sensual stimuli related side of the experience. This may be seen as the 'pleasurable' side of the experience, related to the direct, non-interpretative experience, and includes the impression, appreciation and emotion submodes.

In this paper, we are interested in the significance of form elements as interpreted by designers, which relates to the dimension of representation. In this dimension, the product experience is regarded as a meaning-making phenomenon that can be described by the three submodes of 'recognition', 'comprehension', and 'association'. The process of meaning making is socio-culturally contextualised and can be seen from the perspective of the producer (e.g., the designer or company) and the perceiver (e.g., the customer or user). The representation submodes can be explained through Piercean sign theory (Pierce, 1931-1966) and are described in the following:

The first mode, recognition, is based on familiarity, resemblance or similarity, and requires previous precedents to compare with (i.e., iconic sign references). Thus it is dependent on the existence of pre-established references stored in long term memory (Simon, 1992; Solso,

1999). Recognition of product type and brand requires resemblance to other products through similar sensorial elements. In the visual domain, such elements are known as ‘signifiers’ or ‘design cues’. For example, the characteristic ‘kidney’ front grille of a BMW is an example of design element which identifies the BMW brand through iconic recognition.

Comprehension, the second mode, is about making ‘sense of things’, such that products are “understandable to their users” (Krippendorff & Butter, 1984). Through comprehension, we understand characteristics such as level of quality and nature of the product; the product describes its operation, expresses its properties, and exhorts certain types of action or even non-action; it informs and advises about itself. In comprehension, perceivable references in the product point towards the product itself, providing meaning related to the nature, behaviour, properties and essential physical characteristics of the product. Semiotically, indexical and symbolical signs create references for comprehension of the product. For example, a typical door handle is an example of an indexical sign, describing operation and function. The hard and shiny quality of a stainless steel surface or the sturdiness expressed by a Jeep, are examples of symbolic references, referring to the nature of the product.

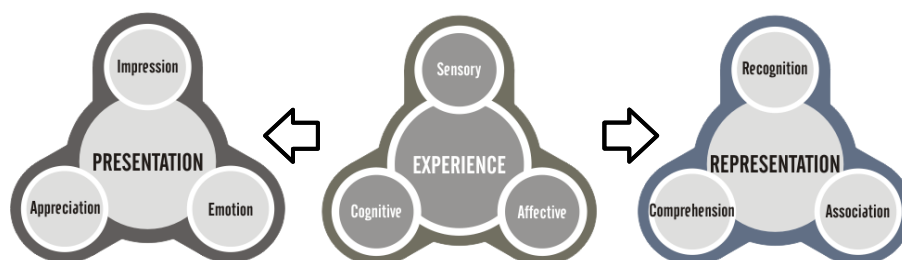


Figure 2. Framework of perceptual product experience (PPE framework), with core modes (centre) and the two dimensions of presentation (left) and representation (right) with submodes (Warell, 2008).

Finally, the third mode, association, is about communication of, e.g., values, origin and heritage. Association is dependent on subjective and socio-culturally conditioned processes of coding, which determine how we create references with meaning through symbolic signs within groups with similar values and aspirations and interpretative communities (Chandler, 1994). In association, meaning is created (encoded) and interpreted (decoded) from two perspectives; from the point of view of the manufacturer, who uses the product to convey strategic brand messages and build brand values (Karjalainen, 2004); and from the point of view of the customer or user, who communicates personal values and preferences through ownership or use of the product. The classical, aristocratic values and the racing heritage imbued by a Jaguar are examples of symbolic association.

The representation dimension of the PPE framework is intimately related to product identity (Warell, 2006a; Warell, Fjellner, & Stridsman-Dahlström, 2006b) according to the following, with respect to identity references for each sub mode:

- Recognition (of Type): “What the product is” (function, use, purpose, maker)
- Comprehension (of Characteristics): “How the product is” (properties, performance, behaviour, mode-of-use)
- Association (to Values): “What the product stands for” (origin, brand, heritage, user)

Consequently, a product with strong representational qualities in all three sub modes will most likely be perceived as having a strong and clear identity.

4. Objective and method

The objective of this research is to investigate how respondents interpret sketches made by designers with respect to representational characteristics. Research questions explored in the study are:

RQ1: What associations are evoked by photographic representations? How do the associations differ between designers and respondents? (In relation to the PPE framework, this question addresses the comprehension and association modes)

RQ2. What expressions are conveyed by sketch representations? What elements carry these expressions? (In relation to the PPE framework, this question addresses the comprehension mode)

RQ3. What visual brand references are carried by the sketches? (In relation to the PPE framework, this question addresses the recognition and association modes)

Two complimentary studies were performed in order to answer these research questions. The first study involved a sketching assignment for practising industrial designers in the automotive industry. The second study involved an elicitation assignment for product design students, based on the sketches produced in the first study.

4.1. Study 1

In Study 1, a total of 43 selected automotive designers in the United Kingdom, Norway, Sweden, and Malaysia were first asked to assign a keyword for a set of front view and three-quarter front view images of selected automotive designs. Each polar image consisted of a grayscale photograph of a production car currently available on the world market (Figure 4).

Secondly, they were given the task of performing morphing sequences for the two views, using manual freehand sketching. Morphing in this paper refers to the shape interpolation (blend shapes, morph targets, and shape interpolation), which is the most intuitive and commonly used technique in shape animation practices (see Figure 3). A blend shape model is simply the linear weighted sum of a number of topologically conforming shape primitives (see Chen & Parent, 1989; Abidin, Warell, & Liem, 2011; Deng & Noh, 2008). We assigned designers to produce morphing sequences, each consisting of three sketches, representing the 25%, 50% and 75% transformation stages, respectively, based on two photographic polar image references. In the assignment, designers gradually morphed from the left image to the right polar image in three consecutive steps. Using this technique would allow later analysis to identify the transformation of specific elements in each sketch, carrying representative characteristics according to the PPE framework. Each designer carried out the assignment individually, at their work premises.

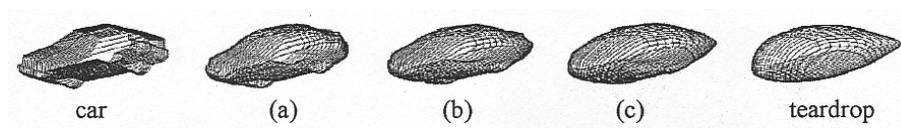


Figure 3. Morphing; weighted average shapes from a car to a teardrop shape for the ratios of (a) 70/30, (b) 50/50, and (c) 30/70 (Chen and Parent, 1989).

4.2. Study 2

In the second study, a total of 10 respondents; all final year, masters level product design students, analysed the morphing sequences produced by the designers in Study 1. Firstly,

the respondents were given the task to identify the car brand and to assign a keyword expressing their spontaneous reaction to each photographic polar base image (Figure 4). They were also asked to list three expressions evoked by the images, and to indicate (using a pencil) three characteristic visual features for each brand.

Secondly, a selection of view sets (front view and three-quarter front view) by five different designers was made by the authors, based on a heuristic quality review. Each view set was represented by five separate morphing sequences of three sketches each. Each respondent participated in two tests. In Test 1 respondents assessed the five sets of front view sketches, while in Test 2, respondents assessed the five sets of three-quarter front view sketches. In total, each respondent assessed 150 sketches. Each student carried out the assignment individually at the university premises.

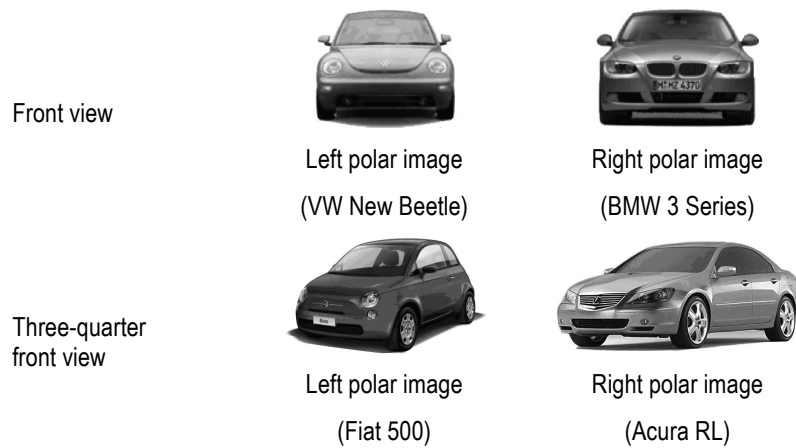


Figure 4. Polar base images used in the study (brand and model identifiers were not provided to respondents).

The respondents were given the five sets of morphing sequences for each view. The morphing sequences of three sketches each were presented one at a time. Thus, in total, ten morphing sequences were presented to each respondent. For each sequence of morphing sketches, the respondents were asked to indicate features carrying the same expressions, as well as features evoking the same associations, as stated previously. Respondents indicated features using colored pencils on grayscale A3 paper printouts of each morphing sequence.

In addition to the annotated sketch material provided by the respondents, the study was recorded using digital audio and video equipment for reference during subsequent analysis.

5. Results and discussion

In this section, the findings of the analysis of Study 1 and Study 2 are presented. The analysis aimed to ascertain what types of elements are perceived to have representational meaning with respect to recognition (iconic references), comprehension (indexical and symbolic references), and associations (symbolic references), according to the categorizations of the PPE framework. During the analysis, responses from respondents were categorized according to the types of representation of the PPE framework and mapped to each representational sub mode (recognition, comprehension, and association, respectively).

The results are summarized and discussed in the following. The presentation is divided into interpretations of photographic base images and of sketch morphing sequences, respectively.

5.1. Interpretations of photographic base images

With respect to the first research question (what associations are evoked by photographic representations, and how do the associations differ between designers and respondents?), a very wide range of interpretations was evoked. Although some responses did match, no clear correlations between designers and respondents could be identified. Since the associative field is of very wide range and dependent on subjective, cultural and contextual variations, this finding is not unexpected. The PPE framework did however assist in revealing these differences, and it is possible that more homogenous groups of subjects would have yielded a more coherent result.

The Volkswagen New Beetle, BMW 3 series and New Fiat 500 were recognised correctly, whereas the recognition of the Acura RL 500 was misinterpreted (not identified correctly with respect to brand).

In terms of comprehension, the New Beetle was perceived as generally pleasant and fun. The BMW 3-series represented masculine traits such as strength, aggression, dominance, etc. The Fiat 500 resembled the New Beetle, but was comprehended as less positive concerning the level of communicated confidence. The Acura RL shared the same traits as the BMW 3 series, but was complemented with some negative perceptions, such as inconsistent, cheap, and dull.

From an association perspective, the New Beetle was perceived to appeal to young singles and families, who are fun-loving, have the interest and economic capacity to spend on safety and quality. They were also perceived to have a sense of nostalgia. The customers of the BMW 3 series were perceived as being male-oriented, profiled as professional individuals valuing superior technological quality. For the Fiat 500, associations seem to be contradicting. On one hand, young, energetic and sporty individuals, who are Mediterranean inspired and are inclined towards an urban lifestyle are seen to have an affinity for the car. On the other hand the car is being associated with low-cost and low quality characteristics. In terms of associative characteristics, the Acura RL resembles that of the BMW 3 series, however, connotations, such as Asian, boring, value for money, and conservative, negatively influence the perception, concerning the dynamic and quality impact of the car.

5.2. Interpretations of sketches

As mentioned earlier, a total of 150 sketches were assessed by respondents. The method of assessment generated qualitative material for analysis, including annotated sketches with pencil markings indicating features carrying representative qualities as interpreted by the respondents, and basic descriptive quantitative material derived from summations of markings in different representational categories (i.e., the three representation modes of the PPE framework). The analysis generated approximately 49 A4 pages of tabulated material, including verbal comments and visual sketch material with annotated features, categorised according to the three representational modes (recognition, comprehension, association). Figures 5 and 6 provide examples of the collated annotated sketch material.

5.2.1. Findings (front view)

Overall, the front view test yielded fewer responses than the three quarter front view test. This may be due to a lower level of sketch complexity, resulting in a smaller number of sketch features.

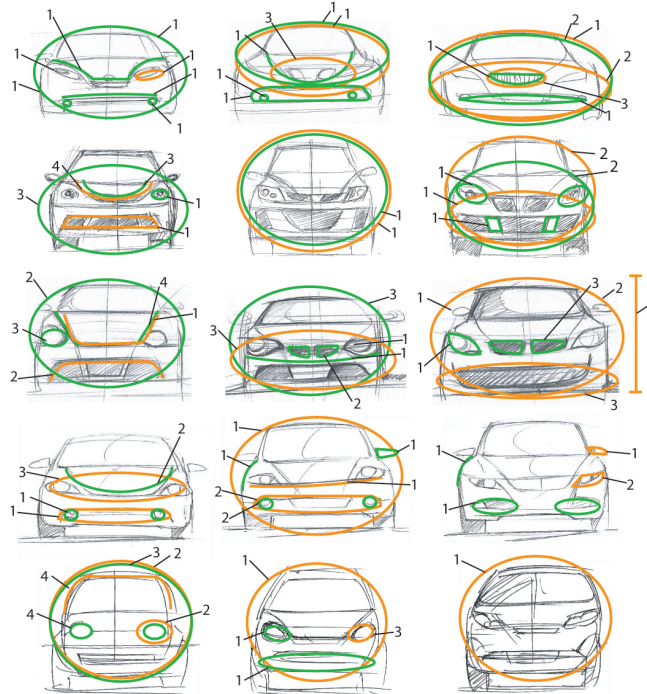


Figure 5. Collated responses to research questions 2 (orange annotations) and 3 (green annotations) based on interpretations from respondents. Each row represents a selection of front view morphing sequences by different designers for left (VW New Beetle) and right (BMW 3-series) polar base images.

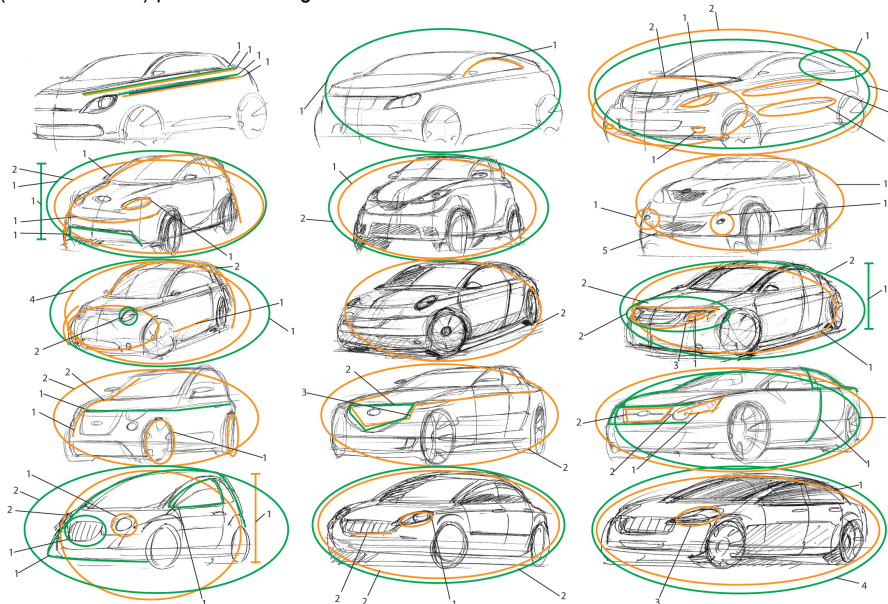


Figure 6. Collated responses to research questions 2 (orange annotations) and 3 (green annotations) based on interpretations from respondents. Each row represents a selection of three-quarter front view morphing sequences by different designers for left (Fiat 500) and right (Acura RL) polar base images.

On an average across all representational modes, respondents indicated between 1,6 and 2,1 features for each sketch image. Indicated features included specific detail form elements as well as overall form on the gestalt level.

Compared to three quarter front view responses, more features in the comprehension mode were indicated for the front view sketch sequences. Possibly, this may be due to respondents being more familiar to interpreting expressive properties in the front view of cars, which is often referred to by automotive designers as the 'face' of the car.

For the research questions, the specific findings were as follows:

RQ2. What expressions are conveyed by sketch representations? What elements carry these expressions?

- In the comprehension mode, the VW New Beetle generated a much stronger response, in terms of the number of interpretations, compared to the BMW 3-series.
- In terms of comprehension, respondents reported a gradual decrease in expressed femininity for morphing sketches towards the right polar base image (the BMW 3-series).
- Expressions for the 25% transformation of each polar image included:
 VW New Beetle: Retro, Confident, Funny, Cute, Happy, Nice, Calm, Fast, Soft
 BMW 3-series: Serious
- Comprehension elements for the 25% transformation of each polar image included:
 VW New Beetle: front lights, bonnet outline, front air intake outline, front fascia, glasshouse silhouette
 BMW 3-series: front fascia, grille outline, frontal silhouette, front light outline, front air intake pillars, height ratio, side rear view mirror

RQ3. What visual brand references are carried by the sketches?

- Recognition of brand is determined by outer shape, bonnet line and headlamps.
- The recognition mode received the strongest response in terms of the number of interpretations. This was true for both polar base images (VW New Beetle and BMW 3-series).
- No general conclusions can be made regarding the association mode, due to the small number and contradictive nature of responses.
- Recognition elements for the 25% transformation of each polar image included:
 VW New Beetle: Headlight outlines, fog lights, bonnet outline, front fascia, front air intake outline, frontal silhouette, glasshouse silhouette
 BMW 3-series: Headlight outlines, front fascia, grille outline, frontal silhouette, front air intake outline, height ratio, side rear view mirror, fender curves
- Associations for the 25% transformation of each polar image included:
 VW New Beetle: Looks like a frog, Unfriendly, Friendly person with soft qualities
 BMW 3-series: Established, Looks big

5.2.2. Findings (three-quarter front view)

Overall, respondents indicated a significantly larger number of responses in the recognition mode, followed by comprehension and association. The reason for this may be methodological, as indicating explicit and characteristic iconic elements (recognition mode) using pencil markings on sketch reference images lends itself more naturally than indicating more implicit and inherent qualities such as expressions (comprehension mode) and values (association mode). This aspect was however considered in the method, as it also allowed respondents to respond qualitatively using free text as a complimentary option. However, it may be more useful for the study of symbolic references to use other methods, such as interviews or visual, associative elicitation methods.

From the 10 respondents, the number of responses on each of the three modes “Recognition”, “Comprehension” and “Association” were less than five for each morphing sequence. On an average across all representational modes, respondents indicated between 1,6 and 2,5 features for each sketch image. Indicated features included specific detail form elements as well as overall form on the gestalt level.

Across all morphing sequences, a considerably stronger response was indicated for the left base image (Fiat 500). More representational qualities were reported for each mode, which was indicated by more features and more symbolic associations compared to the right polar image (Acura RL).

For the research questions, the specific findings were as follows:

RQ2. What expressions are conveyed by sketch representations? What elements carry these expressions?

- The comprehension mode (expressive and descriptive qualities) is considerably stronger for the Fiat 500 than for the Acura RL. Stronger expressions and more references were generated.
- Expressions for the 25% transformation of each polar image included:
 - Fiat 500: Aggressive Confident, Cute, Retro, Stupid, Joy, Humble, Innocent, Feminine, Practical, Simple, Funny
 - Acura RL: Speedy, Macho, Exclusive
- Comprehension elements for the 25% transformation of each polar image included:
 - Fiat 500: Bone line, Belt line, front lights, silhouette, top bumper split line, front façade, wheel outline, height ratio
 - Acura RL: side blisters, front fascia, C pillar, front lights, overall silhouette, grille outline

RQ3. What visual brand references are carried by the sketches?

- Recognition of both cars is determined by the overall outer shape, features and components
- Recognition elements for the 25% transformation of each polar image included:
 - Fiat 500: Waist-line, Bone-line, Belt line, Pillar line, Wheel, Headlamp, Bumper-line, Fender curves, A-pillar shape, Overall Shape, Front fascia, Front overhang
 - Acura RL: C-Pillar, Door-line, Radiator Grill, Bonnet-line, Bumper-line, Overall shape, from Fender curves to A-pillar

- Associations for the 25% transformation of each polar image included:

Fiat 500: Inexpensive, Like a child, Like a mouse, Resembles a toy

Acura RL: Expensive, Shaped, High class person

6. Concluding discussion

The objective of the study was to understand the significance of form elements through the study of representational content of design sketches. The central proposition was made that people interpret sketches with respect to representational qualities through semiotic interpretation. According to the typological categorization of representation of the PPE framework, such qualities include recognition (iconic references), comprehension (indexical and symbolic references), and associations (symbolic references).

Although perceptions of designers and respondents are varied due to the representation format of the ideas as visual hand sketches in the morphing process, the PPE framework is still considered a useful tool for establishing familiarity, understanding quality characteristics and nature of the product and finally determining meanings and assessing values of form elements.

This suggests that within the context of incremental design development (morphing), which is prevalent in the car design industry, a tool to support evaluation and generation of early design concepts may be developed based upon the PPE framework. The tool could be a tool box in a CAD software like “representational softwares” that support qualitative elements through Recognition (of Type), Comprehension (of Characteristics), and Association (of Values) specifically conceived for car design development phases. Furthermore, these findings could open new research paths – e.g., new guidelines to be applied in sketching phases or questionnaires/pictures to be proposed to producers, customers and users.

Once such a tool can be realised within an extended framework of product experience, the business concept of “Value Creation” and “Design-driven Innovation” can then be better understood in relation to the significance of form elements and how these form elements support the communication of brand attributes.

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