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# Aesthetic Design Process: Descriptive Design Research and Ways Forward

Santosh Jagtap and Sachin Jagtap

**Abstract** Consumer response to designed products has a profound effect on how products are interpreted, approached and used. Product design is crucial in determining this consumer response. Research in this field has been centered on studying the relationship between product features and subjective responses of users and consumers to those features. The subject of aesthetic or styling design process has been relatively neglected despite the important role of this process in fulfilling intended consumer response through product design. In this paper, we present a review of descriptive design research on aesthetic design process, and highlight limitations of this research. We also suggest opportunities for further descriptive research on the subject of aesthetic design process.

**Keywords** Product aesthetics • Product design • Descriptive design research • Design process

## 1 Introduction

### 1.1 Consumer Response to Designed Products

Consumer or user response to a designed product can be classified into categories such as ‘aesthetic’, ‘semantic’, ‘symbolic’, etc. [1–3]. Aesthetic response is about the perception of (un)attractiveness in products. Semantic response relates to the interpretation of a product’s function, the mode of using the product, etc. Symbolic response is about the associations between the product-characteristics and owner- or

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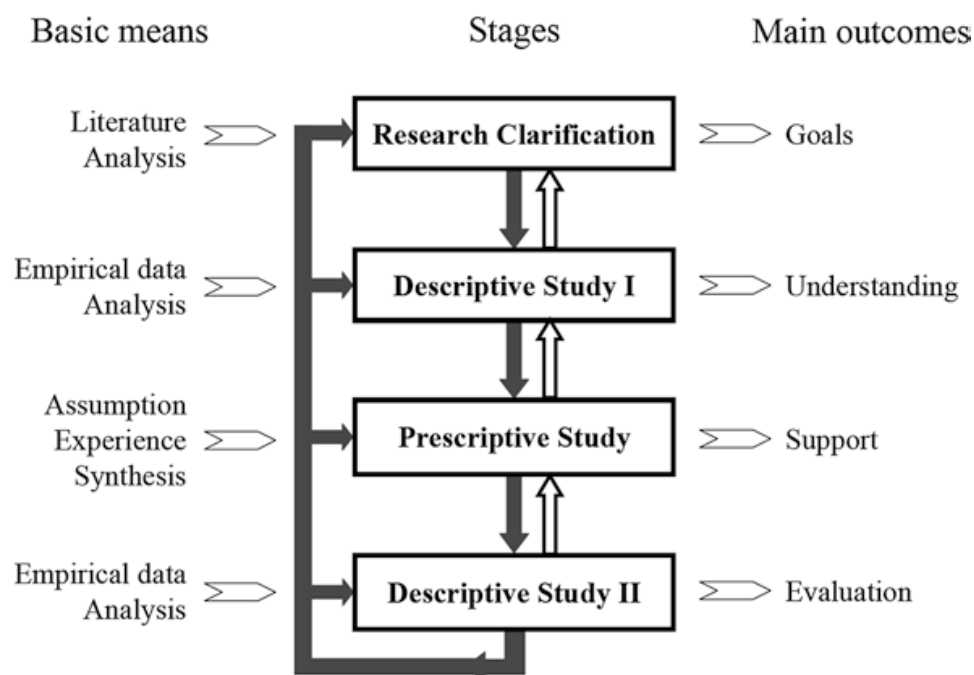
user-identity. Consumer response to a designed product is often stimulated by visual information as the vision system provides data at higher speed and rates as compared to other senses [4]. However, consumer responses can be triggered by other senses, namely, taste, smell, touch, and hearing.

Consumer response to designed products has a profound effect on how products are interpreted, approached and used [5]. Based on such response, evoked by product-characteristics, consumers make judgments on the elegance, functionality and social significance of products [3]. The design of products is crucial in determining consumer response and market success [6]. In a styling or aesthetic design process, designers play an important role in formulating intended consumer response. They generate and evaluate concepts to effectively communicate the intended response. The aesthetic design process has a major influence on the consumer response and product success [5].

## 1.2 Design Research and Aesthetic Design Process

According to Blessing and Chakrabarti [7], the overall aim of design research is to “make design more effective and efficient, in order to enable design practice to develop more successful products”. In order to support a more rigorous approach for undertaking design research, they developed the ‘Design Research Methodology’ (DRM).

As shown in Fig. 1, the DRM consists of the following four stages. (1) *Research clarification*: this stage provides the motivation for undertaking design research.



**Fig. 1** Design research methodology (adopted from Blessing and Chakrabarti [7])

(2) *Descriptive study 1 (DS-I)*: this stage is aimed at understating design in the context of the research motivation. (3) *Prescriptive study*: in this stage, based upon the findings of the DS-I study, and including assumptions and experience, a design method is developed. (4) *Descriptive study 2 (DS-II)*: this stage evaluates the proposed method. While the DS-I aims to understand the design ‘as-is’, the DS-II aims to understand the impact of a support.

Several research studies, from fields such as aesthetics, product design, psychology, and marketing, have been devoted to studying how consumers respond to products. However, the subject of aesthetic design process has been relatively neglected [5]. In order to improve the aesthetic design process, it is important to understand this process (i.e. DS-I study). This research presents a brief review of DS-I studies (henceforth called descriptive studies) in the area of aesthetic design process. We highlight limitations of these studies, and suggest opportunities for further research in this area.

## 2 Aesthetic Design Process: Descriptive Design Research

### 2.1 Aesthetic Design Process: A Broad View

A few studies have explored the general characteristics of a styling design process. Tovey [8] has described the styling design process in the car industry. In the car industry, products generally evolve since there are no radical changes in the design of cars. In this industry, industrial designers, often referred to as stylists, are clearly differentiated from engineers in terms of their role in embodying intended consumer response in the design of cars. The styling process is intuitive and holistic in nature. This intuitive nature of the styling design process has also been reported by Birtley [9]. He also found that stylists use a rich vocabulary of terms for automotive forms. For example, to describe car-forms or connote a feeling, they use words such as ‘warp parabolas’, ‘ellipsoids’, ‘slippery’, ‘fluid’, ‘sheer’, ‘bath tub’, etc.

Several factors influence the aesthetic design process, and thereby the final form of a product. Crilly et al. [5], based on interviews with industrial designers, examined such influencing factors. They developed a framework to represent: the intended consumer response that designers attempt to embody in the design of products; visual sources (e.g. existing products) used by the designers; their activities (e.g. sketching) to represent the product form; and different factors (e.g. manufacturing issues, team characteristics, etc.) influencing the form design. The developed framework is simple in terms of its ability to represent different factors influencing the design of product-forms. Babapour et al. [10] also attempted to investigate designers’ activities in the aesthetic design process. They carried out a diary study with Masters students in order to understand how designers generate forms in styling design. However, their study mainly focused on the research method of diary study, rather than investigating designers’ activities in the form generation process.

While designers and engineers play a synergistic role in designing a product, differences between their ‘general personalities’ and roles may pose challenges in the styling design process. Bangle [11], from his experience of heading a design team at the car company BMW, observed several characteristics of the styling process including the communication problems between designers and engineers. He states, “The designers saw perfection as an ephemeral, almost spiritual, quest—a goal to be achieved in stages; for the engineers, perfection was physical and measurable—something to be done right the first time”. The designers are emotionally sensitive, and may not respond to “cold, rational arguments”. He has also highlighted the importance of using appropriate language (e.g. terms, words) when communicating a concept to different stakeholders so that they can understand the concept easily.

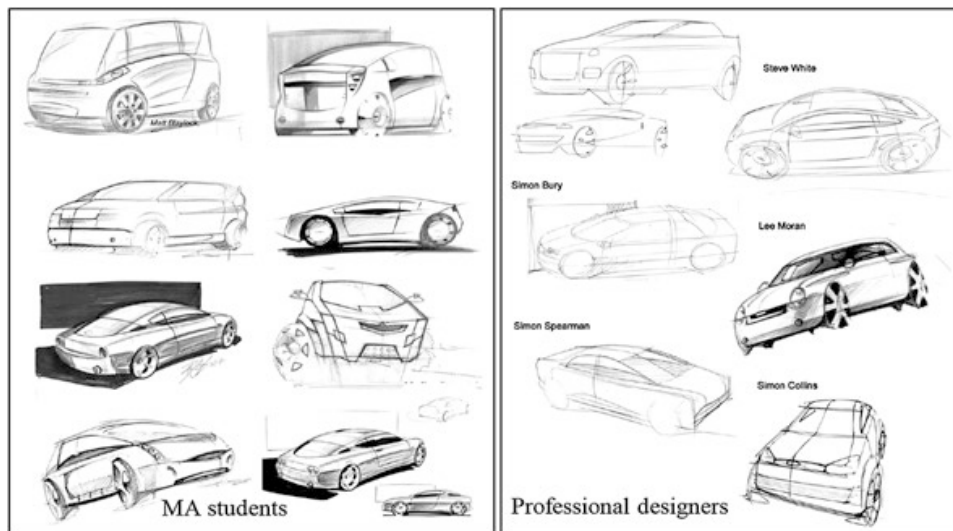
While the above studies have limited scope in providing an in-depth understanding of some specific areas of a styling design process, they do present information on the general nature of the process. For example, these studies point out that a styling design process is intuitive in nature, and that several factors (e.g. manufacturing issues, communication between designers and engineers, etc.) can influence the process. These studies also highlight the artistic and emotional side of designers involved in the process.

## 2.2 *Sketching*

Much of the research work on sketching in design has been carried out in the areas of architectural design and engineering design. Research in these areas found that making and perceiving sketches plays an important role in idea generation [12]. There is an interactive dialog between mind and sketch. Ambiguity in sketches facilitates reinterpretation, and can trigger new ideas. Similar findings were observed by Tovey et al. [13], in his study of sketching activity in car styling. The participants in the study were MA Automotive Design students and professional designers from the Ford design studio in Dunton (UK). They found that designers sketch to generate forms, rather than externalising the pre-conceived forms in their heads.

Tovey et al. also found that the professional designers were more fluent in sketching. The professional designers could convey their form ideas mainly by using form lines without using shading. The design students and professional designers mentioned that the form ideas emerged on the paper while sketching. They also found some obvious differences between the students and the professional designers. As compared to the students, the professional designers produced many sketches in several views (see Fig. 2). This can be attributed to their skills developed over time, with practice.

Another study of sketching in the aesthetic design process is by Warell [14]. Based on the examination of sketches from styling design projects and interviews with experienced industrial designers, they investigated the process of form



**Fig. 2** Sketches produced by MA students and professional designers—adopted from Tovey et al. [13]

development and the function of sketching activity in the process. While their study examined the form development process and sketching activity, the main goal of the study was to verify the ability of their theoretical framework ‘design syntactics’ to describe and explain the nature of aesthetic form development. The framework ‘design syntactics’ includes three concepts—form syntactics, form functionality and design format. The concept ‘form syntactics’ explains the visual structure and content of the form composition, the concept ‘form functionality’ represents the purpose and function of form aesthetics, and the concept ‘design format’ takes into account the philosophy and use of form ingredients of product design. Warell found that designers consciously or unconsciously take into account the concepts of the ‘design syntactics’ framework. Their study mainly focused on styling design projects undertaken by in-house industrial designers (e.g. designers from car industry and large consumer appliances companies).

While there are many studies of sketching in engineering design and architectural design, sketching has been scarcely researched in styling design despite its importance in aesthetic design process.

### **2.3 Role of Information**

In the field of engineering design research, several authors note the significance of the role of information in design activities [15]. The findings of the empirical research conducted by Marsh [16] in an aerospace industry suggest that, on average, 24 % of designers’ time is spent in acquiring and providing information. Furthermore, several studies, carried out in laboratory settings with experienced engineering designers or students, note the importance of information in the



design process [17, 18]. As compared to these studies, the information behaviour of designers in styling design has been under-researched.

We found one study, which assessed the influence of information gained from consumer research on product aesthetics. Crilly and Clarkson [19], from their interviews with industrial design consultants and consumer researchers, found that information about consumers helps designers: (1) to understand how products are perceived, (2) to establish the direction of future projects, and (3) to gain feedback on completed ones. This information also helps them to demonstrate their clients that their designs satisfy consumer needs, and to increase the clients' confidence in the project. While there are benefits of using information from consumer research, the difficulties in collecting and interpreting this information can reduce its impact on product aesthetics.

## ***2.4 Designers' Perceptions of Product Forms***

A few studies have explored how designers perceive product forms. Based on a questionnaire study with practicing car designers and design students, Liem et al. [20] explored designers' perceptions of form characteristics in car styling. The results indicate that designers perceive front emblem, head lamp, radiator grill, tail lamp, and rear bumper as significant components determining the recognition of a car. In their view, the three-quarter front view of a car is important in car-recognition. Balance, scale, and proportion are perceived as the most important principles in car styling. Abidin et al. [21], through a study with professional designer and design students, explored what keywords they assign in expressing their spontaneous reactions to images of cars. While some keywords matched between them, Abidin et al. did not find clear correlations between professional designers and design students. There is large number of studies examining the perception of products by consumers or users. However, the research on the perception of product-forms by designers is sparse.

## ***2.5 Sources of Inspiration***

In the aesthetic design process, designers use different sources of inspiration to formulate intentions, and also to generate concepts that will satisfy those intentions. Crilly et al. [5], from their interviews with industrial designers, found that sources of inspiration "may be drawn from almost any sphere", but generally include similar or dissimilar products, historic products and natural objects. The features from these sources can be embodied in the design, and thus the product form is influenced by these sources. Similar observations were made by Eckert and Stacey [22], from their empirical research in the knitwear industry. They found that sources of inspiration help in defining the context for new designs, in the creation of designs, and in communicating designs by reference to those sources.



## ***2.6 Strategic Styling Decisions***

In product design, companies make strategic decisions to foster a strong visual identity for their brand since brand recognition is important in competitive market. Decisions to create brand recognition through product design are influenced by a number of factors. Karjalainen and Snelders [23] examined how Nokia (mobile phones) and Volvo (passenger cars) created visual recognition of their brands through product design. By analysing information collected through press releases, annual reports, Internet pages, and a number of in-depth interviews, they found that the design philosophy of creating visual recognition of brands was different in Nokia and Volvo. As compared to Volvo, the application of design features over the product portfolio was flexible in Nokia. In addition, the relation between design features and brand values was more implicit in Nokia. They also observed that factors such as life-cycle stage, brand position, portfolio width, brand heritage, and product history influence the strategy of creating visual recognition of brands through product design. While the above study of Karjalainen and Snelders used data from the ‘real life’ design projects, Person et al.’s study [24] collected data through controlled experiments to understand how styling decisions are made. By presenting a number of market situations to design professionals, Person et al. examined how styling decisions are made. The results suggest that a number of internal (e.g. company age, company location, company size, etc.) and external factors (e.g. degree of competition, market size, price sensitivity among consumers, etc.) influence styling decisions. In addition, work experience and formal education of designers influence styling decisions.

## ***2.7 Strategies to Elicit Specific Intentions***

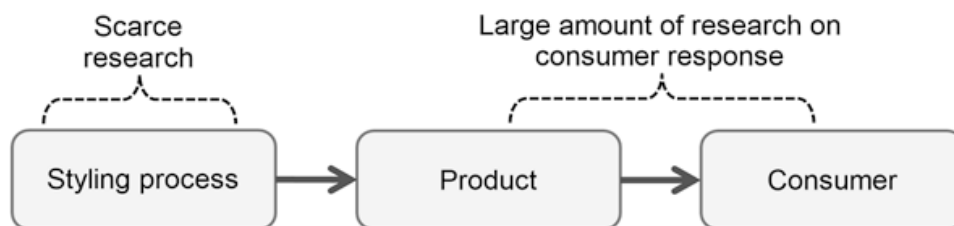
There are studies that have explored strategies used by designers to elicit specific intentions; in particular to elicit ‘surprise’ through product design. Based on interviews with designers and analysis of photographs in magazines and websites, Ludden et al. [25] reported the strategies used by industrial designers in eliciting surprise specifically through visual-tactile incongruity. The strategies include using a new material that appears like a familiar material, a new appearance for a familiar product, transparent material, visual illusion, etc. While Ludden et al.’s study focused on strategies to elicit surprise through visual-tactile incongruity, Ramírez’s [26] study examined strategies that can be applied beyond visual-tactile incongruity. He interviewed senior designers, design managers or CEOs from influential design organisations. Some of the strategies to elicit surprise through product design are: using archetypes in unexpected contexts, challenging assumptions of appearance, magical interactions, etc.

### 3 Discussion and Ways Forward

While the number of descriptive studies in the area of aesthetic design process is small, a review of these studies can help to understand the status of descriptive design research in this area, to identify limitations of this research, and to propose further research in this area. In Sect. 2, we presented a brief review of descriptive (DS-I) studies in the area of aesthetic design process. These studies have covered topics such as sketching, role of inspiration, strategic styling decisions, strategies used by designers to elicit a specific intention, etc. In this section, we identify limitations of these studies, and suggest opportunities for further work.

As compared to disciplines such as engineering design, architectural design, systems engineering, and software design, the descriptive design research in the field of styling processes is scarce. The number of topics examined is much smaller in this field. For example, topics such as creativity, novice-expert differences, analogical thinking, design fixation, social processes of design, and studies of design teams have not been explored in the field of styling design processes. Furthermore, the descriptive research in the studied topics (e.g. sketching, role of inspiration, etc.) is highly scarce and fragmented. This can be attributed to the fact that the design research community in the field of product aesthetics has mainly focused on studying the relationship between product features and subjective responses of users and consumers to those features (see Fig. 3). In other words, design research in product aesthetics is centered on answering the question ‘*what is (or is not) an aesthetic product?*’, rather than the question ‘*how is a successful or an unsuccessful product in terms of eliciting intended consumer response created?*’.

Several researchers in the area of product aesthetics believe that the styling process is intuitive and tacit (e.g. [5, 6, 8]). Real time data collection methods such as protocol studies, ethnographic participation, and observations of ongoing projects can offer promising opportunities to explore the tacit and intuitive aspects of a styling process. However, in this field, research methods such as retrospective interviews and examination of sketches from completed design projects are dominating. While there are some advantages of retrospective interviews, they cannot provide details of the styling process because interviewees may not recall nitty-gritty of the process and they can attempt to rationalize the process for explaining it to the researchers. We believe that future research needs to address these issues by using multiple real-time data collection methods. We also believe that the research community investigating styling processes and the neuroscience



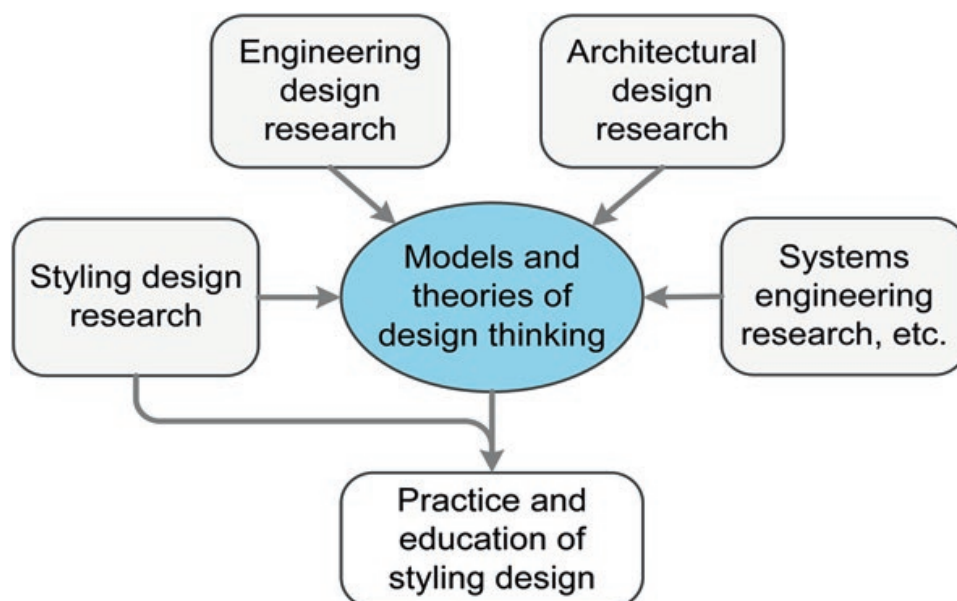
**Fig. 3** Scarce research on styling design process

community have much to learn from each other. Intuitive and tacit aspects of a styling process can be studied by employing research methods from the neuroscience area (e.g. fMRI, eye tracking).

In the field of styling design, designers often mention that form-ideas emerge on the paper while sketching. Sketching plays an important role in styling design. However, in this field, the topic of sketching is relatively neglected by design researchers. There is a need of extensive design research to understand sketching activity in styling design. Furthermore, in styling design, designers can use different media such as clay modelling and CAD. Further research needs to investigate designers' activities in dealing with these media and the influence of these media on the styling design process.

Many descriptive studies of styling processes have been focused on the car industry. There can be differences between the styling processes of products such as electronic gadgets, consumer appliances, furniture, kitchen appliances, and vehicles. These differences can be attributed to the difference between companies designing and manufacturing these products. For example, designers in the car industry are, in general, in-house designers and can be responsible for the design and the final manufactured product. On the contrary, designers of consumer appliances may be from industrial design consultancies, and they may be responsible only for the final design and not for final manufactured product. Furthermore, there can be differences between the styling processes of products using established technology and products using entirely new technology. Future research needs to cover a range of products to increase our understanding of styling processes.

We can note that many descriptive studies of styling design processes are limited in terms of the senses considered. These studies have mainly taken into account visual aspects of product design despite the fact that other senses can be important in the design of products. To address this, further research needs to



**Fig. 4** Descriptive design research in styling design and other disciplines

cover a range of sensory responses (i.e. visual, auditory, tactile, etc.) that designers consider in product design.

Future research investigating styling processes ought to overcome the above limitations. This will help to establish a comprehensive understanding of styling design processes, and will assist in developing tools and methods to improve design practice and education of styling design processes (see Fig. 4). In addition, the understanding of styling design processes will help to develop generic models and theories of design thinking, which in turn can be useful in improving design practice and education of styling processes.

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