A COMPARATIVE ANALYSIS OF DESIGNERS' INTENDED MESSAGES AND USERS' PERCEIVED MESSAGES EMBODIED IN PRODUCT APPEARANCE

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A COMPARATIVE ANALYSIS OF DESIGNERS' INTENDED MESSAGES AND USERS' PERCEIVED MESSAGES EMBODIED IN PRODUCT APPEARANCE

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ABSTRACT

A COMPARATIVE ANALYSIS OF DESIGNERS' INTENDED MESSAGES AND USERS' PERCEIVED MESSAGES EMBODIED IN PRODUCT APPEARANCE

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This study discusses product form perception within the context of communication. The emphasis is on meanings attributed to product visual form, and more specifically the correspondence between messages designers intend users to receive and the messages that users actually receive. Four groupings of appearance-based product attributes are identified; 1) social values and positions; 2) usability and interaction; 3) visual qualities; and 4) personality characteristics. The study was driven by the main research question; 'do users perceive the same meaning from product appearance as designers intended, or is there a level of mismatch?'. An empirical study was conducted using newly-designed Turkish seating furniture to investigate the relationship between designers' and users' ascription of meanings to products based on appearance, as a means to validate or refute opposing answers to the main research question. The results of the study reveal that there exist some considerable differences between designers' intended messages and users' perceived messages decoded from product visual form. The study suggests that designers perform less well at communicating product meanings related to two of the four groupings: usability and interaction, and personality characteristics. Accordingly, these are identified as priority areas for improved message transmission.

Keywords: Product Form, Perception, Visual Attributes, Meanings, Semantic Differential Method

ÖZ

ÜRÜNÜN DIŞ GÖRÜNÜŞÜNDE TASARIMCILARIN HEDEFLEDİKLERİ MESAJLARIN VE KULLANICILARIN ALGILADIKLARI MESAJLARIN KARŞILAŞTIRMALI ANALİZİ

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Bu çalışma ürünün dış görünümünün algısını iletişim bağlamından tartışır. Bu çalışmada ürünün görsel formuna verilen anlamlara, ve özellikle tasarımcıların kullanıcılara aktarmak istedikleri mesajların ve kullanıcıların gerçekte algıladıkları mesajların arasındaki uygunluğa önem verilmiştir. Ürün dış görünüşüne dayanan, dört grup ürün niteliği belirlenmiştir; 1) sosyal değerler ve konumlar; 2) kullanılabilirlik ve etkileşim; 3) görsel nitelikler; ve 4) kişilik karakteristikleri. Bu çalışma ana araştırma sorusundan ortaya çıkmıştır; 'kullanıcıların algıladıkları anlam tasarımcıların ürün formuna aktarmak istedikleri anlam ile aynı mıdır, ya da her hangi bir tutarsızlık seviyesi var mıdır?'. Araştırma sorusunu geçerli kılmak ya da karşıt cevapları çürütmek amacıyla, tasarımcılar ve kullanıcılar arasındaki ürünün dış görünümüne dair anlamadaki farklılıkları açığa çıkarmak için, yeni tasarlanmış Türk oturma mobilyaları kullanılarak bir deneysel çalışma yapılmıştır. Araştırma sonuçları tasarımcıların hedefledikleri mesaj ve kullanıcıların ürünün görsel formuna dair kodlamaları çözerek algıladıkları mesaj arasında önemli farklılıklar bulunduğunu ortaya koymaktadır. Bu çalışma, tasarımcıların ürün anlamlarını iletmede daha az görev yaptıklarını dört gruptan ikisiyle ilişkilendirerek öne sürer: 'kullanılabilirlik ve etkileşim' ve 'kişilik karakteristikleri'. Dolayısıyla, bu iki grup gelişmiş mesaj aktarımını sağlamak için belirtilen öncelikli konular olarak saptanmıştır.

Anahtar Kelimeler: Ürün Formu, Algı, Görsel Nitelikler, Anlam, Semantik Differansiyel Metodu.

To My Parents

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CHAPTER 1

INTRODUCTION

1.1 Problem statement and the scope of the study

The current trend of design based on styling appears when the traditional role of product form (form should follow function) fails or is no longer relevant. A question may arise as to why the visual domain of a product is so important. Two basic arguments can be identified from literature in the visual domain of design (Berkowitz, 1987; Bloch, 1995, Crilly et al., 2004; Creusen & Schoormans, 2005; Demir, 2008). The first view sees product form as a competitive and strategic tool in the hand of a number of design companies. In today's highly competitive marketplace these companies devote much attention to the design of new products in forms that differ from those that already exist, in order to give products a competitive edge and enhance their business success. Thus, according to this perspective, product form is an attractive tool to affect users' preferences and thereby increase sales within a wide variety of products. The second view is a human-oriented perspective rather than profit-oriented, in which design companies are supposed to satisfy the exclusive tastes and psychological needs of users as they expect far more from a product than merely its function. With both perspectives, it can be said that the appearance of a product should be devised in response to users' expectations.

In the process of new product development, designers (as form givers) are responsible for satisfying users' needs, wants, and desires, and these become largely evident through product appearance. The latent ability of product visual form to meet users' psychological needs makes it a crucial determinant of perceived visual attributes (Crilly et al., 2004).

So how do designers generate new product form? Designers traditionally create new product forms based on their 'intuitive feelings, experiences, inspirations from artistic works, and their habits' (Hsiao & Chen, 1997). However, according to Hsu et al. (2000) the artistic style of design does not make sense to the broader population of users. Studies have been done that reveal designers make decisions based on their own experience and intuition as they have no access, or only limited access, to information related to users' natural needs (Maurer et al., 1992; Berkowitz, 1987; Bloch, 1995; Demir, 2008). Consequently, the visual form of a product is conventionally moderated by designers' subjective interpretations. However, this general approach can be contrary to the necessity of 'designing for people, not for ourselves', since designers are frequently not representative of the users of the products that they design. In principle, designers are concerned primarily with satisfying users' needs, which may only slightly overlap with their own needs as a single user. So although the value of designers' skills and experience in creating new form is appreciated, justifying the visual form of a product on the basis of intuitive feeling and imagination is not a reliable or commendable approach (Crilly et al., 2004). The most helpful approach to fulfill users' expectations with respect to product form, and for which some designers already have responsibility and expertise, is to apply user-centered design methods.

A designer or a design team acts as the source of a message to be conveyed through a product. They decide on the visual attributes of the product form. In other words, they create new form and with it they embody intended meanings. Thus, the role of the form creator is to transmit that intended meaning to the end user. However, there can be a gap between the intended message as transmitted and the message as received by users, since users interpret and respond to the product in an environment and context that will inevitably differ from that in which the product was conceived. In other words, with this viewpoint, a product can be viewed as the transmitter of a message. But if we consider design as a process of communication of messages, embodied in product visual form, it is clear that there will exist some potential differences between designers' intentions and users' perceptions (Crilly et al., 2004). The central issue for this thesis is: how large can these differences be, and how can

designers effectively communicate their intended messages to users through product appearance?

How users perceive or respond to a product form is an indicator of users' satisfaction toward that product. User response to the visual appearance of a product is a well studied topic in literature, in which all aspects of response to product appearance, the significant factors influencing the response, the general role of product appearance, and the messages that product appearances convey are investigated (Bloch, 1995; Crilly et al., 2004; Creusen & Schoormans, 2005; Chang et al., 2006; Desmet & Hekkert, 2007). However, one of the most difficult tasks for designers is to understand users' perceptions towards product form and ways in which associated meanings of product form can be clearly transmitted to users. That is, an awareness of users' perceptions may provide a basis on which the subject of the visual form of a product can be better constructed and communicated. According to Crilly et al. (2004) perception is a key stage in the process of communication that affects cognitive, affective and behavioral responses to products. Hsu et al. (2000) explain that users' perceptions in response to product appearance are a complex cognitive process, which in turn is complex to appreciate and understand.

In addition to its significant role in people's first acquaintance with a product, perception may differ over time and across cultures. Thanks to Creusen & Schoormans (2005), it has been identified that perceptions of aesthetic and symbolic value originating from product appearance may differ in time. It is emphasized that aesthetic and symbolic perceptions may be different between users of a targeted user group, since the subject of taste and experience are essentially personal. Consequently, a quantitative and qualitative database regarding aesthetic and symbolic perceptions may not be a reliable or helpful guide to support designers in their form giving activities, although some information related to the perception of usability aspects of product appearance can be valuable since it is assumed these kinds of utility-based perceptions are similar over product categories, persons, and countries (Creusen & Schoormans, 2005). Accordingly, it has been recommended to conduct studies over time and across cultures to identify users' perceptions toward product form. Several semantic differential studies (Maurer et al., 1992; Hsiao &

Chen, 1997; Hsu et al., 2000; Chuang et al., 2001; Mondragón et al., 2005; Hsiao & Chen, 2006) have been performed to investigate users' perceptions of product form, but the results of these studies are limited to certain cultures. Moreover and above all, most of these studies are discussed in isolation from designers' original intentions for communicating messages through product form. Due to the fact that there are cultural, social, and also personal factors that influence users' perceptions, and then users' evaluatory responses, it is important to carry out this current research with the user groups that designers intended for their products.

There are few studies investigating relationship between designers' and users' product form perceptions. Hsu et al. (2000) investigate the relationship between designers' (though not the designers of product) and users' conceptual models with reference to product semantics. The results of the study demonstrate that some significant differences exist between designers and users in perceptions of product visual form, since a single visual element of a product can elicit different impressions.

In a previous research study by the author, differences in product form perception of designers and users were explored (Khalaj, 2007). Semantic Differential Method was applied to evaluate subjects' product perceptions in response to the visual form of lavatories (washbasins) designed by Turkish ceramic companies. The results revealed that there is a perceptual gap between designers and users toward product form. On the one hand, users are not clear about the characteristics of product form, and evaluate it according to their mental images and experiences. On the other hand, perception approaches of users and designers are different, as designers are more sensitive and discriminating regarding the individual elements of product form while users mostly perceive the product as a whole. So, the results suggest that users do not perceive the same system image as designers do. That is, the same product visual form will give designers and users different impressions. However, within the study the perceptions that designers intended users to have remained unexplored.

Due to this gap, the purpose of the current study is to investigate the relationship between designers' intended perceptions and users' actual perceptions related to the

visual appearance of products and their associated messages and meanings. It may also explore the generation and exchanging of meaning in the process of encoding and decoding product form. However, this study will not focus on the relationship between users' perceptions and their preferences. To be more precise, this study will not seek answers to such questions as: what are users' preferences for products based on perceived product form, or which visual elements moderate users' preferences?

This investigation will help designers gain valuable insights so that they can incorporate users' perceptual models and approaches into design activity. It is postulated that mismatches in perceptions will bring failure to a design, or at least significantly limit its success. Therefore, the results will put forward that the reduction of discrepancies in perceptions related to product appearance should be an important objective for designers.

1.2 Definitions of terms

Since researchers' use of words can be different, it is important at the outset to identify the purpose of some critical confusing words used in this thesis. In the first place, the term *product visual form* or *product appearance* is used throughout this study to refer to the exterior of a product, incorporating such elements as 'shape, color, light and shade, and texture (Lewalski, 1988)'. In other words, it refers to the parts of a product that are discernable by the eye, and including material qualities. The term *designer* is used to refer to those who construct the product visual form in the process of product development. The term *user* is used to refer to people who use a product, and more especially to those people that a designer intended a product to be used by (i.e. within a target user group).

1.3 Research questions, and the possible outcomes from the research

The starting point of this research, as expressed through research questions, is as follows.

Q1 Do users perceive the same meaning from product appearance as designers intended, or is there a level of mismatch?

The primary issue of this research will be explored through the following sub-questions.

Q1.1 What do designers have in mind when creating new form and what kinds of messages do designers wish to transmit?

Q1.2 To what extent do designers pay attention to users' perceptions in their decision on product form?

Q1.3 Which visual attributes of product form (i.e. aesthetic, personality, usability, socio-cultural) have the same meaning to both designers and users? And which visual attributes do not?

Q1.4 What are the differences between designers and users in perceiving product form and its concealed meaning?

Q1.5 What values of product visual form are important for designers to communicate to users?

As a research methodology, the Semantic Differential method will be applied to measure designers' intended perceptions and users' actual perceptions at a pre-use stage toward visual appearance of selected items of furniture, all manufactured by Turkish companies. The reason for selecting this industry is that companies in Turkey are trying to differentiate themselves through design. To do so, they design new products in different visual forms and thereby intend to express specific characteristics and conjure specific associations through their products.

By investigating the relationship between designers' and users' product form perceptions in the process of communication, it is hoped that the following benefits will be realized:

- First of all, the results may provide an analytic frame for designers and product managers regarding their product form decisions.
- Secondly, it may show the extent to which designers pay attention to users' perceptions in their decision of product form, as it is a challenge for designers to translate and transfer the users' needs into design specifications.

- Thirdly, it may prove that reducing perceptual differences between designers and users towards product form requires designers to understand target users' perceptions of product form.
- Fourthly, it may argue whether or not designers and users with a shared culture have difficulties in communicating with each other through product form.
- Finally, by understanding where mismatches in perceptions do and do not exist, ways to improve product design specifications and close perceptual gaps may be identified.

1.4 Structure of the Thesis

Following this introductory chapter, the remaining five chapters are formalized as follows:
Chapter 2 discusses about the values of product visual from for the designers, companies, and users. It also briefly explains the reasons or factors that moderate the emergence of new product form.

Chapter 3 investigates the theory behind the communication model in design which sees product form as a transmitter of the message that generated by designer and received by user. After presenting some of the basic frameworks, different aspects of user response and designer intention in relation to product form are referenced and discussed.

Chapter 4 describes the methodology followed in order to investigate the relationship between designer's intended messages with user's perceived messages and also to validate the arguments proposed in the thesis.

Chapter 5 presents the details of the results of the conducted empirical study and the data analysis methods used in the study.

Chapter 6 summarizes and reviews the theoretical discussions on the subject and findings of the empirical study to provide answers to the research questions. It also discusses on the opportunities for further research in this area.

CHAPTER 2

THE VALUES OF PRODUCT FORM

The first section of this chapter briefly discusses the business approaches that manufacturing companies follow, and the role of design in enabling those companies to increase the value of their products. Then, the importance of visual form to the commercial success of products is explained, alongside the meanings that forms can convey.

In the second section, the relationship between what is needed in a society and designers' activities are argued. It focuses on designers' responses to consumers' demands with respect to product visual form.

2.1 Form as a product differentiation strategy

It is clear that new product design based on styling, or other strong determinants of form, has become a competitive or strategic tool in the hands of a number of companies. To give products a competitive edge and enhance their chance of business success, these companies follow a product differentiation strategy through design innovation prioritizing product form. Berkowitz (1987) supports the use of product form as an element of innovation strategy and emphasizes that product form could become a differential advantage in a highly competitive environment.

According to Porter (1996), the most exclusive and competitive strategy is one which focuses on being advantageously different. The emphasis is on serving markets with new designs having different and exclusive attributes compared with the offerings of rivals.

Investment in design can be a key factor in business success. Heskett (2002) indicates two general levels of design practice in organizations; 'the skill level' and 'the managerial level'. The first level contributes to design activity in such

applications as industrial design, graphic design, and interior design, whilst the second level is concerned with managing design processes from a beginning to an end point; from the product development to the distribution and consumption in all respects. Heskett (2002) insists that the presence of both levels is important in any business environment, and without the managerial level the skill level may never result in commercial success.

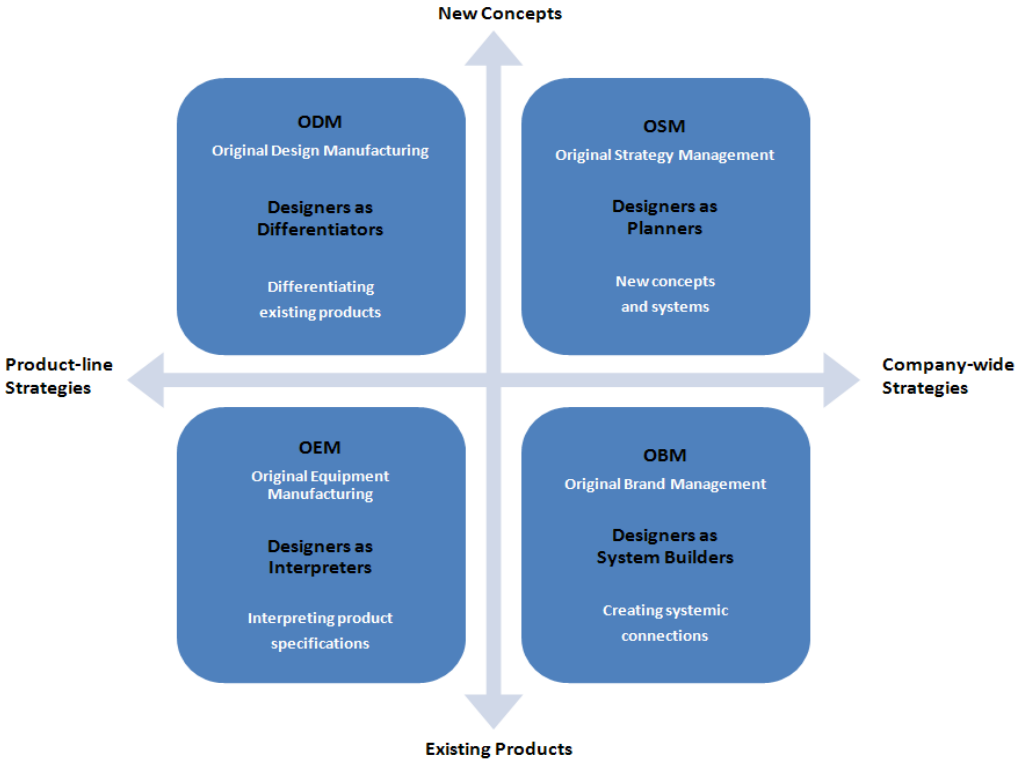


Figure 2.1 Different levels of design practice (Heskett, J., 2002)

With regard to designers' roles in organizations, Heskett (2002) develops a diagram in which different roles of designers within four business approaches are discussed (Figure 2.1). To be brief, the two axes in the diagram identify a company's strategic positioning. The vertical axis distinguishes between a company's existing products and new product concepts, while the horizontal axis distinguishes between activities

relating to a single product or product line, through to those with implications across the whole company. The left side of the diagram is about manufacturing functions, and the right side gives emphasis to management roles.

As the topic of discussion is about product differentiation through design, here just one of the business approaches is relevant: the positioning strategy focused is ODM (Original Design Manufacturing), within the top-left quadrant, which is concerned with creating new concepts to be realized as a new product. In a company engaging primarily in ODM, designers are employed to make products different, or to differentiate existing products. In this approach designers are employed to "develop innovative forms and treatments for products" (Heskett, 2002; p.24). Innovative and exclusive forms may be required to attract users' attentions and create subtle or pronounced discriminations between products.

There have also been many studies that support the role of product visual form in affecting people's decisions to purchase a product. However, it is obvious that apart from visual appearances of a product there are other important factors that influence purchasing decisions. Walsh et al. (1988; adapted from Roy, Walker and Gross, 1987) demonstrate a framework in which the relationship between different aspects of product design and purchasing decisions is explored (Table 2.1). According to this framework, it can be identified that aesthetic perceptions of design are important in two phases: before purchase and at the point of purchase.

In marketing literature, however, it is acknowledged that product appearance is not the only differentiating feature. Differentiating attributes involve "enhanced quality, expressed via durability, precision, ease of operation and distinctive aesthetics and so on, at an appropriate price" (Walsh et al., 1988; p.207).

Table 2.1 How design affects customers' views of a product at different stages of purchase and use (Walsh et al., 1988; adapted from: Roy, Walker and Gross, 1987)

Phase	Product design factors
BEFORE PURCHASE:	Manufacturer's specification, advertised performance and appearance, test results, image of company's products, list price. ("brochure characteristics")
PURCHASE:	Overall design and quality, special features, materials, color, finish, first impressions of performance, purchase price. ("showroom characteristics")
INITIAL USE:	Actual performance, ease of use, safety, etc. ("performance characteristics")
LONG-TERM USE:	Reliability, ease of maintenance, durability, running cost, etc. ("value characteristics")

Today, one of the common strategic business tools still in popular use is product styling, which is a means for creating visually pleasurable products (Fung et al., 2004). The current trend of design based on styling appears when the traditional role of product form fails. In such cases, the principle that 'form follows function', developed by Louis H. Sullivan, has reduced relevance. Cagon and Vogel (2002; p.5) put forward a view that "we are now in a period where form and function must fulfill fantasy". Such famous slogans appears to become a basis of various design strategies and commentaries, such as 'form follows emotion' by Esslinger, the founder of Frog Design company, and 'form follows meaning' by Krippendorff (in Hsu et al., 2000). Cagon and Vogel state that desired aesthetic and human factors were not historically be a primary concerns of product developers or designers. 'Form follows function' was also used as a term to support or otherwise justify the development of unpleasant products that were overly technology-driven. Due to the fact that competition grew rapidly in marketplaces during the late 20th century, companies started to adopt product languages based strongly on styling as a way to

differentiate their products from those of rivals, and to achieve a contemporary appearance (Cagon and Vogel, 2002).

Incorporating semantic value into product form has become an essential strategy for improving a product's competitive edge in the marketplace. Keinonen and Takala (2006) explain that creating distinctive and recognizable product messages through symbolic form is an important strategic approach for an increasing number of companies.

Evidence indicates that product form is one of the factors that play an important role in users' product evaluations and preferences (Bloch, 1995; Creusen and Schoormans, 2005; Hsiao and Chen, 2006). The question may arise as to how visual characteristics of a product affect a user's product evaluation and preference. Creusen and Schoormans (2005) identify six different roles of product appearance from the perspective of users. The product appearance communicates aesthetic and symbolic values, functional behavior, ergonomic information, attracts attention and categorization. However, their study demonstrates that of the six, aesthetic and symbolic values of product appearance are two critical factors influencing subjects' choices. The authors explain that when product alternatives are similar in function and price, users prefer the one that appeals the most to them aesthetically. Creusen and Schoormans (2005) also argue that product form influences the consumer perception of symbolic value, which is a key determinant for preferences in product selection. However, the perception of symbolic value may differ over time and culture as the meaning of forms can change in time (Muller, 2001).

On the other hand, Bloch (1995) explains four characteristics of product form that contribute to overall product success. Firstly, product form is an effective tool to gain users' notice when a wide variety of products is exhibited. Secondly, it communicates some information regarding functionality, strength, power, and ease of use. Thirdly, it has an impact on the quality of users' lives in a larger sense, as it is the product form (i.e. the product's outer embodiment) that users interact with most of the time. For instance, unpleasant forms may evoke distaste, while beautiful and attractive forms may evoke pleasure. Finally, product form could have long lasting

effects. In this case, aesthetic characteristics of a product may have impacts for on users that develop over many years. According to Bloch (1995), ideal form is that which has unrivalled qualities to evoke positive beliefs and positive emotional responses. Bloch (1995) maintains that products should evolve over time, by following or serving the latest marketplace requirements though best excellence and most appropriate specifications.

So what does product styling encompass? The styling of a product refers to its outer visual appearance, but it has deep repercussions. Styling affects how users will react to a product; for example, does it reflect modern trends, and does it communicate its functions clearly? In today's market, users are knowledgeable about design and this is reflected in their spending choices. Hence, styling that is viewed positively by people can be a crucial factor in product success. Cagon and Vogel (2002; p.33) define style as "the sensory elements that communicate the desired aesthetic and human factors of a product or service". The style of a product should take into account user's expectations and reactions. According to Cagon and Vogel (2002), style represents the identity of a product. They insist that style should respond to the lifestyle of target users.

Some companies that create product concepts based on styling explore the boundaries of aesthetic, symbolic (meaning-based) and emotional experiences. For example, one can refer to design concepts by French designer Philippe Starck, Egyptian designer Karim Rashid, Alessi products from Italy, and products from Frog Design company. Style-focused designers conceive ideas that "push the boundaries of form, material, and tactile experience" (Cagon and Vogel, 2002; p.45). For such designers as Luigi Colani and Ross Lovegrove, nature is a rich source for inspirations. The theory of 'biodesign', first developed by Colani, is a stylistic approach in which we are taught that nature is the best designer. Lovegrove often tries to give emphasis to artistic aspects of his designs. For him 'everything is disposable but art is not'. Here is the interpretation of design from one of the most well-known designers of our era:

> I believe that we could be living in an entirely different world - one that is full of real contemporary inspiring objects, spaces, places, worlds, spirits and experiences. Design has been the cultural shaper of our world from the start. We have designed systems, cities, and commodities. We have addressed the world's problems. Now design is not about solving problems, but about a rigorous beautification of our built environments. Design is about the betterment of our lives poetically, aesthetically, experientially, sensorially, and emotionally. *Karim RASHID* (2008; www.karimrashid.com)

The idea that products can be beautiful has often been at the center of argumentations regarding product visual form. Lewalski (1988) argues that the concept of 'beauty' has two general meanings when applied to design. In its first broad meaning, beauty is about being admirable, excellent or desirable. For example, when we talk about a beautiful wine, beautiful car, beautiful meal, and so on, it refers to beauty as an essence of something. Beauty in its second sense is about being visually excellent; it is associated with aesthetically positive qualities of an industrial form.

The objective of creating beautiful product form is one of the most important processes of product design, and it is this activity in a broad sense that is referred to as product styling (Fung et al., 2004). Ms. Rowena Reed Kostellow, who spent most of her life teaching design and exploring the subject she called "the structure of visual relationships", emphasized that "visual solutions for living in our environment" should be a primary concern of designers (in Hannah, 2002; p.42). She believed that new designs should be more beautiful than existing designs. In this respect, it can be said that one of a designer's responsibilities is to provide users with beautiful or otherwise visually appealing products. Of course, this relies on a potentially contentious view that users need, or at least prefer, beautiful artifacts. Furthermore, a question may arise whether users lead or influence designers' activities and imaginations or vice versa. Whatever the answer, it seems probable that the relationship is reciprocal. In contemporary design practices, it is very usual for user needs and demands to be thoroughly investigated and then fed into design

activity, and that these investigations will inevitably influence product styling, either directly or indirectly.

2.2 The need for a new form

In order to meet the psychological needs of users, designers build different styles into new products. According to Lewalski (1988; in Crilly et al., 2004), users' preferences are led by perceived attributes of products and are based on the satisfaction of wants and desires, rather than function-driven needs. Norman (2004) argues that the only way to satisfy a wide variety of needs and preferences is to have a wide variety of products with different qualities. Hsiao and Chen (1997) propose that designers adopt a semantic recognition approach for developing a product form. They argue that this approach may solve the problem of how to design a new product that satisfies users' physical and psychological requirements.

Leonard and Rayport (1997) insist that adopting emphatic design is a successful process to meet users' unarticulated needs. They believe that users are reluctant to express directly their desires and perceived needs. Through this method, positive and negative intangible attributes associated with a product can be identified.

Product visual form not only references product qualities but it also has a capability to satisfy many of the unarticulated needs of users (Crilly et al., 2004). Comparing users' experiences regarding product form with Maslow's hierarchy of needs, Lewalski (1988) suggests that users' expectations are beyond just functional and extend to the satisfaction of higher level needs. Perceived attributes of products, covering aesthetic, symbolic, and emotional experiences, can be delivered or evoked through values hidden in product form. Therefore, product visual form is a key determinant of product values. Crilly et al. (2004) claim that perceived attributes of product appearance are more important than the tangible properties that define that appearance.

According to Marcus (2002), all designs are associated with stories, which are conveyed through "gesture, style, metaphor, identity, or branding" (p.41). Visual attributes of products are the center of attention in the market, where the functionality and performance of products are considered common or prerequisite

values (Crilly et al., 2004). For example, Lewalski (1988) argues that innovative and pleasing forms are welcomed every day as people look for new and visually fresh products in order to overcome boredom.

The visual characteristics of a product strongly define its 'product personality'. In our daily lives, it is not difficult to recognize that people choose and, if they can afford, buy those products with a personality that fits to their own personality self-image, and which in turn defines their social statue. Marcus (2002) maintains that people define and separate themselves from others by customizing products to suit to their own particular needs or to match to their personality; this gives rise to the notion of 'products as signifiers of status'.

There exists a close relationship between design opportunities and lifestyles. Changing lifestyles of a society provide new design opportunities, for which designers must take care. Product visual form should be adapted to those changing lifestyles and environments.

As noted before, an important point to be considered is that product visual appearance should be consistent with emerging social and cultural trends. McDonagh et al. (2002) explain that less tangible issues such as emotional bonding of users with products, cultural perception, and social value systems provide valuable insights for the product developer to help expand knowledge and understanding of user needs beyond functionality. Form can be generated by human responses to shapes and thereby define transformations between descriptive words and shapes (Smyth, & Wallace, 2000).

In the literature there is reportedly a close relationship between users' positive perceptions of product form and their preferences of one form over another. Accordingly, information on users' preferences could conceivably contribute to acceptable or desired product forms. Chuang et al. (2001) hypothesize that users' preferences could be defined as a function of styling images. The styling image in turn, could be represented as a function of design elements.

The characteristics of design elements are a means to carry designers' intentions regarding meanings and associations to target users. Marcus, (2002; p.41) suggests

that style, in product design, is about “aesthetic wrapping” of products in which the elements of design as “shape, color, texture, material, pattern, and ornament” combine to express designers’ imaginations, intentions or messages. With this respect, each product has its own style, which separates it from other products. He insists that the potential role of product unique style makes it desirable as it responses to personal preference and exclusive taste. In this respect, designers or product form developers are encouraged to give unique styles to products.

The term ‘style’ refers to unique, or defining, characteristics of product form and it is used to distinguish if the design belongs to a specific category of fashion (Fung et al., 2004). Chambers (1983, in Fung et al., 2004) in his thesis study titled “Design and Designers: a Sociological Study of the Processes and Meanings of Product Styling” supports four reasons behind the product styling movement that began in earnest in the 1930s with the ‘streamlining’ style. These reasons for applying product styling are summarized in Fung et al. (2004; p.93) as follows:

> 1. To construct a shape that is appropriate for mass production.
> 2. To design an appearance of a product that identifies the product’s functions.
> 3. To create a product form that visually distinguishes it from competitors that contain the same function.
> 4. To illustrate a proposed superior quality through the product’s image.

Moulson and Sproles (2000) insist that one of the most common objectives of some design companies is to predict users’ style preferences and to apply them to their designs. It is believed that valuable insights can be gained by focusing on aspirational lifestyles within a given culture and on the factors and group of people leading this lifestyle.

According to Moulson and Sproles (2000), through market research it is clear that there are consumers who are the ‘first adopters’ of a new style. They state that these ‘early adopters’ are composed of two other groups: ‘consumer innovators’ who are the first buyers of the new styles and ‘opinion leaders’ who motivate others to buy. They argue that the wealthy and upper classes of a society are the earliest adopters and then successively other social classes follow until eventually an adopted style

becomes widespread or accepted by all classes. When the early adopters recognize that the current style is accepted by followers and lower social classes, they will look for a new style to differentiate themselves and to maintain an exclusive status. However, this theory, style acceptance by social classes in order, may still be a debatable topic in the absence of information regarding the intentions that creators of products or styles had in the first place.

To summarize, regular contact with users is required to identify their needs, wants, and desires for new products. One way to reduce the cooperation gap between designers and users is to apply user-centered design approaches, which broadly refers to a way of working in which designers actively seek out the characteristics of a target user group, and investigate users' specific needs and preferences alongside information on general contemporary design trends.

In this way of working, designers often collaborate with social scientists in adopting various methods of user research to understand how well new designs with different characteristics would likely meet people’s needs and demands, and whether ultimately they would be purchased and incorporated into their lives.

CHAPTER 3

MODELS OF VISUAL COMMUNICATION IN DESIGN

The goal of this chapter is to provide a general understanding of the communicative aspects of design. While describing the theory behind the communicative function within design, the focus is to look deeply at the stage in which designers' intended messages are communicated through the visual form of a product.

3.1 Product form as a communicator

Communication is central to general human activities as well as to designers' activities. Through history, humans have used visual elements in order to communicate messages to others. Accordingly, mankind has used various media, for example cave paintings and hieroglyphics, to correspond with people. It is understood that visual communication involves symbols, signs, and even metaphors that are meaningful for both originator and receiver, who share cultural and social values.

Communication, in its general sense, is defined as "social interaction through messages" (Fiske, 1990; p.2). Fiske identifies two basic schools of thought in the study of communication: '*process*' and '*semiotic*' schools. The 'process' school sees communication as the '*transmission of messages'*. It is concerned with how senders encode intended messages in transmissions, how receivers decode messages, and how the messages communicated through the channel existed between senders and receivers. According to Fiske, if received messages do not match intended messages, the communication is considered unsuccessful or a failure. In this respect, the stages of communication processes are amenable to study to try to identify where failure happens. The 'semiotic' school considers communication as the *'production and exchange of meanings'*. It is concerned with meanings or connotations associated with messages within a cultural context. It is about communication of text and

context. In this school of thought, receivers or readers with different socio-cultural backgrounds often exhibit different interpretations and thereby find different meanings in the same text. Accordingly, differences that occur between producers' intended meanings and readers' actual meanings indicate acceptable diversity rather than communication failure.

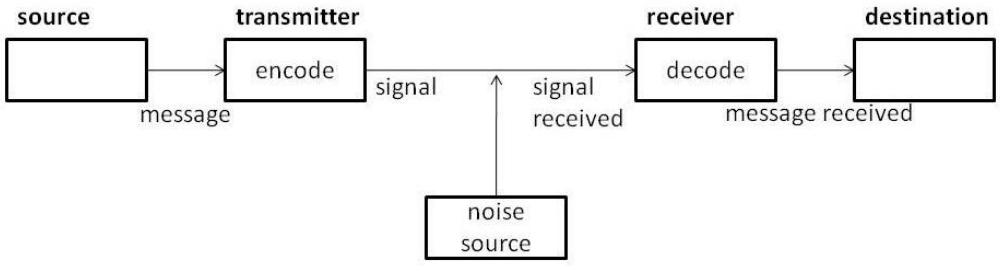


Figure 3.1 Shannon and Weaver's model of communication (in Fiske, 1990)

Figure 3.1 illustrates a basic model of a linear communication process. It shows how a message is encoded and decoded. Through this process, a source (a message to be conveyed) is encoded into a signal by a person acting as a transmitter of the message. The signal is then transmitted across a channel to another person, the receiver. The receiver decodes the signal into the original message and the communication from source to destination is completed. Within the channel between transmission and reception exist 'noises' or influencing factors that can distort the purity of the message on its way to the receiver. The noise is not managed or intended by the source. Fiske (1990) discusses 'semantic noise' in the study of communication. He defines semantic noise as "any distortion of meaning occuring in the communication process which is not intended by the source but which affects the reception of the message at its destination" (p.8).

Accordingly, in a visual communication model of design, a designer is regarded as the source of a message, a product is regarded as the transmitter, a particular

physical attribute of the product is considered the signal, the eye of the person beholding or interacting with the product is considered the receiver, and lastly the perceptive and cognitive processes of the receiver are the necessary means to interpret and understand the intended message.

Product form, and in particular product *visual* form, can be considered the medium through which designers' encoded messages are transmitted. Based on the categorization of types of media by Fiske (1990), product visual form fits into a category of *'representational media'*, being creative in nature and not reliant on the presence of the designer (as originator) to convey messages.

Product visual form is the first and essential medium of communication in product design, considering that it carries the messages or intentions of its creators whilst also moderating users' first impressions and interpretations.

Product visual form speaks to those who interact with it, defining itself through its characteristics and behaviors. In this respect, audiences make a conversation with the originator of the product. However, an important point to consider is whether messages conveyed through product visual form are purposefully woven by the designer, as form giver, or are incidental and outside of the designers' intentions. It is assumed that the communication is commendable if it is managed by the creator of the product form.

Figure 3.2 (Crilly, 2005) illustrates a communicative model of design presented using visual language. According to his model, a designed product can be considered as a 'text' that is 'written' by a designer and 'read' by a user.

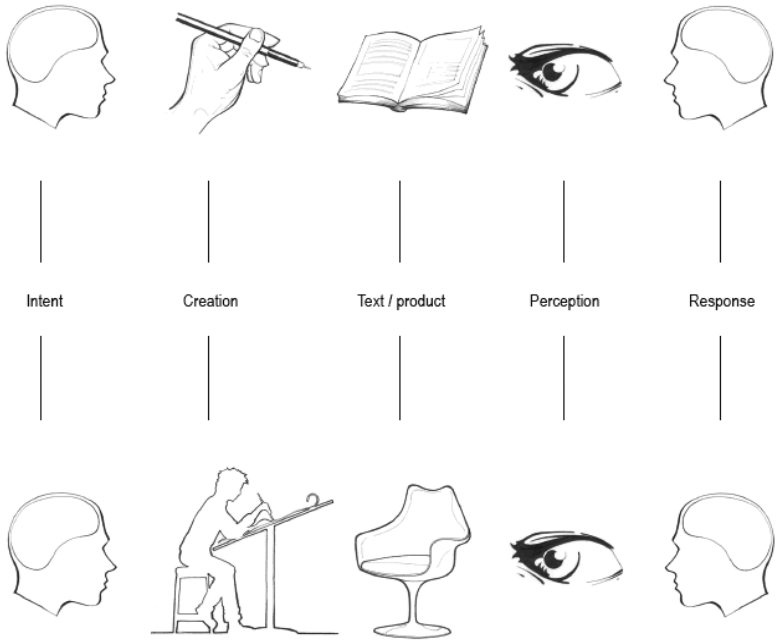


Figure 3.2 Simple illustration of the analogous relationship between texts and products (in Crilly, 2005)

'Form and content' are two fundamental issues in design. From the view of semiotics studies in product design, the form of a product is considered as the *signifier* and the content or the concept conveyed through the signifier is known as the *signified*. Hjelm (2002) in her study, under the title of semiotics in product design, discusses that the *signifier* refers to the appearance and physical form of an object, or what we perceive and express through our senses, and the *signified* refers to the content, embodied messages, associated meanings, and what we feel or define when we interact with an object. She puts forward that the *signifier* is objective while the *signified* is subjective. Meanings are derived from the signified and evoked through our senses.

Semiotics or Semiology refers to the study of signs and the way they are interpreted (by users of the signs) in cultural contexts. Signs refer to something other than themselves; they are pointers. Fiske (1990) argues that the generation and exchange of meanings within a semiotic model of communication is based around the extent to which a writer (constructor of a message) and a reader (interpreter of a message) utilize the same signage system.

Figure 3.3 provides an image of the Boom Rang chair designed in 1992 by Philippe Starck, who is known to have a great talent for creating "striking and unusual forms" (Heskett, 2005; p.38). Fiell and Fiell (2005) point out that Boom Rang demonstrates the impact of the 'Soft Design' movement on Stark's designs in the 1990s. With respect to the Boom Rang and its overall form in an objective sense, it represents the common sign of a chair, having legs, an area for sitting, and a back for leaning. However, in a subjective sense, the concept of the chair and what the chair signifies once a visual interaction takes place is less obvious. To be understood better, and also to re-introduce the argumentation about analogous relationships between texts and products, let us think about the word 'chair' when written on paper. When we read the word, it signifies to us the concept of a chair and a basic image of a chair may be conjured in our mind. However, when we are exposed to the image of an unfamiliar chair, what does that image stand for?

Figure 3.3 Boom Rang, 1992 by Philippe Starck (http://www.starck.com/)

According to Saffer (2007), the visual form of a product provides some indication of how that product behaves and how one should interact with it. He maintains that the property of product visual form that directs how the product should be used and interacted with is called an *affordance*. The term *affordance* became popularly

known after the publication in 1988 of Donald Norman's seminal book *The Psychology of Everyday Things* (in Saffer, 2007). For example, an overall form of a chair provides affordance of sitting, or it is perceived to afford the function of sitting. According to Krippendorff (1992), the affordances of a designed product should be such that they assist ordinary users understand the product in the particular contexts of use.

3.2 Sensation and perception of meaning

"Sense is the feeling of being in contact with the world without reflection, interpretation, or explanation" (Krippendorff, 2006; p.50). Perception, in its general sense, is defined as the interpretation of what has been sensed. Accordingly, perception follows the occurrence of sensation. It may be said that perception is based on sensation, which is detected by people's sensory receptors.

According to Fiske (1990), perception is not just a reception of stimuli, but it is a process through which one tries to make a link between external stimuli with his or her patterns of thought. Herein perception of meaning could be relevant if external factors (stimuli) match internal factors (beliefs and thoughts). That is, a stimulus should make sense to the person perceiving. Fiske puts forward that culture is an influential factor in this matching process (perception process) as "our internal concepts or patterns of thought have developed as a result of our cultural experience" (p.26). This approach may shed light on the idea that perception differs between cultures. Therefore we could summarize that our past experience along with cultural experience play a role like a pair of glasses through which we see the world, as Immanuel Kant says 'we see things not as *they* are but as *we* are'.

Krippendorff (2006) supports that meanings of an artefact may be important to humans than function and physical qualities of an artefact. Accordingly, Heskett (2005) argues that there are some designers (form givers) that concentrate on semantic value of their works rather than usability qualities. Ultimately, product form is defended by its meaning, and not by its usability function.

Meaning is a central concern for design. Meaning in design is the focus of the area of 'product semantics', which was developed and presented by Krippendorff and Butter (1984; in Krippendorff, 2006). Product semantics is defined as the study of symbolic qualities of artefacts in the socio-cultural context of use (Krippendorff, 2006). Accordingly, Krippendorff (2006) claims that a product should make sense, or it should communicate comprehensible meaning to people intended to intract with it. So it can be said that the meaning of the message of product form depends on the context of use, and that the meaning applied to a product is moderated by the message communicated.

3.3 Visual perception and user response to product form

Based on the Shannon and Weavers model of communication (Figure 3.1), Crilly et al. (2004) have developed a basic communication model between designers and users connected through a designed product (Figure 3.4). This framework is composed of five elements: *design team, product, environment, senses,* and *response*. The designer or design team, as the source of the message, decides on product visual form and what it should convey. The product, as the transmitter of the message, refers to physical product attributes conveying the message. The environment, or channel, is the physical space where user-product interaction takes place. For example, the channel within which the product is perceived and interpreted can differ from that used or envisaged during product development. The user's perceptual senses act as the receiver of the message from the product and within the channel. At the end of the continuum is the user's response or evaluation of the sensorial information received. Accordingly, the user assumes a double role in the continuum; that of receiver and destination. In the perception of product form, the role of the sense of vision is more prominent than touch, taste, smell, and hearing (Crilly et al., 2004; and Ulrich, 2007). Thus, this study focuses on visual perception of product form.

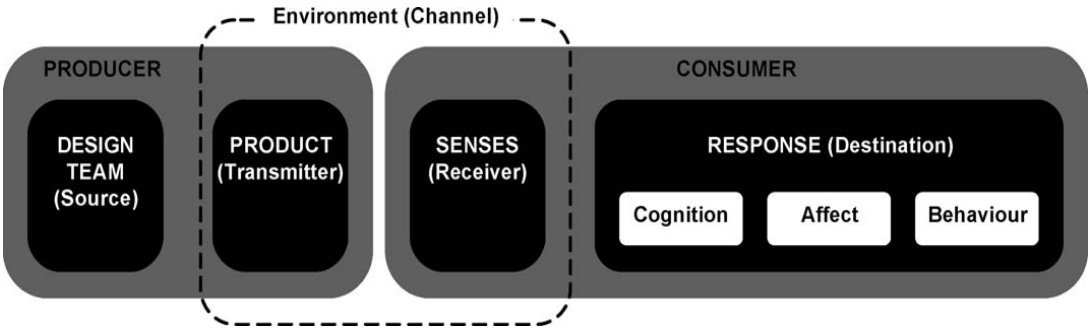


Figure 3.4 Basic framework for design as a process of communication (Crilly et al., 2004)

When people interact with products, they tend to interpret and respond to expressive qualities. Alberto Alessi, general manager of Alessi, who sees industrial design as a phenomenon of art and poetry rather than industry, argues that objects are the considerable media through which people communicate their values, status, and personality. He maintains that expressive qualities of objects provide a solution to a need for communication among people (Alessi, 1992). A review of users' types of responses on the basis of their visual interaction with product form may clarify what kinds of messages designers intended to communicate via the medium of product form.

In the study of product form from a marketing perspective, Bloch (1995) developed a conceptual model of consumer responses to product form (Figure 3.5), which underlies many studies of user interaction with products. He remarks on different types of responses to product from and several factors affecting those responses.

As Figure 3.5 shows, Bloch points out the design objectives and constraints that lead to product form. The emphasis is on the critical role of the designer (or design team) who decides on product form on the basis of (1) expressing his or her own professional work and desires, (2) satisfying a producer's or company's pre-defined commercial goals and manufacturing constraints, and (3) satisfying users' needs and desires.

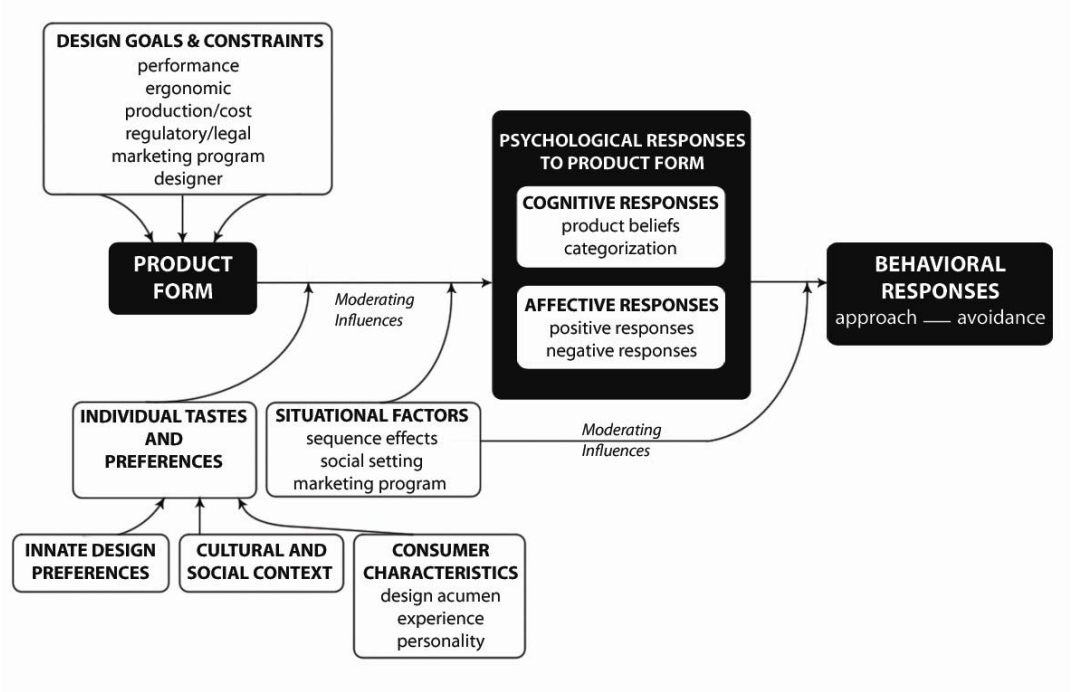


Figure 3.5 Framework for consumer response to product form (Bloch, 1995)

Bloch identifies variables including 'individual tastes and preferences' and 'situational factors' that affect consumer evaluations of product form. The individual tastes and preferences are moderated or shaped by innate design preferences, social and cultural contexts, and consumer personal characteristics. The situational factors that affect both psychological and behavioral responses to product form are discussed at three levels: sequence effects arguing whether product form fits with a consumer's collection of goods, social settings in which a product form is interacted, and marketing program moderators as advertisements.

According to Bloch's conceptual model, once a product form is presented, different types of psychological responses – cognitive and affective – are provoked in consumers. Cognitive and affective responses affect each other and may occur at the same time. Product beliefs and categorization are two important types of cognitive response to product form. By providing information on a product's character and specification, such as durability, technical sophistication, ease of use, prestige, and so on, product form influences consumer beliefs. Categorization is derived from

'perceived similarity' between a newly encountered product and products already aware of. Positive and negative affective reactions to product form perceptions, such as liking or disliking, are considered as affective responses. On the continuum, psychological responses lead to behavioral responses.

Based on Figure 3.4 (Crilly et al., 2004), Crilly (2005) developed an expanded framework for design as a process of communication, considering both sides (design intent and consumer respose) seperately (Figures 3.6 and 3.7).

Figure 3.6 illustrates the dimensions of consumer visual interaction with a product and the contextual factors affecting the response. Similar to Bloch's (1995) framework, cognitive, affective and behavioral responses are also identified in this framework. However, while Bloch defines cognitive and affective responses under the category of psychological responses, Crilly (2005) considers them as two different categories with the classifications of cognitive response further divided into aesthetic impression, semantic interpretation and symbolic association.

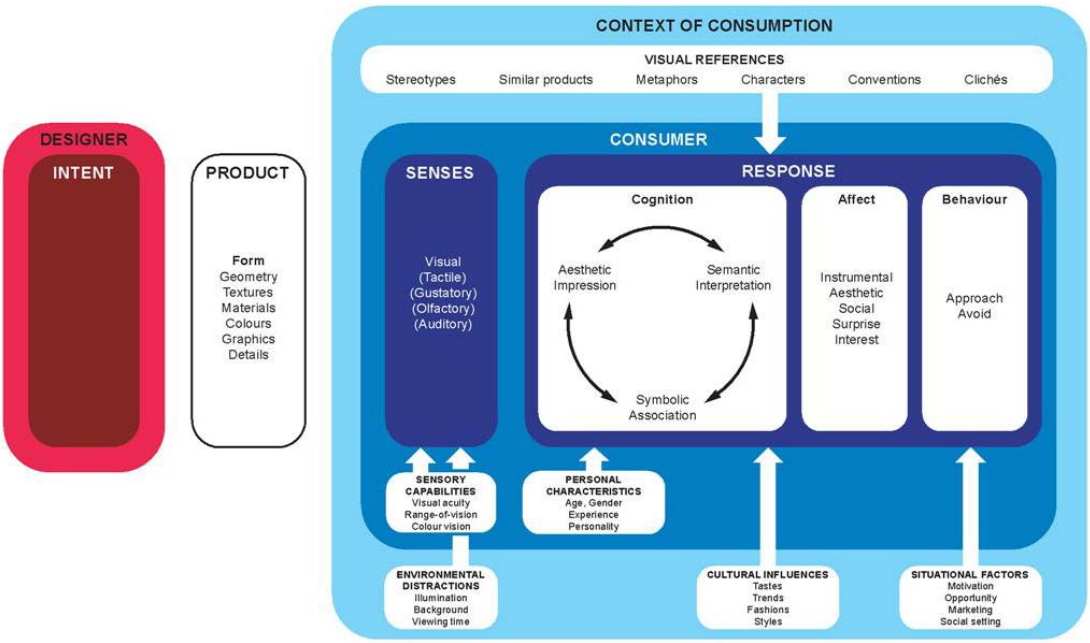


Figure 3.6 Framework for consumer response to the visual domain in product design (Crilly, 2005)

According to Crilly et al. (2004), a cognitive response to product appearance refers to the user's judgmental reaction towards product appearance based on perceived qualities. Crilly et al. (2004) argue that cognitive responses do not amount to objective qualities of a product. Considering the three categories that describe cognitive response, 'aesthetic impression' refers to visual attractiveness of a product, 'semantic interpretation' is the visual perception of product usability and function, and 'symbolic association' is about the meaning attributed to the product based on the product personality and its value in a social context.

The aesthetic response to an object is considered as the first response. Ulrich (2007) discusses that aesthetic response to a design, as a component of cognitive responses, refers to 'immediate feelings' expressed on the basis of information received through the senses. He maintains that aesthetic response is different from other cognitive responses since it is rapid, involuntary, and an aggregate assessment. Ulrich (2007) points out that aesthetic response is firstly provoked by the sensorial information provided by the vision system and then is aroused or augmented by information received through other senses. Referring to the theory of cultural aesthetics, Ulrich (2007) also argues that aesthetic judgments are based on personal experience and cultural context.

Based on the discussion by Crilly et al. (2004), an affective response may also encompass an emotional response. Affective responses describe user feelings and emotions *towards* a product and *by* a product. Similar to Bloch (1995), Crilly et al. (2004) argue that cognitive and affective responses are connected to each other and each system of response influences the other. Crilly et al. (2004), present five categories (instrumental, aesthetic, social, surprise, and interest) to describe affective response. These categories are proposed by Desmet (2003) for the emotional responses elicited by a product. Instrument emotions "such as disappointment or satisfaction" are based on the perceptions of whether or not a product helps users to reach their goals. Aesthetic emotions "such as disgust or attraction" arise from a product's potential to please or displease our senses. Social emotions "such as indignation or admiration" are based on the extent to which a product is perceived to match established or aspired social values. Surprise emotions "such as amazement"

result from the perception of novelty within a product. Lastly, interest emotions "such as boredom or fascination" are driven by the perception of "challenge combined with promise" within a product (in Crilly et al., 2004; p.553).

Referring to Bloch's framework, Crilly et al. (2004) also believe that cognitive and affective responses moderate behavioral responses to a product, which can be either an approach to, or avoidance of, that product. Approach behaviors reveal an attraction whilst avoidance behaviors represent the opposite.

Crilly et al. (2004) identify internal and external factors that moderate users' perception and responses to product visual form and thereby affect the communication of the designer's intended messages. Internal factors are a user's sensory capabilities and personal characteristics. Sensory capabilities refer to 'unanticipated physiological characteristics' of the user that affect sensory perception and which may result in product form being perceived differently to how designers intended. Personal characteristics refer to age, gender, experience, and personality of the user. While sensory capabilities moderate the sensory perception, personal characteristics moderate the response.

In the context of use, external influencing factors are identified; environmental distractions, cultural influences, situational factors, and visual references. Except for environmental distractions, which moderate the sensory perception, these external factors influence the response. The sensations of visual stimuli are moderated by how and when it is represented.

The cultural context in which a user interacts with a product may differ from that of the designer. Accordingly, elements in a cultural context including tastes, trends, fashions, and styles may moderate the type of responses to product visual form. The user's motivation in evaluating product form, the opportunity to continue the consumption process, the marketing programme supporting a product, and the social setting within which a product is used are all considered situational factors that have the potential to influence user responses.

Visual references are sources that can help users understand and interpret sensorial information emanating from a product. In the context of interaction, a newly

encountered product is compared with other concepts, referring to the visual references. Accordingly they may influence user response to a product. Examples of visual references include stereotypes, similar products, metaphors, characters, conventions, and clichés. Crilly et al. (2004) point out that visual references are pooled together through an individual's experiences.

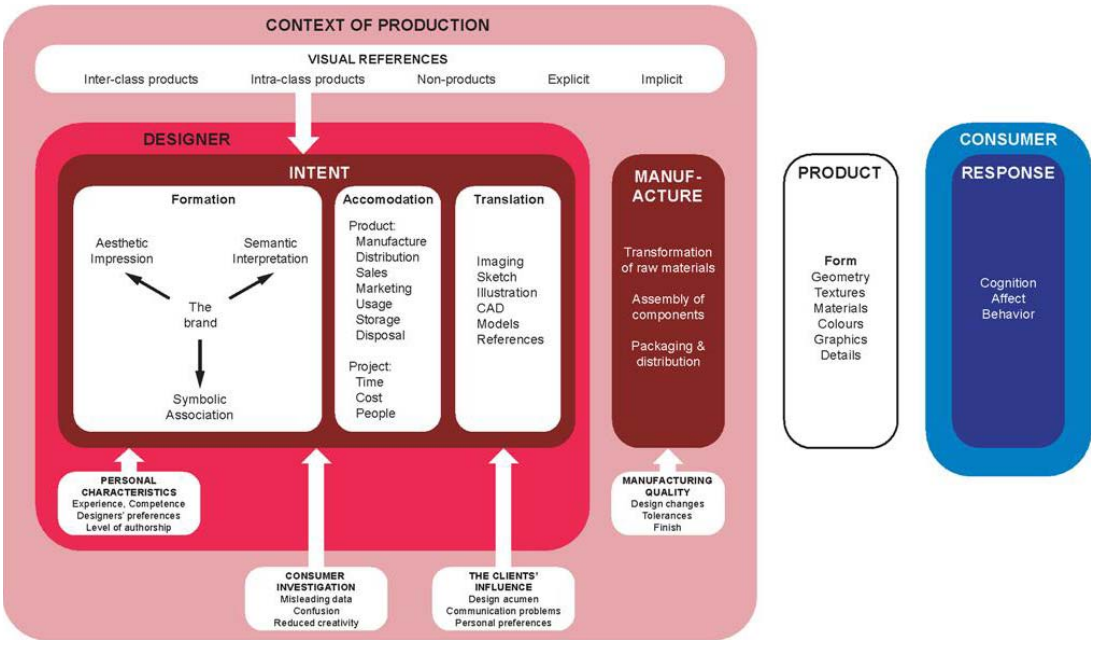


Figure 3.7 Framework for designer intent regarding visual domain in product design (Crilly, 2005)

Figure 3.7 demonstrates designer intentions in relation to generating product visual form together with the contextual factors affecting the intent and thereby the formation of the message. Crilly (2005) observes that product visual form is determined through a combination of designers' intentions with technical, commercial, personal and political pressures. Accordingly, the designer (or design teams) translate their intentions (here classed as aesthetic, semantic, and symbolic aspects of intent) into a physical form that also accommodates design constraints. The three aspects of intent are influenced by the brand that will be marked onto the product. Following the designer intent is the stage of product manufacture, through which intentions are realized in a final physical form to be presented to users.

Accoding to Crilly (2005), designers' intentions or objectives in relation to product visual form relate to the specific responses they wish to evoke. It is clear that almost exlusively, designers intend to induce positive impressions in users. In addition to intentional factors, there are some influencing factors that moderate the generation of product form, such as visual references as the source of inspirations, designers' personal characteristics and preferences, insights gained from user research, and clients' preferences.

CHAPTER 4

METHODOLOGY

The Semantic Differential Method was applied to explore designers' intended perceptions and users' pre-usage perceptions toward product form of some newly designed Turkish seating furniture. The experiment consisted of two stages; (1) constructing the evaluation format to obtain evaluation adjectives and representative products, and (2) the Semantic Differential (SD) study to measure users' and designers' image perceptions.

This study uses the furniture industry as a case to investigate the communication process and also to measure visual perception mismatches between designers and the users. There are some reasons justifying the selection of furniture as an apt case.

Furniture is essential in our daily life. If one thinks about how often people use different types of seat furniture during a typical day, various activities can be imagined, for example when eating, reading, resting, waiting, writing, and so on. Following their function and structure, the visual prominence of furniture is so important since people are in direct everyday contact. Therefore, it can be said that the visual values of furniture, especially seating, are more distinctive when compared with products in other sectors.

The concept of communication through design is highly relevant to furniture design. Across history, the fundamental importance of seat furniture design has been based on the communication of attitudes, ideas, and values, which are embodied in the overall form, material qualities, and symbolic contents of seating (Fiell and Fiell, 2005). Therefore, the visual appearances of furniture are critical determinants of users' perceptions and responses.

Considerable effort is devoted in furniture design to visual form. Besides this, furniture design, in the past or present, has been a common interest of industrial designers.

So based on these reasons, seat furniture was considered a suitable product sector for an investigation into the designer-user communication process through visual form.

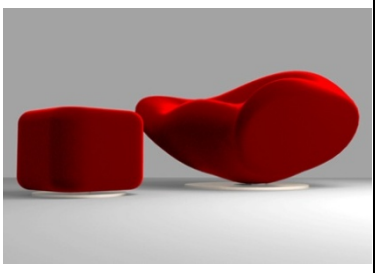
4.1 Stage 1; constructing the evaluation format

4.1.1 Providing representative products

As mentioned earlier, the study was directed towards studying products that represent the current trend of styling in Turkish seat furniture design. Styling refers to aesthetic wrapping of a product in which all visual elements of design (shape, color, texture, material, pattern, and ornament) are put together to convey messages and to differentiate one product from another (Marcus, 2002), with a central reference of visual pleasure (Fung et al., 2004). Therefore, it can be said that product styling is a powerful tool in furniture design. Accordingly, designers are encouraged to devote much attention to the design of new products in shapes and forms that differ from existing products. Styling is interwoven with the development of new lifestyles and thereby new culture.

Within this context, product examples for the study were gathered from a wide variety of seat furniture, each providing the basic function of sitting, e.g. chairs, armchairs, chaise lounges, sofas, and stools, designed by well-known Turkish designers who work for well-known companies. The selection of products was driven by two criteria: (1) products should represent the new edge in Turkish design, being innovative or novel in terms of their visual form; (2) products should be explicitly available to, or targeted at, Turkish users (they may also cover foreign users) because the study required access to Turkish users as research participants. The date of the design and the retail price were not important in the selection process.

Table 4.1 Representative products used in the study

Participants	Product examples	
Öznur ÇÖMLEK (Representative of the design team) Made by **Autoban** Design company		
Alp NUHOĞLU (Designer) Made by **B&T** Design company		
Tanju ÖZELGİN (Designer) Made by **B&T** Design and **Nurus** companies		
Aziz SARIYER (Designer) Made by **Derin** Design company		

To begin with, about twenty representative products created by ten Turkish designers were selected from amongst the wide variety of potential products that were gathered. Then, a reduction to eight products was made, based on the requirement that the designers of the pieces must be available as research participants in the SD study of stage 2. Consequently, three individual designers and one representative of a design team agreed to participate in the study (Table 4.1).

4.1.2 Providing descriptive adjective pairs (image-word pairs)

When people interact with a visually appealing product, they like to interpret its expressive qualities and characters, which portray values hidden in the product visual form. Adjectives are the words one uses to describe ideas and impressions about an object or a person. Krippendorff (2006) insists that without adjective constructions it would be difficult for one to distinguish the properties of things. Adjective pairs, which refer to the polar extremes of semantic attributes and characters that can be labeled to a product, are frequently used to describe people's perceptions regarding product visual form.

The literature points to no specific group of adjective pairs that can be applied to all product categories, or to one specific product category (in this case seating/furniture). So, to decide on appropriate adjective pairs for the Semantic Differential test of stage 2, four steps were taken.

In the first step, based on a literature review, forty seven image-word pairs (adjectival antonyms) mostly from previous Semantic Differential studies (Hsiao and Chen, 2006; Mondragon et al., 2005; Chuang et al., 2001; Hsu et al., 2000; and Maurer et al., 1992) and some from Krippendorff (2006), were found to be relevant to express perceptions in relation to visual form of furniture. Most of the adjective pairs originated from the study conducted by Hsiao and Chen (2006) on the affective responses to product forms of an automobile, sofa, and kettle (Table 4.2).

Table 4.2 Adjective pairs used in preliminary test

Cute - not cute	Dazzling- ordinary	Reliable - unreliable	Contemporary - traditional
Feminine - masculine	Rational - emotional	Strong - weak	Avant-garde - conservative
Futuristic - nostalgic	Innovative - imitative	Attractive - repulsive	Formal - casual
Elegant - not elegant	Heavy - light	Ornate - plain	Comfortable - uncomfortable
Mature - immature	Varied- monotonous	Practical - decorative	Excited - calm
Dynamic - static	Consistent - inconsistent	Compact - large	Soft - hard
Simple - complex	Delicate - rough	High technology - low technology	Easy to clean- difficult to clean
Streamlined - rugged	Truthful-exaggerated	Specialized - popularized	Flexible - rigid
Steady - unsteady	Old - young	Easy to use - difficult to use	Quiet- noisy
In fashion - out of fashion	High class - low class	Global - local	Safe - dangerous
Clear - confusing	Efficient - inefficient	Balanced - imbalanced	Orderly-disorganized
Aggressive - submissive	Warm - cold	Proud - humble	

One of the most difficult tasks in conducting Semantic Differential study is to follow a time-consuming method to extract appropriate adjective pairs to evaluate product form perception. However, this study used previous studies as references, and then adjective pairs from those studies were cross-checked in order to collect adjective pairs to be applied in measuring visual perception of seating units. In the relevant Semantic Differential studies, the attribute pairs (adjective pairs) were identified by following a projection method and then a keyword analysis. Through the projection method, subjects, who were expressive about product form, were encouraged to express their perceptions of real product samples or photographic images of products. The subjects' verbal descriptions of their perceptions of the product visual form were recorded. Through the keyword analysis the attributes with higher distribution frequency were collected and classified.

In the second step, to bring some order to the collection of adjective pairs, and to ensure an even spread of pairs relating to different aspects of product visual form, the pairs were classified into four proposed categories:

(1) Adjective pairs of *social values and positions*,

(2) Adjective pairs of *perceived usability and interaction*,

(3) Adjective pairs of *visual qualities*, and

(4) Adjective pairs of *impression and emotion.*

The intention of imposing such a classification was to help research subjects to evaluate the adjective pairs in a consistent context; without a classification, the different pairs may not be understood to have the same meaning to all subjects (Table 4.3).

The subject of classification of adjective pairs is not a well-studied topic in design-related literature. Krippendorff (2006) in his book titled *The Semantic Turn: A New Foundation for Design* identifies five types of adjective pairs used to describe the character traits of an artifact, which are explained in his words as follows:

- Adjectives that are seemingly objective and potentially measurable in quantitative terms; (i.e. Fast - Slow, Large - Small, Bright - Dark)
- Adjectives of evaluation, especially aesthetic; (i.e. Beautiful - Ugly, Balanced - Imbalanced, Ingenious - Trivial)
- Adjectives of social values and positions; (i.e. High class - Low class, Expensive - Cheap, Universal - Individual)
- Adjectives of causes for particular emotions; (i.e. Exciting - Boring, Appealing - Revolting, Frustrating - Satisfying)
- Adjectives of interface qualities; (i.e. Reliable - Unreliable, Clear - Confusing, Efficient - Inefficient)

Table 4.3 Classification of adjective pairs based on Table 4.2

Group 1:Adjective pairs of **social values & positions**	Group 2:Adjective pairs of **perceived usability & interaction**	Group 3:Adjective pairs of **visual qualities**	Group 4:Adjective pairs of **impression & emotion**
In fashion - Out of fashion	Easy to use - Difficult to use	Elegant - Not elegant	Emotional - Rational
High class - Low class	Easy to clean - Difficult to clean	Futuristic - Nostalgic	Attractive - Repulsive
Contemporary - Traditional	Reliable - Unreliable	Dynamic - Static	Cute - Not cute
Avant-garde - Conservative	Safe - Dangerous	Streamlined - Rugged	Excited - Calm
Specialized - Popularized	Delicate - Rough	Steady - Unsteady	Dazzling - Ordinary
High technology- Low technology	Flexible - Rigid	Innovative - Imitative	Aggressive - Submissive
Formal - Casual	Comfortable- Uncomfortable	Varied - Monotonous	Feminine - Masculine
Global - Local	Clear - confusing	Consistent - Inconsistent	Mature - Immature
Practical - Decorative	Efficient - Inefficient	Simple - Complex	Young - Old
		Ornate - Plain	Heavy - Light
		Compact - Large	Strong - Weak
		Soft - Hard	Quiet - Noisy
		Balanced - Imbalanced	Truthful - Exaggerated
		Orderly - Disorganized	Proud - Humble
			Warm - Cold

Hsiao and Chen (2006) also identify four perception factors underlying the dimensions of affective responses to product forms from their automobile, sofa, and kettle study:

- Factor 1; called “trend factor” since evaluation adjectives relate to time, familiarity, and trend (i.e. contemporary- traditional, old- young)
- Factor 2; called “emotion factor” since evaluation adjectives relate to the emotional character of a product (i.e. rational - emotional, feminine - masculine)
- Factor 3; called “complexity factor” since evaluation adjectives is about the shape complexity (i.e. simple- complex)
- Factor 4; called “potency factor” since evaluation adjectives relate to the psychological weight conveyed by the product shape (i.e. heavy - light, strong - weak).

There is also a classification of adjective pairs which is used in psychological studies in relation to the semantic differential approach developed by Osgood et al. (1957). They identify three factors underlying most of the adjectival constructions that people use to describe their world:

- Evaluative factors (i.e. good - bad)
- Potency factors (i.e. strong – weak)
- Activity factors (i.e. active - passive)

Although these classifications of adjective pairs were useful as background information, it was still necessary to devise a categorization applicable to visual attributes of furniture.

In the third step, the adjective pairs were translated from English to Turkish, to be used in product evaluation forms. The Semantic Differential study was conducted in the participants’ preferred language (Turkish or English). The English adjective pairs were translated into Turkish by the help of an English-Turkish dictionary. The translations later were checked through a Turkish-English dictionary. Then, some irrelevant translations were corrected by one native Turkish speaker with design background who is also superior in English. However, there existed some adjectives that had different meanings in Turkish. So it was needed to identify the most relevant meanings.

In the final step, consultation was made with six staff of the Department of Industrial Design, METU, in order to (i) identify and rectify any adjective pairs that were not considered appropriate, (ii) verify the classification of the adjective pairs, and (iii) check the English-Turkish translations.

It was known that the SD study would be administered through a questionnaire. To get helpful feedback, a draft of the questionnaire was prepared for the METU staff to check. In the questionnaire, the subjects were introduced with the purpose of the study and the proposed methodology in order to be clear about the scope of the study. They were asked to decide on each descriptive adjective pair regarding whether they found it (i) applicable to furniture and (ii) closely tied to its stated category. The results of the consultations are discussed as follows;

4.1.2.1 Category 1; adjective pairs of *Social Values and Positions*

The group of adjective pairs under the title of 'social values and positions' was validated. Except for adjective pairs *Specialized-Popularized* and *Practical-Decorative*, all pairs were found to be applicable to visual form evaluation. The *Specialized-Popularized* was removed as it was considered that it doesn't make sense, or it may not be interpreted in the same manner by all users. The *Practical-Decorative* was thought not to be relevant to this category. It is about perceived usability attributes of a product. Moreover, the subjects insisted that it is not exactly an opposite adjective pairs. Therefore, the moving of *Practical-Impractical* to the second category (usability and interaction) was suggested. The adjective pair of *Expensive-Cheap* was recommended to be added, since it is a most common behavior of people in a society to ascribe a price to a product based on product appearance before knowing its real price. Another adjective pair that was proposed as an addition was *In fashion-Out of fashion*. When on the topic of fashion, jewelry and clothing product categories are usually the main focus. However, the results of a study (Fung et al., 2004) give good indication that fashion trends exist in other product categories, including furniture (Table 4.4).

Table 4.4 Adjective pairs related to social values and positions

	Adjective Pairs (English)	**Adjective Pairs (Turkish)**
1	In fashion - Out of fashion	Moda - Demode
2	High class - Low class	Üst sınıf - Alt sınıf
3	Contemporary - Traditional	Çagdaş - Geleneksel
4	Avant-garde - Conservative	Yenilikçi - Tutucu
5	High technology- Low technology	Yüksek teknoloji - Düşük teknoloji
6	Formal - Casual	Resmi - Gayri resmi
7	Global - Local	Evrensel - Yöresel
8	Expensive - Cheap	Pahalı - Ucuz

4.1.2.2 Category 2; adjective pairs of *Usability and Interaction*

The title of 'usability and interaction' was a modification of the original 'perceived usability and interaction' category title, because all adjective pairs used in this study are perceived attributes of a product. Except for *Efficient-Inefficient*, all adjective pairs were identified to be applicable to this category. *Efficient-Inefficient* was rejected because it was argued that seating is not a mechanical object or a device based on performance, on which the concept of efficiency relies. To be clearer in meaning for the research participants, the adjective pair *Delicate-Rough* was modified to *Robust-Delicate*. *Comfortable-Uncomfortable* is a common or 'standard' expression of perceived attributes of seating. It was applied to help participants express their mental images regarding whether the sample furniture makes them anticipate a physically comfortable state (or otherwise) when using the product. However, for the purposes of finding out whether participants regarded the the sample chair as suitable for relaxation or for working, the adjective pair *Formal-Casual* was most relevant (and appears in the first category). As mentioned in section 1.2.1, *Practical-Impractical* was added to this category. *Steady-Unsteady*

was moved from the third category (visual qualities) to the second category, whilst *Heavy-Light* was also moved, from the fourth category (personality characteristics) to the second category. Both of these adjectives pairs were considered better matched to perceived usability and interaction. In the end, eleven adjective pairs were adopted for the 'usability and interaction' category (Table 4.5).

Table 4.5 Adjective pairs related to usability and interaction

	Adjective Pairs (English)	**Adjective Pairs (Turkish)**
1	Easy to use - Difficult to use	Kullanımı kolay - Kullanımı zor
2	Easy to clean - Difficult to clean	Temizlemesi kolay - Temizlemesi zor
3	Reliable - Unreliable	Güvenilir - Güvenilmez
4	Safe - Dangerous	Emniyetli - Tehlikeli
5	Robust - Delicate	Dayanıklı - Narin
6	Flexible - Rigid	Esnek - Bükülmez
7	Comfortable - Uncomfortable	Rahat - Rahatsız
8	Clear - confusing	Anlaşılır - Kafa karıştırıcı
9	Practical - Impractical	Kullanışlı - Kullanışsız
10	Steady - Unsteady	Sabit - Oynak
11	Heavy - Light	Ağır - Hafif

4.1.2.3 Category 3; adjective pairs of *Visual Qualities*

The title of 'visual qualities' was verified for the related adjective pairs. However, *Futuristic-Nostalgic*, *Streamlined-Rugged*, *Steady-Unsteady*, *Varied-Monotonous*, and *Balanced-Imbalanced* were removed from this category. *Futuristic-Nostalgic* was found not to be relevant to the category, but better placed in category four

(personality characteristics). *Streamlined-Rugged* was suggested to be replaced by two adjective pairs, *Symmetrical-Asymmetrical* and *Organic-Geometric*. Regarding *Varied-Monotonous*, it was argued that it may be difficult for participants to make their evaluation on a single product (i.e. it suggests the evaluation of more than one of the products within an environment). With respect to *Balanced-Imbalanced* and *Steady-Unsteady*, it was emphasized that these adjectives were too 'designerly' in their description of product visual elements. That is, the use of such language is connected to a design training, whilst for the untrained eyes such language is very abstract. Table 4.6 lists the adjective pairs used for the evaluation of visual qualities.

Table 4.6 adjective pairs related to visual qualities

	Adjective Pairs (English)	**Adjective Pairs (Turkish)**
1	Elegant - Inelegant	Zarif - Zarafetsiz
2	Dynamic - Static	Hareketli - Durağan
3	Innovative - Imitative	Yenilikçi - Taklitçi
4	Consistent - Inconsistent	Tutarlı - Tutarsız
5	Simple - Complex	Yalın - Karmaşık
6	Ornate - Plain	Süslü - Sade
7	Compact - Large	Az yer kaplayan - İri
8	Soft - Hard	Yumuşak - Sert
9	Orderly - Disorganized	Düzenli - Düzensiz
10	Symmetrical - Asymmetrical	Simetrik - Asimetrik
11	Organic - Geometric	Organik - Geometrik

4.1.2.4. Category 4; adjective pairs of *Personality characteristics*

The title of 'personality characteristics' was advised for this category as an alternative for 'impression and emotion'. It was argued that the adjectives proposed for this category were not exactly related to one's emotional responses elicited by the visual appearance of a product. According to Krippendorff (2006) they are 'adjectives of causes for particular emotions'. Of course, designers are interested in eliciting positive emotions from users of their products, however, this study is product-focused rather than emotion-focused. Nonetheless, it is advocated that adjectives under all four groupings will have some degree of affect on users' emotions towards products. As it is mentioned in some literature, the adjective pairs within this final group refer to personality characteristics that one may ascribe to a product visual form. Therefore, the best and clear name that can be given to this category is 'personality characteristics'.

The adjective pairs *Emotional-Rational*, *Cute-Not Cute*, *Heavy-Light*, and *Strong-Weak* were advised to be removed. *Futuristic-Nostalgic, Friendly-Unfriendly,* and *Interesting-Boring* were advised to be added. *Emotional-Rational* was considered too scholarly for user evaluations. *Cute-Not Cute* was thought to be too subjective and confusing, and in turn too difficult to be understand, or simply without a clear meaning. *Heavy-Light* did not fit to the theme of the category, whilst *Strong-Weak* was very ambiguous. It was queried about what sense a seat can be strong or weak. If it is about power ascribed to objects, it is hidden in such adjectives as young, and masculine; if it is structurally strong or weak then it is a physical property. The adjective pair *Excited–Calm* was adapted to *Exciting–Calm* because the pair should refer not to how one feels when exposed to a product, but to the character one ascribes to a product at first glance. *Dazzling-Ordinary* was modified to the *Extraordinary–Ordinary*. Table 4.7 lists the adjective pairs used for evaluating personality characteristics. Table 4.8 collates the final categorizations of the adjective pairs used for the Semantic Differential study (44 adjective pairs across four categories).

Table 4.7 Adjective pairs related to personality characteristics

	Adjective Pairs (English)	**Adjective Pairs (Turkish)**
1	Attractive - Repulsive	Çekici - İtici
2	Exciting - Calm	Heyecan verici - Sakin
3	Extraordinary - Ordinary	Olağan dışı - Sıradan
4	Aggressive - Submissive	Saldırgan - Uysal
5	Feminine - Masculine	Kadınsı - Erkeksi
6	Mature - Immature	Olgun - Toy
7	Young - Old	Genç - Yaşlı
8	Futuristic - Nostalgic	Gelecekçi - Nostaljik
9	Quiet - Noisy	Sessiz - Gürültülü
10	Truthful - Exaggerated	Gerçekçi - Abartılı
11	Proud - Humble	Iddialı - Gösterişsiz
12	Warm - Cold	Sıcak - Soğuk
13	Interesting - Boring	İlginç - Sıkıcı
14	Friendly - Unfriendly	Samimi - Gayri samimi

Table 4.8 Full list of adjective pairs used for SD study

Group 1:Adjective pairs of **social values & positions (n=8)**	Group 2:Adjective pairs of **usability & interaction (n=11)**	Group 3:Adjective pairs of **visual qualities (n=11)**	Group 4:Adjective pairs of **personality characteristics (n=14)**
In fashion - Out of fashion	Easy to use - Difficult to use	Elegant - Inelegant	Attractive - Repulsive
High class - Low class	Easy to clean - Difficult to clean	Dynamic - Static	Exciting - Calm
Contemporary - Traditional	Reliable - Unreliable	Innovative - Imitative	Extraordinary - Ordinary
Avant-garde - Conservative	Safe - Dangerous	Consistent - Inconsistent	Aggressive - Submissive
High technology- Low technology	Robust - Delicate	Simple - Complex	Feminine - Masculine
Formal - Casual	Flexible - Rigid	Ornate - Plain	Mature - Immature
Global - Local	Comfortable - Uncomfortable	Compact - Large	Young - Old
Expensive - Cheap	Clear - confusing	Soft - Hard	Futuristic - Nostalgic
	Practical - Impractical	Orderly - Disorganized	Quiet - Noisy
	Steady - Unsteady	Symmetrical - Asymmetrical	Truthful - Exaggerated
	Heavy - Light	Organic - Geometric	Proud - Humble
			Warm - Cold
			Interesting - Boring
			Friendly - Unfriendly

4.2 Stage 2; conduct of the Semantic Differential study

An empirical study was conducted to investigate the relationship between designers' and users' ascription of meanings to products based on appearance, as a means to validate or refute arguments proposed in the thesis. To achieve this, the Semantic Differential (SD) method was applied. The Semantic Differential method, developed

by Osgood et al. (1957), is a commonly used procedure to ascertain semantic differences between the characters of objects, to conceptualize character, and to assess affective meaning elicited by product appearance, using a set of bipolar adjective pairs, e.g. good-bad, on a series of 7-point or 5-point Likert scales.

The investigation was made on eight items of seating furniture and was composed of two stages; (1) exploring designers' intended messages encoded in product visual form, and (2) exploring users' perceived messages encoded in product visual form.

4.2.1 Exploring designers' intended messages encoded in product visual form

Before evaluating the designers' intended perceptions, it was necessary to explore what messages the designers had in mind when designing. It is proposed that designers are sensitive and expressive about product forms and this becomes increasingly so when they are asked to talk about their own designs. To understand the extent to which designers are successful in communicating their intended messages, two sections below were followed.

4.2.1.1 Investigating designers' overall intentions

As it was mentioned before, three individual designers and one representative designer of a design team agreed to participate in the study. A questionnaire was devised to probe designers' intentions. The first part of the questionnaire aimed to understand the designers' intentions in relation to product visual form. The designers were first asked to explain who gave the product name, and why, and then if needed, a new name summarizing the visual characteristics of the product was requested.

The questionnaire included questions about the intended messages and values hidden in the visual appearance of their products, and through which particular product attributes the designers hoped to convey these messages to target users.

To understand the extent to which designers pay attention to users in general, with reference to serving unexpressed needs and desires including perception attitudes, they were asked if they were sure that their target users would receive the messages they argue about, and on what basis they support their expectations.

The designers were asked if they had intended users in mind when designing, and on the questionnaire to fill in the demographic information of the target users including their age, gender, income level, and level of education together with a description of users' lifestyle and characteristics identified through design scenarios.

Then, the designers were asked to state their general opinions about whether or not their intentions in relation to product form have been actually realized in the manufactured product. Based on the designers' answers, the discussion on the process of communication from designer to user could be illuminated. For example, if one of the designers' intentions was not realized in the manufactured product, the process of communication failed at this stage with no need for further investigation (for full questionnaire see Appendix A).

4.2.1.2 Identifying designers' intended perceptions

In this section of the questionnaire, the designers were informed to focus on the image-words that they aimed to communicate to users through the product form only (and to ignore image-words related to physical interaction or performance, which were subjects beyond the scope of this study).

Further, the designers were asked to evaluate their own perceptions according to a SD Likert scale for those adjective pairs they considered applicable to their product. A 5-point Likert scale was employed, because the use of a longer scale was considered inappropriate since it was unlikely users would be able to distinguish subtle differences in product forms. Using standard procedures, the Likert scale was constructed as "(++) (+) (0) (+) (++)" to indicate levels of agreement or neutrality towards the bipolar adjectives.

4.2.2 Exploring users' perceived messages encoded in product visual form

A second questionnaire was developed to investigate the meaning of product forms as attributed by users. Ten users were involved in evaluating each of the eight product examples, resulting in a total of 80 product evaluations. The detailed profile of the target users for each product is explained in a later chapter. One of the most difficult and critical tasks of this study was to approach to ten target users of each product example. Discussing about the target users' social status, characteristics and

lifestyles, designers were asked to mention in which places and in which regions of town the author can find their intended users. Before commencing the questionnaire with users, it was important to pose some questions on demographic information to be sure that their occupations and interests matched those mentioned as target users by designers. Although everybody approached undertook the questionnaire, the data collected from the users that didn't match to the profile of target users were rejected to be used in the analysis stage. The study was conducted at ADDRESSISTANBUL Design Center, high class cafes and shopping centers/Istanbul, Bebek seaside/Istanbul (especially for evaluating Sumo product as outdoor seating), architecture faculties of Istanbul Technical University, and Middle East Technical University.

The participants were provided with Turkish and English versions of the questionnaire and requested to choose one to fill in. Although the questionnaire to designers was performed entirely in Turkish, users opted for their questionnaire to be run either in English or Turkish at an approximate division of 50:50. A typical session took between 10 and 20 minutes. The products were represented through colored pictures printed on A3 paper and accompanied by the product dimensions. The pictures were selected by the product designer as appropriate for use in the study.

The participants were asked if they were in a good mood to answer the questionnaire, as mood might affect perceptions. Also, the participants were guided to make their evaluations on the basis of the product's characteristics, and not just a literal interpretation on the basis of the product pictures.

The first three questions were employed to prepare participants for the SD study, and can be considered a warm-up session. However, this session usefully provided an alternative (but less systematic) way to reveal users' perceptions of encoded messages. Users were asked to draw or write their first impressions of the product form and to give a name to the product that comes to their mind. Users were asked to express the kinds of messages they received through product visual form or what product visual form coveys. Then, users were asked to identify product attributes

through which they receive product messages. However, this approach may have a drawback since it relies on users' abilities to deconstruct a product into component forms and attributes, which they may not necessarily be able to do.

After the warm-up session, the participants move on to the SD study, which would lead to a quantitative analysis of their perceptions. The same approach and scales were used as for the study of designers' intentions (see Appendix B).

Figure 4.1 A session of user's evaluation of Ball product

CHAPTER 5

RESULTS AND ANALYSIS

This chapter discusses the results and analysis procedure of the conducted case study. The communication process between the designer and the target users through each of the products is argued separately, and then the process is cross compared over the 8 product examples in order to provide answers to the proposed research questions.

Different types of data, qualitative and quantitative data, were collected from the questionnaire. The qualitative data involve first impression, denotation and connotation levels of meaning, and analogy statements. The quantitative data refer to the numerical data collected from subjects' ratings on Semantic Differential scales. The analyses of the two types of data are discussed in the following sections, individually for each product. The analysis methods are explained in detail for the first section, which deals with product example 1 (AS). The subsequent sections, for the remaining 7 products, make use of the same analysis methods.

5.1 Analysis of product example 1 (Sledge)

Product example 1 (Sledge) is made by Autoban Design company, which is established by the architect Seyhan Özdemir and interior designer Sefer Çaglar. They are the heads of the Autoban design team. They introduced Öznur Çömlek as a member of their design team appointed to participate in the study. Mrs. Çömlek holds a master degree in industrial design from Istanbul Technical University. The abbreviation of 'AS', which derives from Autoban (name of the company) and Sledge (name of the product), is used throughout this section as the product code (Figure 5.1.1).

The intended user group of AS, according to Autoban's design scenarios, was identified by Mrs. Çömlek (see Table 5.1.1). Ten (10) users were selected to participate in the survey, by completing a short interview to gauge their demographic information, occupations and interests. The ten participants who were considered to fit to the designers' intended user profile are identified in Table 5.1.2.

Figure 5.1.1 Product AS created by Autoban design team

Table 5.1.1 Specifications of the intended user group related to AS product

Gender	Male and female
Age range	25-48
Income level	Moderate and high
Level of education	Undergraduate and graduate
Lifestyle and personality	Young, energetic, active, enjoy travelling, appreciate aesthetics
Occupations	Advertiser, graphic designer, artist, architect, designer, or creative, artistic, and skillful principles

To begin with, it is helpful to mention the designer's perspective on the product form and its messages intended to be received by users. Mrs. Çömlek put forward that the intended form and the content of the form of AS had been exactly realized in the

manufactured product. She stated that the design team members were aware of design languages and took users' perceptions into account. She argued that users would receive the messages that designers had intended, based on the designers' professional experience and artistic inspirations.

Table 5.1.2 List of users participating in the evaluation of AS product

users	gender	Age range	Level of education	occupation
1	Male	25-36	Undergraduate	Packaging designer
2	Male	25-36	Undergraduate	Packaging designer
3	Male	25-36	Undergraduate	Photographer
4	Female	25-36	Graduate	Industrial designer
5	Female	37-48	Some college	Architect
6	Male	25-36	Doctoral	Industrial designer
7	Male	25-36	Undergraduate	Architect
8	Male	25-36	Undergraduate	Architect
9	Female	25-36	Graduate	Student
10	Male	25-36	Undergraduate	Student

The comparison of designers' intended messages and users' perceived messages are discussed under the three sections of (1) associated names, (2) intended attributes versus perceived attributes, and (3) semantic differential study.

5.1.1 Names associated with AS

To explore what the AS image signifies for the intended users, they were asked to give a name to the product, which may define the characteristics of the AS's visual form. The users also were given a chance to draw their first impressions. Tables 5.1.3 and 5.1.4 contain the results.

Table 5.1.3 Mental images elicited from AS at first glance

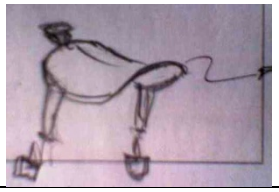
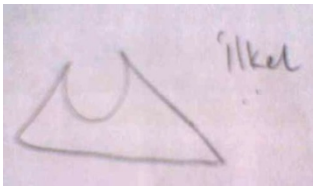
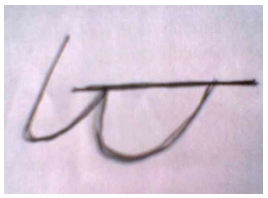
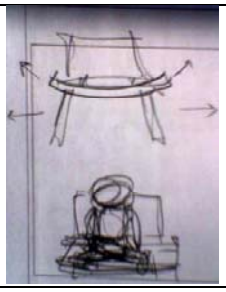
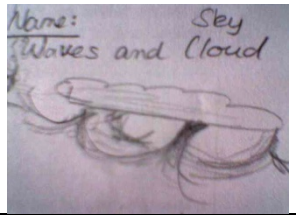
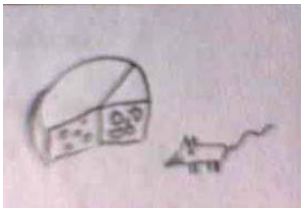
Stimulus	Analogies	
  	U1	U2 
	U3 	U4 
	U5	U6
	U7 	U8 
	U9 	U10 

Table 5.1.4 Comparison between the designer's product name and names given to AS by users

Designer	Users	
SLEDGE (Its design is directly inspired by the form of a sledge…)	1	Grandpa (it is old & traditional)
	2	Horse Saddle (leather seat & negative circle space on the frame)
	3	Snowboard (shape, dynamic, mature)
	4	Primitive
	5	…
	6	Arch, Curve (curved lines on the frame)
	7	Chink, Cleft (Turkish: Gedik)
	8	Sit-Lie (comfortable)
	9	Waves & cloud (movement and stableness)
	10	Alpine cheese (circles on the frame, cutting edges)

According to the designer, the name 'Sledge' was given to the AS by the design team because the visual characteristics of a sledge were influential factors in determining the product form. On the other hand, users with the help of imagination tried to deconstruct the visual characteristics of the AS product form into familiar sketched analogies. In comparing the sketched analogies and the names proposed by users, the former method seems to have been the most effective at eliciting product form signals that matched designers' intentions.

As the essence of the given names and analogies imply, three kinds of names could be distinguished. The first kind of names refers to objects or concepts around us that exist in reality such as Horse Saddle, Snowboard, Waves & Cloud, and Alpine Cheese. It reveals that users found similar attributes involving aesthetic, function, material, and other characteristics in these objects as they found in the AS. The second group refers to such attributes that lead to a direct assessment of form or function independent of a product reference, such as Primitive, Arch, Chink, Sit-Lie. For example, the name of Sit-Lie not only explains about the product from but also suggests a level of product comfort. The last group refers to the personality of the product form. The name of Grandpa given by the first user describes the product personality as being old, traditional. The results show that semantically the name Snowboard is the closest name to the Sledge. So it can be said that design team were slightly successful in transmitting messages that would lead users to understand the choice of product name Sledge.

5.1.2 Intended attributes versus perceived attributes (AS)

This section compares the design team's explicit messages for the product with the messages that users' perceived from the product. This argumentation is based on a linear communication process: designer (architect of meaning) → product form (medium for embodying meanings) → intended users (construers of meaning). In other words, it takes into consideration that designers or design teams encode certain messages through product form, which are intended (or at least hoped) to be communicated with clarity to users.

The results were intended to reveal those values of product visual form that were important or dominant for the designer to communicate to users. Equally, it was

anticipated that dominant values of product visual form influential in evoking users' perceptions would be identified.

To compare the communicated messages through product from of the AS, statements on this matter gathered from the designer and user questionnaires were considered. The key messages or attributes of the product form could then be extracted. As an example, where one user had stated that "the form of product is used for function" (user 4), it signified that the subject had perceived the product form to be functional. So, Functional attributes of the AS were taken into consideration. There were some users that directly stated specific attributes of product form that they perceived, e.g. "traditional, old, uncomfortable, hard" (user 1).

The content analyses of the communicated attributes of the AS are assembled in Table 5.1.5. The communicated attributes were found to usefully group into five categories: (1) Social Values & Positions, (2) Usability & Interaction, (3) Visual Qualities, (4) Personality Characteristics (see Chapter 4), and one that was associated with connotative meanings of products, considered as (5) Overall Impression.

Based on an overall look at the distribution of attributes and their frequency of mention, it can be observed that the design team of the AS wished to transmit positive attributes that fell mostly within the Usability & Interaction and Personality Characteristics categories. However, the attributes related to Social Values & Positions, and Visual Qualities were not concerns of the designers. According to the Overall Impression attributes mentioned by the designers, it was found that designers intended to reach an overall visual form that induced a positive emotional impression. From these findings, it can be said that positive attributes in relation to Usability & Interaction and Personality Characteristics were the two dominant aspects of product visual form that the designers intended to communicate with users.

On the other hand, an examination of the distribution of attributes data originating from users reveals that product visual form evokes attributes that are related to Usability & Interaction (with 16 statements), Personality Characteristics (with 11 statements), and Visual Qualities (with 8 statements). The Social Values & Positions

category (with 1 statement) caught users' attentions the least. Therefore, in contrast to the designers' intent, users found product form attributes under the Visual Qualities category to be useful in describing their perceptions of product form.

In contrast to the designers' overall impression, which indicated that the product visual form aimed to please and inspire users, the actual overall impression received by users was more detailed, and related to the 'experience of meaning' level of product interaction (see Desmet & Hekkert, 2007), as well as the users' judgmental behavior. In the example 1 (below), it is clear that the user attached the product to Andrea Branzi's designs. The idea that 'people see what they already know' is highly relevant to the attribution of overall impressions. In the example 2, the user made his judgment on the product's usability attributes. It may signify that the user didn't perceive it as very comfortable.

> *Example 1 (experience of meaning); "Its form reminds me Andrea Branzi…" (user4)*
> *Example 2 (judgmental behavior); "Its design tells that you may not fall asleep on it…" (user10)*

Table 5.1.5 Comparisons between designer's intentions and users' perceived attributes

SLEDGE	Designer	Users	
Social Values & Positions		1	Traditional
		2	
		3	
		4	
		5	
		6	
		7	
		8	
		9	
		10	
Usability & Interaction	Low chair, comfortable, sustainable, customized,	1	Uncomfortable
		2	
		3	
		4	Functional, low chair, comfortable

		5	Practical, comfortable, wide
		6	
		7	Well-seated, comfortable
		8	Comfortable, wide
		9	Stable, clear thoughts
		10	Safe, stable, light (circles on frames)
Visual Qualities		1	Hard
		2	
		3	Dynamic
		4	Primitive, Contrast
		5	Chic
		6	
		7	
		8	
		9	Balance, plain, soft
		10	
Personality Characteristics	Enjoyable, funny, playful, childish	1	Old, conservative
		2	
		3	Mature, nostalgic
		4	Attractive
		5	
		6	
		7	
		8	Interesting
		9	Relax, calm, friendly, warm
		10	Attractive
Overall Impression	This lounge chair reminds us of playing outside on snowy winter days, while offering itself as the cozy refuge indoors.	1	It reminds you some memories; you can take seat for a long time…
		2	It reminds us a moment when someone rides a horse…
		3	The combination of leather & wood reminds me the beginning of 20th century, some nostalgic, and Scandinavian- American style…
		4	Its form reminds me Andrea Branzi…(architect & designer, professor of ID at Politecnico Di Milano…working for Alessi, Artemida, Cassina,…)
		5	Design should be for function, no need to tell you something…
		6	Representing the characteristics of wood…
		7	…
		8	…
		9	Its design gives you feel of freedom and self-confidence …
		10	Its design tells that you may not fall asleep on it…

Table 5.1.5 (continued)

It of course is a debatable topic whether all messages evoked by product visual form can be regarded as messages that the designer/design team intended, anticipated, or at least are responsible for. However, this study focuses on the communication or exchange of designers' *intended* messages, and more especially the extent to which target users get close to *receiving* the intended messages, which can be called real or true messages.

By looking in Table 5.1.5 at intended messages expressed by the designer for the Usability & Interaction category, it can be seen that the design team could not evoke within users an impression of sustainability and customization. However, the design team successfully conveyed the impression that the product was comfortable to four (4) users. Nonetheless, only one user perceived the product as being a low chair.

Regarding the personality of the product, the design team aimed to convey the meanings enjoyable, funny, playful, and childish, however the users found it as an old, mature, relaxing, and calming product. This shows that design team failed considerably in their ambition to convey certain messages to users as Personality Characteristics.

Table 5.1.6 identifies specific physical attributes of AS through which the designers aimed to communicate their product messages, and through which users actually received messages. The results support the observation that product visual form, allied to material surface qualities, are a critical determinant in the communication of product messages.

Table 5.1.6 Identification of physical product attributes of AS through which messages were communicated

Designer	Users	
Form, (color, shape of frame) Function, Material, especially woody frame	1	Form; conservative form Materials; wood, matt leather
	2	Form; circle shapes Materials; leather
	3	Form, (angular and dynamic legs) Material, wood and leather together
	4	Form, (form for function, grown and black color, contrast of negative and positive space on the frame, curved)
	5	Functional form Material, a chic wooden workmanship
	6	Form Material, a appearance of massive wood
	7	Form, (shape of frame) Material
	8	Form, (color, shape of frame) Function
	9	Form, (circles on the frames, black & woody colors, shape of frame, squared shape of seat and back) Function,(nothing limit your behavior while sitting) Material, especially woody frame
	10	Form, (color of wood and leather, shape) Material

5.1.3 Semantic Differential study (AS)

This section discusses the results and analysis procedure of the Semantic Differential study, carried out as a rigorous quantitative method to compare designers' intended perceptions from product form and users' actual visual (pre-usage) perceptions.

As mentioned in chapter 4, 44 bipolar adjective pairs representative of product attributes falling under four categories were selected for use in the Semantic Differential (SD) study. SD studies were conducted with the designers and users in the same format (see Appendix A & B). Subjects were asked to express their perceptions of a sample product for each bipolar adjective pair using a 5-point Likert scale.

Since these adjective pairs were opposite in meaning, e.g. beautiful-ugly, the 5-point scale was constructed with two directions in the format ++, +, 0, +, ++. An alternative 5-point scale using the format -2, -1, 0, +1, +2 was rejected as it was thought firstly to affect the subjects' response behaviors, and secondly the characteristics of negative (-) and positive (+) directions would encourage subjects to make advance judgments that adjectives placed on the left of the scale had negative connotations and those on the right had positive connotations, when no such mapping was intended. However, in the analysis procedure following data collection, in order to quantify the subjects' perceptions and also identify the subjects' positions on the scale, the Likert data was mapped from ++, +, 0, +, ++ to -2, -1, 0, +1, +2.

Since the SD data led to a comparison between one (1) designer and ten (10) intended users, it was decided following some trials that statistical methods were not especially useful in revealing the main results. Instead, an analysis based directly on the empirical results on a user-by-user basis was carried out, leading to identification of the significant mismatches and exact matches in product perception between the designer and each user.

Significant mismatches and significant exact matches (AS)

As it is accepted that there exist 'noises' and other influencing factors that can distort the transmission of intended product messages (Fiske, 1990; Crilly et al., 2004), it was thought that some degree of mismatch between designers' intentions and users' perceptions would be detected through this study. With this in mind, it was decided important to distinguish between *significant* and *non-significant mismatches*, and between *significant* and *non-significant exact matches*. To do this, two steps were taken.

The first step considered individual user data. A threshold of one step on the Likert scale above and below the designer's grade was chosen as a reasonable boundary for identifying a *mismatch.* Thus, any grade outside of the boundary (i.e. $v>d\pm1$) was noted as a mismatch. As a hypothetical example, if a designer selects a (0) point on the scale, then a user's grades of (-1) and (+1) were within the threshold and

considered a *match*. However, grades outside this range, i.e. (-2) and (+2), were considered as mismatches. *Exact matches* were identified as circumstances when a user's score was identical to the designer's score (i.e. v=d), which in the hypothetical example would be (0).

The second step considered the data from all ten users as a whole to identify *significant mismatches* and *significant exact matches*. A threshold was set, which took into consideration the number of users who scored outside the matching range of the designer's score (i.e. v>d±1). If for a given adjective pair, greater than half the number of users (i.e. ≥6 users) scored outside this range, then that adjective pair was considered a *significant mismatch*. Similarly, if greater than half the number of users (i.e. ≥6 users) gave identical scores to the designer, then that adjective pair was considered a *significant exact match*.

Through the procedure, five significant mismatches and only one significant exact match were identified (see Figures 5.1.2 and 5.1.3). The adjective pairs that were considered as significant mismatches are adj.6 (Formal-Casual), adj.19 (Heavy-Light), adj.30 (Organic-Geometric), adj.32 (Exciting-Calm), adj.36 (Mature-Immature). Figure 5.1.2 reveals adj.19 to have the most significant mismatch, with every user giving a score outside the threshold (v>d±1). Following this are adj.36, adj.32, adj.30, and adj.6 with 9, 8, 7, and 6 mismatch evaluations respectively. In contrast, the adjective pair considered as a significant exact match is adj.1 (In fashion-Out of fashion), having 6 exact match evaluations. In total, data for 38 of 44 adjective pairs were considered non-significant. If we consider the four adjective pair categories, the following findings can be reported: 1 significant mismatch (adj.6) and 1 exact match (adj.1) in category 1; 1 significant mismatch (adj.19) in category 2; 1 significant mismatch (adj.30) in category 3; and 2 significant mismatches (adj.32 & adj.36) in category 4. A more detailed category-based analysis spanning all 8 product samples is given in section 5.9.

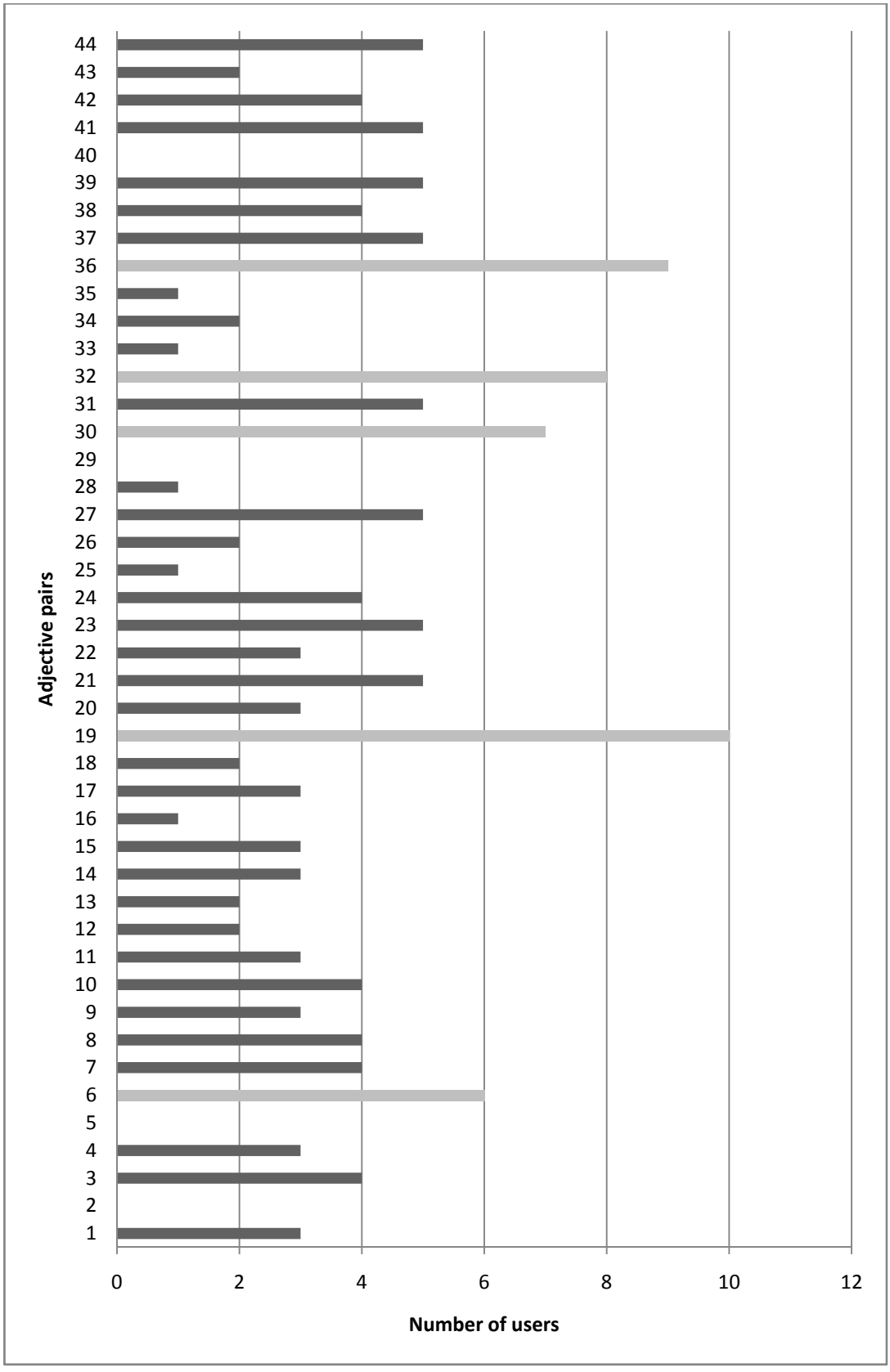


Figure 5.1.2 Number of users giving Likert grades mismatching the designer's grade (v>d±1); the gray bars indicate significant mismatches

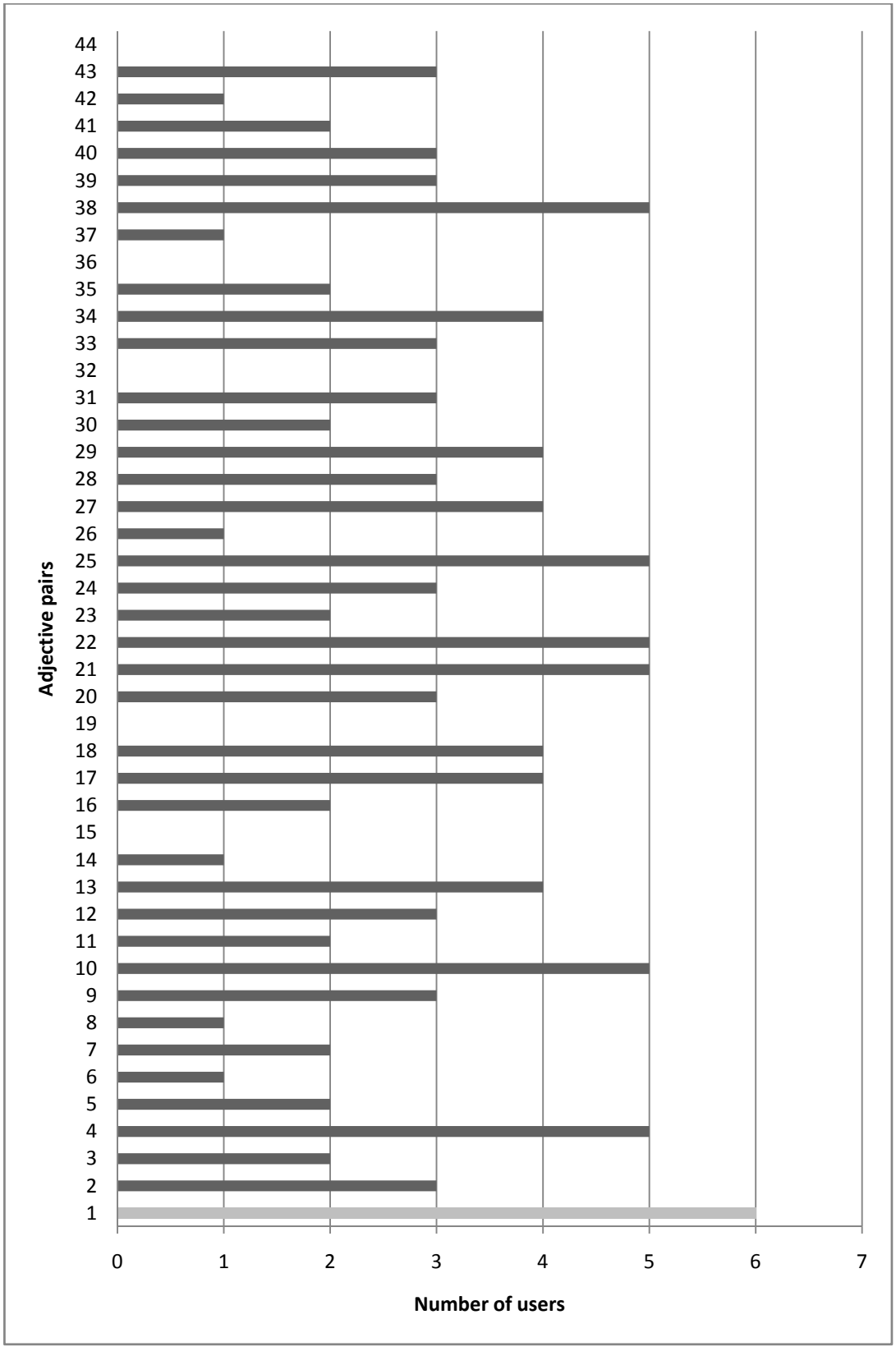


Figure 5.1.3 Number of users giving Likert grades exactly matching the designer's grade (v=d); the gray bars indicate significant exact matches

Significant mismatches – further analysis (AS)

The significant discrepancies in perception between the designer and pool of users, based on an analysis of Likert scale frequency data, are now discussed with reference to Figures 5.1.4-8.

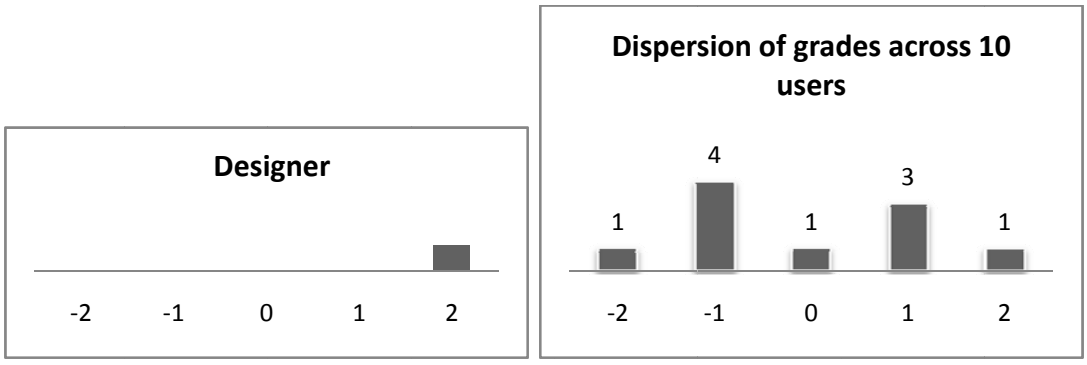


Figure 5.1.4 Designer and user evaluations for adj.6 (Formal-Casual)

The designer considered AS to be very casual. However, only one user agreed. Four users found AS to be quite formal, whilst one user considered it to be very formal. One user remained neutral on the scale. Three users were close to the designer's evaluation, considering it to be quite casual. So it can be said that a 60% level of mismatch exists between the designer's intended perception and users' actual perceptions of product appearance regarding the adjective pair Formal-Casual.

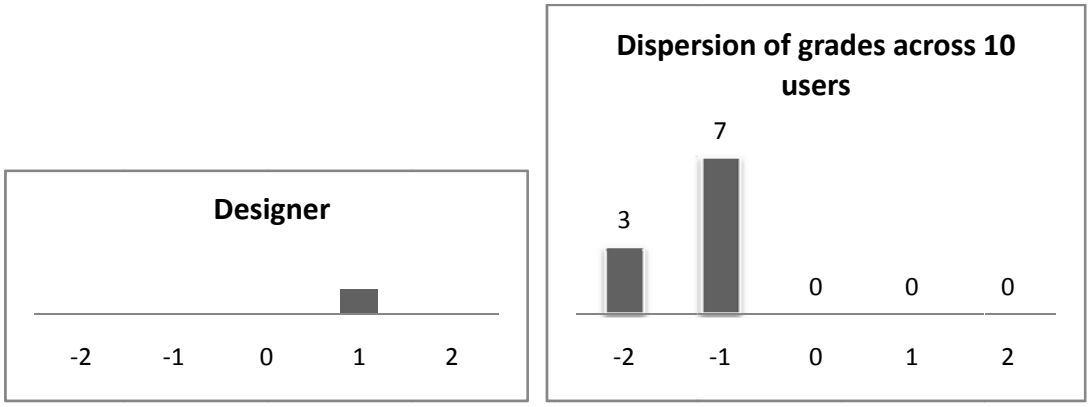


Figure 5.1.5 Designer and user evaluations for adj.19 (Heavy-Light)

Regarding the adjective pair Heavy-Light, it is clear that none of the users agreed with the designer's evaluation that AS is quite light. All users perceived AS to be

heavy to some degree: seven users quite heavy, and three users very heavy. It is assumed that the designer's evaluation was based on their physical interaction with the product and knowing that it was relatively lightweight, while the users had no benefit of physical interaction. However, in any case, the lightweight message through the product appearance was not clearly received by the users, with the data revealing a 100% level of mismatch.

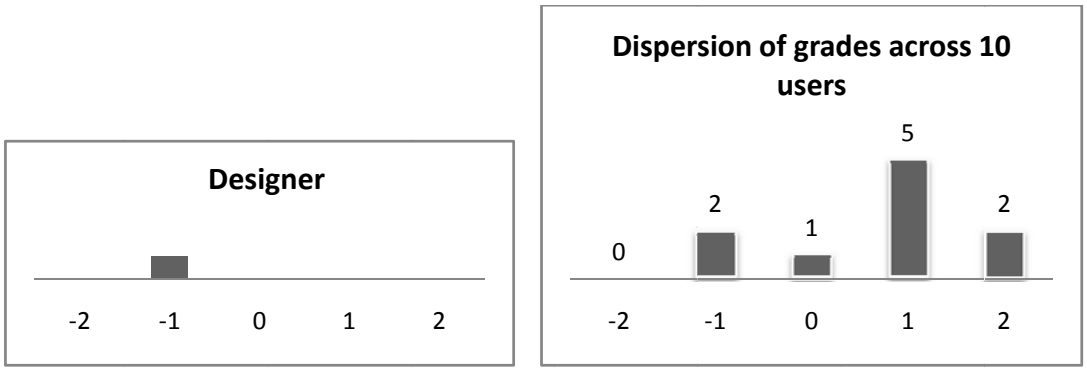


Figure 5.1.6 Designer and user evaluations for adj.30 (Organic-Geometric)

Seven users stayed on the rightmost side of the scale, seeing AS as quite geometric (five users) or very geometric (two users). This was despite the designer intending the product to be perceived as quite organic. The finding reveals either the majority of users could not differentiate organic form from geometric form, or the designer was simply not successful in conveying an organic product appearance despite an intention to do so. The second explanation seems reasonable, since if the users as a whole could not discriminate organic and geometric forms, they would probably give scores in the middle in the scale (i.e. neutral), but only one user did this. A 70% level of mismatch exists for this adjective pair.

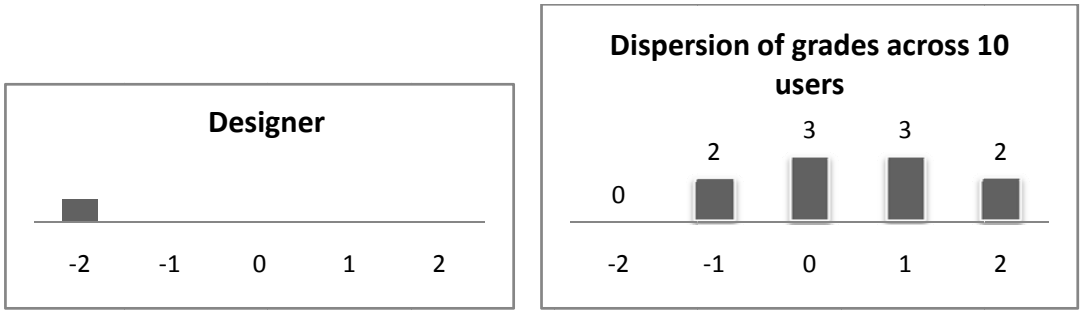


Figure 5.1.7 Designer and user evaluations for adj.32 (Exciting-Calm)

None of the users agreed with the designer that AS gives a very exciting impression. Two users are somewhat inclined to this view, grading AS as quite exciting. However, five users regarded AS to be either very calm (two users) or quite calm (three users). Furthermore, three users stayed neutral. The designer significantly failed in communicating an exciting perception for the product, with the data revealing a 80% level of mismatch. This point was also raised in the first section of the questionnaire (see Table 5.1.3), where the design team aimed (but failed) to evoke such attributes as being enjoyable, funny, and childish, which have strong links to excitement.

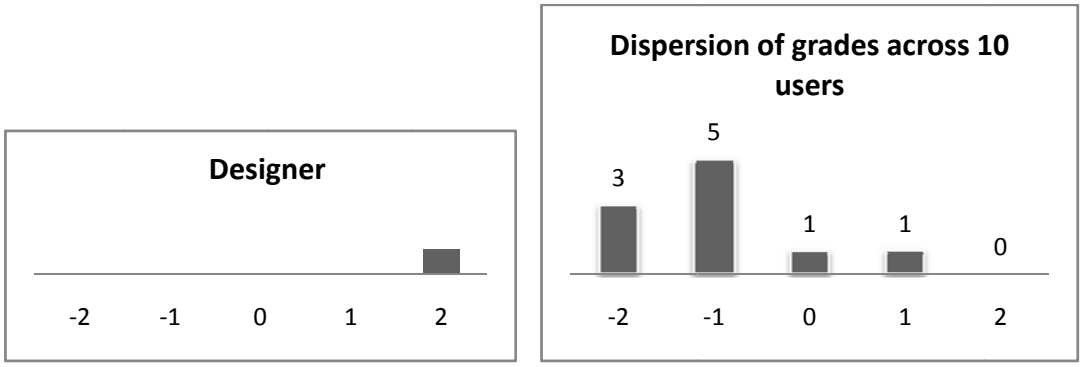


Figure 5.1.8 Designer and user evaluations for adj.36 (Mature-Immature)

While the designer regarded AS to be very immature (citing it as childish and exciting, see Table 5.1.5), the users in contrast perceived it as being either very mature (three users) or quite mature (five users). Only one user each perceived the product as quite immature or neutral. A 90% level of mismatch existed for this adjective pair.

Significant exact matches – further analysis (AS)

As previously indicated, the designer was capable of communicating only one adjective pair to a high level of success (In fashion-Out of fashion). A 60% level of exact match existed for this adjective pair, where the majority of users agreed with the designer that the product appearance was quite in fashion (Figure 5.1.9).

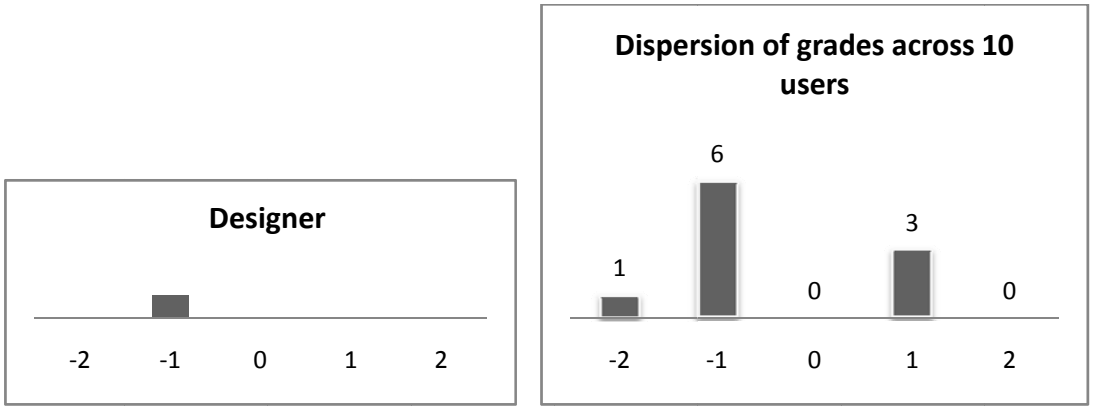


Figure 5.1.9 Designer and user evaluations for adj.36 (In fashion-Out of fashion)

To summarize, the intentions in relation to product appearance of (AS) were moderated by visual characteristics of a sledge, together with the designer's (design team's) artistic inspirations and professional experiences. Such attributes ascribed to the product appearance were based on the design team's own perceptions. Thus, the designers made judgments about the product characteristics in the absence of user trials. This might explain why 38 of 44 adjective pairs were evaluated as non-significant findings. The cross-comparisons in section 5.9 examine the levels of significant mismatches, significant exact matches, and non-significant findings for all eight product samples.

5.2 Analysis of product example 2 (Mushroom)

Another product example (Mushroom) from Autoban Design was selected. Mrs. Çömlek, a member of the Autoban design team, stated the company's intentions in the design of Mushroom. AM, which stands for Autoban (name of the company) and Mushroom (name of the product), is used throughout this section as the product code (Figure 5.2.1). The target user group identified by Mrs. Çömlek is described in Table 5.2.1. Table 5.2.2 gives general information on the ten users who participated in the evaluation of the AM product.

Figure 5.2.1 Product AM created by Autoban design team

Table 5.2.1 Specifications of the intended user group related to AM product

Gender	Male and female
Age range	25-48
Income level	Moderate and high
Level of education	Undergraduate and graduate
Lifestyle and personality	Intellectual, young, active, enjoy travelling, appreciating aesthetics
Occupations	Advertiser, graphic designer , artist, architect, designer, or creative, artistic, and skillful principles

Table 5.2.2 List of the users participating in the evaluation of AM product

Users	**Gender**	**Age range**	**Level of education**	**Occupation**
1	Male	25-36	Undergraduate	Student
2	Male	25-36	Undergraduate	Student
3	Female	25-36	Graduate	Researcher
4	Male	25-36	Graduate	Market Analyst
5	Female	25-36	Graduate	Engineer
6	Female	37-48	Some college	Employee (furniture firm)
7	Female	25-36	Graduate	Editor
8	Male	25-36	Undergraduate	Editor-Translator
9	Male	25-36	Undergraduate	Interior Designer
10	Female	25-36	undergraduate	Architect

5.2.1 Names associated with AM

Table 5.2.3 represents the analogies that four participants used to describe their first impressions. These sketches correlate to the names given to AM by the participants (see Table 5.2.4).

Table 5.2.3 Mental images elicited from AM at a first glance

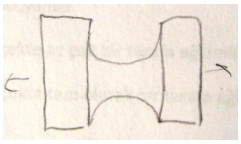
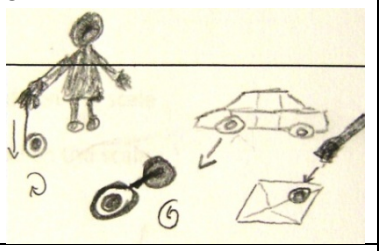
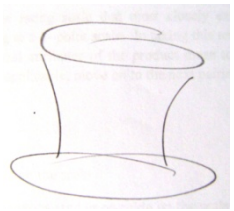
Stimulus	Analogies	
	U1 	U2 
	U3 	U4 
	U5	U6
	U7	U8
	U9	U10

Table 5.2.4 Comparison between the designer's product name and names given to AM by users

Designer	Users	
MUSHROOM (Its design is directly inspired by the organic form of a mushroom…) **Chocolate** ("It reminds me a chocolate" said Mrs. Çömlek)	1	Oval (curved lines, there is no straight line)
	2	Stamp (wooden body, and black seating part)
	3	Fountain (black surface; looks like water coming out)
	4	Pawn, Castle (looks like a chess piece)
	5	Stamp
	6	Bobbin (reel), Mushroom
	7	Cozy Stop
	8	Goblet (Wine glass) Sofa; Turkish: Kadeh koltuk
	9	Pawn, Dumbbell
	10	Bobbin (reel)

A mushroom was the source of inspiration for the design team to create AM. Accordingly, the name ‘Mushroom’ was given to AM. Mrs. Çömlek also proposed a new name ‘Chocolate’ on the basis of what the product form reminded her.

Considering the names proposed by users, three types of names could be identified. The name of Oval given by user 1, defines the dominant visual qualities of AM, as the curvaceous attributes of AM were the center of attentions. It can be supported by the sketched analogy and the visual qualities of AM defined by user 1. Another group of names refers to familiar objects with similar properties regarding overall shape, material, function, and other characteristics. Eight of the names of Stamp (proposed by U2 and U5), Fountain (U3), Pawn (proposed by U4 and U9), Bobbin (proposed by U6 and U10), and Goblet (U8) were found to match this group. The name of Cozy Stop (U7) refers to a message about the overall impression of the product (see table 5.2.5) that “this stool tells me to stop and take a cozy break”.

The names of Castle (U4), Mushroom (U6), and Dumbbell (U9) were given as secondary names. These names reveal that AM, with impressive curves on its wooden body, was successful to remind people of familiar objects, mostly on a small scale. The name ‘Mushroom’ was directly noted by user 6 (and indirectly by user 3, who drew a mushroom growing under a fountain in her sketched analogy). Therefore, the design team was relatively successful in communicating the organic characteristics of a mushroom.

5.2.2 Intended attributes versus perceived attributes (AM)

Considering the meaning attributes of AM intended by design team (see Table 5.2.5), it is assumed that the team was willing to communicate attributes of product form that are related to Usability & Interaction, Visual Qualities, and Personality Characteristics categories. Their intentions were in favor to evoke positive emotional responses.

Similar to the design team’s intended attributes, the users’ perceived attributes of product from were associated with the Usability & Interaction, Visual Qualities, and Personality Characteristics categories. The Social Values & Positions attributes did not exist in users’ perceived descriptions; they were also not the preferred messages

or the concerns of the design team. However, there existed some mismatches between the attributes the design team intended to communicate with and the attributes the users actually perceived. Regarding the Usability & Interaction category, the design team was successful to communicate the comforting attributes of AM, while they failed to evoke within users an impression of sustainability and repairability. The users' perceived descriptions revealed positive attributes of AM, such as being easy to use, easy to carry, and practical: interestingly, these were not noted in the designer's descriptions. The design team was successful in communicating all intended attributes under the Visual Qualities, and Personality Characteristics categories.

The overall impression received by users was related to connotative meanings attributed to the product together with their judgmental behavior. A connotative level of meaning was clearly stated by user 3 in her overall impression (" it creates friendly atmosphere"), as well as in her sketched analogy (see Table 5.2.3), drawing a cup with steam coming out. The overall impression of user 9 was an example where connotative meaning of product form and the user's judgmental behavior were noted together.

Table 5.2.5 Comparisons between designer's intentions and users' perceived attributes

MUSHROOM	Designer	Users	
Social values & positions		1	
		2	
		3	
		4	
		5	
		6	
		7	
		8	Modern
		9	
		10	
Usability & interaction	Comfortable, sustainable, repairable	1	Practical, easy to use, easy to carry, low chair
		2	Cozy, comfortable
		3	Comfortable, restful

		4	Mobility
		5	Practical, well-built
		6	
		7	Comfortable, useful
		8	
		9	Comfortable, easy to carry, easy to use
		10	Comfortable, strong, low, easy to carry
Visual qualities	Organic, soft, impressive curves, symmetrical, disorganized	1	Rounded
		2	Curved surface, contrast (different patterns), dynamic
		3	Rounded shape, curved lines on the body, plain, soft
		4	Compact, simple
		5	Curved and surface
		6	Organic
		7	
		8	Minimalist, aesthetic, free lines
		9	Plain, compact, rounded
		10	Rounded, soft, small (compact)
Personalities	Warm, natural, Close, friendly	1	Friendly
		2	Natural, warm, attractive, interesting, playful
		3	Warm, easygoing, plain-thinking
		4	Natural
		5	Warm, natural
		6	
		7	Lovely, cozy feeling
		8	Attentive
		9	Beautiful and feminine
		10	
Product story	This stool demonstrates the influence of organic design. Its impressive curves, visual softness, and natural materials demand a tactile interaction… It embodies close and friendly attitudes.	1	Being made of solid wood, it creates friendly atmosphere…
		2	This cozy stool invites you to sit on in order to experience, satisfying your curiosity… it encourages you to turn it and play with it…
		3	Invitation for comfortable sitting…taking a short rest…
		4	…
		5	…
		6	It is inspired by the nature…
		7	This stool tells me to stop and take a cozy break…
		8	It represents a modern lifestyle…
		9	Its design gives you feel of freedom and nothing limits your sitting positions and directions, no need to arrange it…
		10	…

Table 5.2.5 (continued)

Based on the participants' (designer's and users') statements related to the specific physical attributes of AM, it is observed that material qualities and a natural and organic form were intended as the design team's medium to communicate their intended messages. This was successfully received by users (see Table 5.2.6).

Table 5.2.6 Identifications of physical product attributes of AM through which messages were communicated

Designer	Users	
Form, (organic form, curved surface…) Material, especially solid wood, unifying different tonalities/pattern of wood (disorganized), leather seat cushion…	1	Form and dimensions Materials; wood, black leather of seating part
	2	Form; (color, contrast of color; black and bright, curved surface…) Materials; leather & wood
	3	Form, (curves on the surface, rounded shape) Material, wood and leather together
	4	Form, (wheel-like form, chess-piece) Material, natural
	5	Form, without straight lines Material, a wooden workmanship, leather
	6	Form, Material,
	7	Form, (shape, color) Material,
	8	Form, Material, (mixture of modern design and classic material)
	9	Form, (curves) Material, wooden body
	10	Form, (stem-liked body) Material,

5.2.3 Semantic Differential study (AM)

The results of the SD study on AM product are discussed in detail in the following sections.

Significant mismatches and significant exact matches (AM)

Following the analysis procedure, seven (7) significant mismatches, seven (7) significant exact matches and thirty (30) non-significant findings were identified (see Figure 5.2.2 and 5.2.3) from the evaluation of 44 adjective pairs (see Appendix D for full data).

The adjective pairs considered significant mismatches were: adj.9 (Easy to use-Difficult to use), adj.17 (Practical-Impractical), adj.21 (Dynamic-Static), adj.28 (Orderly-Disorganized), adj.32 (Exciting-Calm), adj.33 (Extraordinary-Ordinary), and adj.35 (Feminine-Masculine). Adj.28 was found to be the most significant mismatch, with nine (9) users giving a score outside the threshold ($v>d\pm1$). Following this are adj.17, adj.9, adj.21, adj.32, adj.33, and adj.35 with 8, 7, 7, 6, 6, and 6 mismatch evaluations, respectively.

The significant exact matches identified in the designer's and users' evaluations for adjective pairs were: adj.1 (In fashion-Out of Fashion), adj.16 (Clear-Confusing), adj.18 (Steady-Unsteady), adj.24 (Simple-Complex), adj.25 (Ornate-Plain), adj.26 (Compact-Large), and adj.29 (Symmetrical-Asymmetrical). Adj.29 had 8 users giving a score identical to the designer's score ($v=d$), followed by adj.1, adj.16, adj.25, adj.26, adj.18, and adj.24 with 7, 7, 7, 7, 6, and 6 exact match evaluations, respectively.

Considering the four categories of adjective pairs, the following results can be noted: 1 significant exact match (adj.1) in category 1; 2 significant mismatches (adj.9 & adj.17) and 2 exact matches (adj.16 & adj.18) in category 2; 2 significant mismatches (adj.21 & adj.28) and 4 exact matches (adj.24, adj.25, adj.26 & adj.29) in category 3; and 3 significant mismatches (adj.32, adj.33 & adj.35) in category 4. So from 14 significant mismatches/exact matches, 6 of them are related to category 3 (Visual Qualities) followed by category 2 (Usability & Interaction), category 4 (Personality Characteristics), and category 1 (Social Values & Positions) with 4, 3, and 1 significant mismatches/exact matches.

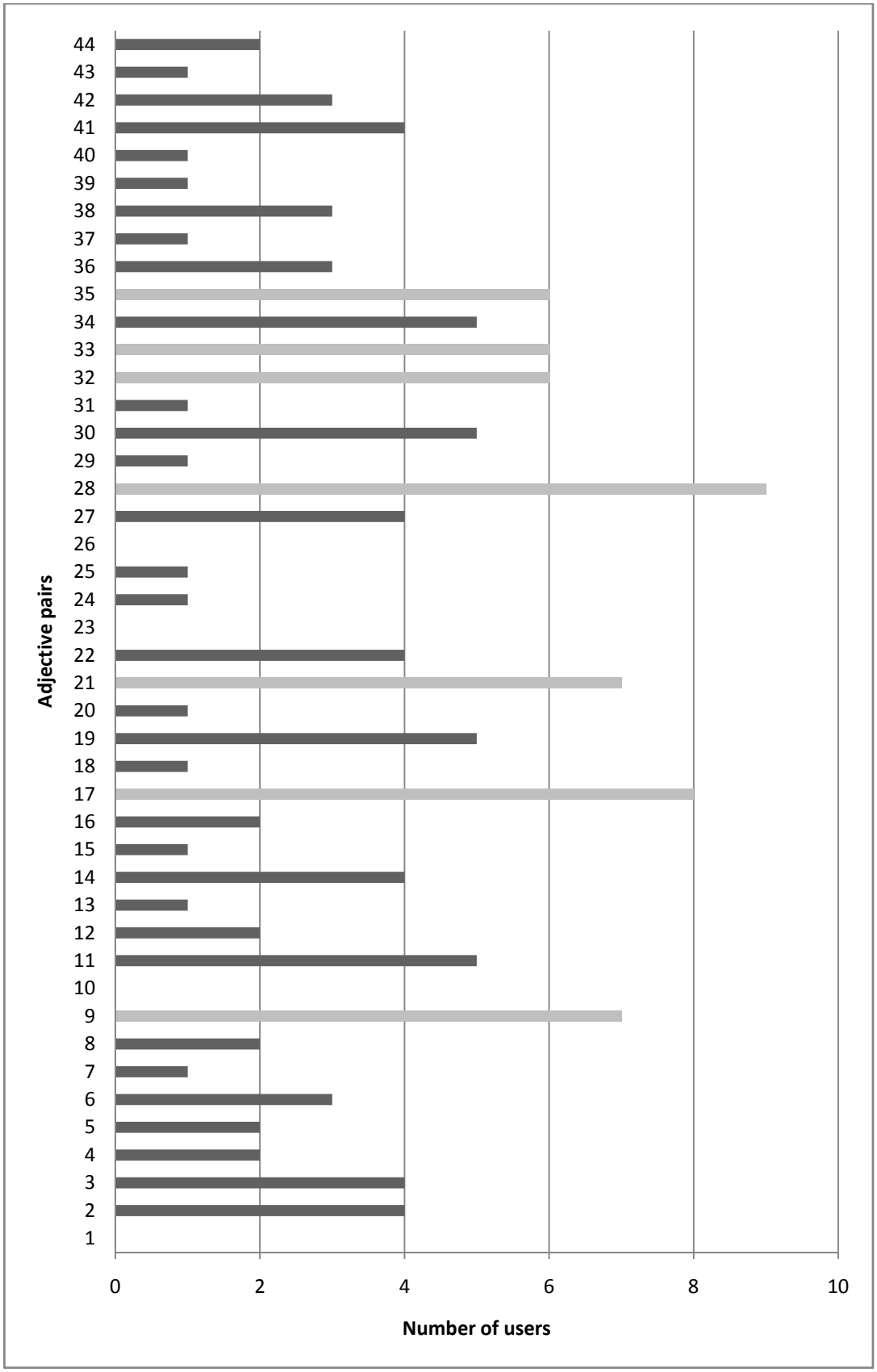


Figure 5.2.2 Number of users giving Likert grades mismatching the designer's grade (v>d±1); the gray bars indicate significant mismatches

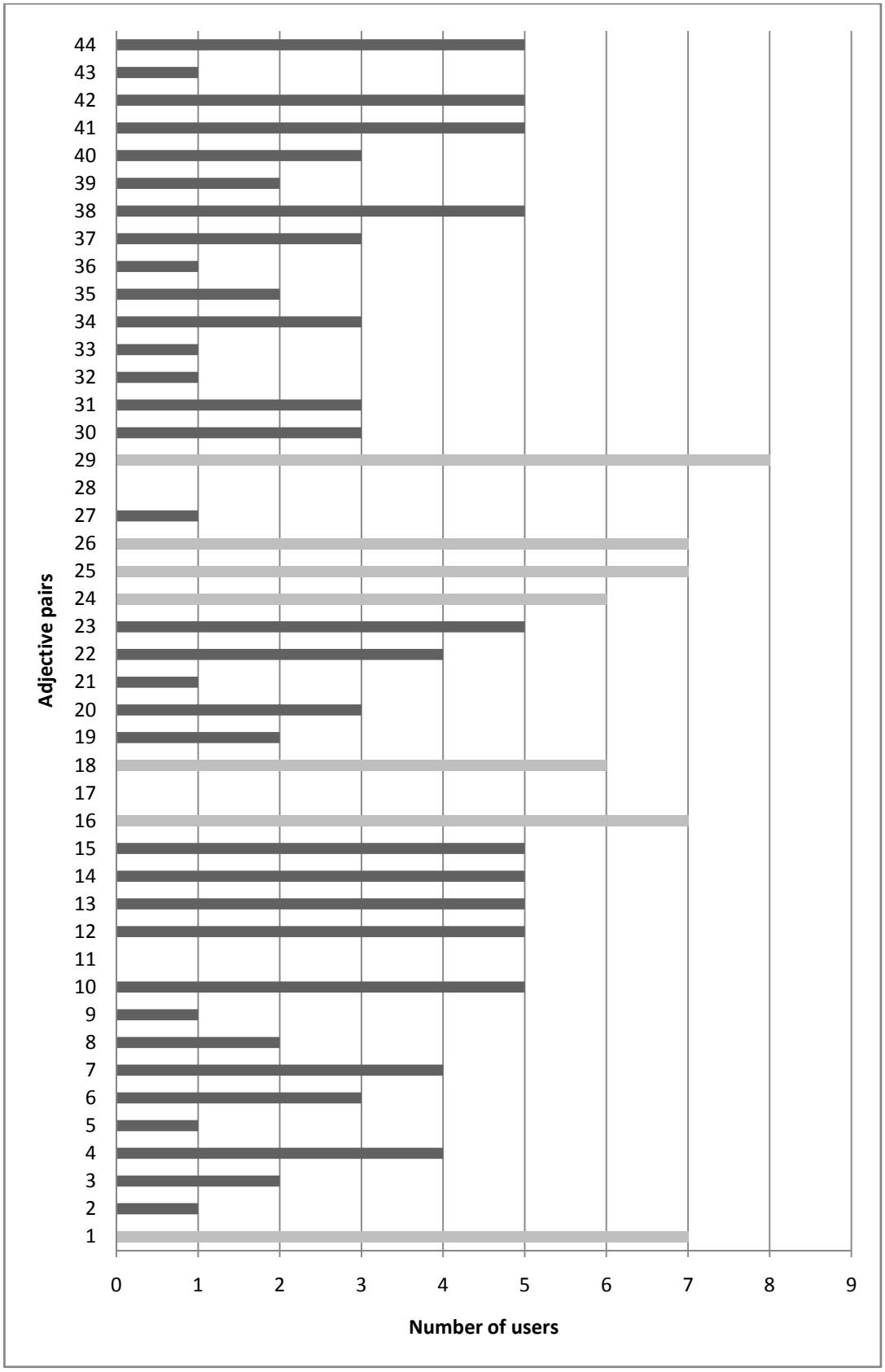


Figure 5.2.3 Number of users giving Likert grades exactly matching the designer's grade (v=d); the gray bars indicate significant exact matches

Significant mismatches – further analysis (AM)

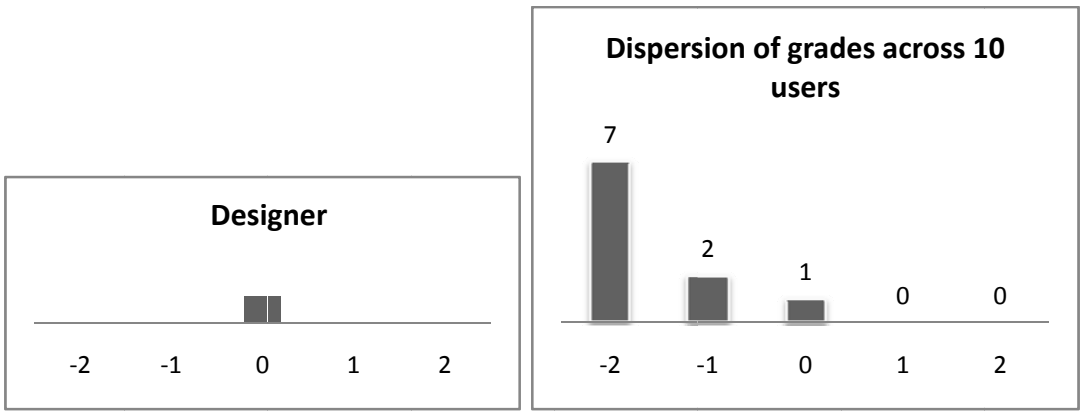


Figure 5.2.4 Designer and user evaluations for Adj.9 (Easy to use-Difficult to use)

In contrast to the designer, who stayed neutral on the scale, the majority of users found AM to be very easy to use. Two of the users considered it as quite easy to use. Just one of the users agreed with the designer. Being easy to use was also one of the perceived attributes that some of the users mentioned previously in the first stage of the questionnaire (see Section 5.2.2). However, the designer did not explain that the design team had intended to evoke this positive impression in users' responses. So a 70% level of mismatch existed between the designer's intended perception and the users' visual perceptions regarding this adjective pairs.

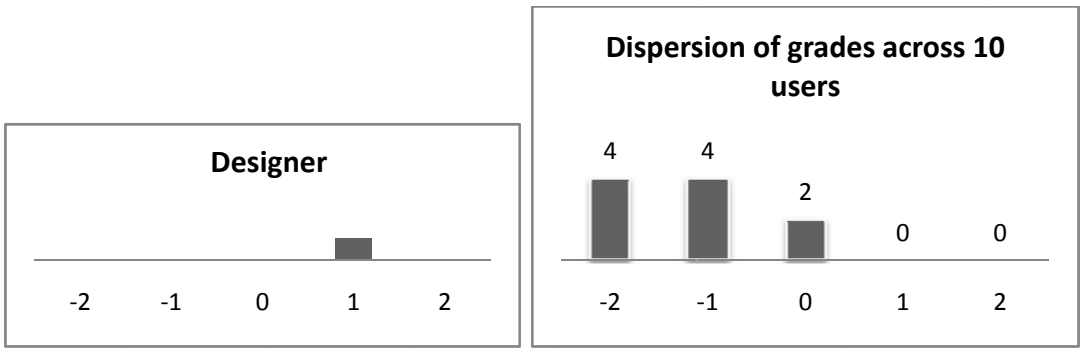


Figure 5.2.5 Designer and user evaluations for Adj.17 (Practical-Impractical)

The designer intended AM to be perceived quite impractical. In contrast, four users found AM to be very practical, and four users considered it as quite practical. Two

users remained neutral on the scale. The users' evaluations also can be supported by the perceived attributes of AM mentioned in section 5.2.2. Here the question may arise as to why the design team intended to evoke a negative impression in users' responses toward product appearance. An 80% level of mismatch existed for this adjective pair.

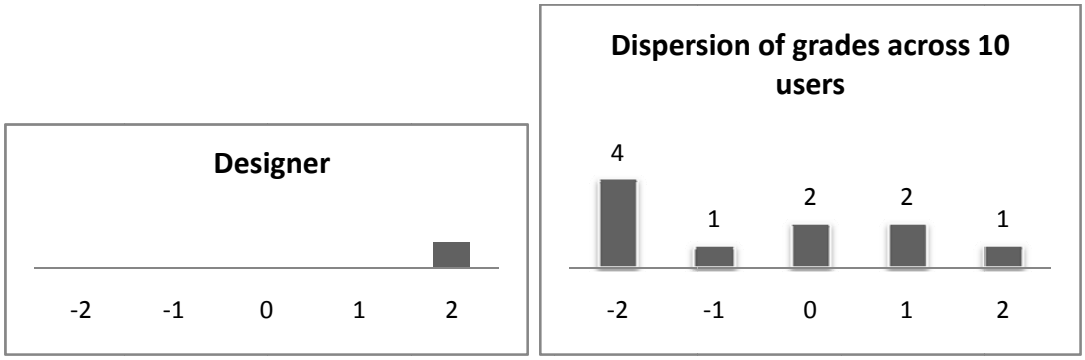


Figure 5.2.6 Designer and user evaluations for Adj.21 (Dynamic-Static)

In contrast to the designer, who found AM to be very static, different evaluations existed within users, who considered AM as very static (1 user), quite static (2 users), quite dynamic (1 user), very dynamic (4 users). Two users stayed neutral on the scale. These findings reveal that the target users were not clear about the meaning of the adjective pair. Although the adjective pair was represented under the Visual Qualities category, it is assumed that the designer confused the adjective of Static with Stable (i.e. not likely to topple over or move – literally static). As the designer claimed that the product possessed organic form, it is somewhat questionable that the description 'static' is compatible. Except for this argumentation and considering the designer's intended perception and users' actual perceptions, a 70% level of mismatch can be identified.

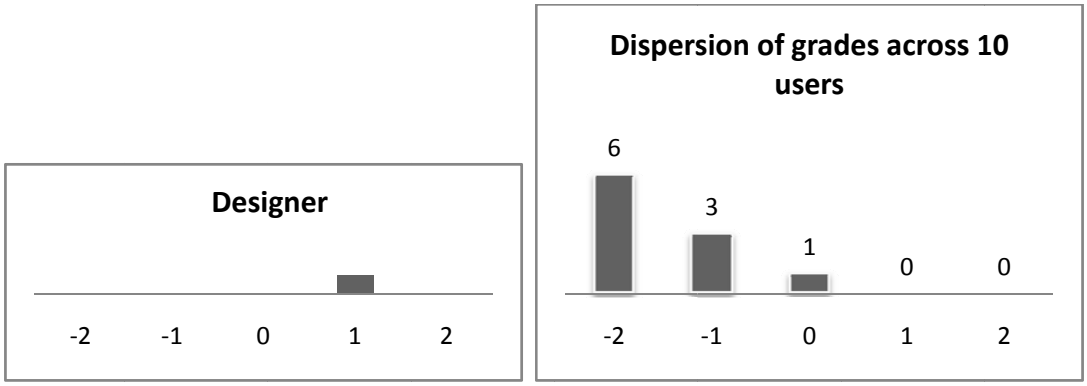


Figure 5.2.7 Designer and user evaluations for Adj.28 (Orderly-Disorganized)

This adjective pair is also a point of debate. The designer considered AM to be quite disorganized; her evaluation (see section 5.2.2) was based on the material properties unifying different solid woods, oak & walnut, with different tonalities and patterns, which in result contribute to a disorganized attribute. However, the users' evaluations seem to be based on the overall shape of AM and not the material surface qualities. Six users perceived AM as very orderly, whilst three users found it to be quite orderly. One user also remained neutral on the scale. Therefore, the design team failed to communicate the intended message in the product because material visual qualities dominated, with the data revealing a 90% level of mismatch.

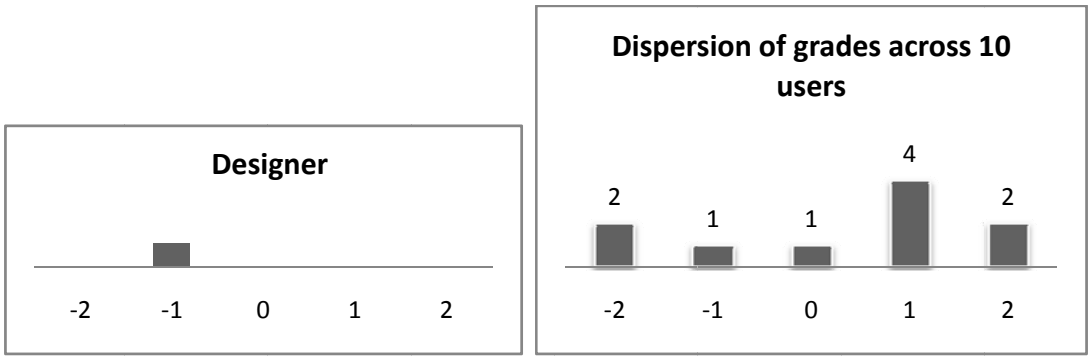


Figure 5.2.8 Designer and user evaluations for Adj.32 (Exciting-Calm)

The designer intended AM to be perceived as quite exciting. One of the users agreed with the designer and two users found it very exciting. However, six users perceived AM as quite calm (four users) or very calm (two users). So it can be said that the

exciting attribute of AM was not clearly received, with the data indicating a 60% level of mismatch.

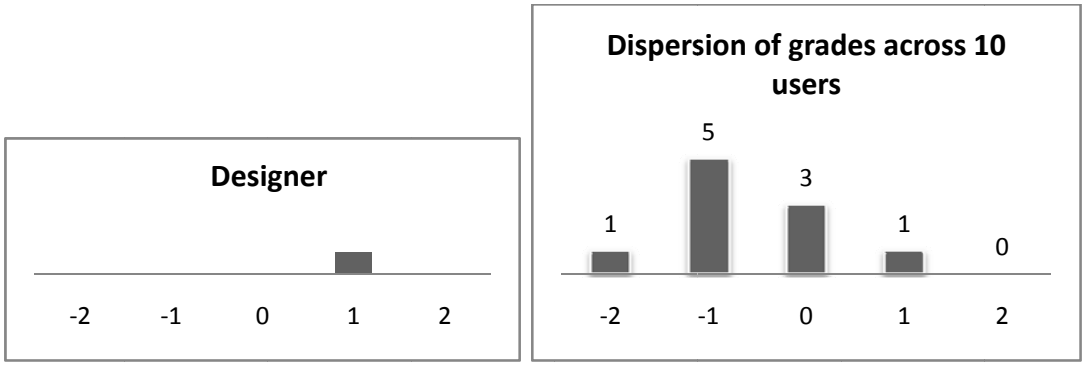


Figure 5.2.9 Designer and user evaluations for Adj.33 (Extraordinary-Ordinary)

One of the users agreed with the designer that AM is quite ordinary. In contrast, six users regarded it to be either quite extraordinary (five users) or very extraordinary (one user). Three users stayed neutral. A 60% level of mismatch existed for this adjective pair. The finding reveals that such stools as AM are familiar for designers, but not for all users. It may mostly be related to previous experiences and knowledge to discriminate one object from others in the same category regarding extraordinary vs. ordinary.

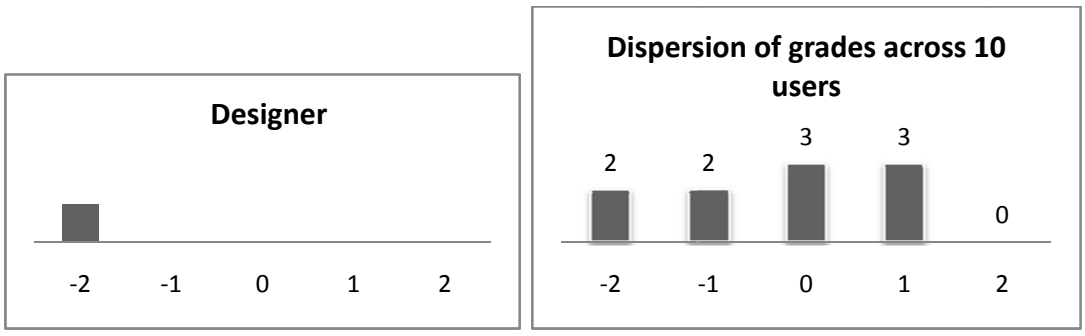


Figure 5.2.10 Designer and user evaluations for Adj.35 (Feminine-Masculine)

The designer and two users considered AM to have a feminine personality. Two users regarded it quite feminine. While three users stayed neutral, three users found it to be quite masculine. So a 60% level of mismatch existed in communicating the intended message. Based on the participants' gender characteristics (see Table 5.2.2), five female users grades showed that they considered AM as quite masculine

(two female users), and quite feminine (one female user), or prefer to stay neutral (two female users). None of the female users agreed with the designer who is also female. So gender differences in perceptions between the original designer and the intended user (across genders) could be a direction for future research.

Significant exact matches – further analysis (AS)

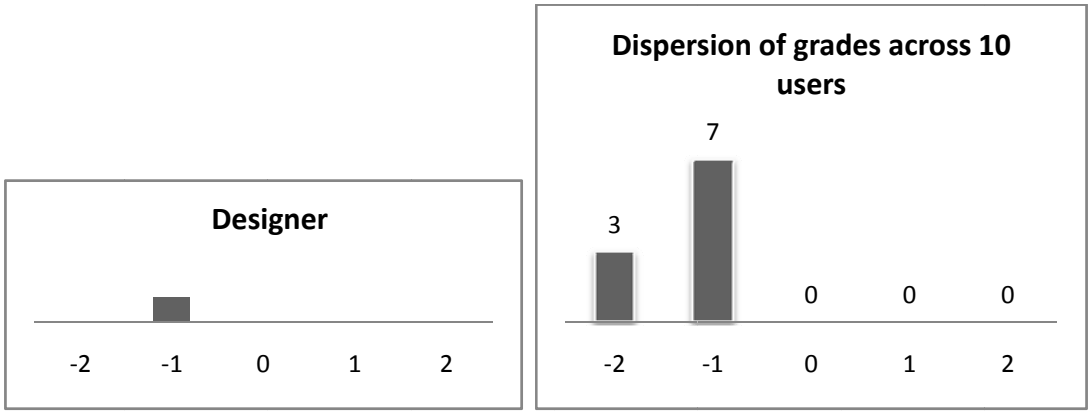


Figure 5.2.11 Designer and user evaluations for Adj.1 (In fashion-Out of fashion)

Both the designer and users attributed the same meaning to AM. The designer found the product to be quite in fashion. Users also regarded AM to be either quite in fashion (seven users) or very in fashion (three users). So the design team was successful in communicating the attribute message. A 70% level of exact match existed for this adjective pairs.

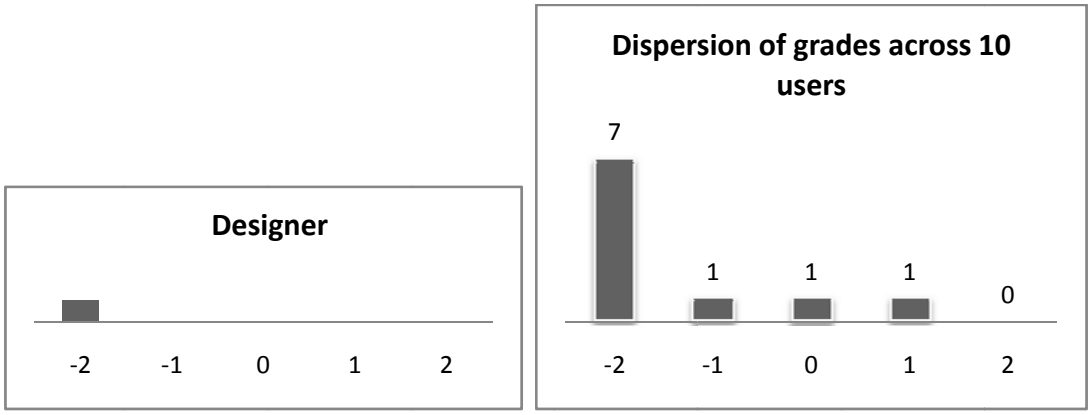


Figure 5.2.12 Designer and user evaluations for Adj.16 (Clear-Confusing)

The evaluations of designer and users for the adjective pair of clear vs. confusing revealed a 70% level of exact match. Seven of the users agreed with the designer and considered AM as very clear, and one user found it to be quite clear. Only one user found AM quite confusing whilst one user remained neutral.

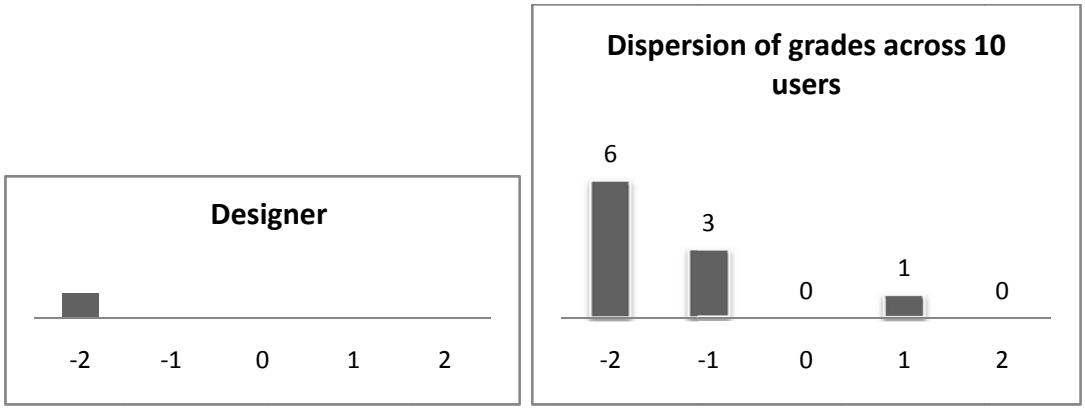


Figure 5.2.13 Designer and user evaluations for Adj.18 (Steady-Unsteady)

Six users agreed with the designer that AM gives a very steady impression. Three users found it to be quite steady. One user did not found it to be steady and considered it as quite unsteady. A 60% level of exact match existed for this adjective pair.

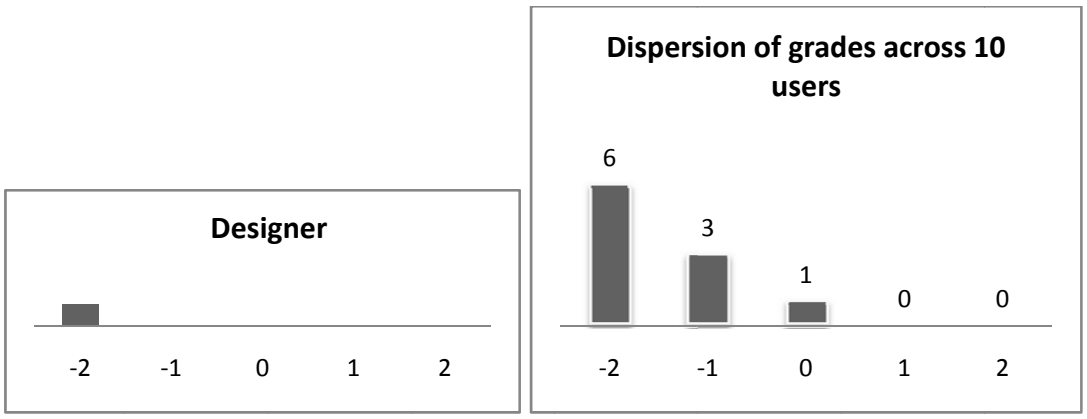


Figure 5.2.14 Designer and user evaluations for Adj.24 (Simple-Complex)

While one user remained neutral on the evaluation of the adjective pair of simple vs. complex, nine users agreed with the designer and stayed on the leftmost side of the scale, considering AM as very simple (six users) or quite simple (three users). The data reveals a 60% level of exact match.

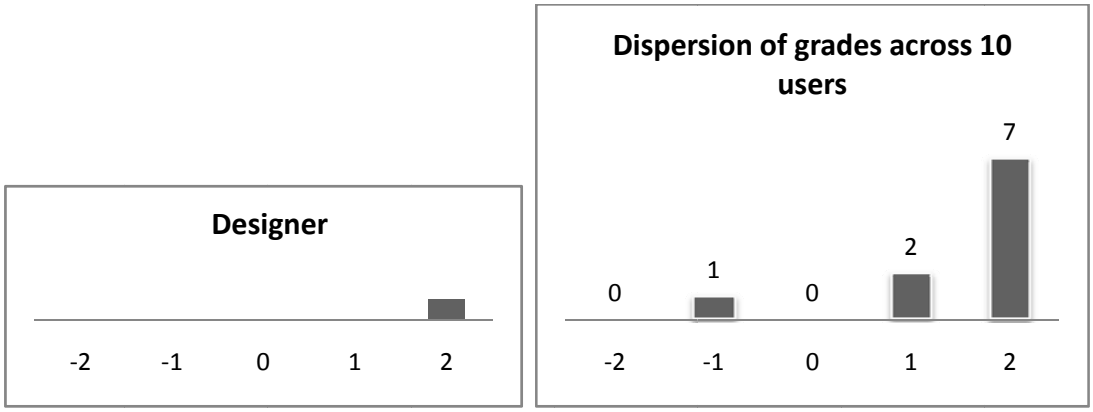


Figure 5.2.15 Designer and user evaluations for Adj.25 (Ornate-Plain)

This adjective pair is likely to be correlated to the simple vs. complex adjective pair (i.e. if a participant found AM to be simple, he or she would also probably grade it as plain). Seven users agreed with the designer, considering AM as very plain. Three users inclined to this view, considering it as quite plain. One user (U8), who stayed neutral on the evaluation of the adjective pair of simple vs. complex, graded AM as quite ornate. The results reveal a 70% success in communicating the intended attributes of product visual form.

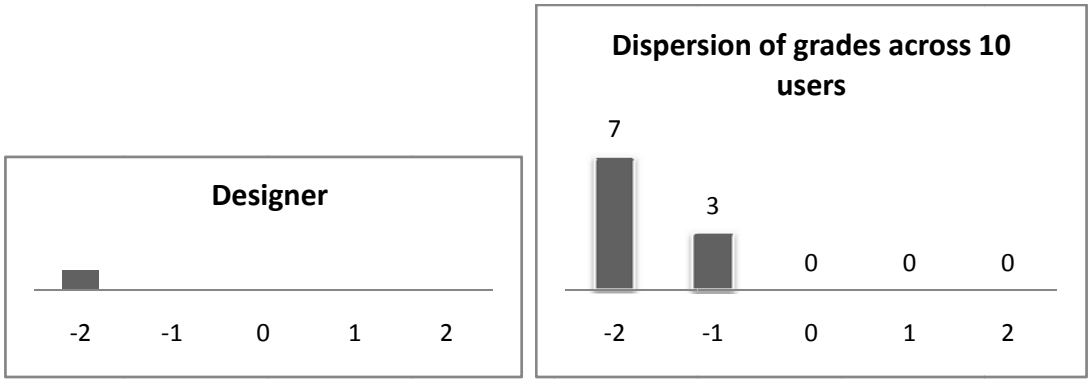


Figure 5.2.16 Designer and user evaluations for Adj.26 (Compact-Large)

According to all scores, it can be said that the design team's intended message was realized in the users' perceived messages. Similar to the designer, all users stayed on the left side of the scale, seeing the product as very compact (seven users) or quite compact (3 users), with the data revealing a 70% level of exact match.

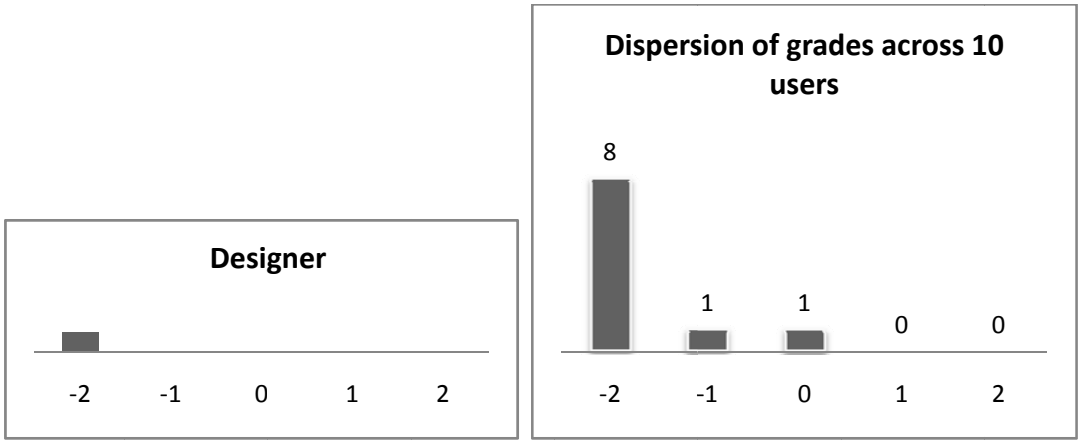


Figure 5.2.17 Designer and user evaluations for Adj.29 (Symmetrical-Asymmetrical)

This adjective pair was identified as the most significant exact match. It reveals an 80% success in communicating the symmetrical attribute of AM. Nine users found AM either very symmetrical (eight users) or quite symmetrical (one user). Only one of the users stayed neutral on the scale.

The comparisons between the designer's intended messages and users' perceived messages show that the messages, intended and perceived, are likely to be related to the Usability & Interaction, Visual Qualities, and Personality Characteristics of a product. However, the design team could not transmit all the messages regarding Usability & Interaction that they had in mind. Such attributes of product form that are related to Social Values & Positions were not the concern of the design team. Equally, the participants did not perceive any attribute associated to this category. The design team was successful to evoke positive impression in users' responses as they wished. It is supported by users perceived descriptions and sketched analogies. A comparison between the designer's intended perceptions and users' actual (pre-usage) perceptions, which were explored through the SD study, reveals that the most significant mismatches were related to the Personality Characteristics category and the most significant exact matches existed in the Visual Qualities category.

5.3 Analysis of product example 3 (Daydream)

Product 3 (Daydream) is made by B&T Design. Mr. Alp Nuhoğlu, who is one of the well-known Turkish designers of furniture, was the designer of this product. He

holds a Bachelor degree in industrial design from Mimar Sinan University, Istanbul. He accepted to participate in this study. The abbreviation ND (Nuhoğlu and Daydream) is used as the product code (Figure 5.3.1).

The designer gave the detail of the target user group for whom OT was designed (Table 5.3.1). Ten users who were considered to be a good match to the intended user profile were approached to participate in the study (Table 5.3.2).

Figure 5.3.1 Product ND designed by Alp Nuhoğlu

Table 5.3.1 Specifications of the intended user group related to ND product

Gender	Male and female
Age range	25-48
Income level	High
Level of education	Undergraduate, graduate and doctoral
Lifestyle and personality	Intellectual, townsman, appreciating and discriminating design, following new developments in the world…

Mr. Alp Nuhoğlu stated that his intentions in relation to the form of ND and its content were realized in the manufactured product. He claimed that the intended users would get the messages embodied in the product form. The designer's

expectation was based on his professional design experience and constant observation of users' behaviors and responses towards products in the same category with ND at the point of purchase.

Table 5.3.2 List of users participating in the evaluation of ND product

Users	Gender	Age range	Level of education	occupation
1	Female	25-36	Undergraduate	Architect
2	Male	25-36	Graduate	Res. Asst./designer
3	Female	25-36	Graduate	Teacher
4	Female	25-36	Graduate	Teacher
5	Female	25-36	Undergraduate	Work in TV
6	Female	25-36	Undergraduate	Lawyer
7	Female	25-36	Undergraduate	Manager
8	Female	25-36	Undergraduate	Finance
9	Male	25-36	Graduate	Designer
10	Male	25-36	Undergraduate	Packaging designer

5.3.1 Names associated with ND

The name of 'Daydream' was given to ND by the designer. Through the given name, the designer communicates positive emotional attributes of the product, in that one can make a dream while sitting. An English name was given because the company has customers from countries other than Turkey. An alternative Turkish name of 'Düş', which means dream, was suggested by the designer (Table 5.3.4).

Considering the sketched analogies, three distinct types can be identified (Table 5.3.3). The sketched analogy of user 1 originated from the product's overall shape that reminds the user of a Boomerang, an object with similar visual qualities. Another type of sketched analogy refers to the product function, as users (U2 & U10) tried to show that ND would swing as one sits. The last group of sketched analogies reflects participants' feelings toward ND. User 4 expressed that she was happy while user 9 tried to express that ND provided privacy for a single person. Except for user 1, other users (U2, U4, U9, & U10) gave names to ND on the basis of sketched analogies.

Table 5.3.3 Mental images elicited from ND at first glance

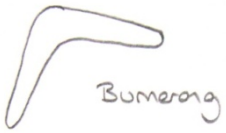
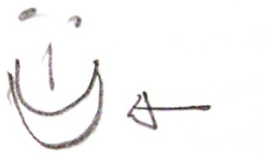
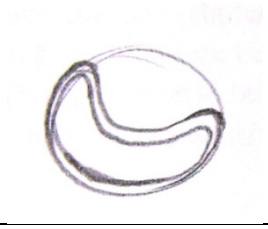
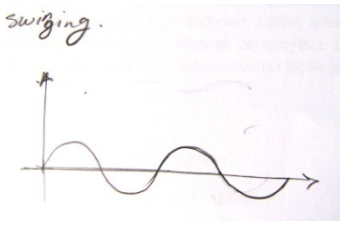
Stimulus	Analogies	
	U1 	U2 
	U3	U4 
	U5	U6
	U7	U8
	U9 	U10 

Table 5.3.4 Comparison between the designer's product name and names given to ND by users

Designer	Users	
DAYDREAM (pleasant and sweet dreams while sitting) **DÜŞ** (dream)	1	Destination
	2	Esne (Turkish, derived from Esnek: flexible)
	3	Loneliness
	4	Smiley
	5	Desire
	6	Chaise lounge
	7	Even (düzlem; flat & smooth surface)
	8	Ahmet (it reminds my husband, he likes product like this…)
	9	Privacy
	10	Swing

Most of the proposed names referred to feelings and connotative interpretations of an object. The names of Destination, Loneliness, Smiley, Desire, and Privacy fit to this group. Based on the sketched analogies of users 2 & 10, it is obvious that the names of Esne and Swing originated from the perceived usability or function of the product.

The name Chaise Lounge refers to denotative meaning, being tied to the obvious function of the object. Even as a name it describes the product's visual properties. The name of Ahmet (a common male name in Turkey) is related to user 8's experience level of meaning attached to her husband.

5.3.2 Intended attributes versus perceived attributes (ND)

The designer of ND did not give information in detail about his intentions in relation to product visual form. In general, as Table 5.3.5 represents, he wished to evoke emotional impressions in users' perceptual responses. He intended ND to be perceived as different. He stated that the product through its visual properties and associated meanings intended to differentiate itself among other products and it was expected that users would receive this message and discriminate it from other products.

According to users' overall impressions and the perceived attributes they highlight (see Table 5.3.5), it was indeed the case that that designer was capable of communicating the messages he had in mind to most of the users.

The meanings users attributed to ND were pertinent to all four categories. The results reveal that users were affected, mostly in a positive way, by the product visual form. Based on users' perceptions, it can be noted that attributes of product visual form related to Social Values & Positions were not dominant.

Users' overall impressions represent their judgmental behaviors, as most users were judging their feelings and usability aspects of ND positively and explaining about where and for what purpose the product could be used. For example, user 2 expressed that ND is such a comfortable and relaxing product, making it useable for watching TV; or user 10 found ND to be good whilst reading book and also good for storing books under it. However, in one case, user 5, the overall impression was quite different, as she attached the product to Ying Yang.

Both the designer and users emphasized in their statements that the overall shape and warm colors were the physical product attributes of ND through which messages were communicated.

Table 5.3.5 Comparisons between designer's intentions and users perceived attributes

DAYDREAM	Designer	Users	
Social Values & Positions		1	
		2	
		3	Class (statue)
		4	
		5	
		6	
		7	Ultra modern
		8	Modern
		9	
		10	
Usability & Interaction		1	Flexible, double-sided use, clear, comfortable
		2	Swinging, comfortable
		3	Comfortable
		4	
		5	Swinging chair, for a long time it would be uncomfortable
		6	Comfortable
		7	
		8	
		9	Low, double-sided use
		10	Comfortable
Visual Qualities		1	Elegant, soft
		2	Neo-retro
		3	Beautiful
		4	
		5	Minimalist, simple, well-balanced, rounded corners
		6	Minimalist, chic, plain
		7	Plain, simple
		8	
		9	Smooth surface, curved lines, unique shape
		10	
Personality Characteristics	Different	1	Attractive
		2	Relaxing
		3	Pure
		4	Relaxing, cute
		5	Proud
		6	
		7	Energetic
		8	Extraordinary, different, interesting
		9	Alone, active, friendly, laughing, playful, private, relaxing

		10	Relaxing, playful, warm, friendly
Overall Impression	This cozy lounge chair invites you to take a seat to read your book in silence and peace, having pleasant thoughts and dreams in your daily life…	1	It attracts your attentions, which are based on its function and general appearance together…
		2	This chaise lounge offers a moment for relaxation, lying down, releasing tiredness, when watching TV… it gives users moral support…
		3	…
		4	Conceived for relaxation…
		5	It reminds infinity, endlessness to us… Ying Yang
		6	…
		7	…
		8	Having extraordinary design, it differentiates itself from the others…
		9	It lets you keep your privacy, read your book, put your book under it…
		10	It invites one to rest, playing by swinging…one can fly in his/her dream…

Table 5.3.5 (continued)

5.3.3 Semantic Differential study (ND)

The results of the SD study are discussed in detail as follows.

Significant mismatches and significant exact matches (ND)

Comparing the designer's intended perceptions and the users' actual (pre-usage) perceptions through the SD study over 44 adjective pairs resulted in nine (9) significant mismatches, four (4) significant exact matches and thirty one (31) non-significant findings (see Figures 5.3.2 and 5.3.3).

The adjective pairs that were identified as significant mismatches were: adj.3 (Contemporary-Traditional), adj.5 (High technology-Low technology), adj.17 (Practical-Impractical), adj.18 (Steady-Unsteady) adj.27 (Soft-Hard), adj.35 (Feminine-Masculine), adj.36 (Mature-Immature), adj.37 (Young-Old), adj.38 (Futuristic-Nostalgic), with 10, 8, 6, 7, 7, 7, 7, 7, and 7 mismatch evaluations respectively. It shows adj.3 to have the most significant mismatch, with every user giving a score outside the threshold ($v>d\pm1$). In contrast, the adjective pairs of significant exact matches were: adj.16 (Clear-Confusing), adj.25 (Ornate-Plain),

adj.28 (Orderly-Disorganized), and adj.29 (Symmetrical-Asymmetrical) with 7, 6, 6, and 6 exact match evaluations respectively.

Considering the four adjective pair categories, the following findings can be reported: two significant mismatches in category 1, two significant mismatches and one significant exact match in category 2, one significant mismatch and three significant exact matches in category 3, and four significant mismatches in category 4 (see Appendix E for full data).

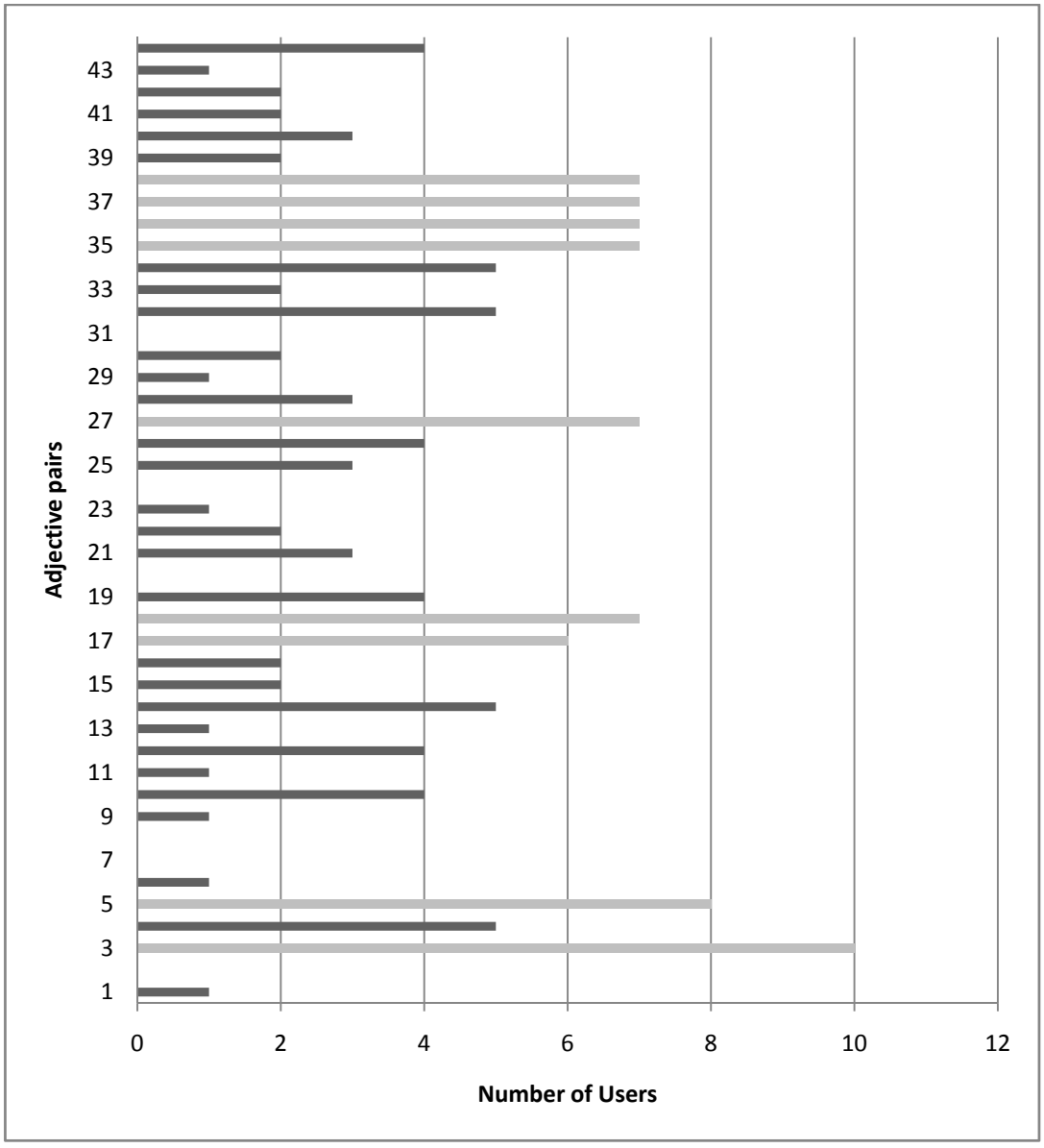


Figure 5.3.2 Number of users giving Likert grades mismatching the designer's grade (v>d±1); the gray bars indicate significant mismatches

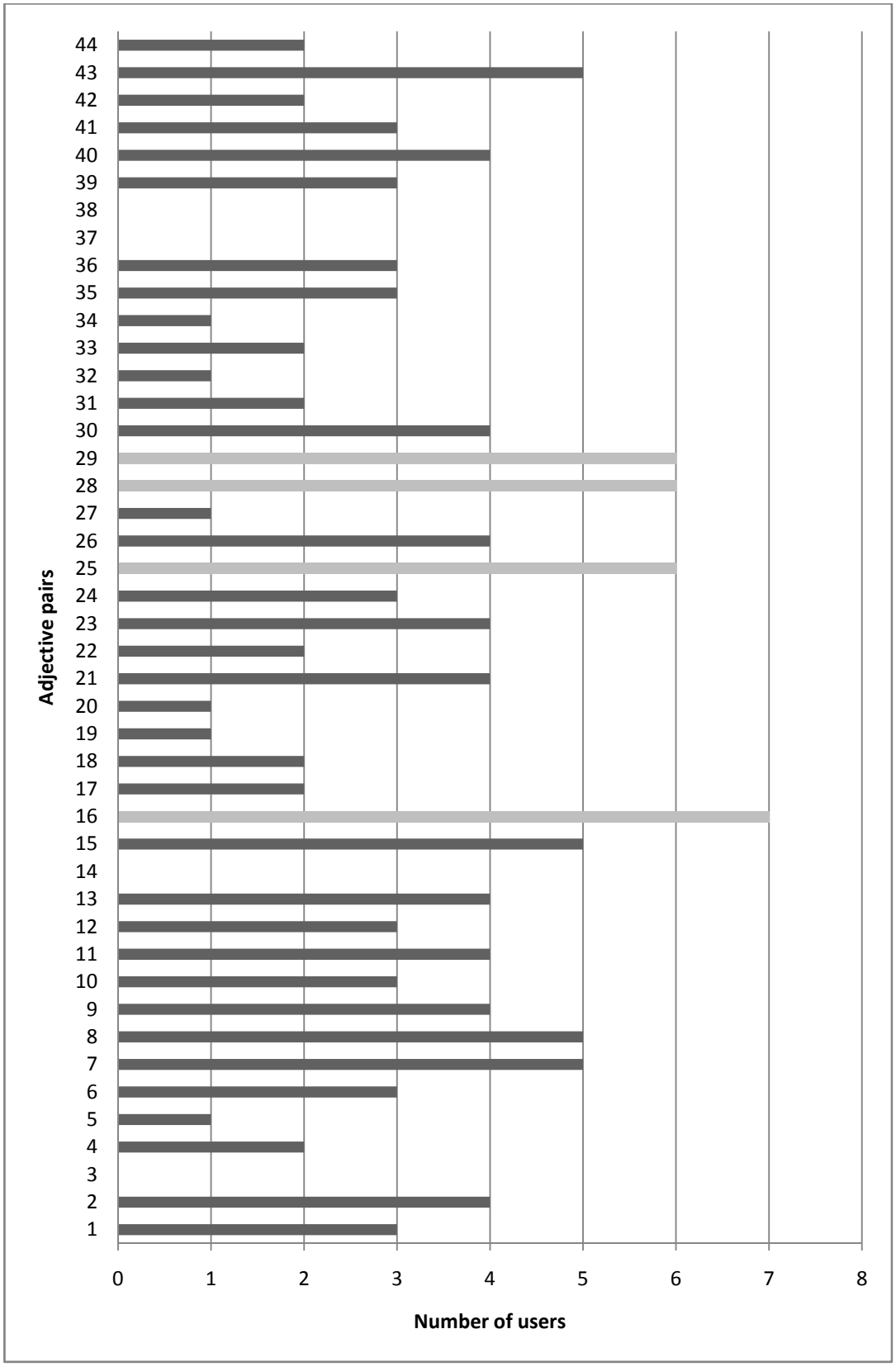


Figure 5.3.3 Number of users giving Likert grades exactly matching the designer's grade (v=d); the gray bars indicate significant exact matches

Significant mismatches – further analysis (ND)

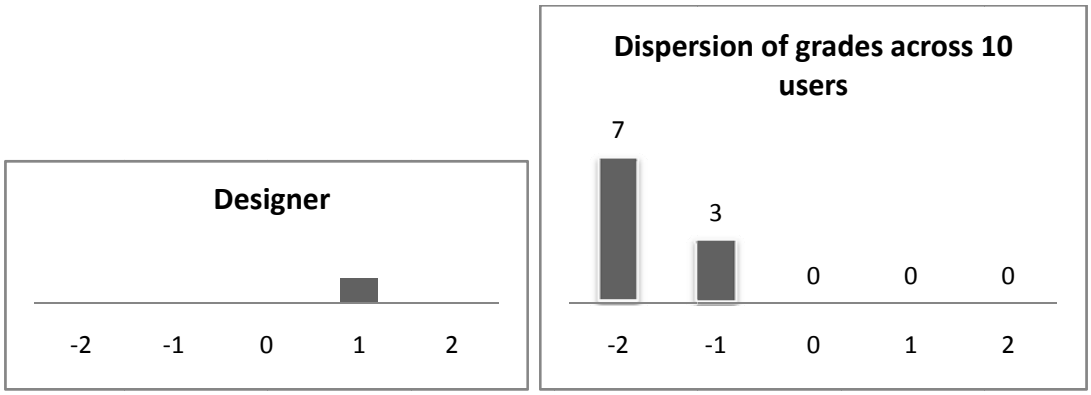


Figure 5.3.4 Designer and user evaluations for Adj.3 (Contemporary-Traditional)

The designer intended ND to be perceived as quite traditional. In contrast, none of the users agreed with the designer and perceived it as either very contemporary or quite contemporary. Users' perceptual evaluations for this adjective pair were expected, as they attributed such a meaning to this product prior to the SD study (see section 5.3.2). The designer intended message through product form was not clearly received, with the data revealing a 100% level of mismatch.

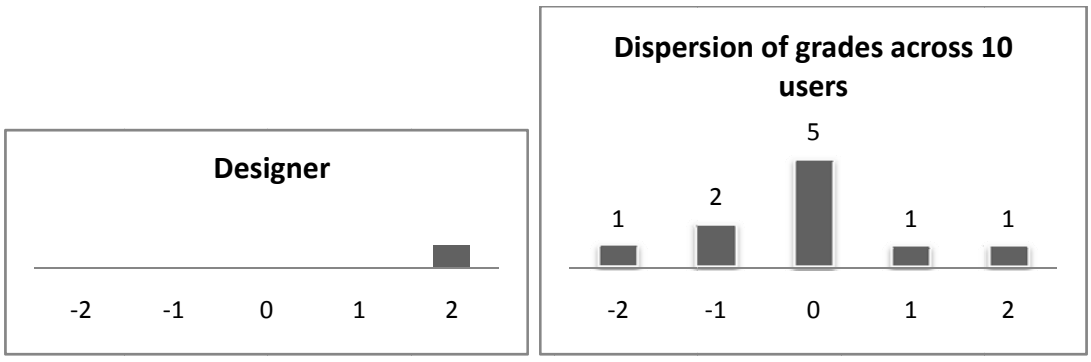


Figure 5.3.5 Designer and user evaluations for Adj.5 (High technology-Low technology)

The designer intended to represent ND as a result of very low technology. However, the users could not differentiate low technology from high technology, since five users stayed neutral on the scale. Five users also had different opinions. It shows that the evaluation for this adjective pairs is problematic, and depends on subjects' previous knowledge. In this respect, the designer's evaluation can be taken as most

relevant, as he probably knows better than users the technological level of the materials and manufacturing processes involved. However, the results show that the designer was not aware of users' perceptual responses. So an 80% level of mismatches existed for this adjective pair.

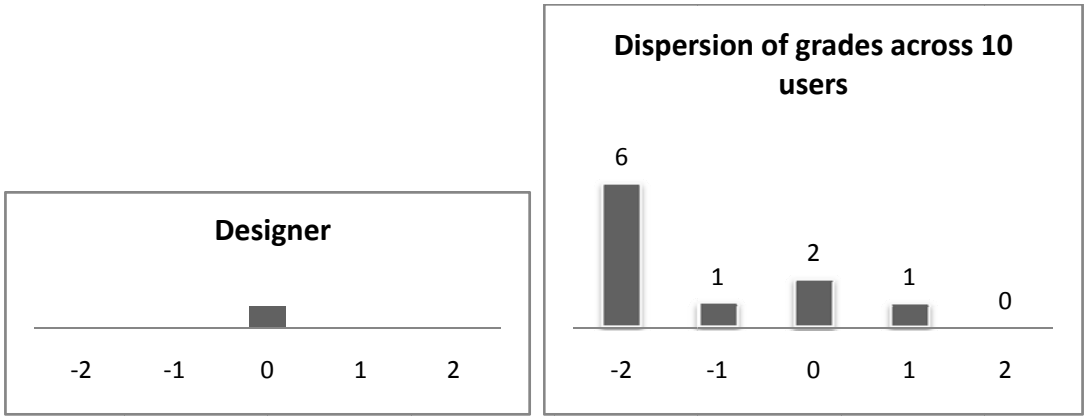


Figure 5.3.6 Designer and user evaluations for Adj.17 (Practical-Impractical)

While the designer took a cautious approach to this adjective pair and stayed neutral on the scale, most of the users found ND to be very practical (six users) or quite practical (one user). Two users agreed with designer and only one considered it as quite impractical. A 60% level of mismatch existed.

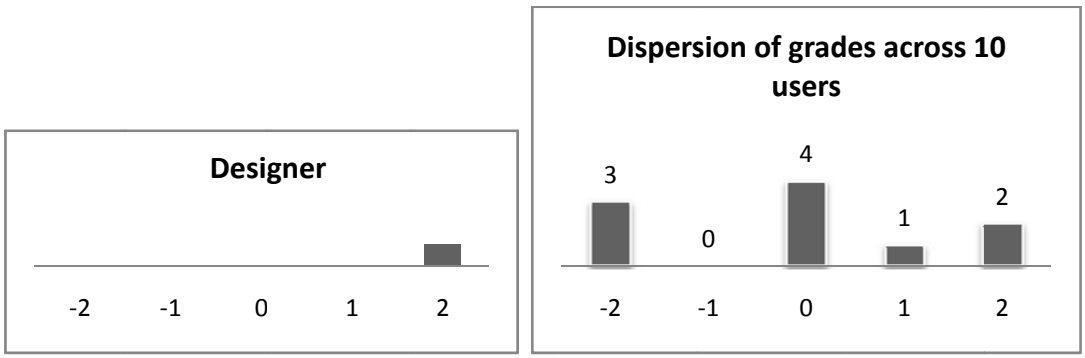


Figure 5.3.7 Designer and user evaluations for Adj.18 (Steady-Unsteady)

The designer considered ND as very unsteady. Two of the users agreed with designer. One user found it to be quite unsteady. Four users stayed neutral on the scale. Three users totally disagreed with designer and perceived it as very steady. A

wide range of evaluations existed among users. This reveals that users were not clear in their understanding of this adjective pair, whilst he designer was most probably very clear. The data indicates a 70% level of mismatch.

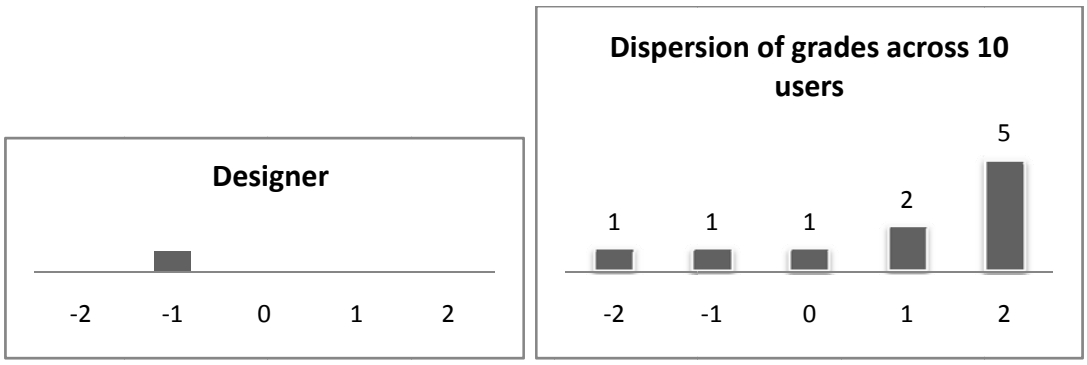


Figure 5.3.8 Designer and user evaluations for Adj.27 (Soft-Hard)

One user (an architect) agreed with the designer, perceiving the product as quite soft in its visual qualities. One user (a designer) was also inclined to this view, grading it very soft. One user remained neutral. However, most of the users stayed on the right side of the scale, seeing ND as either quite hard (3 users) or very hard (5 users). A 70% level of mismatch existed for this adjective pair. Users' grades reveal that they seemingly evaluated the adjective pair based on perceived usability and interaction (i.e. literally soft and hard) although this adjective pair was proposed under the visual quality category.

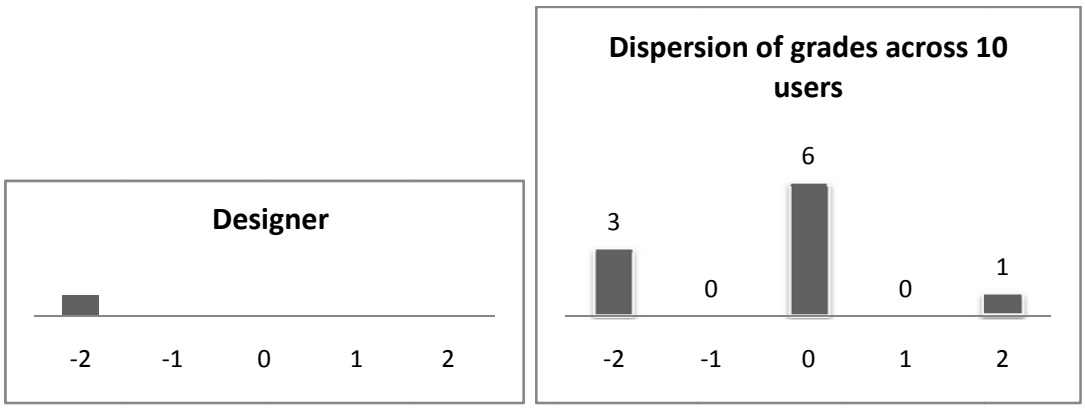


Figure 5.3.9 Designer and user evaluations for Adj.35 (Feminine-Masculine)

The designer was able to successfully communicate the intended meaning of very feminine to three users (2 females and 1 male). However, one female user found it to

be very masculine. Six users (4 females and 2 males) preferred to stay neutral on the scale. Of the three male users, none graded ND as very masculine. This reveals that perceptual responses are varied between genders. A 70% level of mismatch existed for this adjective pair.

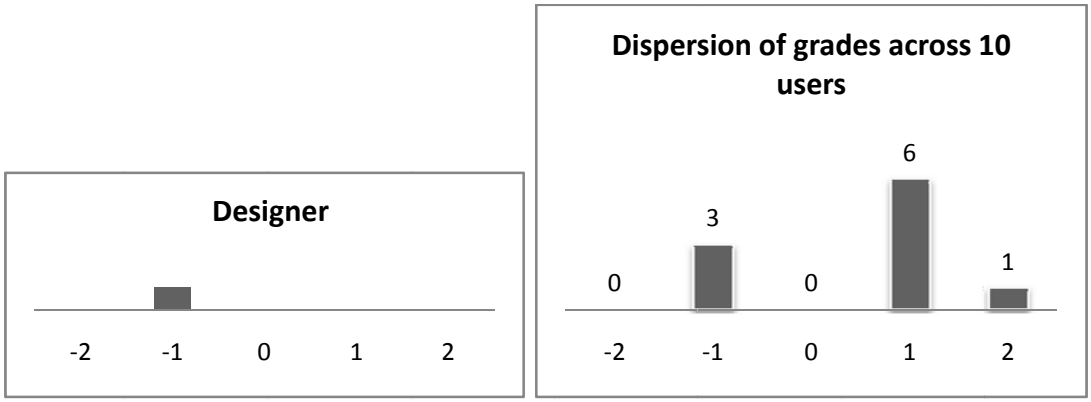


Figure 5.3.10 Designer and user evaluations for Adj.36 (Mature-Immature)

The designer intended ND to be perceived as quite mature. Just three users found it to be so, whilst the remainder perceived it as quite immature (six users) or very immature (one user). The designer had a 70% failure in communicating his message.

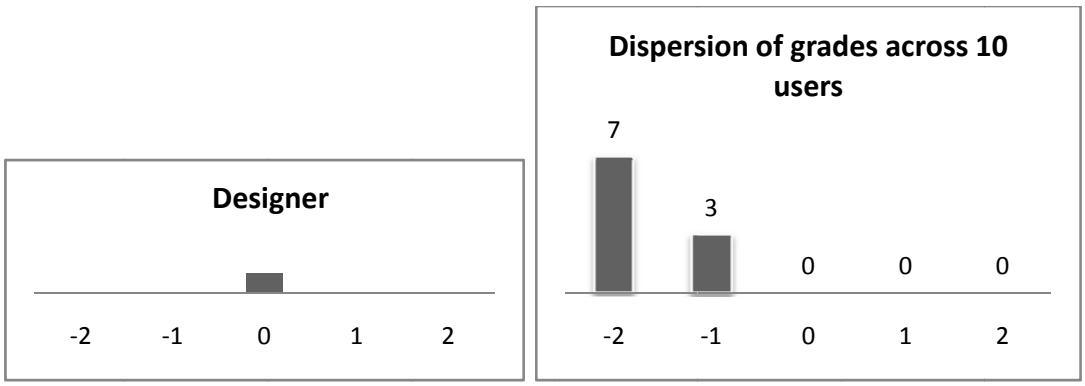


Figure 5.3.11 Designer and user evaluations for Adj.37 (Young-Old)

Although the designer stayed neutral regarding the adjective pair young vs. old, all users stayed on the left side of the scale, perceiving ND as very young (seven users) or quite young (three users). A 70% level of mismatch existed for this adjective pair.

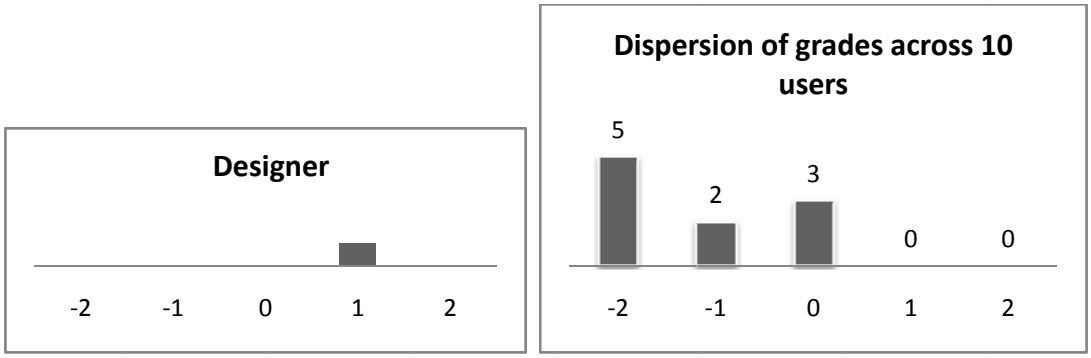


Figure 5.3.12 Designer and user evaluations for Adj.38 (Futuristic-Nostalgic)

The designer considered the product as quite nostalgic, however none of the users agreed. Three users remained neutral and two users considered ND as quite futuristic. Five of the users attributed it as very futuristic. So, a 70% level of mismatch existed for this adjective pair.

Significant Exact matches – further analysis (ND)

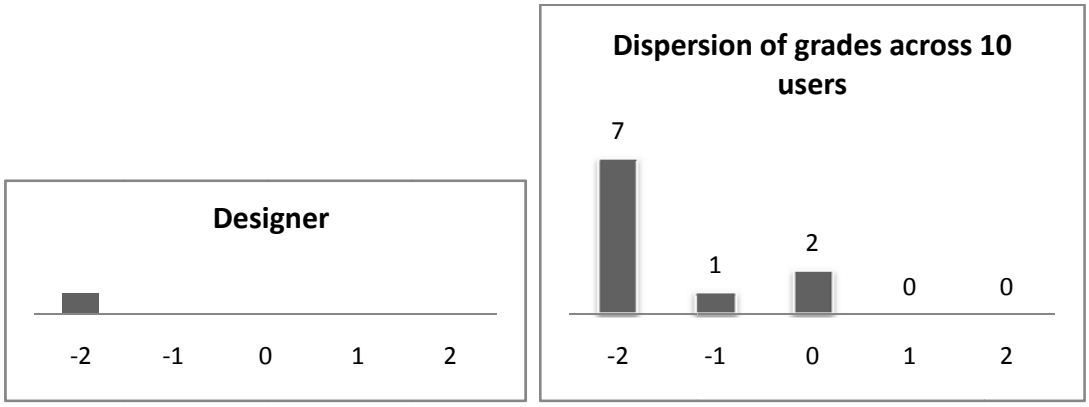


Figure 5.3.13 Designer and user evaluations for Adj.16 (Clear-Confusing)

The designer was capable of communicating the intended attribute of ND to a majority of users, as they found the product's essential function to be very clear. Two users stayed neutral on the scale. A 70% level of exact match existed for this adjective pair.

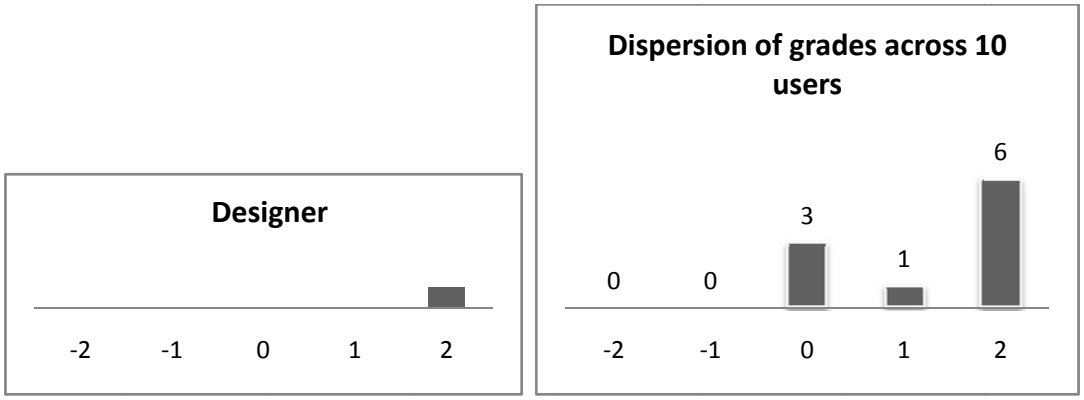


Figure 5.3.14 Designer and user evaluations for Adj.25 (Ornate-Plain)

The designer and six of the users found ND to be very plain. One user was inclined to this view, considering it quite plain. Three users stayed neutral on the scale. A 60% level of success existed in communicating this visual attribute of the product.

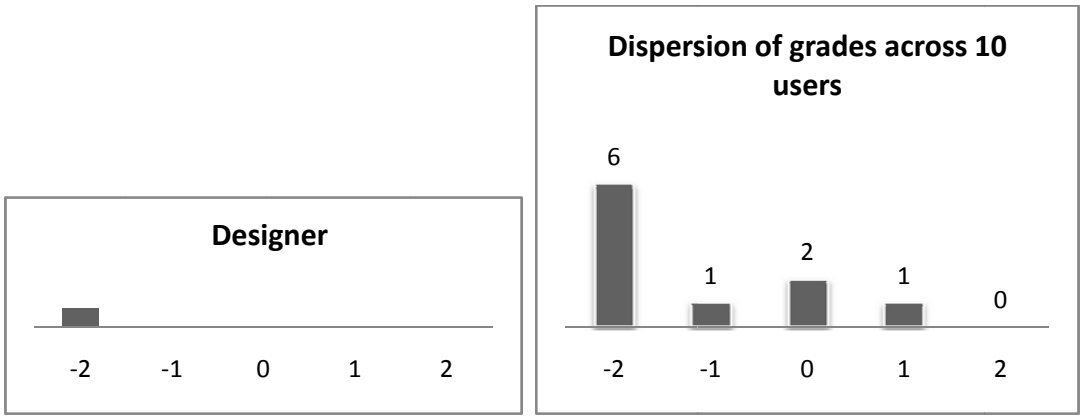


Figure 5.3.15 Designer and user evaluations for Adj.28 (Orderly-Disorganized)

The designer found ND to be very orderly: six users agreed. One user considered it as quite orderly. Two users remained neutral. However, one user regarded it to be quite disorganized. The designer was capable of communicating the intended meaning at a 60% level of exact match.

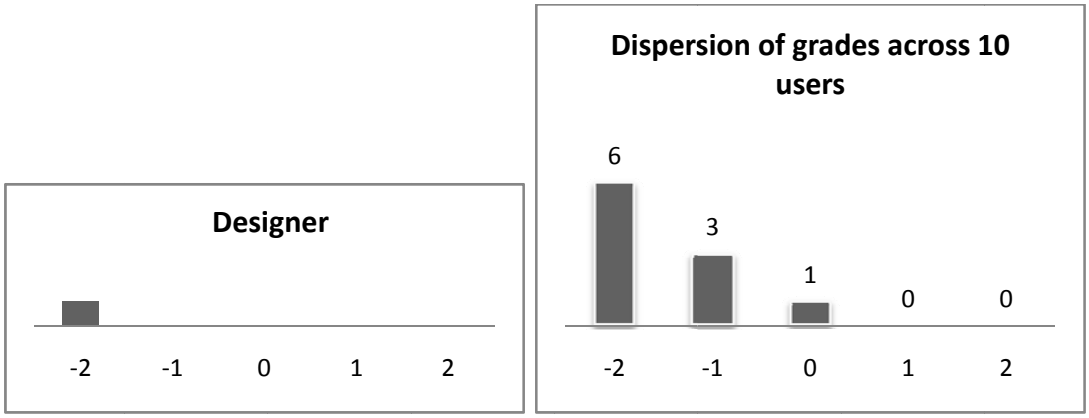


Figure 5.3.16 Designer and user evaluations for Adj.29 (Symmetrical-Asymmetrical)

The majority of users agreed with the designer, regarding the product as very symmetrical. Three users considered it quite symmetrical. One user stayed neutral on the scale. A 60% level of exact match existed for this adjective pair.

The results of the analysis reveal that the designer was relatively successful in evoking intended impressions in users' perceptual responses (see section 5.3.2). However, the comparison of the designer's intended perceptions and users' actual (pre-usage) perceptions, over 44 adjective pairs in the SD study, revealed that there were 9 significant mismatches, most of which fell within the Personality Characteristics category (having 4 mismatches). Of the 4 significant exact matches, 3 were related to the Visual Qualities category. Overall, in the first half of the results, the designer had a high level of success in achieving communication of his intended messages, but in the more detailed SD study, the designer failed significantly to successfully communicate 9 of the 44 adjective pairs.

5.4 Analysis of product example 4 (Sumo)

The product example 4 (Sumo) is one of the breakthrough products designed by Alp Nuhoğlu. Sumo is made by B&T Design. In this study designer identified the messages he intend to communicate to users through visual form of Sumo. The short name of NS (Nuhoğlu and Sumo) is used throughout the study as the product code (Figure 5.4.1). The designer indicated the intended user group for the product (Table 5.4.1). Ten users found as representatives of the intended user group participated in this study to evaluate the perceived attributes of product form of NS (Table 5.4.2).

Figure 5.4.1 Product NS designed by Alp Nuhoglu

Table 5.4.1 Specifications of the intended user group related to NS product

Gender	Male and female
Age range	25-48
Income level	Moderate and high
Level of education	Some college, undergraduate, graduate and doctoral
Lifestyle and personality	Intellectual, townsman, appreciating and discriminating design, following new developments in the world…

Table 5.4.2 List of users participating in the evaluation of NS product

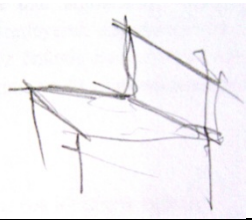
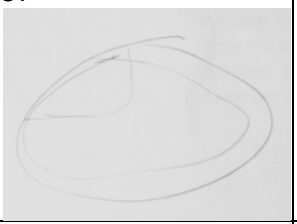
Users	**Gender**	**Age range**	**Level of education**	**Occupation**
1	Female	25-36	Graduate	Finance
2	Male	37-48	Graduate	Teacher
3	Male	37-48	Undergraduate	Employee (furniture firm)
4	Male	25-36	Undergraduate	Urban planner
5	Female	25-36	Undergraduate	...
6	Female	25-36	Undergraduate	Market Analyst
7	Female	25-36	Undergraduate	Nurse
8	Male	25-36	Undergraduate	Self-employee
9	Male	25-36	Graduate	Engineer
10	Female	25-36	Undergraduate	Designer

5.4.1 Names associated with NS

The name 'Sumo' was given to NS by the designer, for the following reasons. He noted that NS resembles a sumo wrestler in material qualities, being very strong and robust. Therefore he wanted to communicate this attribute of NS through the name of Sumo and its associated meanings.

Three sketched analogies existed in users' first impressions of NS (Table 5.4.3). User 2 attached NS to a tree and a piece of trunk that can be used for sitting and playing as it rolls on the ground. User 4 demonstrates a common chair, with four legs, a sitting area and a back. It is assumed that the user either compared NS with a common chair, or he tried to represent the obvious function of NS as being used for sitting. User 7 tried to make the visual structure of NS clear for herself. However, just user 2 proposed a name that matched the analogy he sketched. The others (users 4 & 7) suggested names that were not based on the sketched analogies (see Table 5.4.4).

Table 5.4.3 Mental images elicited from NS at first glance

<table>
<tr><th>Stimulus</th><th colspan="2">Analogies</th></tr>
<tr><td rowspan="6"> 
  </td><td>U1</td><td>U2
  </td></tr>
<tr><td>U3</td><td>U4
  </td></tr>
<tr><td>U5</td><td>U6</td></tr>
<tr><td>U7
  </td><td>U8</td></tr>
<tr><td>U9</td><td>U10</td></tr>
</table>

The impressive color of NS was an influential factor in most of the users' perceived impressions and proposed names. Three users (U2, U3, & U4) suggested the names of Green Trunk, Green Pea, and Kiwi, referring to familiar things with similar visual qualities. The names of Rolling chair and Bathtub refer to the perceived usability of NS. User 1 proposed the name of Topitop. However, the user did not explain why she gave this name to NS and what it means. One user considered the product as shaped like a cube and accordingly gave the name Cube. One user found NS to be similar to plastic products from Kartell Design company and gave the name of Kartell to NS. The name of Idle refers to product personality.

Table 5.4.4 Comparison between the designer's product name and names given to NS by users

Designer	Users	
SUMO (powerful and strong like a sumo wrestler)	1	Topitop
	2	Green Trunk
	3	Kiwi
	4	Green Pea
	5	…
	6	Cube
	7	Kartell (similar to Kartell design)
	8	Bathtub (Küvet)
	9	Rolling chair
	10	Idle (aylak)

5.4.2 Intended attributes versus perceived attributes (NS)

The designer stated that he aimed to design a product to satisfy exclusive needs and tastes of users. He also wanted to represent his professional work as an industrial designer, from whom users and customers had high expectations and looked for new and special designs. He stated that through NS and its organic form together with material quality, plastic coating, and enjoyable characteristics, he intended to surprise users and make them happy (Table 5.4.5). The designer put forward the view that NS, as a garden or outdoor furniture item with its impressive dimensions, can also be a playful object for children as they can pass through it (Figure 5.4.2).

Figure 5.4.2 NS as a playful object for children

Users' perceived attributes and their frequency of mention reveal that they received most of the messages the designer had intended to convey. Users attribute meanings, mostly positive, to NS that fall under all four meaning categories. However, attributes related to Social Values and Positions category were not dominant in users' perceptions.

According to the users' overall impressions, it is obvious that they not only expressed their positive feeling and favorable evaluation of NS, but they also showed their curiosity about product function. For example, the overall impression of user 5 reveals that she wanted to discover and know if the product is ergonomic or not. Some users, e.g. U10, expressed the perceived usability of the product, stating it may "roll back and forth".

Table 5.4.5 Comparisons between designer's intentions and users' perceived attributes

SUMO	Designer	Users	
Social Values & Positions		1	Modern
		2	
		3	Modern
		4	
		5	
		6	
		7	Modern, small target, experimental
		8	
		9	
		10	Modern
Usability & Interaction	Robust, powerful	1	Comfortable, swinging
		2	Restful, thick and strong
		3	Comfortable
		4	
		5	
		6	
		7	Powerful
		8	
		9	Rocking
		10	Swinging, unsteady, easy to sit on
Visual Qualities	Rounded, organic	1	Simple, rounded
		2	Rounded
		3	Simple, plain
		4	
		5	Novel
		6	Stylish
		7	Funky (unusual), large
		8	Curved surface, oval
		9	Dynamic, oval
		10	
Personality Characteristics	Enjoyable, playful, surprising	1	
		2	Playful, enjoyable
		3	Striking
		4	
		5	Interesting
		6	Extraordinary, different
		7	Show case, relaxing
		8	
		9	Relaxing, fun

		10	
Overall impressions	This outdoor or garden furniture unit with its powerful structure and personality, unique form and consistent color with nature not only add aesthetic value to the area in which it is used but it also can be enjoyable object for children to play with it.	1	…
		2	This sitting unit tells me; come and take a rest… play with me and enjoy your time in nature…
		3	…
		4	Outdoor furniture… It is probably designed to be used in the recreation grounds…
		5	I wonder it is ergonomic or not!
		6	Everything doesn't need to be ordinary…
		7	It may be a showcase of feature piece amongst other furniture…
		8	…
		9	The oval form and cupped slat with the chair enveloping the person sitting in it…dynamic-looks as if It should rock back and forth…
		10	It may roll back and forth…

Table 5.4.5 (continued)

5.4.3 Semantic Differential study (NS)

The designer's intended perceptions and users' actual perceptions of NS, which were evaluated across 44 adjective pairs, are discussed as follows.

Significant mismatches and significant exact matches (NS)

Comparing the designer's and the ten users' evaluations for the 44 adjective pairs resulted in seven (7) significant mismatches, eight (8) significant exact matches and twenty nine (29) non-significant results (Figures 5.4.3 and 5.4.4). Considering the four adjective pairs categories, the following findings can be reported: four significant exact matches in category 1, one significant mismatch in category 2, two significant mismatches and two significant exact matches in category 3, and three significant mismatches and two significant exact matches in category 4 (see Appendix F for full data). Adjective pairs that were identified as significant mismatches were: adj.16 (Clear-Confusing), adj.24 (Simple-Complex), adj.25 (Ornate-Plain), adj.30 (Organic-Geometric), adj.39 (Quiet-Noisy), adj.40 (Truthful-

Exaggerated), and adj.41 (Proud-Humble), with 6, 7, 7, 6, 8, 7, and 6 mismatch evaluations respectively. In contrast, adjective pairs of significant exact matches were: adj.3 (Contemporary-Traditional), adj.4 (Avant-garde-Conservative), adj.6 (Formal-Casual), adj.8 (Expensive-Cheap), adj.21 (Dynamic-Static), adj.29 (Symmetrical-Asymmetrical), adj.38 (Futuristic-Nostalgic), and adj.43 (Interesting-Boring) with 7, 6, 7, 6, 6, 7, 6, and 6 exact match evaluations respectively.

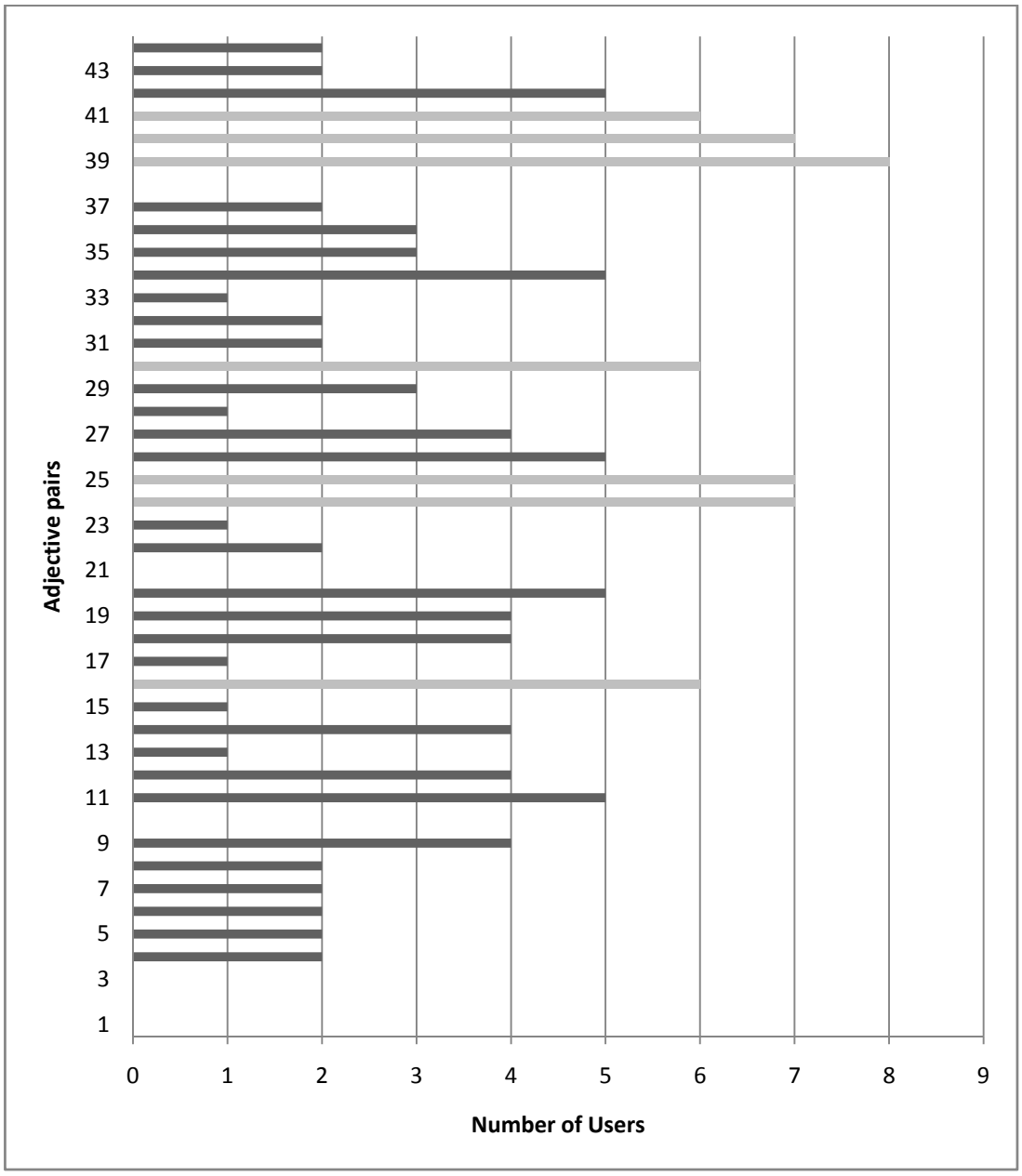


Figure 5.4.3 Number of users giving Likert grades mismatching the designer's grade (v>d±1); the gray bars indicate significant mismatches

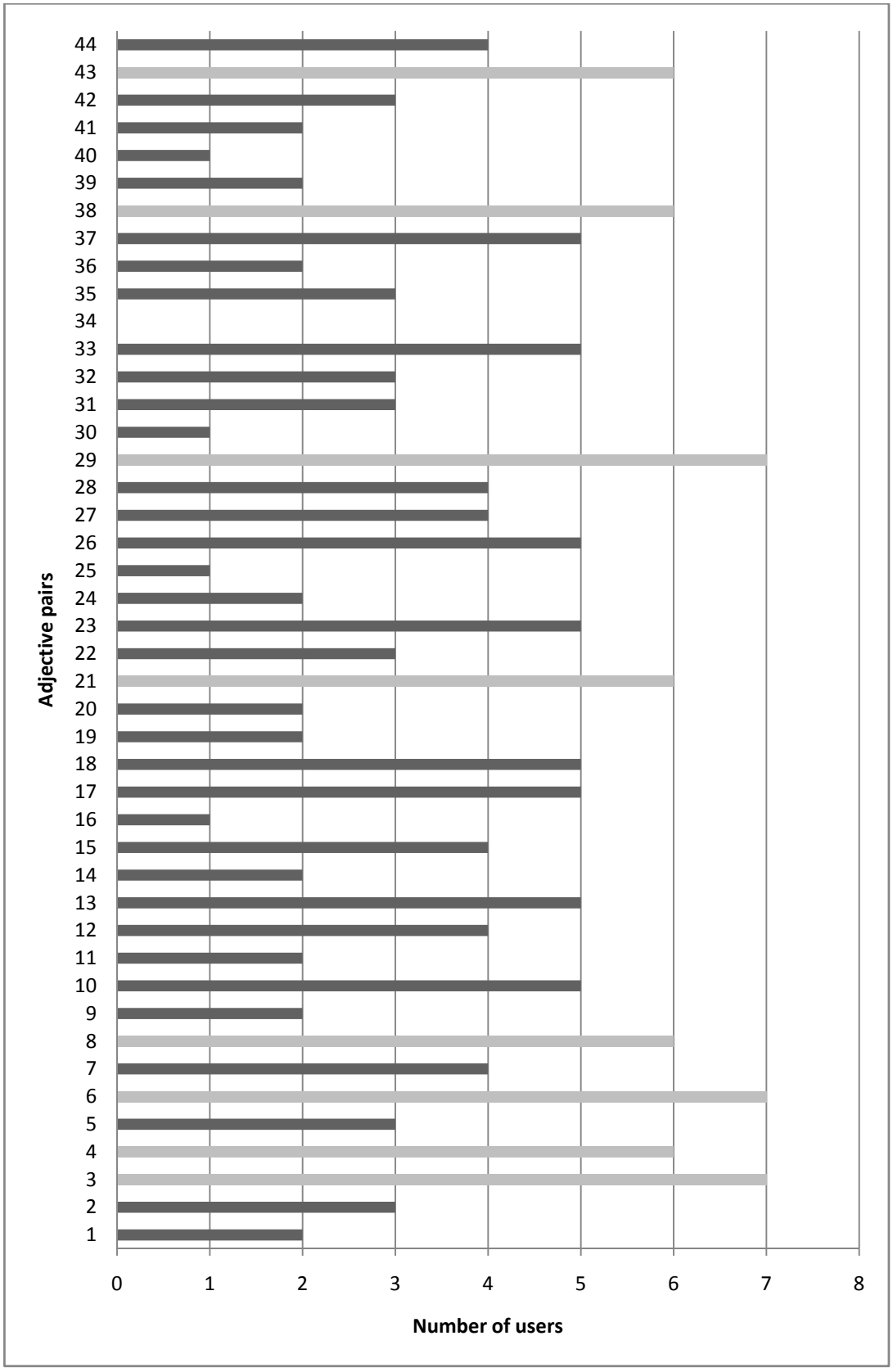


Figure 5.4.4 Number of users giving Likert grades exactly matching the designer's grade (v=d); the gray bars indicate significant exact matches

Significant mismatches – further analysis (NS)

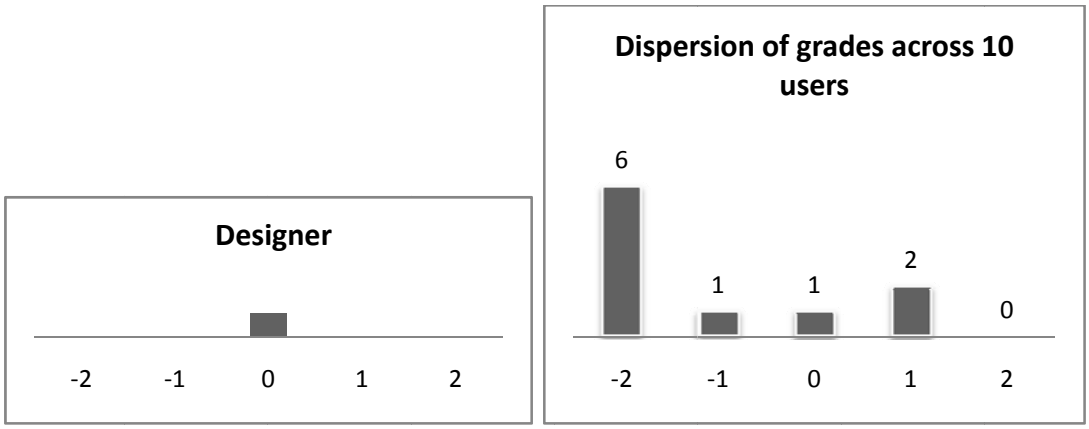


Figure 5.4.5 Designer and user evaluations for Adj.16 (Clear-Confusing)

The designer remained neutral on the evaluation of NS regarding the adjective pair clear vs. confusing. One of the users agreed with designer's evaluation. However, the majority of users found it to be either very clear (six users) or quite clear (one user). Two users found it to be quite confusing. Accordingly, the designer's evaluation does not match with many of the users' evaluations, with the data revealing a 60% level of mismatch.

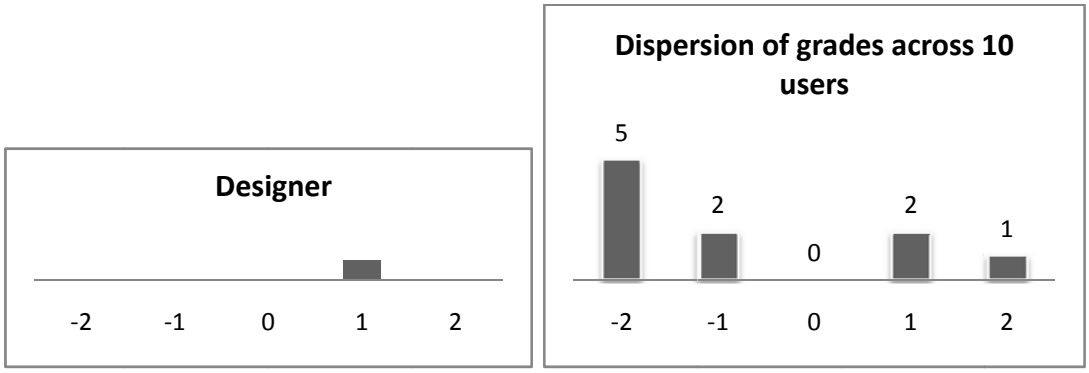


Figure 5.4.6 Designer and user evaluations for Adj.24 (Simple-Complex)

Two users agreed with the designer that the visual quality of NS could be considered as quite complex. One user saw it as very complex. However, many users found it to be very simple (five users) or quite simple (2 users). So the designer intended message was not clearly received, with the data revealing a 70% level of mismatch.

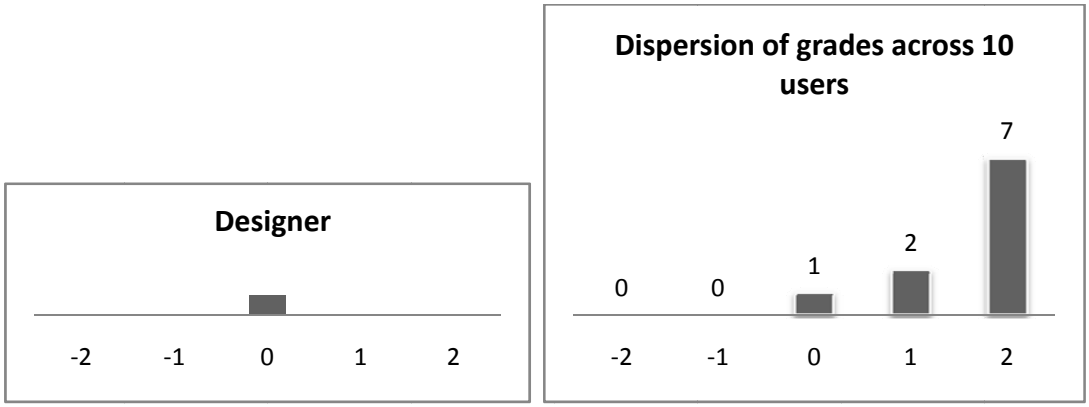


Figure 5.4.7 Designer and user evaluations for Adj.25 (Ornate-Plain)

The designer stayed neutral on the scale. Although the designer took a cautious evaluation, many users' evaluations were strongly opinionated, considering NS as very plain (seven users) or quite plain (two users). Users' evaluations were likely correlated with adj.24 (Simple-Complex). So, a 70% level of mismatch existed for this adjective pair.

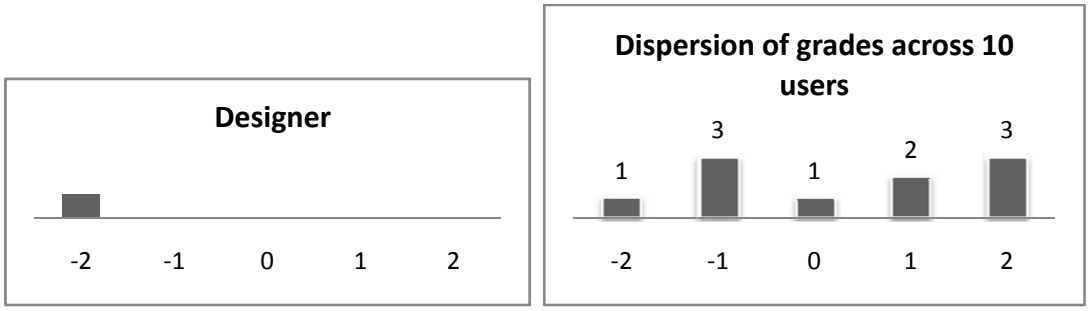


Figure 5.4.8 Designer and user evaluations for Adj.30 (Organic-Geometric)

The designer intended NS to be perceived as very organic. However, different opinions existed in users' evaluations, as all possible scores were used by users. Just one user stayed neutral on the scale. The findings reveal that the designer could not communicate clearly the message of an organic form to many users, with the data revealing a 60% level of mismatch.

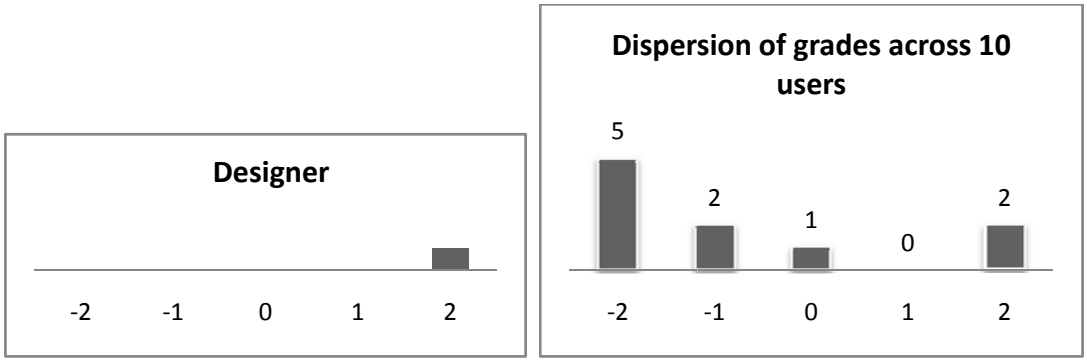


Figure 5.4.9 Designer and user evaluations for Adj.39 (Quiet-Noisy)

The designer attributed a very noisy personality to NS. However, the majority of users did not agree, seeing NS as very quiet (five users) or quite quiet (two users). An 80% level of mismatch existed for this adjective pair.

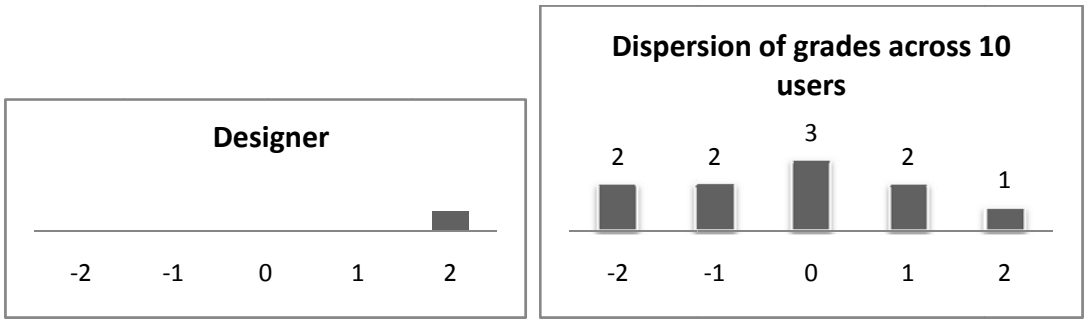


Figure 5.4.10 Designer and user evaluations for Adj.40 (Truthful-Exaggerated)

The designer and one user found NS to be very exaggerated. Two users were inclined to this view, considering it as quite exaggerated. Three users stayed neutral on the scale. Four users, however, stayed on the left side of the scale, disagreeing with the designer. The users' evaluation reveals that they were not clear enough about the meaning of the adjective pair, although the designer's evaluation would have been given confidently. A 70% level of mismatch existed for this adjective pair.

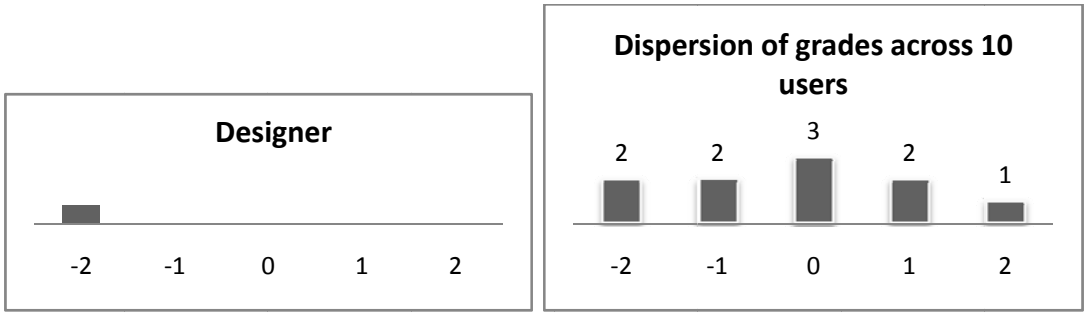


Figure 5.4.11 Designer and user evaluations for Adj.41 (Proud-Humble)

The designer's position on the scale is clear: he attributed a very proud personality to NS. However, the users' evaluation for this attribute reveals that they were not sure enough to find ND very proud. A 60% level of mismatch existed for this adjective pair.

Significant Exact matches – further analysis (NS)

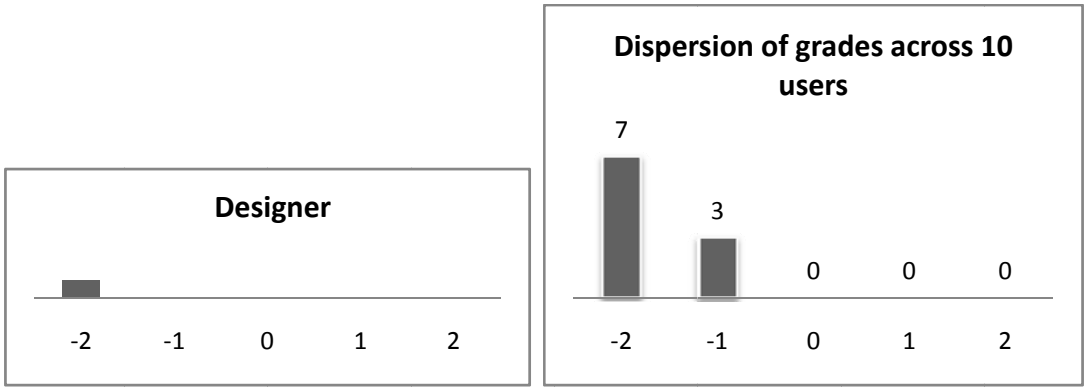


Figure 5.4.12 Designer and user evaluations for Adj.3 (Contemporary-Traditional)

The designer and users stayed on the left side of the scale, considering NS as a contemporary product. The data reveals a 70% level of exact match for this adjective pairs. Users' evaluations can be supported by the perceived attributes of the product they mentioned in section 5.4.2.

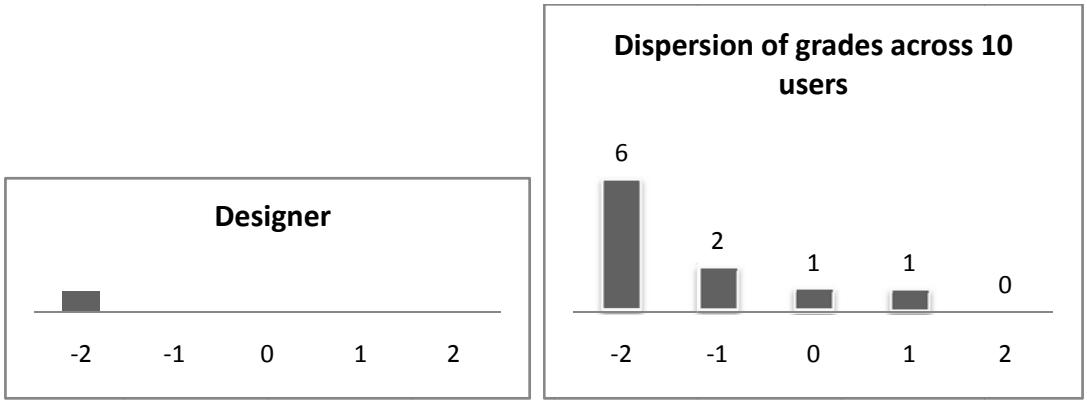


Figure 5.4.13 Designer and user evaluations for Adj.4 (Avant-garde-Conservative)

The designer was capable of communicating the avant-garde attribute of NS to many users, who graded it as very avant-garde (six users) or quite avant-garde (two users). A level of 60% exact match success was achieved for this adjective pair.

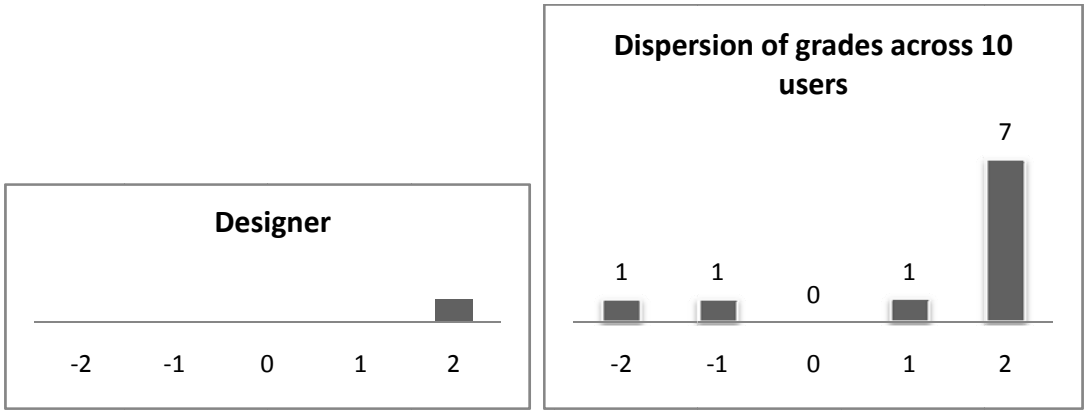


Figure 5.4.14 Designer and user evaluations for Adj.6 (Formal-Casual)

Although two users found NS to be formal, eight users stayed on the opposite side on the scale, finding NS to be very casual (seven users) or quite casual (one user). The designer was successful to communicate a casual meaning of the product to many users, with the data revealing a 70% level of exact match.

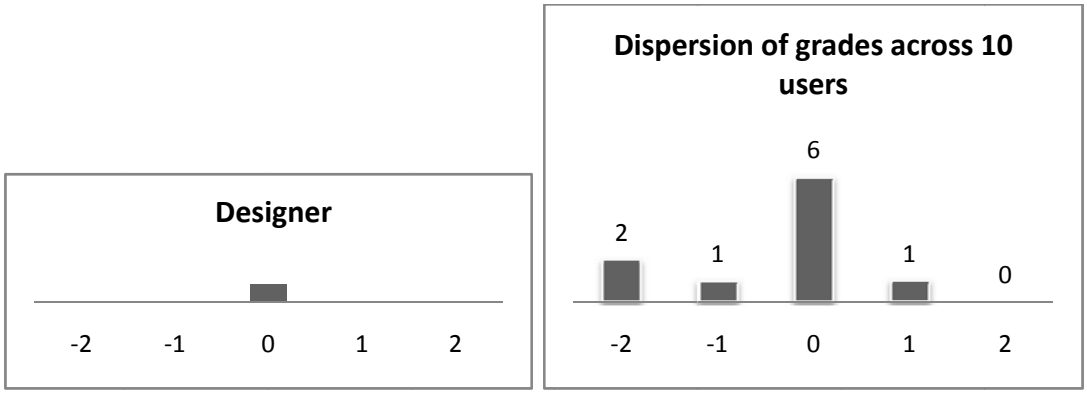


Figure 5.4.15 Designer and user evaluations for Adj.8 (Expensive-Cheap)

The designer and six users remained neutral on the evaluation of NS for the adjective pair expensive vs. cheap. Three users found it to be expensive while one user had the opposite view, considering NS as quite cheap. A 60% level of exact match existed for this adjective pair.

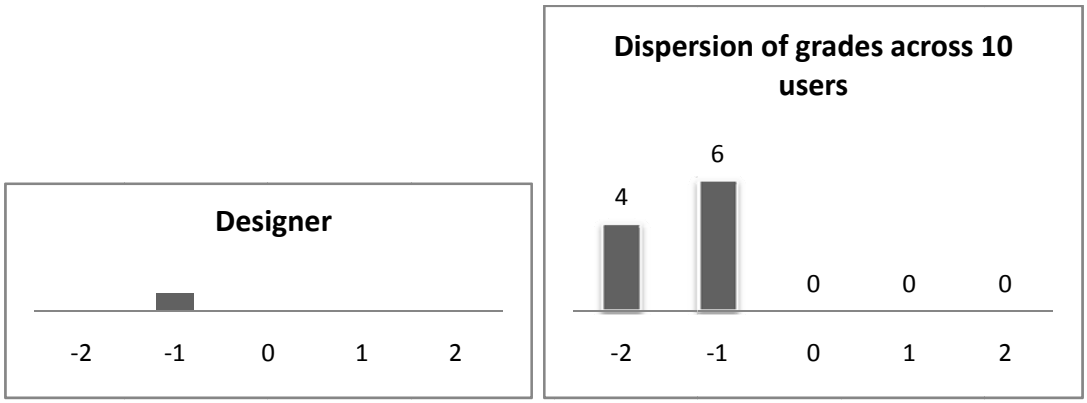


Figure 5.4.16 Designer and user evaluations for Adj.21 (Dynamic-Static)

The designer and users stayed on the left side of the scale. The designer and six users found the visual quality of NS to be quite dynamic, whilst four users considered it very dynamic. A level of 60% exact match success was achieved for this adjective pair.

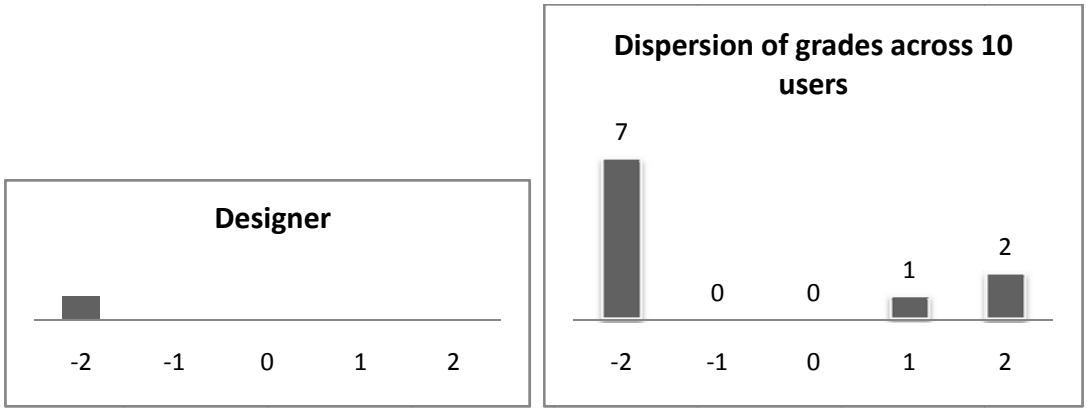


Figure 5.4.17 Designer and user evaluations for Adj.29 (Symmetrical-Asymmetrical)

The designer was able to communicate a symmetrical attribute of NS to many users. However, three users stayed in opposite side of the scale. It is assumed that their evaluations were based on the side views of the product. It reveals that evaluation against this adjective pair is quite confusing, nevertheless a level of 70% exact match success was achieved.

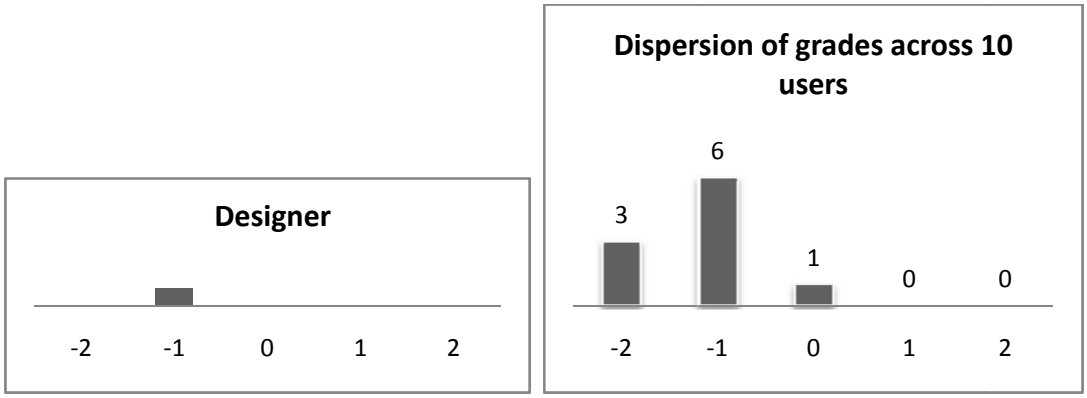


Figure 5.4.18 Designer and user evaluations for Adj.38 (Futuristic-Nostalgic)

The designer attributed a quite futuristic personality to NS: six users agreed. Three users evaluated it as very futuristic. One person remained neutral on the scale. A 60% level of exact match existed for this adjective pair.

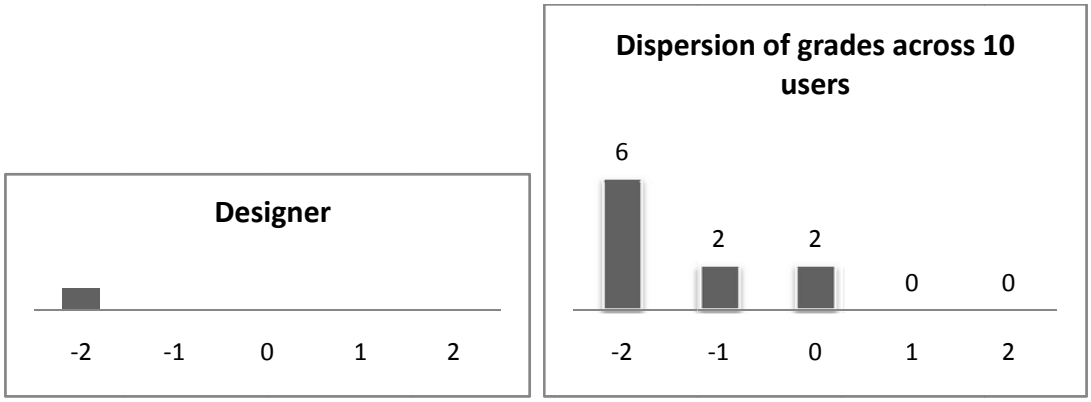


Figure 5.4.19 Designer and user evaluations for Adj.43 (Interesting-Boring)

Although two users remained neutral on the evaluation of NS regarding the adjective pair interesting vs. boring, many of users agreed with the designer, staying on the left side of the scale, with the data revealing a 60% level of exact match.

The results of the comparative analysis of designer's intended messages and users' perceived messages embodied in product form of NS, which were discussed under three sections, reveals that the designer was able to communicate the material quality as being strong, powerful, and surprising to many users. He assigned the name Sumo to signify these characteristics. In the second section, the designer was revealed to be also relatively successful in evoking intended impressions in users' perceptual responses. The comparison of designer's intended perceptions and users actual (pre-usage) perceptions, over 44 adjective pairs through SD study, revealed 7 significant mismatches, most of which fell into the Visual Qualities and Personality Characteristics categories (3 mismatches in each category). However, the participants' evaluations for adjs. 16, 24, and 25 showed that the designer had taken a very cautious approach and stayed neutral whilst users were inclined to give strong positive evaluations, finding the product to be clear, simple, and plain. From the 8 significant exact matches, 4 adjective pairs were related to the Visual Social Values and Positions category. This shows that the designer was successful in communicating attributes originating from this category.

5.5 Analysis of product example 5 (Boxer)

Product example 5 (Boxer) is made by B&T Design, which is a highly respected furniture design company based in Turkey. The company's professional reputation is owed partly to working with well-known designers, such as Tanju Özelgin who is the creator of product 5 (Boxer). Mr. Tanju Özelgin, who agreed to participate in this study, is the founder and head of the 'TO studio' design team since 1987. He holds a bachelor degree in industrial design from Marmara University, Istanbul, and has approaching 20 years professional experience in furniture design. The abbreviation of 'OB', which derives from a combination of Ozelgin and Boxer is used throughout this section as the product code (Figure 5.5.1).

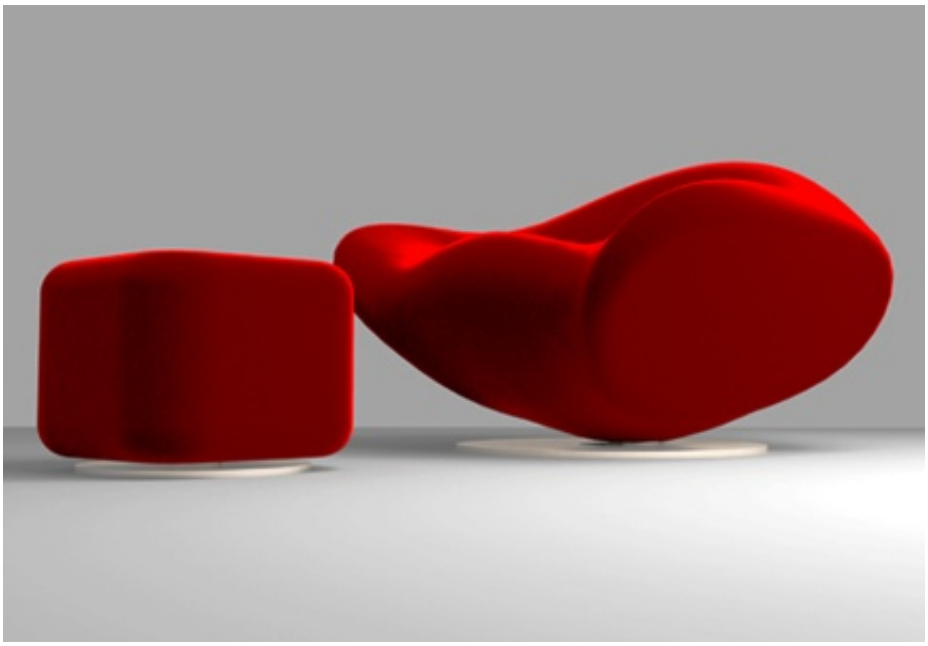


Figure 5.5.1 Product OB designed by Tanju Özelgin

Table 5.5.1 Specifications of the intended user group related to OB product

Gender	Male and female
Age range	25-48
Income level	Moderate and high
Level of education	Any
Lifestyle and personality	Intellectual, appreciating and discriminating design and aesthetic values of it …

The target user group of OB, which the designer had in mind when designing, was identified with reference to demographic information and personality (see Table 5.5.1). The designer asserted that he wanted to communicate to users who were aware of the visual language of design or its aesthetic values. Accordingly, ten (10) users were selected to participate in the study (see Table 5.5.2).

Table 5.5.2 List of users participating in the evaluation of OB product

users	gender	Age range	Level of education	occupation
1	Male	37-48	Undergraduate	Photographer
2	Male	25-36	Undergraduate	Working for Media &TV
3	Female	25-36	Graduate	Musician
4	Male	25-36	Some collage	Painter
5	Male	25-36	Graduate	Packaging designer
6	Male	25-36	Undergraduate	Architect
7	Female	25-36	Graduate	Student
8	Female	25-36	Undergraduate	Student
9	Female	25-36	Graduate	Student
10	Male	37-48	Doctoral	Artist

The survey advocated that the designer wished to transmit the intended messages, not only through visual communication, but also through physical interaction with the product, since he noted that "he/she would feel the messages while sitting or twisting in the Boxer". The expectation was based on the designer's professional experience. The designer also argued that his goals in relation to the visual form of OB had been exactly realized in the manufactured product. However, the users' evaluations were limited in scope compared with the designer's vision, since users had access only to a computer-generated image.

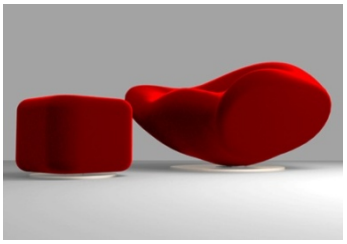
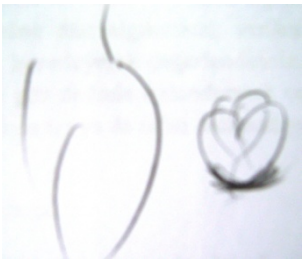
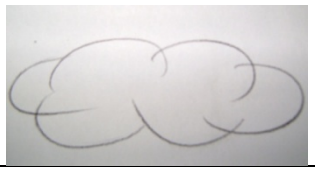
5.5.1 Names associated with OB

According to the designer, the name 'Boxer' was given because of the product's overall form. The name was the shared idea of both the designer and the company, B&T Design. 'Pieta' was an alternative name the designer gave to the product, representing the Holy Mary. The designer also suggested some signified behavior of

the product form: as if holding one's body in the palm of the furniture, protecting, taking, and carrying.

The users also made subjective interpretations on the basis of their first impressions. Five users made analogies and tried to understand what the product visual form signifies or meant to them. All users gave names to the product, which somehow define the visual characteristics of the product (see Tables 5.5.3 and 5.5.4).

Table 5.5.3 Mental images elicited from OB at first glance

Stimulus	Analogies	
	U1	U2
	U3 	U4 
	U5	U6 
	U7 	U8
	U9	U10 

The sketched analogies defined the natural and sculptural qualities of the product form, together with its sensual behavior. The users identified similarities between the curvaceous attributes of OB and a woman's body, cloud, flower, and wine glass. Most of the users were inspired by attractive curves on the body of the product. For

user 6, OB reminded him of a tulip next to a small rock. It can be interpreted that the user wanted either to put emphasis on pleasing attributes of the sitting unit or to illustrate that there is a lack of harmony between the sitting unit and the footstool. For user 10, OB implied some pieces of rocks that were naturally carved into the shape of a sitting unit.

Table 5.5.4 Comparison between the designer's product name and names given to OB by users

Designer	Users	
BOXER (Associated name derived from its overall form...) **PIETA**	1	Contrast
	2	Red pilot (it reminds me the sitting units of pilots' resting room)
	3	Wine glass
	4	Red Bud
	5	Bumpy
	6	Swan-feather, Eiderdown (warm, restful)
	7	Dreaming Cloud
	8	Sensual
	9	Love lounge
	10	Red Hen

Based on the proposed names, different types of name can be identified. The names of Swan-feather and Dreaming Cloud refer to the impressions that were based on the integration of 'perceived usability and analogy'. Regarding the name of Swan-feather, the user found it to be warm to rest against, just as the natural characteristics of the feather of a swan is. The user proposed the name of Dreaming Cloud because she found it a very restful and comfortable sitting unit that one can take a seat, and fly in his/her dreams like a cloud. The next group of names refers to the 'personality' of the product form, such as Sensual and Love lounge. The names of Contrast and Bumpy refer to OB's 'visual quality'. User 1, who proposed the name Contrast, did not find visually harmonies and compositions between the two objects (sitting unit and footstool). User 5 explained that the product had uneven movements on its surface, so he named it Bumpy. One of the names derived from OB's 'visual quality' and 'evoked experience' was Red Pilot. The other names that refer to integration of 'visual quality and analogy' were Red Hen, Red bud, and Wine glass. Each of these shows that the wine color of the product, together with its rounded shape, were influential on most users' first impressions.

5.5.2 Intended attributes versus perceived attributes (OB)

As noted in previous section, the designer tended to talk about the personality characteristics and abstract or implicit behaviors of the product visual form, as he attached the product to Pieta. Based on the Overall Impression attributes (see Table 5.5.5), the designer claimed that the product not only satisfies the basic need of sitting, but adds aesthetic values to its surrounding, being an impressive sculptural object.

According to the users' perceived descriptions (see Table 5.5.5), it is clear that the most frequently mentioned attributes of the product visual form were in relation to the Personality Characteristics, and Visual Qualities categories. The users' perceptual responses may support the designer's viewpoint that the product's Personality Characteristics and Visual Qualities are two dominant values of OB's form.

Some of the attributes, mentioned by users, are related to Social Values & Positions and Usability & Interaction categories. With regard to perceived usability, most users saw the product being comfortable (although the designer did not note directly that the product would be considered comfortable – perhaps this was something to be taken for granted by the designer). Regarding attributes under the category of Social Values and Positions, some users found it to be specialized, meaning that they felt OB had a niche market. OB is designed for people who see aesthetic values as an important part of their living space. For example, user 10 said "although I like this sculptural object, I wouldn't like to have this because I should make a harmony with the other objects around this…I cannot afford it". Two of the users also considered the product to be modern. Considering the designer's intentions, these attributes, modern and specialized, were in the designer's mind, as he explained OB "has the *exclusive style* of the *first-class* furniture *for those* who want to *add value* to their *space* with not just a sitting unit but also a *statuesque object*". Accordingly, the designer was successful in evoking these attributes in target users' perceptual responses.

Table 5.5.5 Comparisons between designer's intentions and users' perceived attributes

BOXER	Designer	Users	
Social Values & Positions		1	
		2	
		3	
		4	
		5	
		6	
		7	Specialized (not being used by everybody)
		8	
		9	Modern
		10	Modern, Specialized not general-accepted
Usability & Interaction		1	Comfortable, ergonomic
		2	
		3	
		4	
		5	Comfortable
		6	Comfortable
		7	Comfortable, good for silence room
		8	
		9	
		10	Comfortable, light
Visual Qualities		1	Contrast, contradiction
		2	Aesthetic, chic, oval and rounded
		3	
		4	
		5	
		6	Simple, organic, rounded, dynamic, deconstruction, novel
		7	Wave-like surface, plain
		8	
		9	Stylish
		10	Novel, soft, rounded
Characteristics Personalities		1	
		2	Attractive
		3	Warm, restful
		4	Lively
		5	Erotic, relaxing
		6	Warm
		7	Exclusive, flying
		8	Sensual
		9	Relaxing, warm, lovely, fire-like/aggressive
		10	Attractive, different, relaxing

Overall Impression	Boxer has the exclusive style of the first-class furniture for those who want to add value to their space with not just a sitting unit but also a statuesque object. Boxer, with its body that can rotate for 360 degrees and its extending footstool, is a product that successfully combines aesthetic with functionality.	1	This armchair invites you to take a seat in peace and comfort, lolling back in the chair, stretching your body…
		2	Its appearance beauty may steal its comfort. However, this armchair differentiates itself from the others especially through the aesthetic value of it, and covers its discomfort… In terms of visual qualities, comparing with the sitting unit, the foot stool seems to be rough and hard…
		3	This warm and restful armchair offers a moment for releasing your tiredness…
		4	Post modernism, nature & beauty, bionic design, lively, flower, woman, strawberry, lust… (but, two units don't match together in terms of overall shape)
		5	Its color with its form together transfers a sense of sex…
		6	It reminds a tulip next to a small rock… and inspired by human anatomy, it attracts your attention…
		7	It embodies relaxing, dreaming, flying attributes but still staying on earth because of the red color. There is nothing else to do in this chair but relax. It is not so good for reading a book or conversation…
		8	It looks sensual, like female lips…
		9	The coating material looks like velvet that appears comfortable…
		10	At first glance, its shapes seem to be made naturally from rock…like a sculptural work…but its color makes it to be a beautiful and fancy object although still there are some mismatches and inconsistency between two units in terms of overall shapes…

Table 5.5.5 (continued)

The actual overall impressions implied the users' judgmental behavior in response to both product visual qualities and perceived usability. Moreover, the 'experience of meaning' level of product interaction was substantial in the users' impressions: one user (U5), for example, identified an erotic personality in the product form, evoking sensual desires.

The mismatches and inconsistency between the form of the two units (sitting unit and footstool) was the one major drawback of the design from users' perspectives. It was one of the frequently mentioned attributes of the product visual form (see U1, U2, U4, U6, U10). However, the designer did not explain anything related to these arguments, to understand if the inconsistency was intentional or not.

5.5.3 Semantic Differential study (OB)

The results of the Semantic Differential study related to OB are discussed as follows.

Significant mismatches and significant exact matches (OB)

Following the analysis procedure, two (2) significant mismatches, ten (10) significant exact matches and thirty two (32) non-significant results were distinguished (see Figures 5.5.2 and 5.5.3) from the evaluation of 44 adjective pairs (see Appendix G for full data). The two significant mismatches were related to the evaluations of adj.15 (Comfortable-Uncomfortable) and adj.18 (Steady-Unsteady). These two adjective pairs are related to the Usability and Interaction category. Accordingly, the designer may have had a problem in conveying the usability aspects of the product through its visual form, in comparison to success in the other attribute categories.

On the other hand, the ten adjective pairs that were considered as significant exact matches were: adj.1 (In fashion-Out of fashion), adj.3 (Contemporary-Traditional), adj.7 (Global-Local), adj.8 (Expensive-Cheap), adj.12 (Safe-Dangerous), adj.13 (Robust-Delicate), adj.29 (Symmetrical-Asymmetrical), adj.30 (Organic-Geometric), adj.33 (Extraordinary-Ordinary), and adj.43 (Interesting-Boring). The results highlight that the most significant exact matches appeared in the Social Values and Positions category, having 4 exact matches, followed by the remaining categories with 2 significant exact matches each.

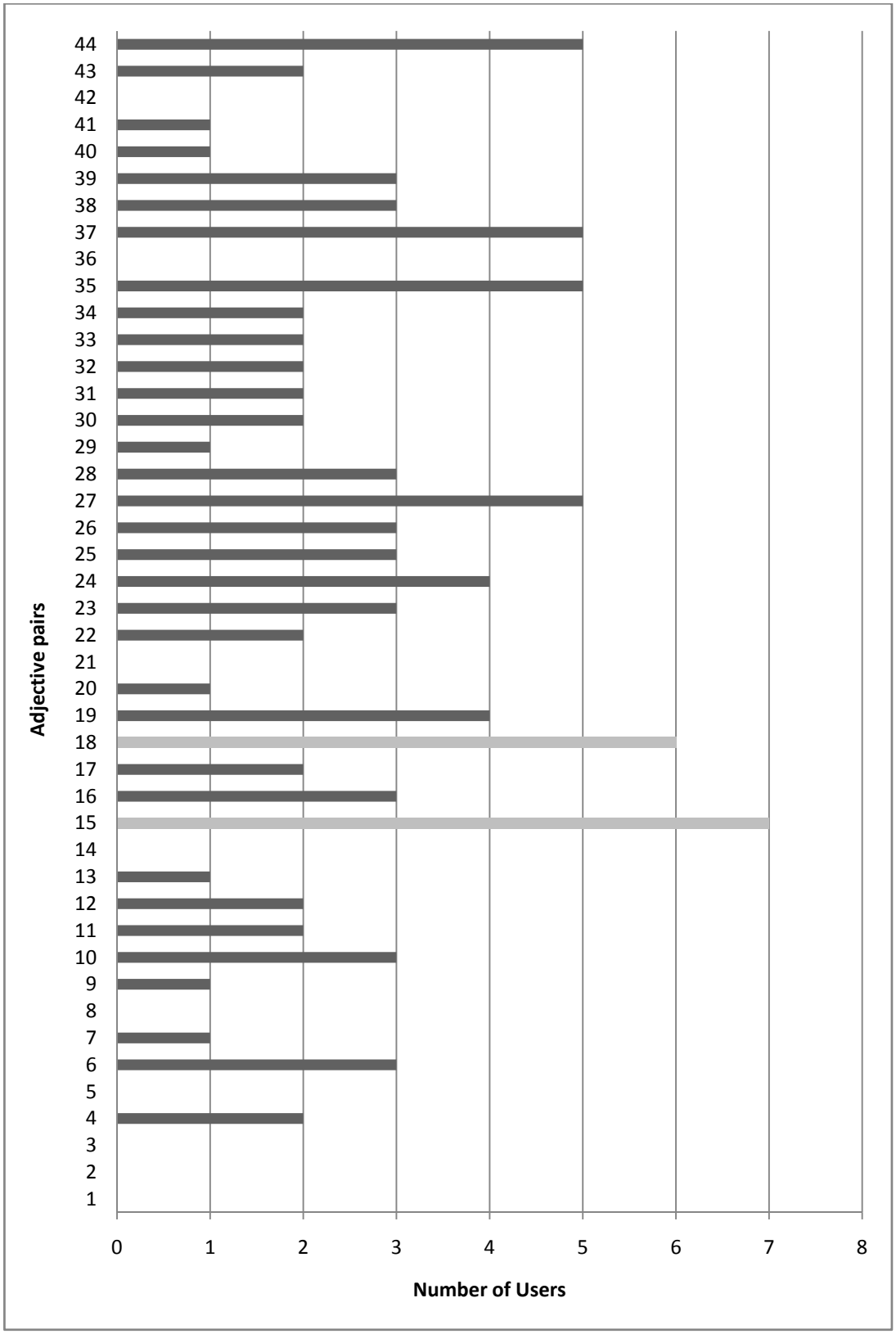


Figure 5.5.2 Number of users giving Likert grades mismatching the designer's grade (v>d±1); the gray bars indicate significant mismatches

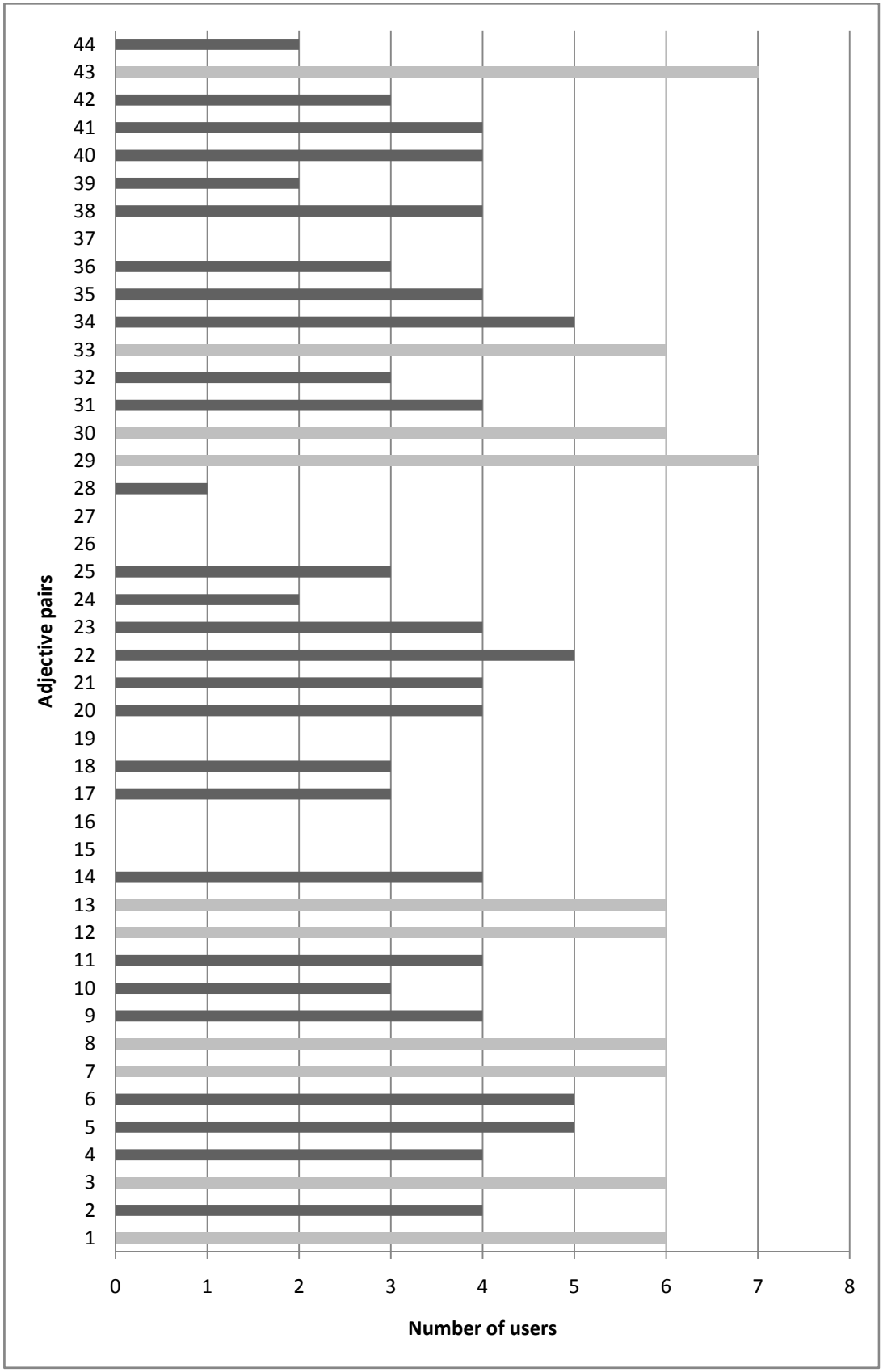


Figure 5.5.3 Number of users giving Likert grades exactly matching the designer's grade (v=d); the gray bars indicate significant exact matches

The details of significant mismatches and exact matches are discussed in the following sections.

Significant mismatches – further analysis (OB)

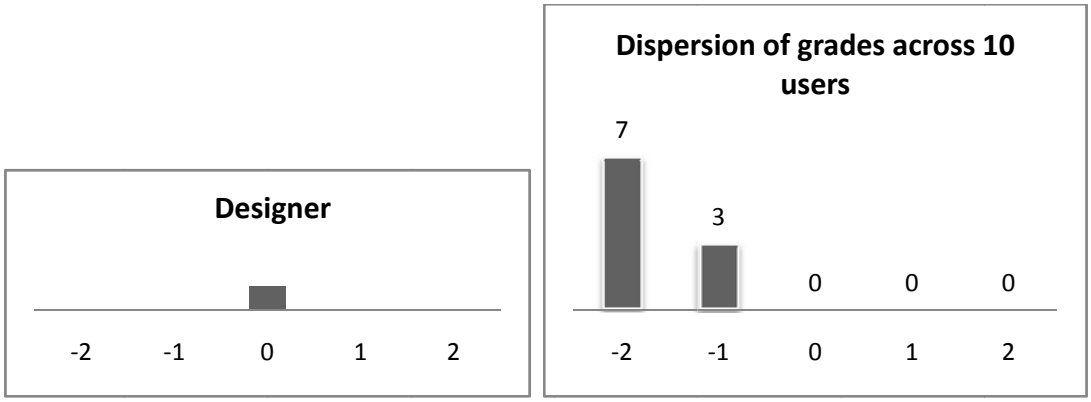


Figure 5.5.4 Designer and user evaluations for Adj.15 (Comfortable-Uncomfortable)

Figure 5.5.5 shows that users found OB to be either very comfortable (seven users) or quite comfortable (three users), as they had mentioned previously in their perception descriptions (see Table 5.5.5). In contrast, based on the grade (0) the designer used, the designer stayed neutral on scale. The designer's position reveals that he was not sure if the product visual form implies itself to be comfortable or uncomfortable. Although the intended perception is still debatable in terms of whether the message was intentional or accidental, the product visual form miscommunicated the intended neutral attribute. A 70% level of mismatch exists for this adjective pair.

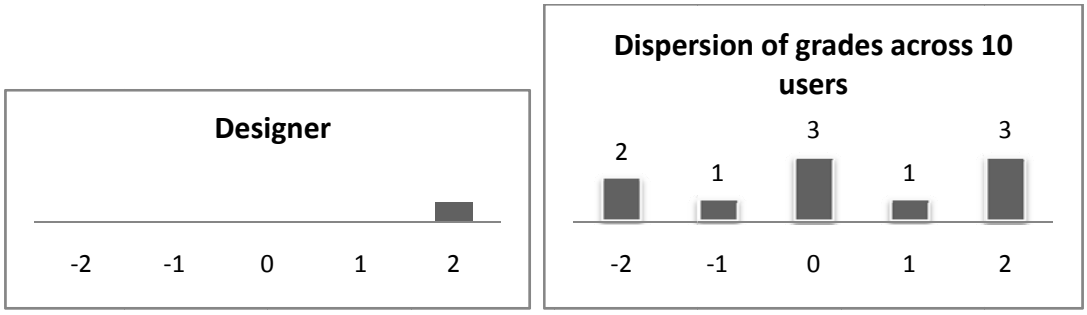


Figure 5.5.5 Designer and user evaluations for Adj.18 (Steady-Unsteady)

While the designer's intended perception through product visual form was clear that OB is a very unsteady product, the users had different opinions. Three users agreed

with the designer and one user perceived OB as quite unsteady. In contrast, two users found OB to be very steady, and one considered it to be quite steady. Three of the users remained neutral, or they couldn't decide on what the product visual form implied. Accordingly, it can be said that there were significant perceptual differences among users for the steady-unsteady adjective pair. So, a 60% level of mismatch exists between the designer's intended perception and users' actual perceptions.

Significant exact matches – further analysis (OB)

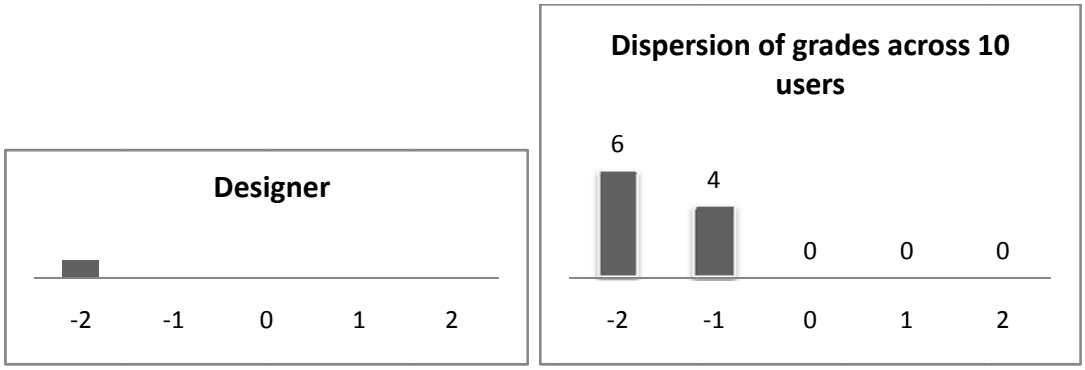


Figure 5.5.6 Designer and user evaluations for Adj.1 (In fashion-Out of Fashion)

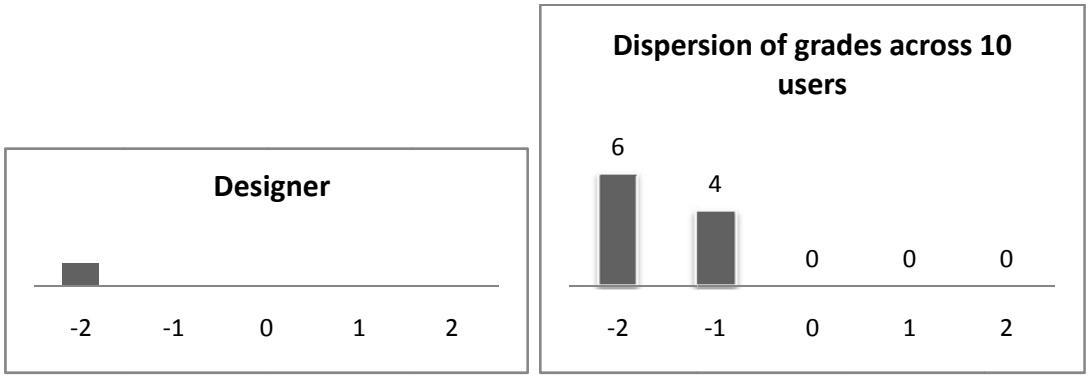


Figure 5.5.7 Designer and user evaluations for Adj.3 (Contemporary-Traditional)

The designer's and the users' evaluations for the two adjective In fashion-Out of Fashion and Contemporary-Traditional showed that both subjects found OB to be very in fashion and contemporary, in both cases revealing a 60% level of exact match. These perceptual responses can be supported by the subjects' perceived statements, presented in the previous section.

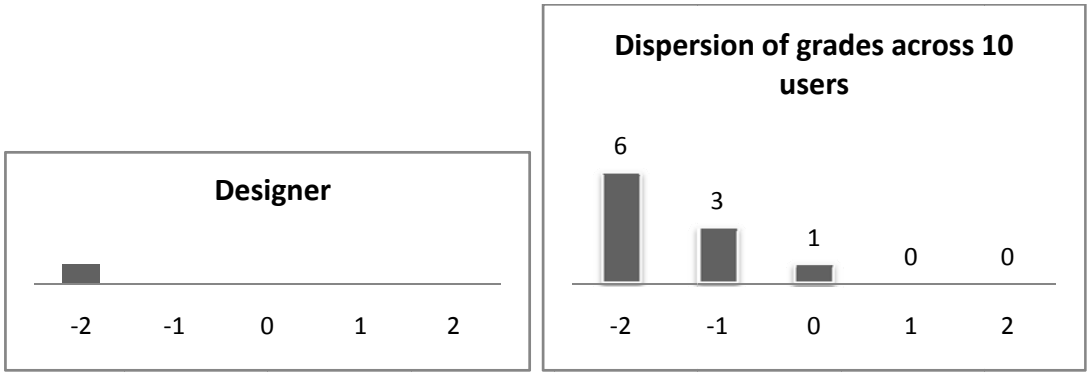


Figure 5.5.8 Designer and user evaluations for Adj.7 (Global-Local)

Although one of the users stayed neutral on the scale, six users agreed with the designer's intent that OB as a very global design. Three users found OB to be a quite global design. The results indicate that OB is not tied to a specific culture or region. So, a 60% level of exact match existed for this adjective pair.

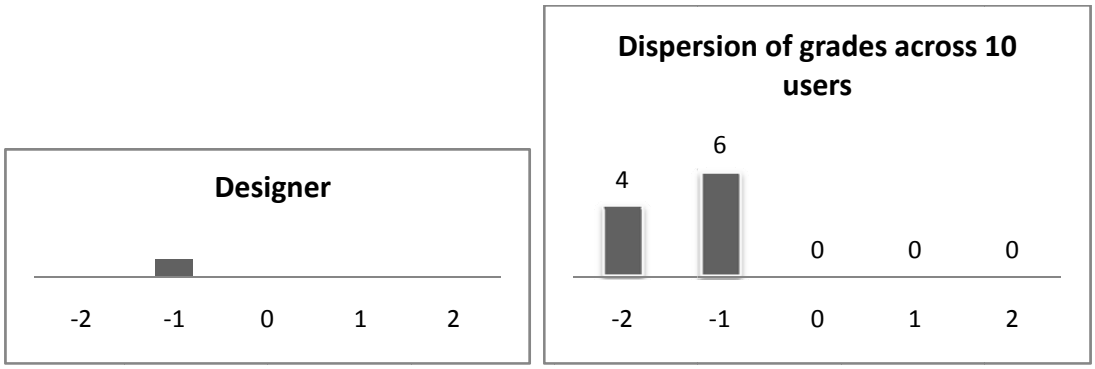


Figure 5.5.9 Designer and user evaluations for Adj.8 (Expensive-cheap)

The evaluations of the designer and users were influenced by attributes raised earlier, concerning the suitability of the product for a limited range of people or for professional users, for whom the aesthetic experience of the product is important and who adapt themselves with new fashions. This kind of thinking helped the evaluators determine that the product is expensive, with a 60% level of exact match between the designer and users.

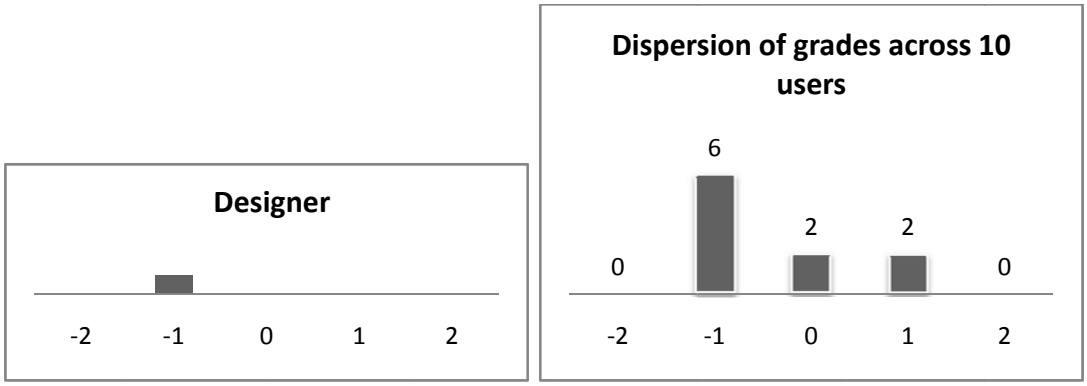


Figure 5.5.10 Designer and user evaluations for Adj.12 (Safe-Dangerous)

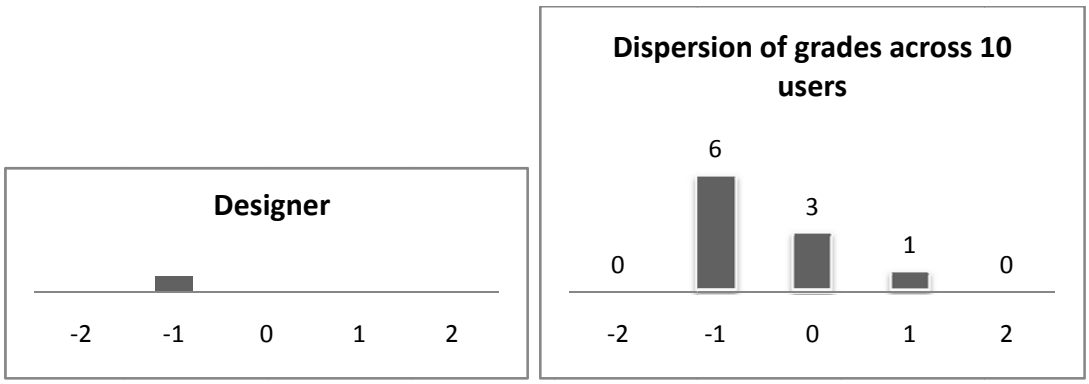


Figure 5.5.11 Designer and user evaluations for Adj.13 (Robust-Delicate)

Although the users' perceptions were based on the visual image of the product and absent of any physical interaction, 60 % of the intended users agreed with the designer that the product seemed quite safe and robust. About 20% of users remained neutral for the adjective pair Safe-Dangerous, whilst 30% of users remained neutral for the adjective pair Robust-Delicate. These findings may imply that these users would give more opinionated gradings having experienced or used the product.

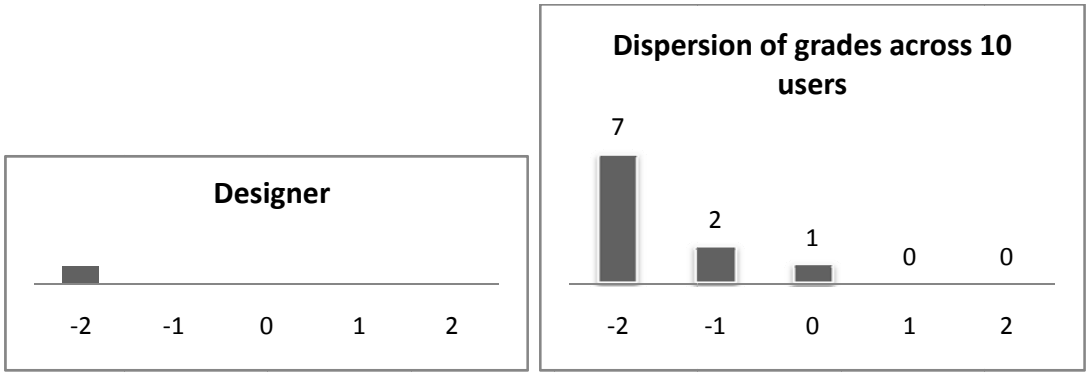


Figure 5.5.12 Designer and user evaluations for Adj.29 (Symmetrical-Asymmetrical)

Symmetrical-Asymmetrical was one of the confusing adjective pairs. One user (U1), who remained neutral on the Likert scale, argued that evaluation with this adjective pair was mostly relevant to the sides of the product. He highlighted that the footstool overall shape is symmetrical from any side but this is not the case for the sitting unit. The user's (U1) point of view is applicable here although the two users' evaluations for (-1) are still questionable. However, as the designer's intention shows, the front view of the sitting unit was the focus of the evaluation, as picked up by the remaining users, with a 60% level of exact match.

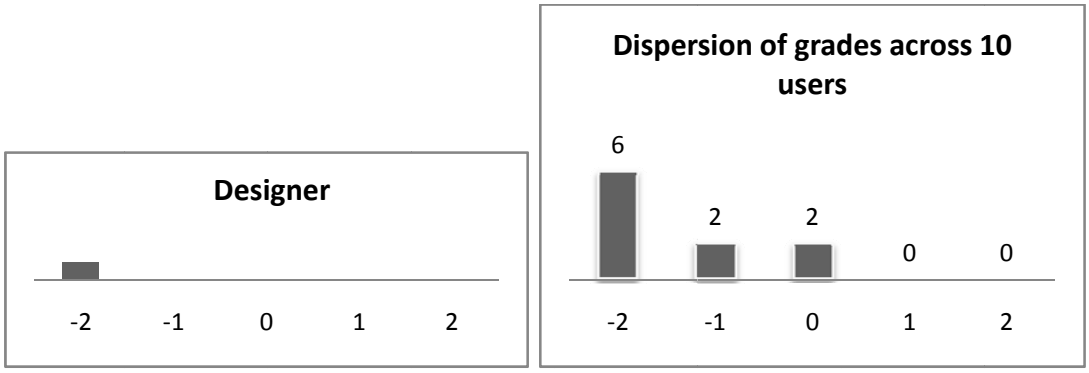


Figure 5.5.13 Designer and user evaluations for Adj.30 (Organic-Geometric)

There exists a 60% level of exact match for this adjective pair. Although the majority of users' visual perceptions matched the designer's intent, two of the users (U1, U7) stayed neutral on the scale. These users noted that they found the sitting unit organic, but they could not perceive the footstool in the same manner since there exists contrast between the two units in terms of overall shape. So, they preferred to stay in

the middle of the scale. The adjective pair was quite confusing also for the other users, as they explained during the evaluation session that their grades were based on the sitting unit's visual qualities. However, the designer's real intention is still not clear as to whether or not he took both units into consideration when constructing intent.

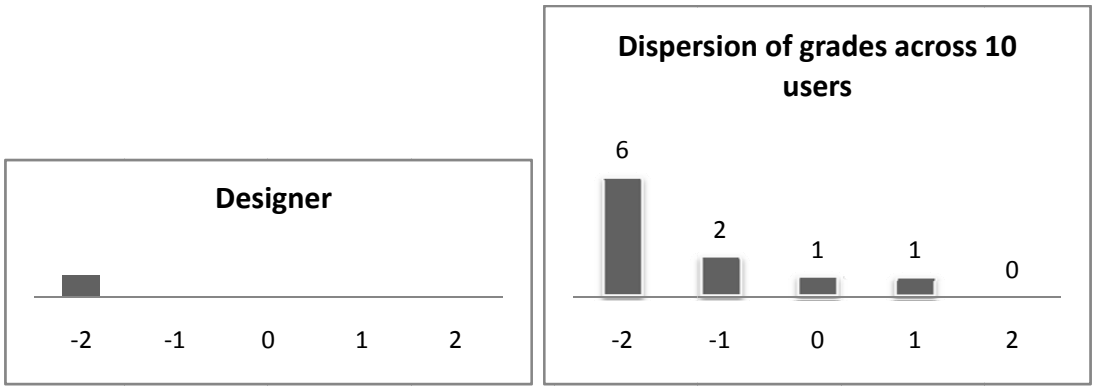


Figure 5.5.14 Designer and user evaluations for Adj.33 (Extraordinary-Ordinary)

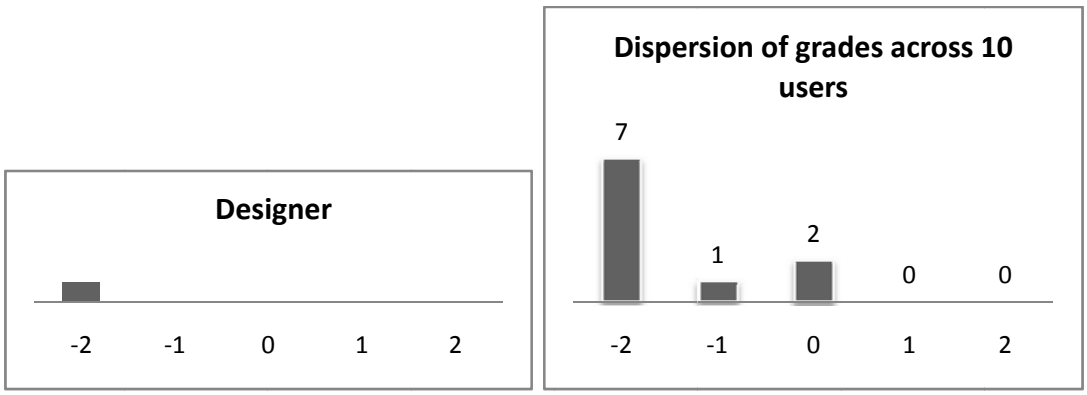


Figure 5.5.15 Designer and user evaluations for Adj.43 (Interesting-Boring)

The designer intended to represent the product as being extraordinary and interesting. The results show a 60% and 70% success in achieving this. However, two of the users (U1-Photographer, U10-Artist) disagreed with the designer: their evaluations may imply that they were more discriminatory regarding product visual language. As mentioned before, they were arguing that their evaluations were based on the perceptions toward both units, sitting unit and footstool.

Although the designer failed to represent some usability aspects and visual consistency of OB, he was successful to communicate most of his intentions and evoke some positive emotional response through the product visual form.

5.6 Analysis of product example 6 (TO Armchair)

The product example 6 (TO Armchair) was manufactured by Nurus, which is a well-known furniture design company in Turkey. The TO Armchair was designed by Tanju Özelgin, who is also the designer of product example 5 (OB, see section 5.5). Mr. Tanju Özelgin agreed to participate in this study. The short name of OT, which derives from Özelgin (name of the designer) and TO (name of the product) is used as the product code (Figure 5.6.1).

The designer identified the target user group for OT, detailed in Table 5.6.1. Users who were considered to be a good match to the target user group were arranged to participate in the study (Table 5.6.2).

Figure 5.6.1 Product OT designed by Tanju Özelgin

Table 5.6.1 Specifications of the intended user group related to OT product

Gender	Male and female
Age range	30-64
Income level	High
Level of education	Any
Occupation	Managers, businessmen, high-level office workers, company workers.

Table 5.6.2 List of users participating in the evaluation of OT product

Users	Gender	Age range	Level of education	occupation
1	Female	37-48	Undergraduate	(Construction industry) Engineer
2	Male	37-48	Graduate	Chemistry Engineer
3	Male	49-64	Some collage	Official
4	Male	49-64	Some collage	Manager
5	Male	49-64	Some collage	Manager
6	Female	25-36	Undergraduate	IT manager
7	Male	25-36	Undergraduate	Mechanical head
8	Male	25-36	Undergraduate	Planning master
9	Male	37-48	undergraduate	Manager
10	Male	25-36	undergraduate	QA Expert

The designer confirmed that his intentions in relation to the form of OT were realized in the manufactured product. He claimed that intended users would receive the messages embodied in product form. The designer's expectation was based on his professional design experience. He stated that previous knowledge as education, and being aware of characteristics of a form, together with users' observations and getting insight of users' feedbacks on previous products, helped him to know users and their perceptual responses.

5.6.1 Names associated with OT

The name of 'TO Armchair' was given to OT by the designer. The given name is a synonym for Tanju Ozelgin. An alternative name of 'Kunt' was suggested by the designer, signifying that the product can be trusted.

Users, on the other hand, proposed different kinds of names, none of which was related to the actual name and its symbolic meanings (Table 5.6.4). Four users gave a name to OT that mostly referred to familiar objects or concepts with similar visual characteristics (Hot Wheelbarrow, Kite, Ship, Teeter Board, and Bird). The analogies sketched by users 1 and 10 support these kinds of names (Table 5.6.3). There existed two names, Deep and Isometric, that directly judge the visual quality of OT. The name Relaxing signified the product personality. The name Solmaz is

mostly related to the experience level of meaning, because the participant attached OT to her daughter. One of the users could not suggest a name for OT.

Table 5.6.3 Mental images elicited from OT at first glance

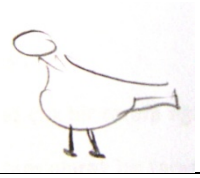
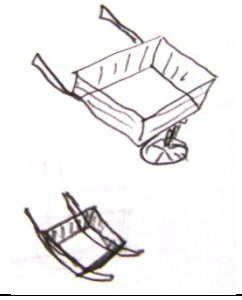
Stimulus	Analogies	
	U1 	U2
	U3	U4
	U5	U6
	U7	U8
	U9	U10 

Table 5.6.4 Comparison between the designer's product name and names given to OT by users

Designer	Users	
TO (the abbreviation for Tanju Ozelgin) **KUNT** (Turkish name; it means conveying a sense of trust)	1	Bird (with two thin legs)
	2	Deep
	3	Relaxing
	4	…
	5	Teeter Board
	6	Solmaz (it is endless like my daughter life)
	7	Isometric
	8	Ship
	9	Kite
	10	Hot wheelbarrow, Hot sledge

5.6.2 Intended attributes versus perceived attributes (OT)

The designer's intentions, which are classified in Table 5.6.5, reveal that he aimed to transmit positive attributes through OT that mostly related to the Usability & Interaction, Visual Qualities, and Personality Characteristics categories.

Transmitting attributes related to Social Values and Positions was not the concern of the designer.

Table 5.6.5 Comparisons between designer's intentions and users' perceived attributes

TO	Designer	Users	
Social Values & Positions		1	Contemporary
		2	
		3	
		4	Modern
		5	Modern
		6	
		7	
		8	
		9	
		10	
Usability & Interaction	Functional, low	1	
		2	High
		3	Relaxing
		4	
		5	Unbalanced
		6	Relaxing
		7	Not well-settled, uncomfortable
		8	
		9	Unsteady, unbalanced
		10	
Visual Qualities	Innovative, original, plain, pure	1	Luxurious, novel, different form
		2	Large
		3	Innovative
		4	Simple
		5	
		6	
		7	Classic
		8	
		9	Novel, deconstructive style
		10	
Personality Characteristics	Impressive, exciting, close, monumental, silent, friendly, surprising	1	
		2	
		3	
		4	
		5	

		6	
		7	
		8	Exciting, powerful, serious
		9	Different
		10	Aggressive, creative, proud, hot
Overall Impression	TO is not only a sofa but a totally new alternative way of meeting or maybe for somewhere else… TO with its unique design adds innovation, purity and originality to a home, office, and surrounding… "in terms of visual perceptions, some questions may arise in users' mind about its reliability and safety… actually, this was my intention, and wanted to answer and surprise users after using that in contrast it is reliable and functional…"	1	…
		2	Body with a high back and deep…
		3	Different type of armchair…
		4	…
		5	It reminds me teeter board as it seems to be turned over. Therefore, it doesn't look to be safe and reliable…
		6	…
		7	…
		8	…
		9	…
		10	…

Table 5.6.5 (continued)

Users, on the other hand, attributed some meanings to OT that were pertinent to all four categories. Although the attributes related to Social Values & Positions, Visual Qualities, and Personality Characteristics were mostly positive attributes of OT, the perceived attributes of Usability & Interaction were somehow negative. It means that

OT evokes negative impressions in users regarding its usability aspects. The users' overall impressions also indicate a negative judgmental behavior toward OT. However, these negative or questioning responses to OT were intentional by the designer, as he stated in his statement of overall impression that users would be satisfied after *using* the product and visually (before using) they would perceive it as unbalanced, and unreliable. The designer argued that through physical proportion and characteristics of form, e.g. thin and small legs versus a heavy and massive body, he aimed to communicate these kinds of questioning messages. For users it was the same, as they stated that visual qualities of product form, e.g. overall shape, color, connection of two legs to the chair body, and the leg positions, were the product elements through they received messages.

5.6.3 Semantic Differential study (OT)

The results of the SD study are discussed as follows.

Significant mismatches and significant exact matches (OT)

Comparing the designer's intended perceptions and the users' actual perceptions through the SD study across 44 adjective pairs resulted in three (3) significant mismatches, ten (10) significant exact matches and thirty one (31) non-significant results (see Figures 5.6.2 and 5.6.3).

The adjective pairs that were considered as significant mismatches were: adj.12 (Safe-Dangerous), adj.13 (Robust-Delicate), and adj.37 (Young-Old) with 6, 6, and 9 mismatch evaluations respectively. In contrast, adjective pairs of significant exact matches were: adj.2 (High class-Low class), and adj.3 (Contemporary-Traditional), adj.4 (Avant-garde-Conservative), adj.8 (expensive-Cheap), adj.22 (Innovative-Imitative), adj.28 (Orderly-Disorganized), adj.29 (Symmetrical-Asymmetrical), adj.31 (Attractive-Repulsive), adj.39 (Quiet-Noisy), and adj.43 (Interesting-Boring) with 7, 6, 7, 6, 8, 6, 6, 6, 6, and 7 exact match evaluations respectively.

Considering the categories of the adjective pairs, the following findings existed: four significant exact matches in category 1, two significant mismatches in category 2, three significant exact matches in category 3, and three significant exact matches and one significant mismatch in category 4. Therefore, category 1, Social Values &

Positions, in which 4 from 8 adjective pairs were found to be significant exact matches, reveals the designer had good success in communicating related attributes of the product (see Appendix H for full data).

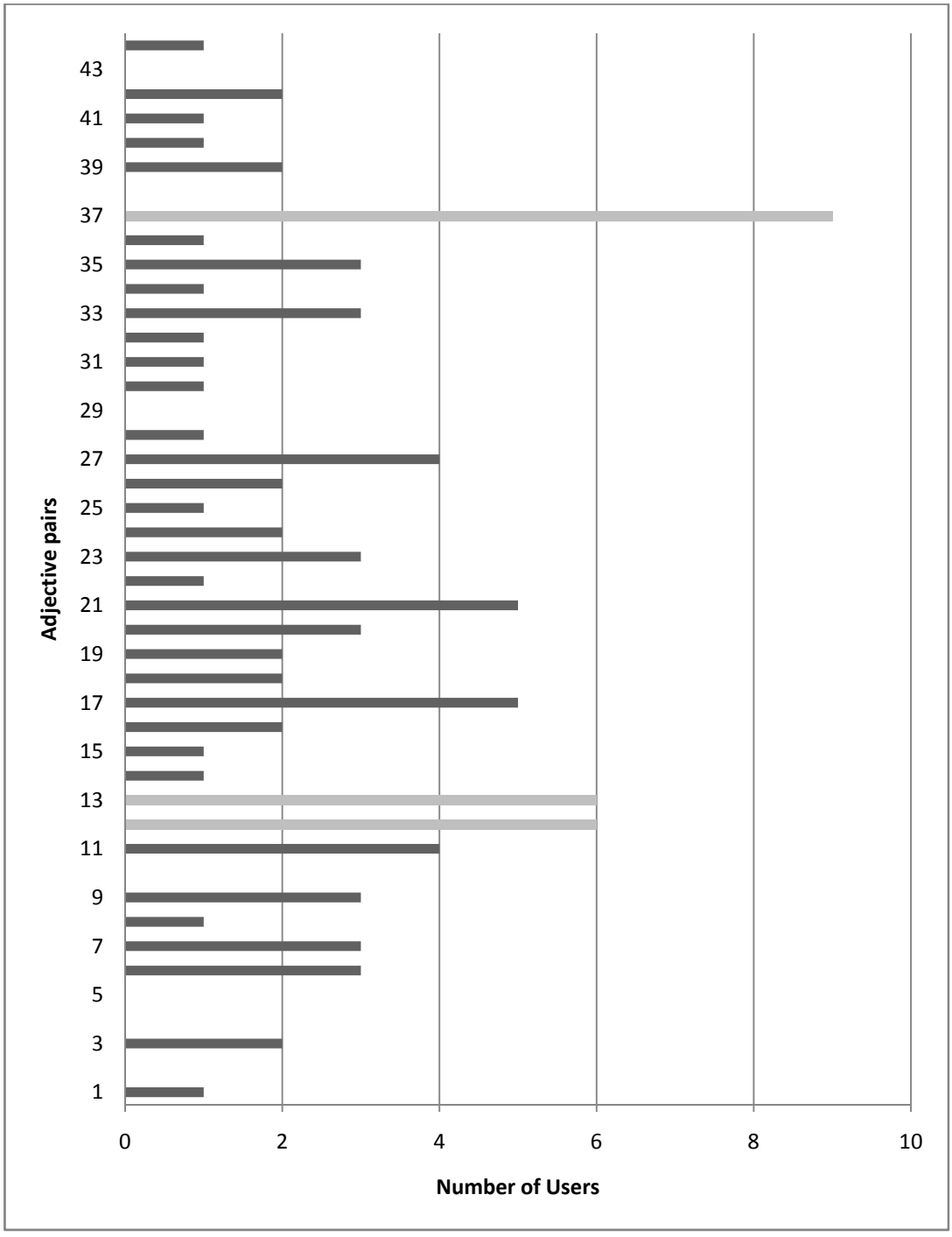


Figure 5.6.2 Number of users giving Likert grades mismatching the designer's grade (v>d±1); the gray bars indicate significant mismatches

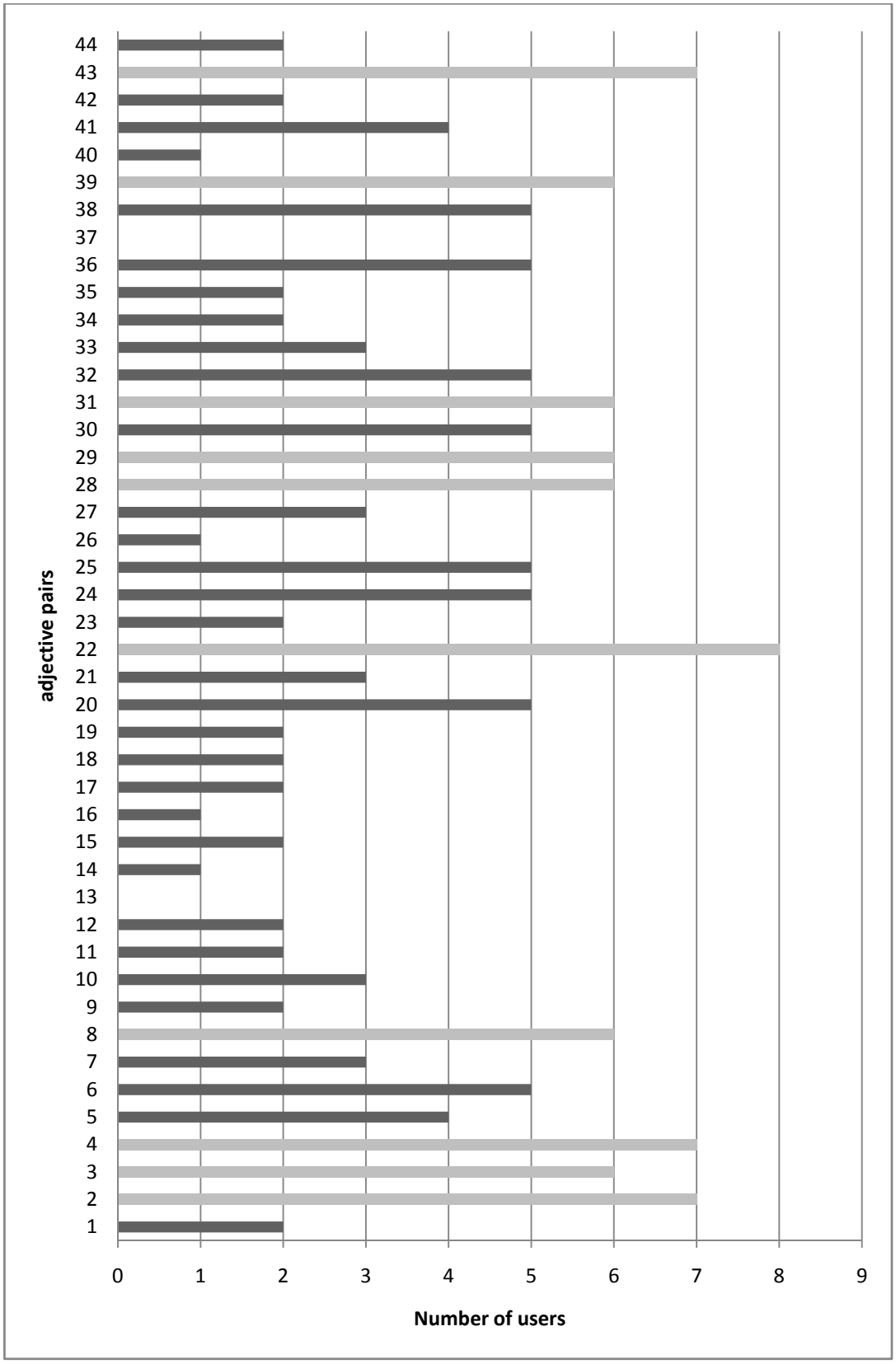


Figure 5.6.3 Number of users giving Likert grades exactly matching the designer's grade (v=d); the gray bars indicate significant exact matches

Significant mismatches – further analysis (OT)

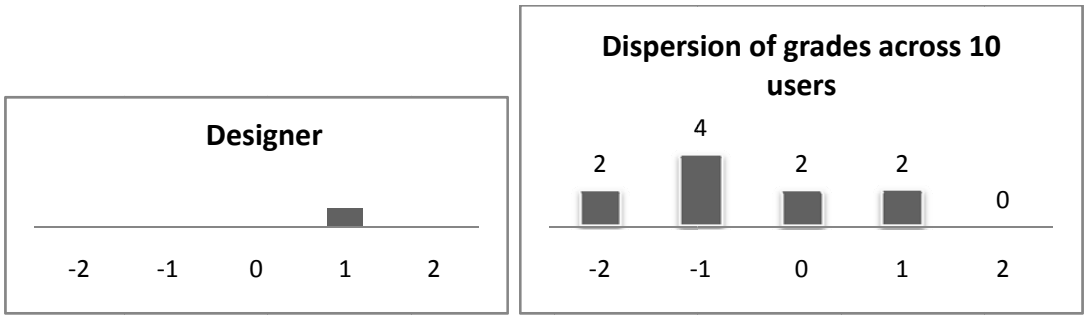


Figure 5.6.4 Designer and user evaluations for Adj.12 (Safe-Dangerous)

In contrast to the designer, who intended OT to be perceived quite dangerous, six users considered it to be either quite safe (four users) or very safe (two users). Two of the users perceived it to be quite dangerous as the designer intended. Two users also remained neutral on the scale, which indicates they were not sure about the safety of OT. It is assumed that the designer wanted to generate surprise with danger. However, the intended message was not clearly received. A 60% level of mismatch existed for this adjective pair.

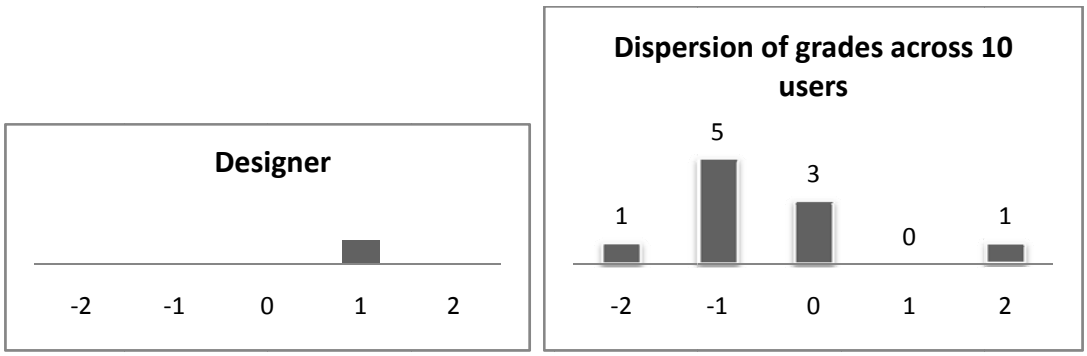


Figure 5.6.5 Designer and user evaluations for Adj.13 (Robust-Delicate)

None of the users agreed with the designer, who intended OT to be perceived as quite delicate. Only one user was somewhat inclined to this view, seeing the product as very delicate. Five users found it to be quite robust and one user considered it to be very robust. Three users remained neutral. The result revealed a 60% level of mismatch for this adjective pair.

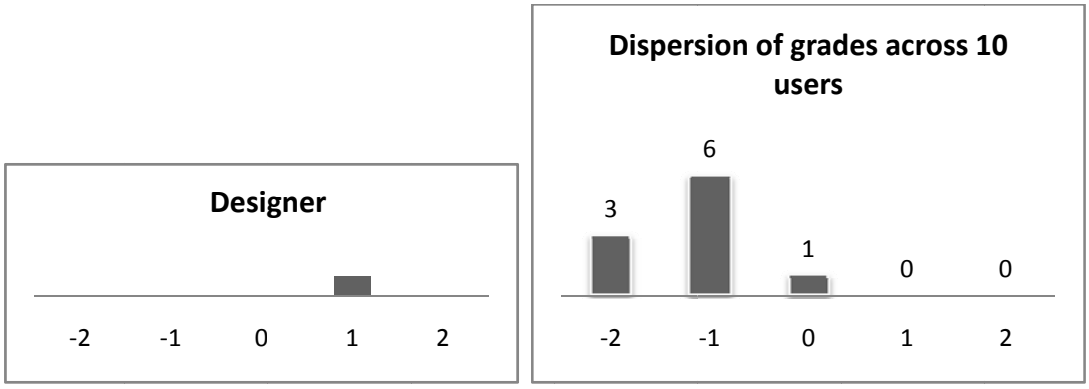


Figure 5.6.6 Designer and user evaluations for Adj.37 (Young-Old)

The designer considered OT as quite old. However, 90% of the users did not agree, perceiving OT as quite young (six users), or very young (three users). One user stayed neutral on the scale.

Significant Exact matches – further analysis (OT)

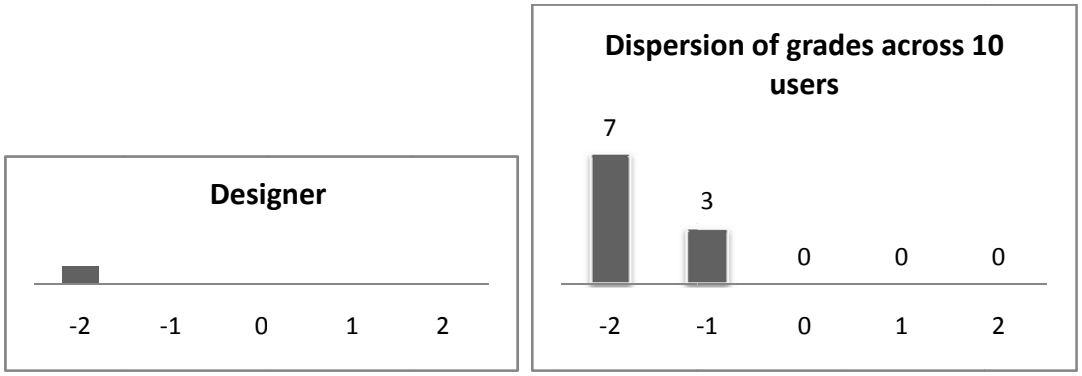


Figure 5.6.7 Designer and user evaluations for Adj.2 (High class-Low class)

The designer considered OT to be very high class. Users agreed, seeing the product as very high class (seven users) or quite high class (three users). The data reveals a 70% level of exact match.

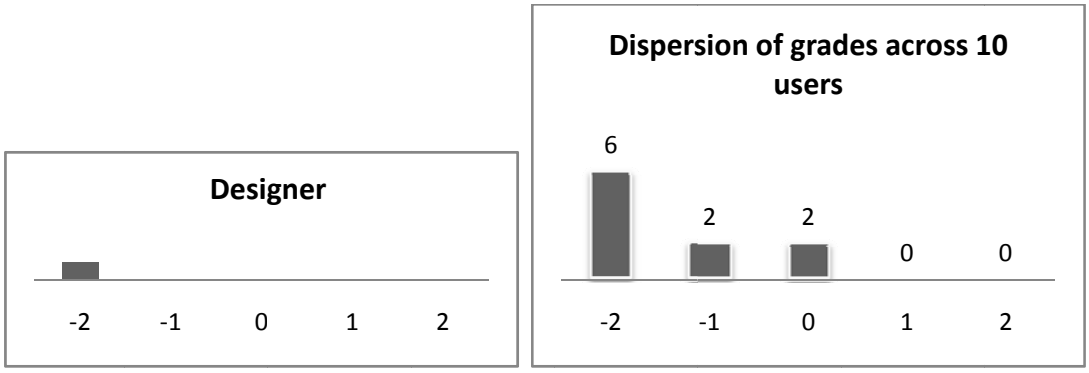


Figure 5.6.8 Designer and user evaluations for Adj.3 (Contemporary-Traditional)

Similar to the designer, the majority of users found OT to be either very contemporary (six users), or quite contemporary (two users). However, two users stayed neutral in the evaluation of this adjective pair. So it can be said that a 60% level of exact match existed for this adjective pair. The evaluation of users can be supported by the perceived attributes of OT that they mentioned previously (see section 5.6.2).

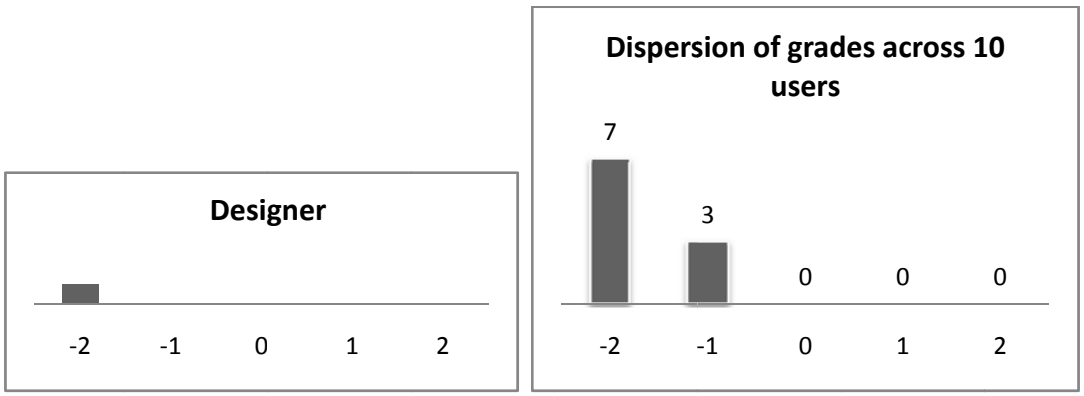


Figure 5.6.9 Designer and user evaluations for Adj.4 (Avant-garde-Conservative)

This adjective pair seems to be likely correlated with the adjective pair of contemporary vs. traditional. The designer intended OT to be perceived as very avant-garde, as he also intended the product to be very contemporary. Users' perceptual responses also advocate this correlation between adj.3 and adj.4. The finding reveals a 70% exact match success in communicating this attribute of product form.

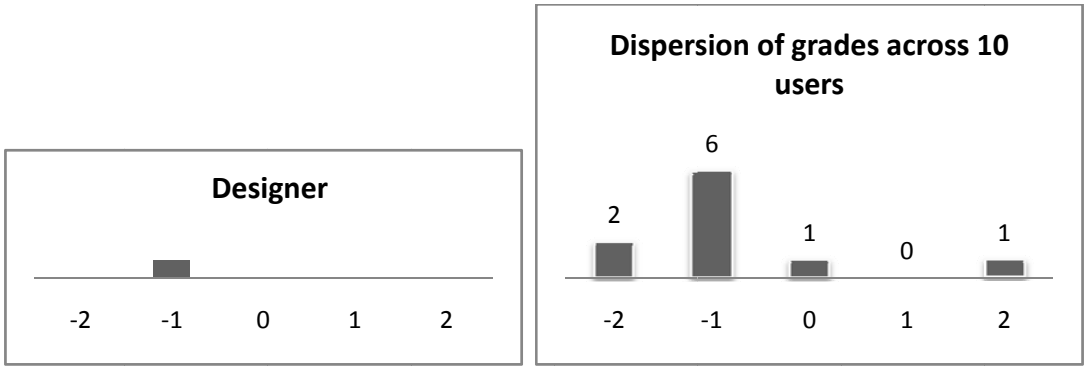


Figure 5.6.10 Designer and user evaluations for Adj.8 (Expensive-Cheap)

Both the designer and six users found OT to be quite expensive. Two users regarded it as very expensive. The reason the designer intended OT to be perceived as quite expensive is he created this product for business people with a high social level. Evaluations for this adjective pair reveal a 60% level of exact match.

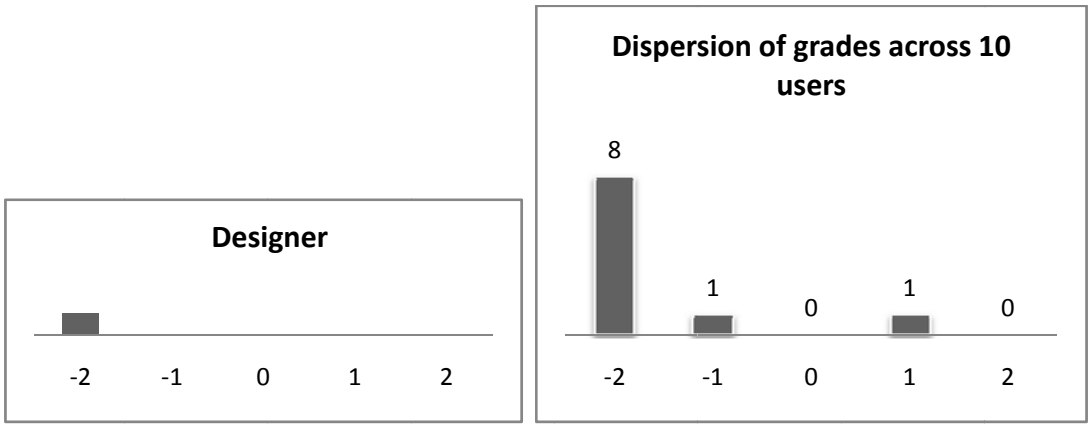


Figure 5.6.11 Designer and user evaluations for Adj.22 (Innovative-Imitative)

The designer was successful in communicating with the majority of users: eight users agreed with the designer that the product was very innovative. One user considered it as quite innovative. Only one user did not agree and perceived OT as imitative. An 80% level of exact match existed for this adjective pair. The designer also could evoke this impression in users' perceived attributes related to visual qualities of the product (see 5.6.2).

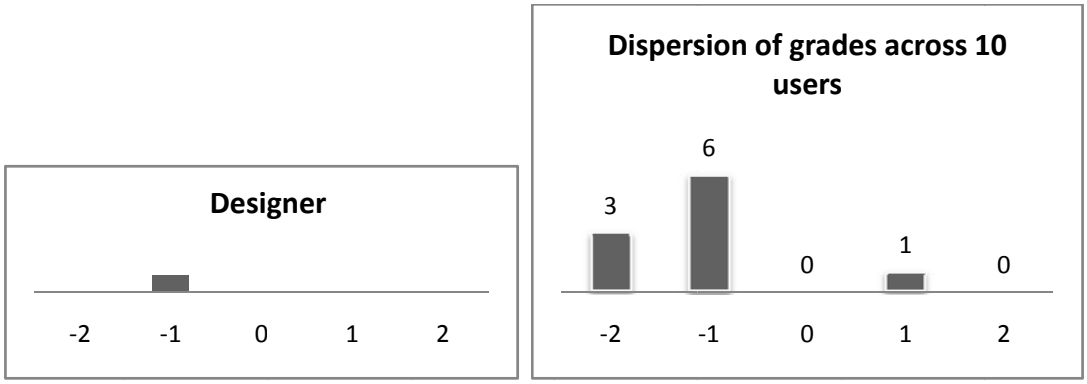


Figure 5.6.12 Designer and user evaluations for Adj.28 (Orderly-Disorganized)

Similar to the designer, six users considered OT as quite orderly. Three users found it to be very orderly. Only one user regarded it as quite disorganized. A 60% level of exact match existed for this adjective pair.

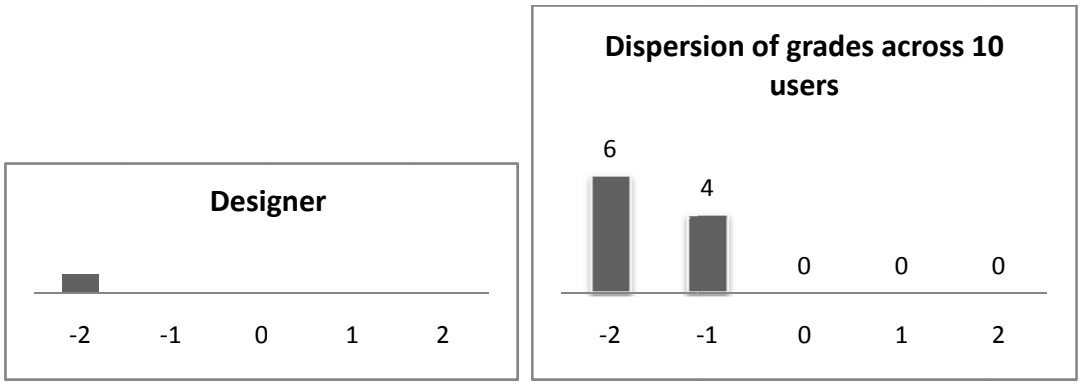


Figure 5.6.13 Designer and user evaluations for Adj.29 (Symmetrical-Asymmetrical)

The evaluations of the designer and users for the adjective pair symmetrical vs. asymmetrical reveal a 60% level of exact match. Six users agreed with the designer and considered OT as very symmetrical, and four users found it to be quite symmetrical.

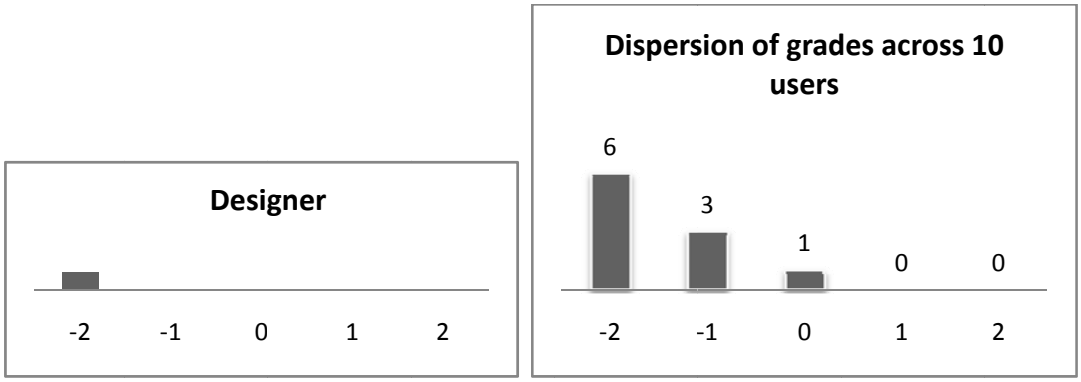


Figure 5.6.14 Designer and user evaluations for Adj.31 (Attractive-Repulsive)

Both the designer and six users found OT to be very attractive. Three users were inclined to this view, seeing it as quite attractive. One user stayed neutral on the scale. The data reveals a 60% level of exact match.

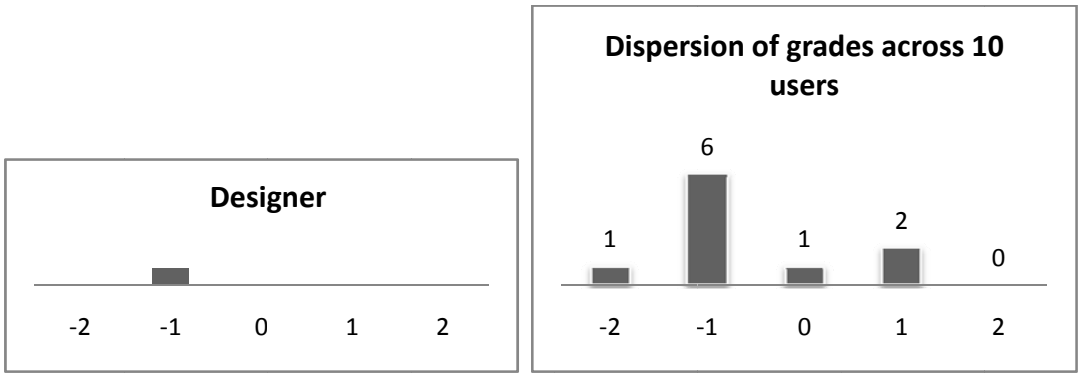


Figure 5.6.15 Designer and user evaluations for Adj.39 (Quiet-Noisy)

The designer intended OT to be perceived as quite quiet. The majority of users agreed (six users). One user considered it as very quiet. However, there were two users that found it to be quite noisy. One user remained neutral. So a 60% level of exact match existed for this adjective pair.

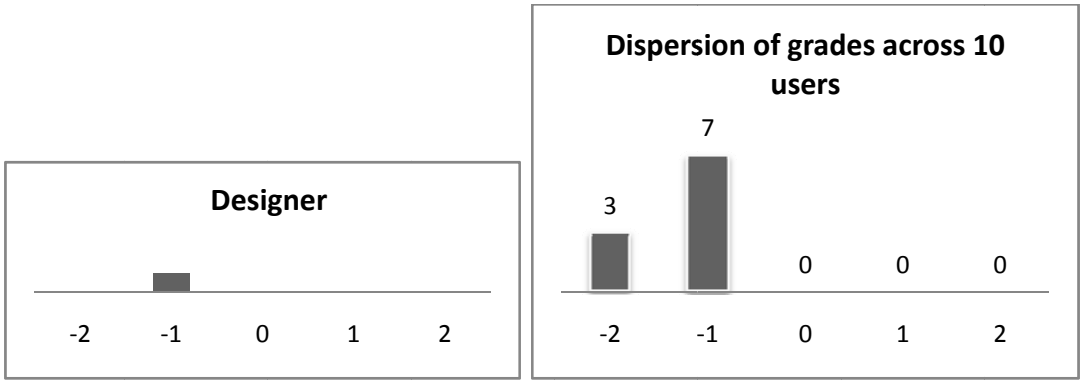


Figure 5.6.16 Designer and user evaluations for Adj.43 (Interesting-Boring)

Seven users evaluated OT the same as the designer, considering it as quite interesting. Three users also inclined to this view and regarded it as very interesting. Therefore, the designer was very successful in communicating this attribute of product form, with the data revealing a 70% level of exact match.

Comparative analyses of the designer's intended attributes and users' perceived attributes embodied in product form for OT shows that the designer was relatively successful to evoke intended impressions in users' perceptual responses. Comparing the designer's intended perceptions and users' actual (pre-usage) perceptions, which were explored through the SD study, reveals that most significant mismatches (2 in total) were related to the Usability & Interaction category and most significant exact matches (4 in total) existed in Social Values & Positions category. Although the designer was more or less capable of communicating what he had in his mind through product form, still there were 31 non-significant results in which users' perceptual responses were slightly different to the designer's intentions.

5.7 Analysis of product example 7 (Ball)

Product example 5 (Ball) is manufactured by Derin Design, a prestigious furniture design company based in Turkey. Mr. Aziz Sarıyer, having more than 30 years professional experience in furniture design, is the founder and head of the Derin design team since 1971. He agreed to participate in the study. The short name of 'SB', which derives from Sarıyer (name of the designer) and Ball (name of the product) is used throughout this section as the product code (Figure 5.7.1).

Figure 5.7.1 Product SB designed by Aziz Sariyer

The designer identified the users he intended to communicate to through SB (Table 5.7.1). Based on the designer's description, ten users who were found to fit to the designer's intended group were arranged to participate in the study (Table 5.7.2).

Table 5.7.1 Specifications of the intended user group related to SB product

Gender	Male and female
Age range	18-36
Income level	Moderate and High
Level of education	Any
Lifestyle and personality	Intellectual, young, bright, futuristic, appreciating and discriminating art and design. A person who wants to differentiate himself… A person with high cultural values…

Table 5.7.2 List of users participating in the evaluation of SB product

Users	Gender	Age range	Level of education	occupation
1	Female	25-36	Undergraduate	Social researcher
2	Female	25-36	Doctoral	Student
3	Female	18-24	Undergraduate	Student
4	Male	25-36	Undergraduate	Engineer
5	Male	25-36	Undergraduate	Jeweler
6	Male	18-24	Some collage	Jeweler/designer
7	Male	25-36	Some collage	Self-employee
8	Female	18-24	Undergraduate	Agricultural engineer
9	Male	18-24	Undergraduate	Student
10	Male	18-24	Undergraduate	Student

The designer argued that his intentions regarding product form and its properties had been exactly realized in the manufactured product. He claimed that the intended users would receive the intended messages encoded in the product form. This claim was based on the designer's professional experiences in furniture design and being aware of the visual language of a product. He said that he understood different characteristics of product form so that he could speak with a product while designing. He put forward the view that users' positive feedbacks and responses toward several previous products made it clear for him that intended messages had been successfully communicated.

5.7.1 Names associated with SB

The designer stated that the name 'Ball' was given because the product resembles a ball in appearance. He suggested a second name of Globe because of the product's spherical shape.

Two users sketched analogies to reveal their first impressions. User 5 found SB to be like a peeled potato from which an SB-like shape is carved out. The user noted that SB reminded him of a peeled potato because of its color and shape. User 7 sketched his feelings as he found SB to be very comical, as its appearance resembles a smiling face. These two users gave names to SB on the basis of their sketched analogies (Table 5.7.3).

The users' first impressions and proposed names show that SB with its impressive color and spherical shape evokes similar impressions in users' perceptions. Accordingly, the name of Lemon Chair (U1), Lemon (U3), Egg (U4), Peeled-Boiled Potato (U5), Lemon (U9) and Limbal (U10) can be identified. The names of Chick and Cradle signify the familiar and childlike characteristics of SB. However, the name of Cradle may also represent the user's perceived usability as she found it to be comfortable. The name of Corners of Sphere related to this user's evaluation of the overall product shape. As mentioned before, the name of Smile was based on the user's sketched analogy that refers to product personality.

Table 5.7.3 Mental images elicited from SB at first glance

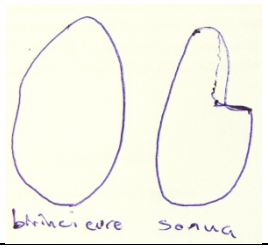
Stimulus	Analogies	
	U1	U2
	U3	U4
	U5 	
	U7 	U8
	U9	U10

Table 5.7.4 Comparison between the designer's product name and names given to the SB by users

Designer	Users	
BALL (Its form conveys a ball…) GLOBE	1	Lemon chair
	2	Chick
	3	Lemon
	4	Egg
	5	Peeled & Boiled Potato
	6	Corners of Sphere
	7	Smile
	8	Cradle
	9	Lemon
	10	Limbal (looks like a lemon)

5.7.2 Intended attributes versus perceived attributes (SB)

According to the distribution of attributes (Table 5.7.5) it can be observed that the designer of SB intended to transmit positive attributes that fell mostly within the Personality Characteristics category, followed by Visual Qualities and Usability & Interaction categories. However, attributes related to Social Values & Positions were

not of concern to the designer. These attributes can be supported by the designer's overall impression that emphasized the intended attributes, which are about product personality, function, and aesthetic values (visual qualities) encoded in product form.

According to the users' perceived descriptions (Table 5.7.5), it is clear that product visual form evokes attributes that are related to Personality Characteristics (with 16 statements), Visual Qualities (with 16 statements), and Usability & Interaction (with 8 statements). Social Values & Positions (with 2 statements) caught users' attentions the least. These findings reveal that the users' perceptual responses may support the designer's viewpoint that the product's Personality Characteristics, Visual Qualities and Usability & Interaction, in order, are three dominant values of product visual form.

The users' perceived attributes, originating from perceived usability of the product, show that there existed diversity of opinions regarding product comfort. For example, user 1 stated that although SB doesn't look to be comfortable, it was expected to be so because today's designers take care of product comfort. Users 2 and 6 found it to be uncomfortable. However, user 6 noted that only after a long time sitting would it be uncomfortable. User 3's overall impression showed a skepticism that the designer cared about product comfort. However, five users stated that SB was comfortable. The designer, on the other hand, did not attribute this meaning to the product: he intended SB to be considered a reliable product. However, the designer's intended attributes related to product personality, along with its visual quality, were received by users.

Three users' overall impressions indicate that the impressions were on the basis of perceived usability and product visual properties. All users and the designer argued that the product's spherical shape and its impressive color were the physical attributes of SB through which messages were communicated. The designer argued that the color of yellow was used to give SB a childlike characteristic.

Table 5.7.5 Comparisons between designer's intentions and users' perceived attributes

Ball	Designer	Users	
Social Values & Positions		1	Modern
		2	
		3	Casual
		4	
		5	
		6	
		7	
		8	
		9	
		10	
Usability & Interaction	Reliable, swivel chair	1	Comfortable (although it doesn't look comfortable)
		2	Uncomfortable
		3	
		4	Comfortable
		5	
		6	Uncomfortable (in a long time)
		7	Comfortable
		8	Comfortable
		9	Comfortable, wide
		10	Comfortable
Visual Qualities	Novel, unconventional, sculptural, plain	1	Plain, chic, spherical
		2	Innovative, novel, spherical
		3	Simple, but ornate
		4	Simple
		5	Simple, rounded
		6	Rounded
		7	Circular, Soft
		8	Simple
		9	
		10	Aesthetic
Personality Characteristics	Exciting, childish, friendly, cheerful, enjoyable, pleasing, smiling face, attractive, different	1	Smiling
		2	Warm, friendly, adorable, lovely
		3	Sweet, charming, warm
		4	
		5	Temperate, warm
		6	
		7	Comic, smiling face, funny, enjoyable
		8	
		9	
		10	Attractive, impressive

Overall Impression	Ball Swivel chair with its smiling face embodies simplicity and function together… it engenders new aesthetic as its design is wonderfully sculptural…	1	It reminds me a nice lemon served with lentil soup…
		2	…
		3	Sweetness; it looks like that here comfort is not so important…
		4	…
		5	…
		6	From the outset, it invites you to have a rest…
		7	…
		8	…
		9	…
		10	…

Table 5.7.5 (continued)

5.7.3 Semantic Differential study (SB)

The designer's and users' perceptions of visual form of SB are discussed in the following sections.

Significant mismatches and significant exact matches (SB)

Based on the comparison of the designer's and ten users' evaluations for 44 adjective pairs, two (2) significant mismatches, nine (9) significant exact matches and thirty three (33) non-significant results were identified (Figures 5.7.2 and 5.7.3). Considering the four adjective pairs categories, the following findings can be reported: two significant exact matches in category 1, two significant mismatches and one significant exact match in category 2, four significant exact matches in category 3, and two significant exact matches in category 4 (see Appendix I for full data). So the designer may have had a problem in communicating the usability-related attributes to target users through product visual form.

Adjective pairs that were identified as significant mismatches were: adj.12 (Safe-Dangerous), and adj.18 (Steady-Unsteady) with 6 and 7 mismatch evaluations respectively. In contrast, adjective pairs of significant exact matches were: adj.1 (In fashion-Out of fashion), adj.5 (High technology-Low technology), adj.16 (Clear-Confusing), adj.22 (Innovative-Imitative), adj.24 (Simple-Complex), adj.25 (Ornate-Plain), adj.28 (Orderly-Disorganized), adj.35 (Feminine-Masculine), and adj.40 (Truthful-Exaggerated) with 6, 6, 7, 7, 7, 8, 6, 7, and 7 exact match evaluations respectively.

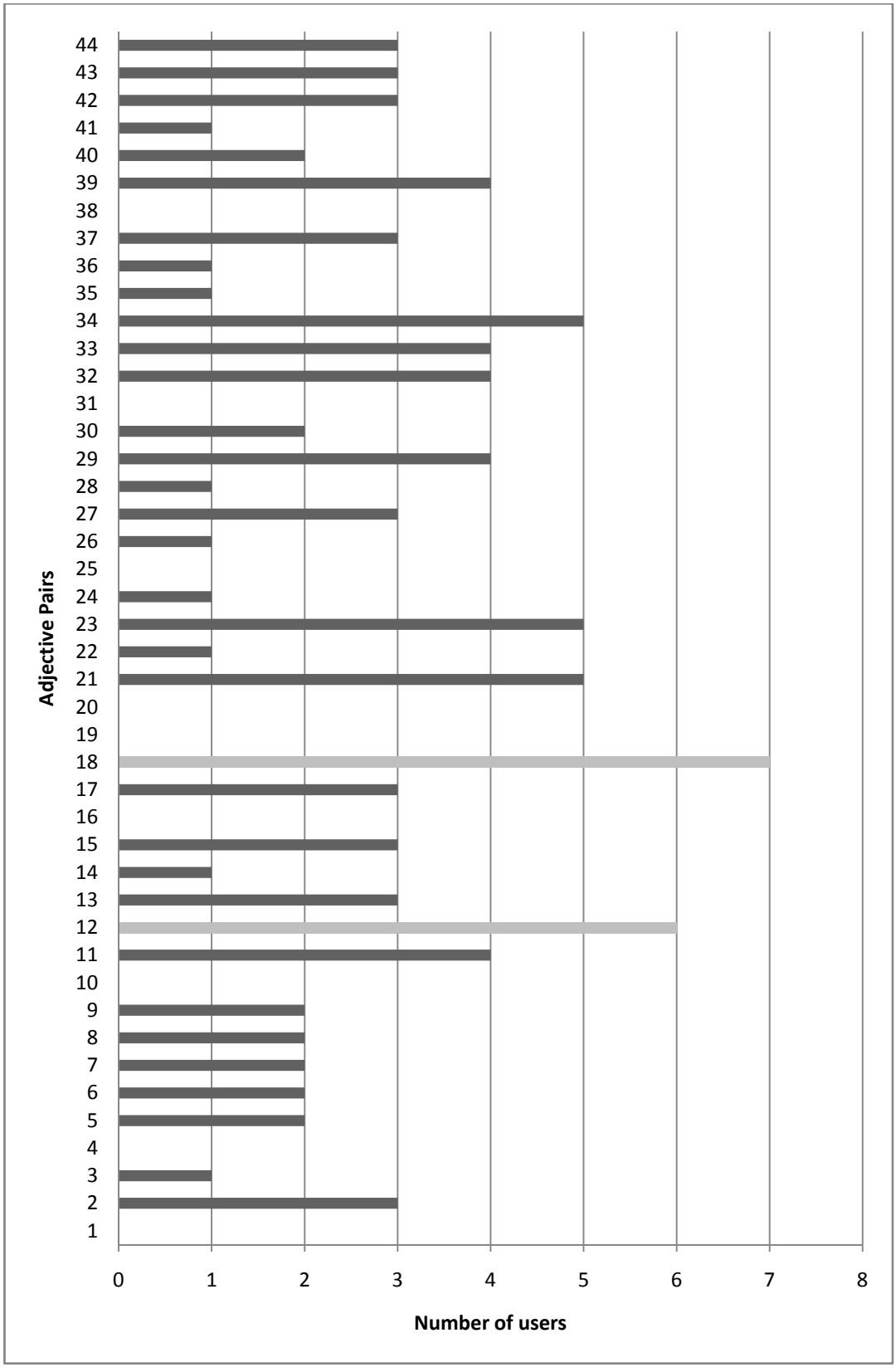


Figure 5.7.2 Number of users giving Likert grades mismatching the designer's grade (v>d±1); the gray bars indicate significant mismatches

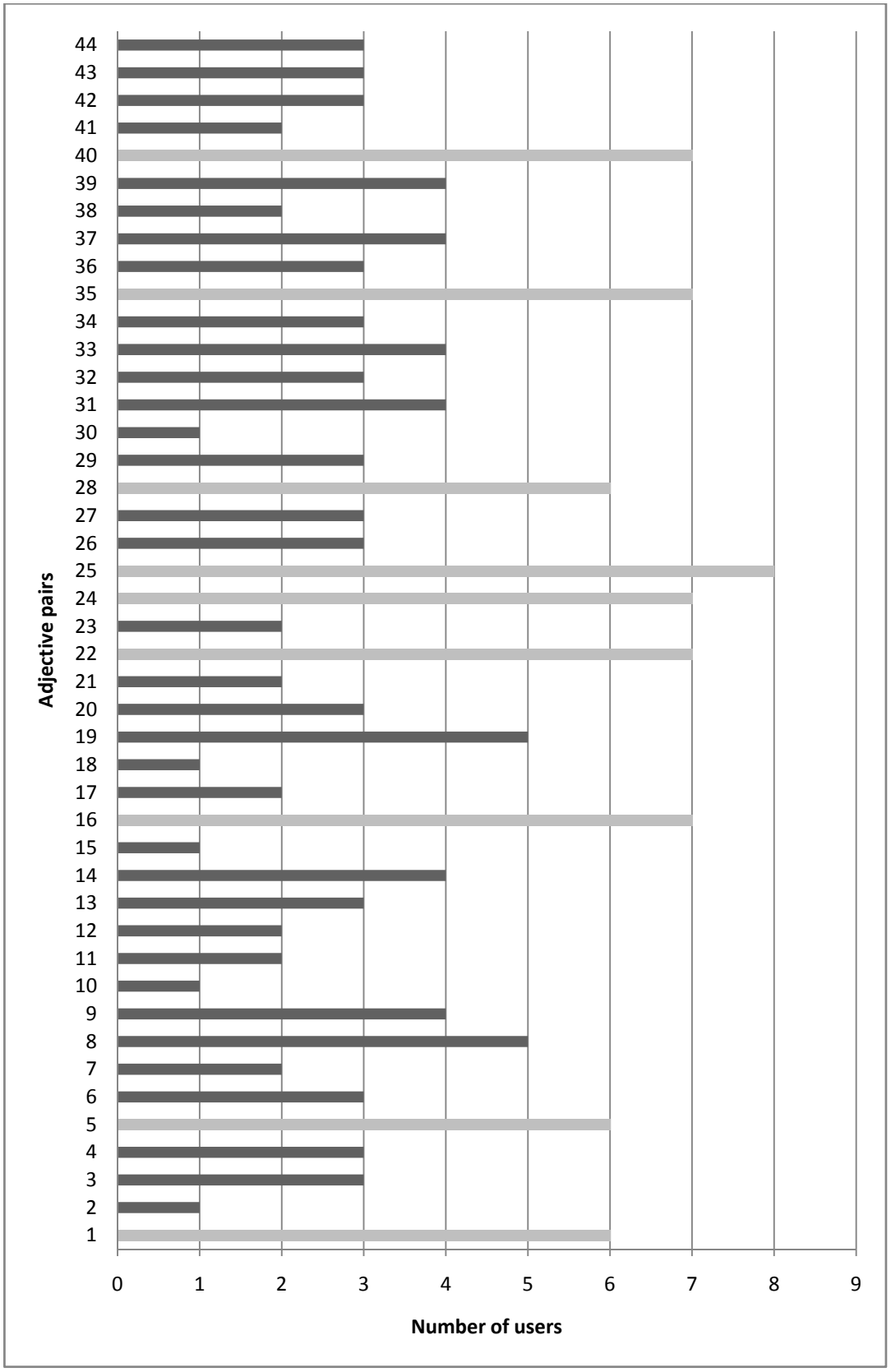


Figure 5.7.3 Number of users giving Likert grades exactly matching the designer's grade (v=d); the gray bars indicate significant exact matches

Significant mismatches – further analysis (SB)

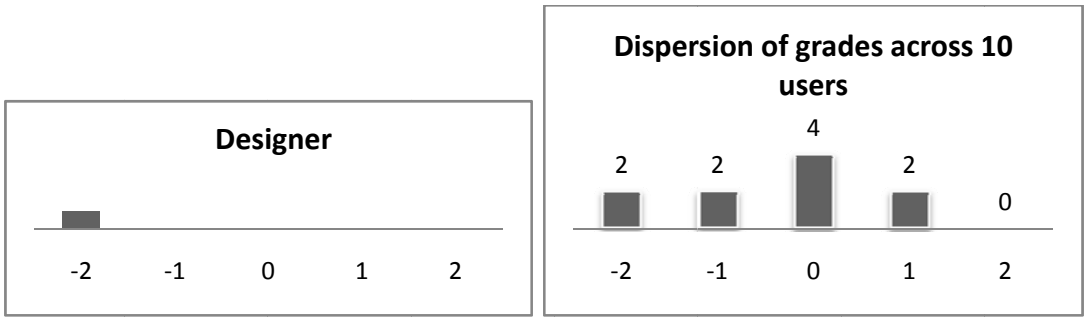


Figure 5.7.4 Designer and user evaluations for Adj.12 (Safe-Dangerous)

The designer's evaluation was forthright as he considered SB as very safe to be used. However, a diversity of opinions existed from users' evaluations. Four users found it very difficult to evaluate product safety before use/interaction, or to express their perceptions based on the product image, so preferred to stay neutral on the scale. Two users agreed with the designer. Two users perceived SB as quite safe while two users found it to be quite dangerous. The designer could not clearly communicate the attribute through product visual form, with the data revealing a 60% level of mismatch.

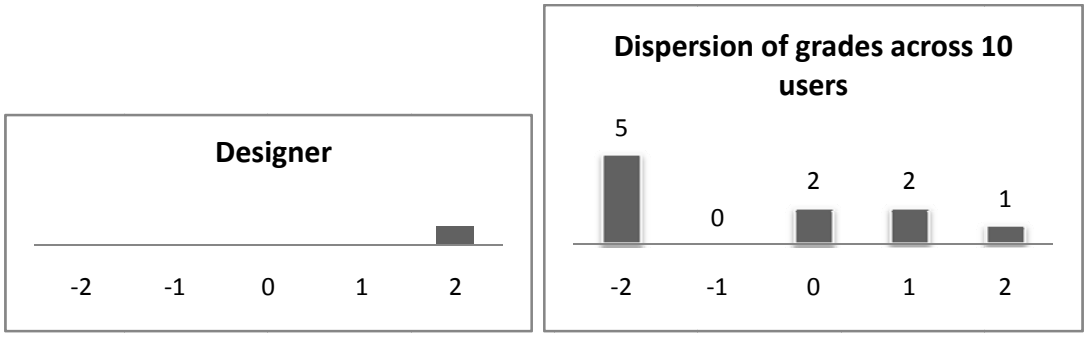


Figure 5.7.5 Designer and user evaluations for Adj.18 (Steady-Unsteady)

The designer considered SB as very unsteady. In contrast, five users found it to be very steady. Two users stayed neutral on the scale. Two users inclined to the designer's intention and perceived it as quite unsteady. The designer's evaluation seems to be based on his prior physical interaction with SB while users' evaluations were based on the perceived usability of product visual form. A 70% level of mismatch existed for this adjective pair.

Significant Exact matches – further analysis (SB)

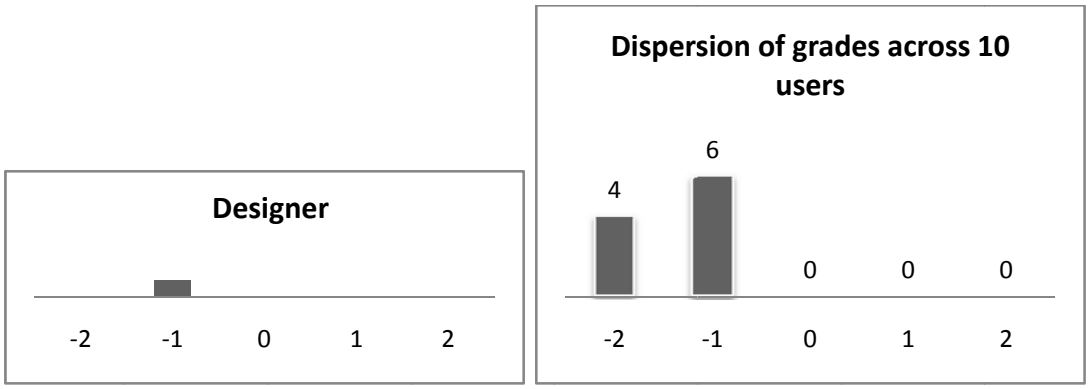


Figure 5.7.6 Designer and user evaluations for Adj.1 (In fashion-Out of fashion)

The designer intended SB to be perceived as quite in fashion: six users agreed. Four users found it to be very in fashion. It reveals that the designer was clear about the product attribute and its position in the society he intended SB to be used. A 60% level of exact match existed for this adjective pair.

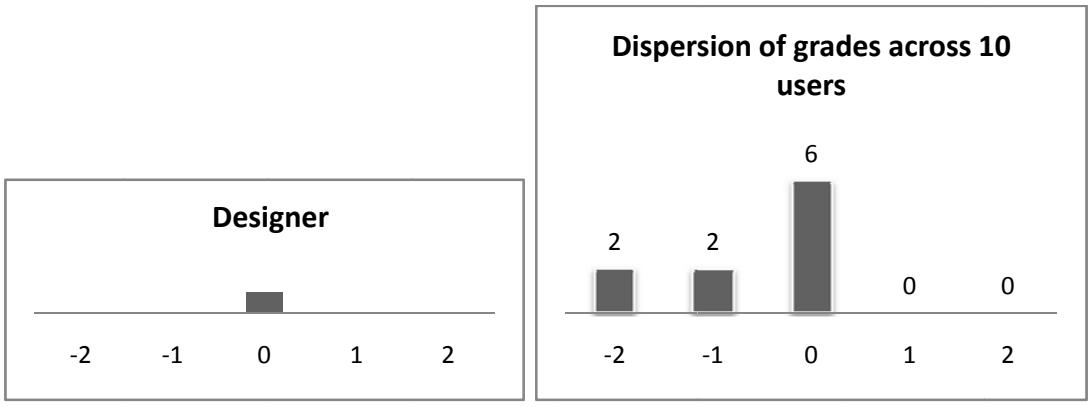


Figure 5.7.7 Designer and user evaluations for Adj.5 (High technology-Low technology)

The designer remained neutral on the evaluation scale. Six users also stayed neutral. However, the remaining users considered SB as a result of very high technology (two users) or quite high technology (two users). It reveals that the designer is more or less aware of users' knowledge of discriminating between high and low technology, with the data revealing a 60% level of exact match for this attribute.

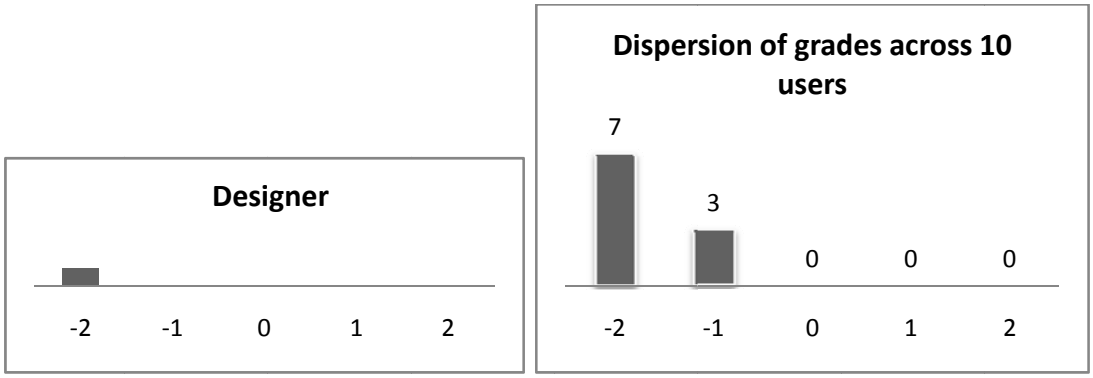


Figure 5.7.8 Designer and user evaluations for Adj.16 (Clear-Confusing)

Similar to the designer, seven users considered that the obvious function of SB is very clear. Three users inclined to this view, seeing it quite clear. So the designer was capable of communicating the obvious function of SB, as a seating unit, to the majority of users, with the data revealing a 70% level of exact match.

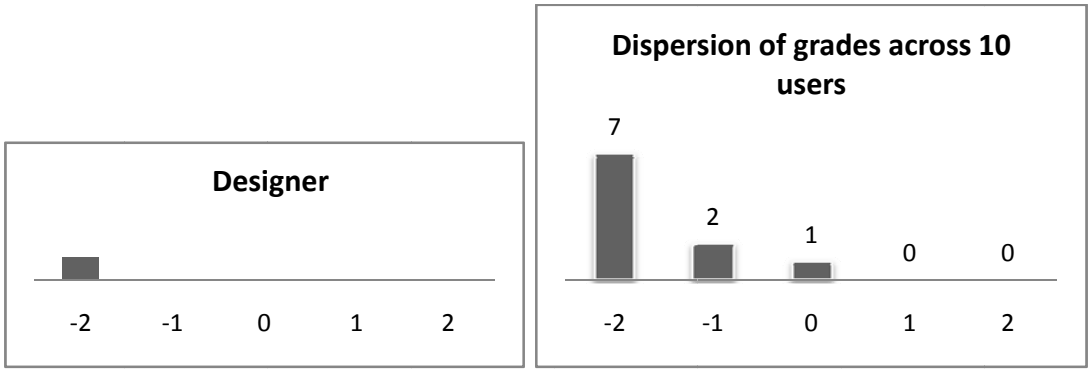


Figure 5.7.9 Designer and user evaluations for Adj.22 (Innovative-Imitative)

The designer intended SB to be considered as very innovative regarding its aesthetic values. The majority of users agreed with this view, regarding it to be very innovative (seven users) or quite innovative (two users). One user stayed neutral. The users' evaluation can be supported by their perceived attributes originated from their first impressions (see section 5.7.2). A 70% level of exact match existed for this adjective pair.

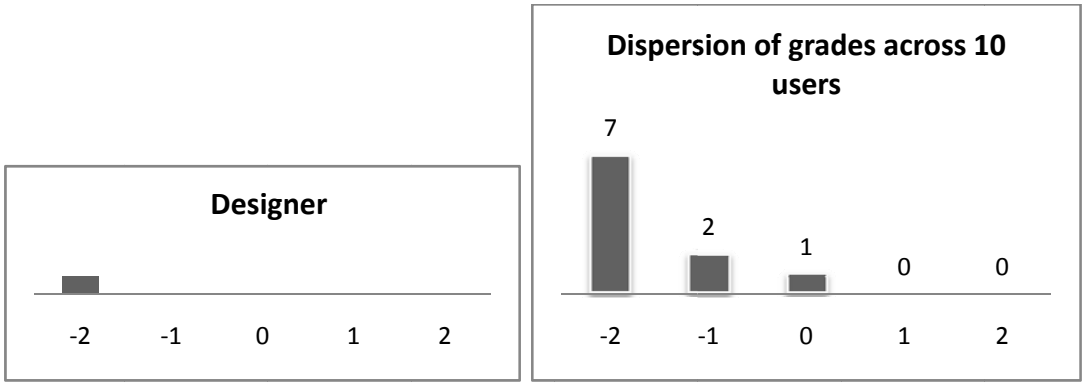


Figure 5.7.10 Designer and user evaluations for Adj.24 (Simple-Complex)

The designer evaluated the product form as being very simple. Although one user stayed neutral on the evaluation scale, the remaining users agreed with designer, seeing it as very simple (seven users) or quite simple (two users). A 70% level of exact match existed for this adjective pair.

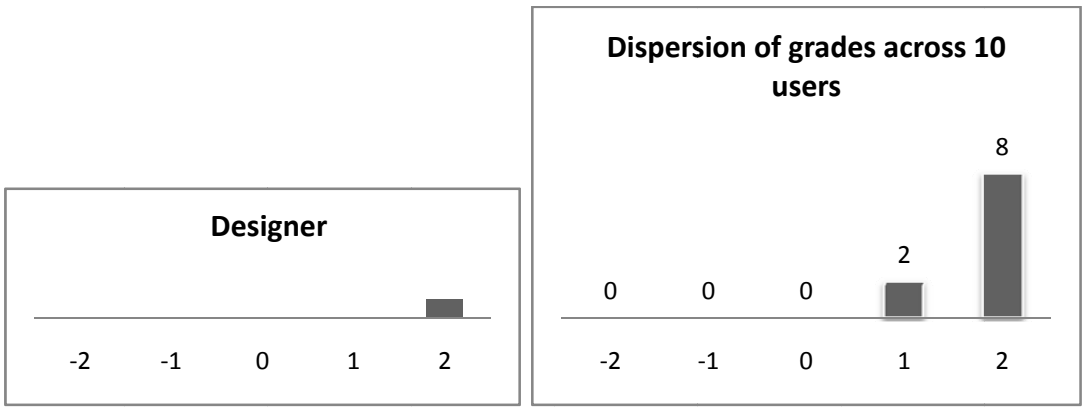


Figure 5.7.11 Designer and user evaluations for Adj.25 (Ornate-Plain)

Similar to the designer, all users stayed on the right side of the scale when evaluating SB regarding the adjective pair ornate vs. plain. Eight users found it very plain and two users considered it as quite plain. The data reveals an 80% level of exact match. It can be observed that there existed considerable correlation between this adjective pair and the adjective pair simple vs. complex. The users found SB's visual qualities to be simple and plain.

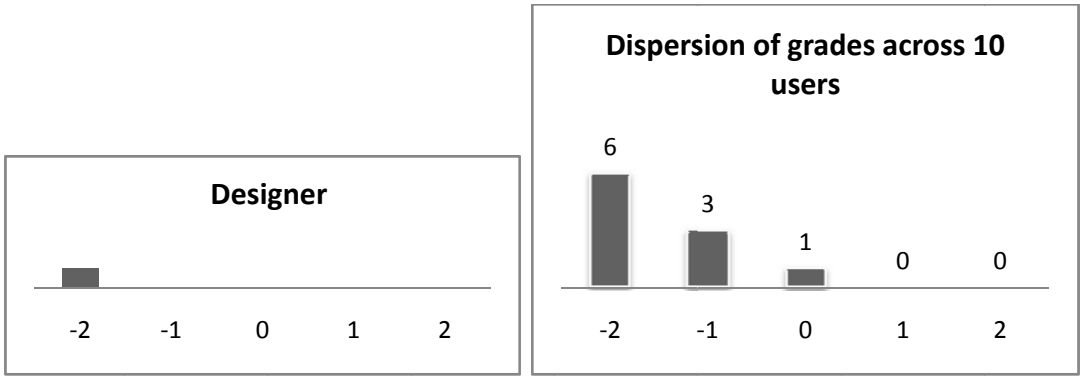


Figure 5.7.12 Designer and user evaluations for Adj.28 (Orderly-Disorganized)

The designer intended the visual qualities of SB to be perceived as very orderly: six users agreed. Three users inclined to the designer's intention, perceiving it as quite orderly. One user remained neutral on the evaluation scale. The Subjects' perceptual responses reveal a 60% level of exact match for this adjective pair.

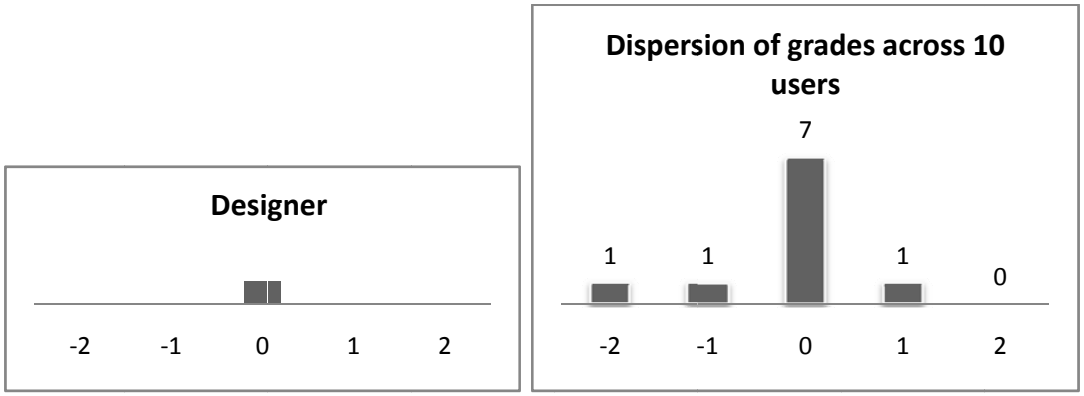


Figure 5.7.13 Designer and user evaluations for Adj.35 (Feminine-Masculine)

Regarding the evaluation of SB's personality through the adjective pair feminine vs. masculine, the designer preferred to stay neutral on the scale. The majority of users also remained neutral on the evaluation scale. A 70% level of exact match existed. From the four females' evaluations, one (U3) considered SB as quite masculine, and the other three female users stayed on the middle of the scale. One male regarded it to be very feminine and one considered it quite feminine. These findings reveal that the evaluation of product personality based on visual form is quite different between genders.

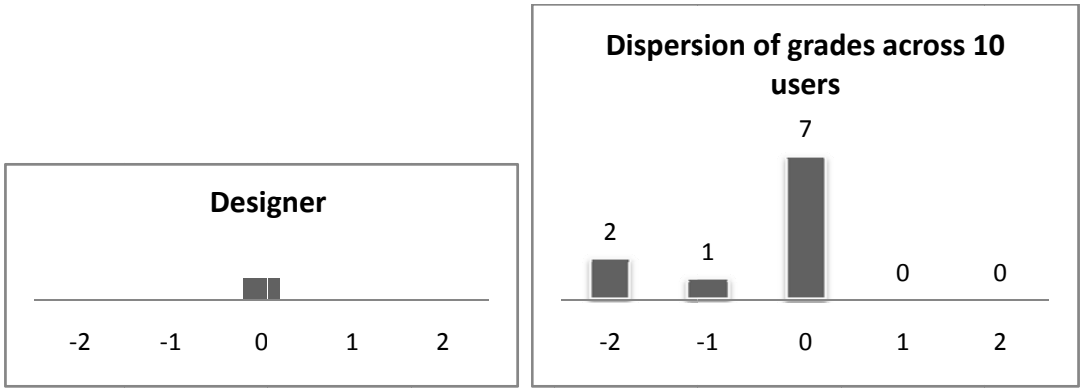


Figure 5.7.14 Designer and user evaluations for Adj.40 (Truthful-Exaggerated)

Similar to the designer's evaluation, seven users stayed neutral on the evaluation of SB regarding the adjective pair truthful vs. exaggerated. Two users, however, found it to be a very truthful product and one considered the product personality as quite truthful. The data reveals a 70% level of exact match for this adjective pair.

The results of the comparative analysis of the designer's intended messages and the users' perceived messages embodied in product form of SB, reveals that the designer was successful in evoking positive impressions in users' perceptual responses. He calls SB Ball as it resembles a ball in visual form. The impressive color of yellow was used to give childlike and adorable personality characteristics to the product. Most of the users found SB to be like a lemon because of its color and spherical shape. In the second section, the designer was also relatively successful to communicate intended attributes to users, except for attributes related to 'perceived usability', as users considered it either comfortable or uncomfortable. The users did not decode the reliable attributes that the designer had intended. A comparison of the designer's intended perceptions and users actual (pre-usage) perceptions, over 44 adjective pairs through the SD study, reveals that there were 2 significant mismatches within category 2, Usability & Interaction. From the 9 significant exact matches, 1 adjective pair was related to the Usability & Interaction category. It shows that without considering attributes from category 2, the designer was still successful in communicating attributes falling into the other three categories, although 33 adjective pairs were evaluated as non-significant results.

5.8 Analysis of product example 8 (S Armchair)

Product 8 (S Armchair) is the second product from Derin Design company selected for analysis in this study. S Armchair was designed by Aziz Sarıyer, also the designer of product example 7 (Ball). The abbreviation 'SS' which derives from Sarıyer (name of the designer) and S Armchair (name of the product) is used throughout this section as the product code (Figure 5.8.1).

The intended user group of SS was identified by Mr. Aziz Sarıyer. He maintained that both SS and SB (product 7) are in the same category, and thereby the considered target users of the products share similar personal characteristics and lifestyles (Table 5.8.1). Accordingly, ten users fitting the profile were arranged to participate in the study (Table 5.8.2).

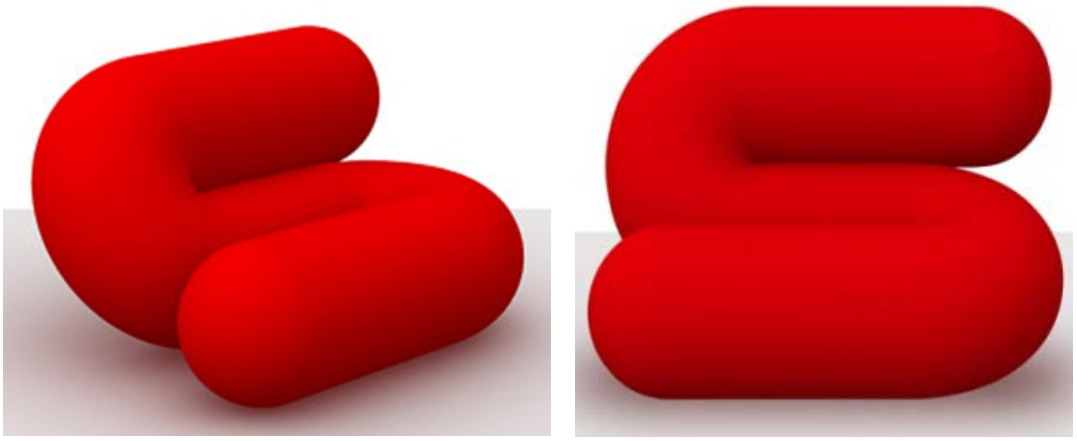


Figure 5.8.1 Product SS designed by Aziz Sarıyer

Table 5.8.1 Specifications of the intended user group related to SS product

Gender	Male and female
Age range	18-36
Income level	Moderate and High
Level of education	Any
Lifestyle and personality	Intellectual, bright, futuristic people appreciating and discriminating art and design. A person who wants to differentiate himself… A person with high cultural values…

Table 5.8.2 List of users participating in the evaluation of SS product

Users	Gender	Age range	Level of education	Occupation
1	Female	18-24	Undergraduate	Landscape architecture
2	Male	25-36	Undergraduate	Architecture
3	Male	25-36	Undergraduate	Engineer
4	Female	18-24	High school graduate	Student
5	Male	18-24	Some college	Student
6	Female	18-24	High school graduate	Student
7	Male	25-36	Graduate	Student (marketing)
8	Female	25-36	Undergraduate	Teacher
9	Male	18-24	Undergraduate	Student
10	Female	18-24	Undergraduate	Landscape architecture

The designer argued that users would be able to receive his intended messages through the visual language of product form. His expectations, as he mentioned in section 5.7, were based on his professional experiences in furniture design and being clear about associated meanings of different forms. One of the drawbacks of this particular case study is that users were exposed to only low quality images of SS.

5.8.1 Names associated with SS

According to the designer, the name S Armchair was given because visual characteristics of the 'S' letter were influential in determining the overall product shape. It is a continuous curved line, consistent with the letter S. Based on its visual characteristics, the designer suggested the alternative names of Spiral and Flex.

Four users used analogies to indicate their first impressions. Three users (U1, U2, and U5) sketched analogies that reveal they were trying to deconstruct the visual characteristics of SS. The sketched analogies helped them to name the product. The sketched analogy from user 8 demonstrated product personality characteristics (Table 5.8.3).

The names given by most of the users reveal that SS with its distinctive form and characteristics evokes similar impressions in users' visual perceptions (Table 5.8.4).

Table 5.8.3 Mental images elicited from SS at first glance

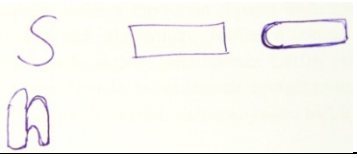
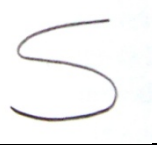
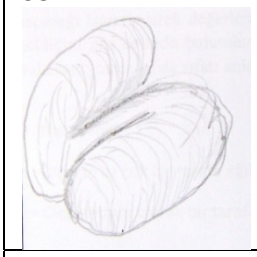
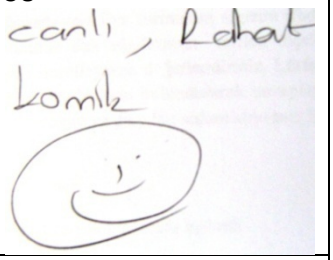
Stimulus	Analogies	
 	U1 	U2 
	U3	U4
	U5 	U6
	U7	U8 
	U9	U10

Table 5.8.4 Comparison between the designer's product name and names given to SS by users

Designer	Users	
S (Its design is directly inspired by the "S" letter) SPIRAL, FLEX	1	Fatty "S"
	2	Snake
	3	Saun (no meaning, just comes to my mind)
	4	Snuggle
	5	"S-ofa"
	6	S-shaped couch
	7	Snake
	8	Sebere
	9	S armchair
	10	"S"

The names of Fatty "S", S-ofa, S-shaped Couch, S Armchair, and S are close to the name designated by the designer. Two users (U2 and U7) proposed the name Snake, which signifies the product's behavior. The name of Snuggle from user 4 intimates product comfort. However, there existed two names of Sebere and Suan, neither of

which have explicit meanings nor indicate the reason behind them. Based on the proposed names by users, it can be said that the designer was highly successful in transmitting messages that led users to understand the choice of product name S Armchair.

5.8.2 Intended attributes versus perceived attributes (SS)

Based on the distribution of attributes and their frequency of mention (Table 5.8.5), it can be said that the positive and affective attributes related to the Personality Characteristics of SS were intended to be received by target users. The designer also attributed meanings to SS that are related to Visual Qualities and Usability & Interaction categories. However, these attributes seemed not to be as dominant values of SS compared with attributes related to product personality. The attributes related to Social Values & Positions were not of concern to the designer.

Users' perceived attributes also fell within the Personality Characteristics (with 17 statements), Visual Qualities (with 14 statements), and Usability & Interaction (with 8 statements) categories (Table 5.8.5). One attribute originating from Social Values & Positions was mentioned. These findings reveal that the users' perceptual responses may support the designer's viewpoint that the product's Personality Characteristics, Visual Qualities and Usability & Interaction, in order, are the three dominant values of product visual form. However, the intended attributes and perceived attributes pertinent to perceived usability of the product are not matched together. Accordingly, the designer likely failed to communicate the intended attributes of SS as being reliable and its added value of double-sided use. All users and the designer argued that the overall shape (S), movement, and its fiery color were affective visual properties of SS that moderated intended attributes and perceived attributes. While the designer's overall impression was about product visual qualities being unique and simple, the users' overall impressions emphasized their actual behavior of measuring product visual form and its perceived usability.

Table 5.8.5 Comparisons between designer's intentions and users perceived attributes

s	Designer	Users	
Social Values & Positions		1	
		2	
		3	
		4	
		5	
		6	Fashionable
		7	
		8	
		9	
		10	
Usability & Interaction	Double-sided, reliable	1	Thick
		2	Relaxing (comfortable)
		3	
		4	Comfortable, efficient
		5	
		6	
		7	Comfortable, confusing
		8	Comfortable
		9	Comfortable, functional
		10	Comfortable, not ergonomic
Visual Qualities	Novel, plain, dynamic	1	Rounded, smooth, puffy
		2	Plain
		3	Curved, sleek, minimalistic
		4	
		5	
		6	Stylish
		7	Novel
		8	Dynamic
		9	Aesthetic, beautiful
		10	Novel, soft
Personality Characteristics	Exciting, childish, enjoyable, pleasing, attractive, different, proud, hot, expressive,	1	
		2	
		3	Attractive, extraordinary
		4	Attractive
		5	Lovely
		6	Eye-catching, relaxing, pleasing, interesting
		7	Attractive, different
		8	Lively, relax, funny, comic, free
		9	
		10	Attractive, proud

Overall Impression	"The magic resides in the simplicity", which is especially valid for the S ARMCHAIR. This piece, which essentially is nothing more than a roll of bright red Polster, is the perfect lounge furniture.	1	Three dimensional "S" armchair…
		2	…
		3	Its form evokes an attractive woman…
		4	The design embodies a fast-paced lifestyle where comfort is integrated into a sleek minimalistic design to answer to the users' need of comfort and efficiency…
		5	…
		6	This is a couch made for relaxation and pleasure…
		7	This innovative design is made for comfort…its design also would affect users' purchasing behavior…
		8	…
		9	…
		10	A truly memorable design, far from classic forms…

Table 5.8.5 (continued)

5.8.3 Semantic Differential study (SS)

The results of the comparative study of designer's and users' perceptions are discussed as follows.

Significant mismatches and significant exact matches (SS)

Through the analysis procedure, six (6) significant mismatches, four (4) significant exact matches and thirty four (34) non-significant results were identified (Figures 5.8.2 and 5.8.3): one significant exact match in category 1, five significant mismatches and one significant exact match in category 2, one significant mismatch in category 3, and two significant exact matches in category 4 (see Appendix J for full data). The findings reveal that the designer may have had a problem in communicating the usability-related attributes to target users through the visual form of SS.

Adjective pairs that were considered as significant mismatches were: adj.10 (Easy to clean-Difficult to clean), adj.12 (Safe-Dangerous), adj.13 (Robust-Delicate), adj.14 (Flexible-Rigid), adj.18 (Steady-Unsteady), and adj.25 (Ornate-Plain), with 8, 8, 7, 8, 7, and 6 mismatch evaluations respectively. In contrast, adjective pairs of

significant exact matches were: adj.4 (Avant-garde-Conservative), adj.19 (Heavy-Light), adj.34 (Aggressive-Submissive), and adj.38 (Futuristic-Nostalgic) with 6, 6, 8, and 7 exact match evaluations respectively.

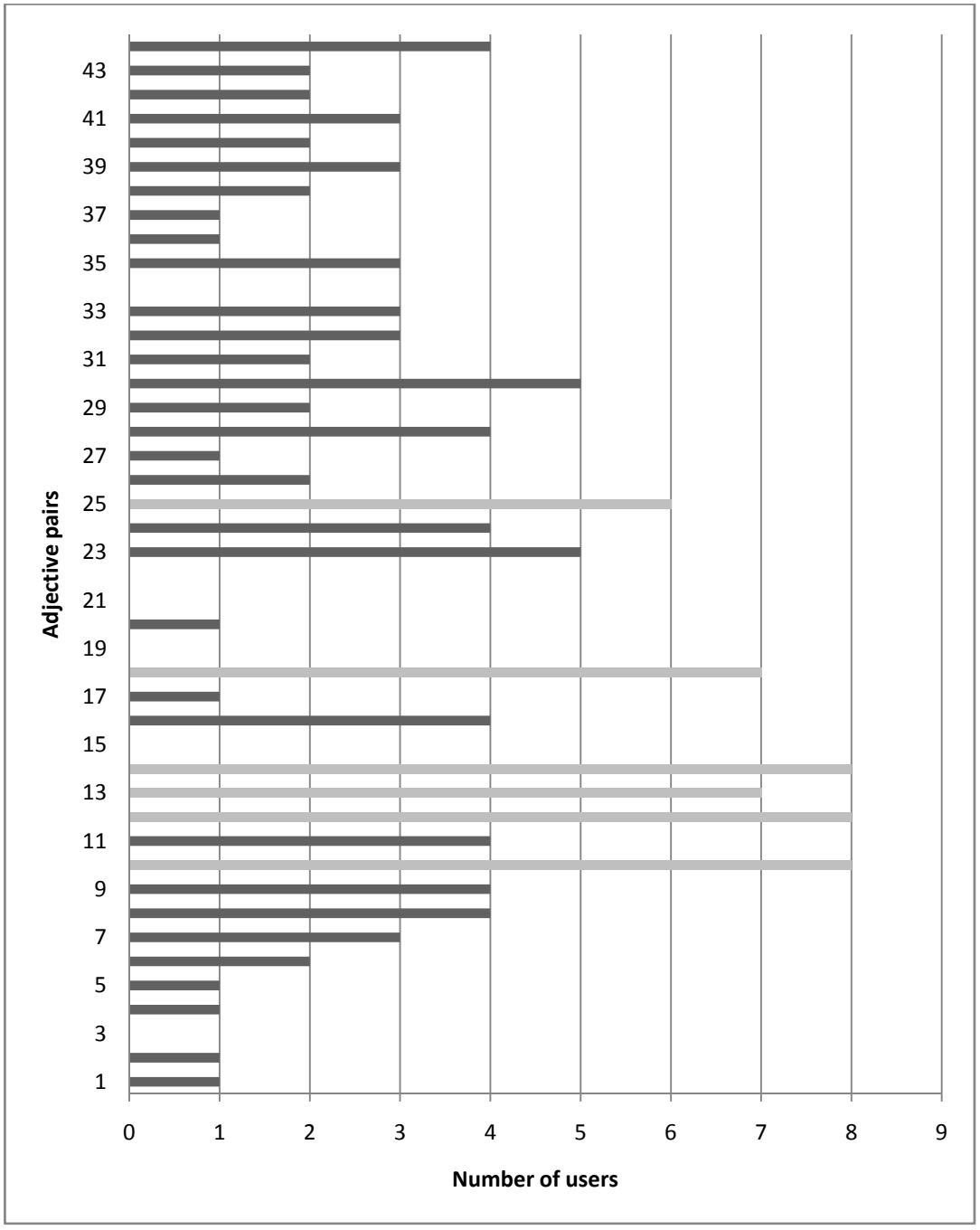


Figure 5.8.2 Number of users giving Likert grades mismatching the designer's grade (v>d±1); the gray bars indicate significant mismatches

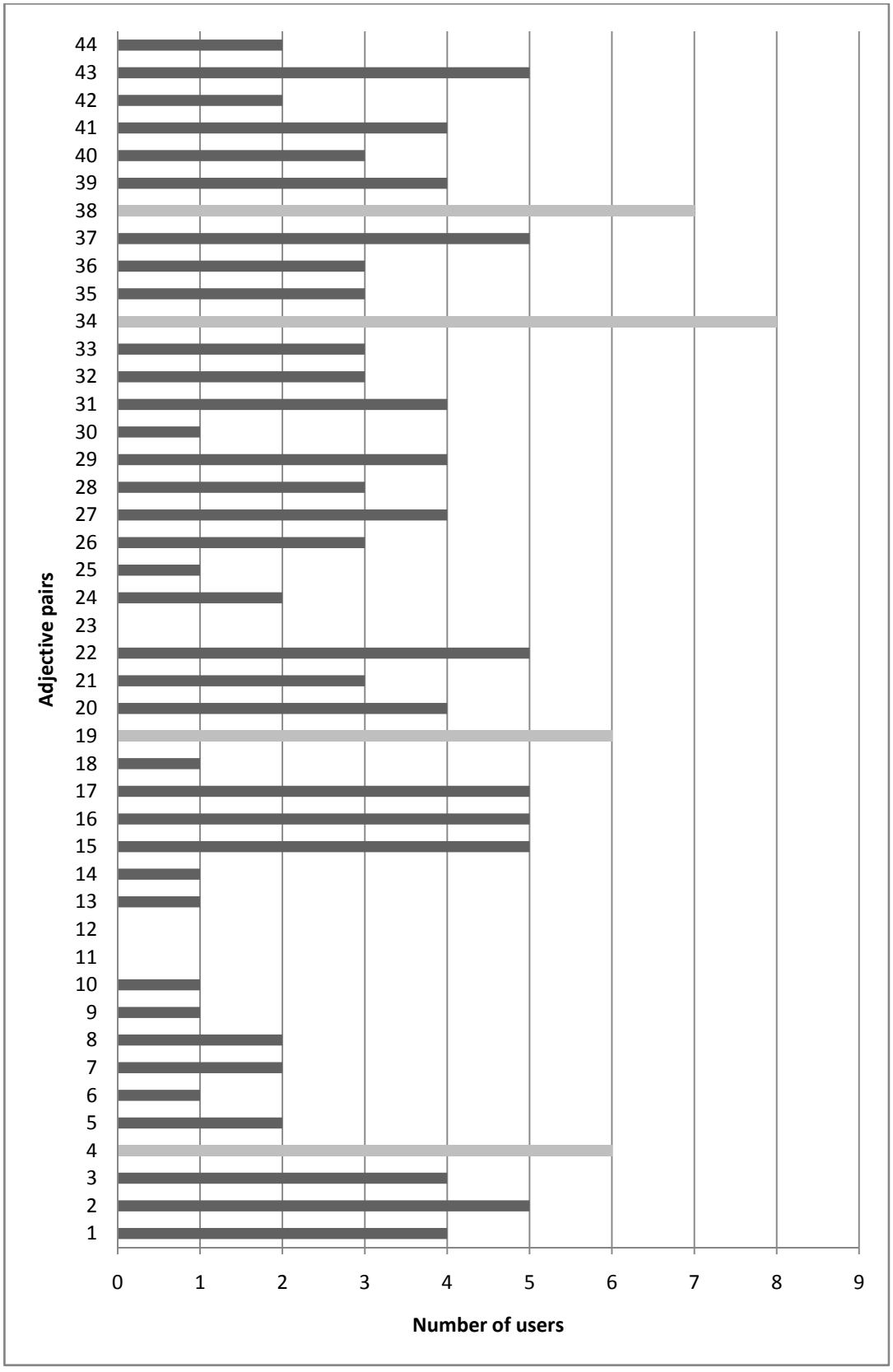


Figure 5.8.3 Number of users giving Likert grades exactly matching the designer's grade (v=d); the gray bars indicate significant exact matches

Significant mismatches – further analysis (SS)

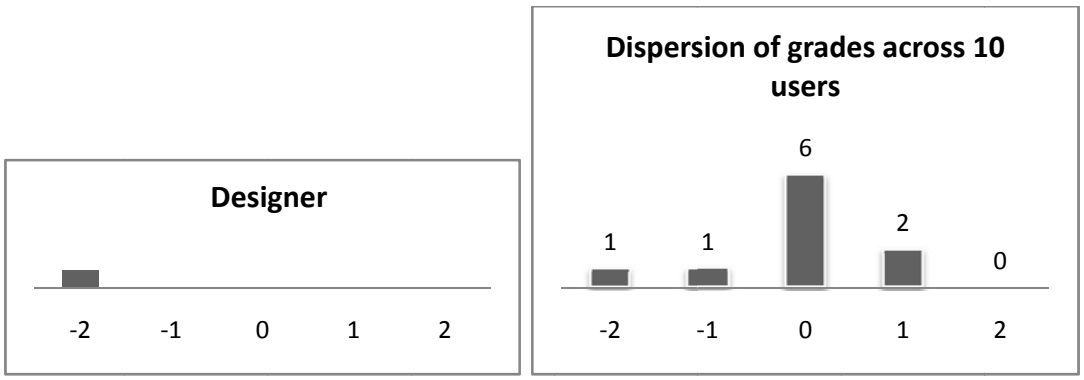


Figure 5.8.4 Designer and user evaluations for Adj.10 (Easy to clean-Difficult to clean)

The designer intended SS to be perceived as very easy to clean. Only one user perceived it as the designer intended. Six users preferred to remain neutral on the evaluation scale. Users' perceptual responses reveal that without physical interaction with SS or product experience, it is difficult to evaluate SS regarding the adjective pair easy to clean vs. difficult to clean. An 80% level of mismatch existed for this adjective pair.

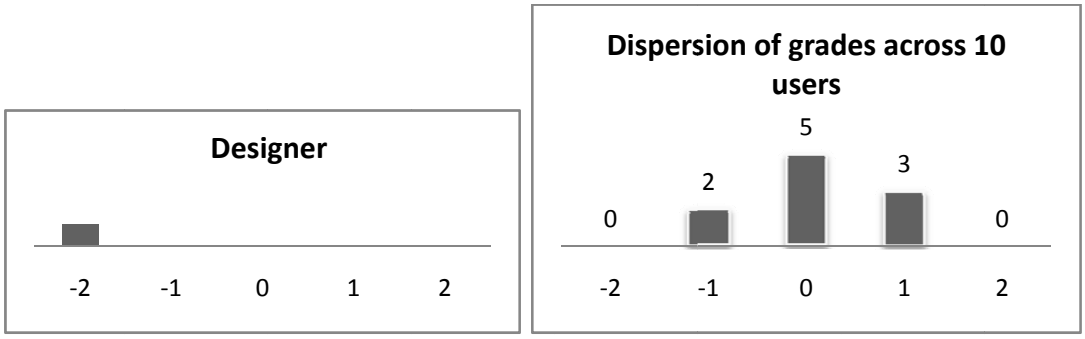


Figure 5.8.5 Designer and user evaluations for Adj.12 (Safe-Dangerous)

None of the users agreed with the designer, who considered SS as very safe. Users had a tendency to grade SS within the range of -1, 0, and 1. It reveals that users found it quite difficult to evaluate SS with respect to the safe vs. dangerous adjective pairing prior to product use. An 80% level of mismatch existed for this adjective pair.

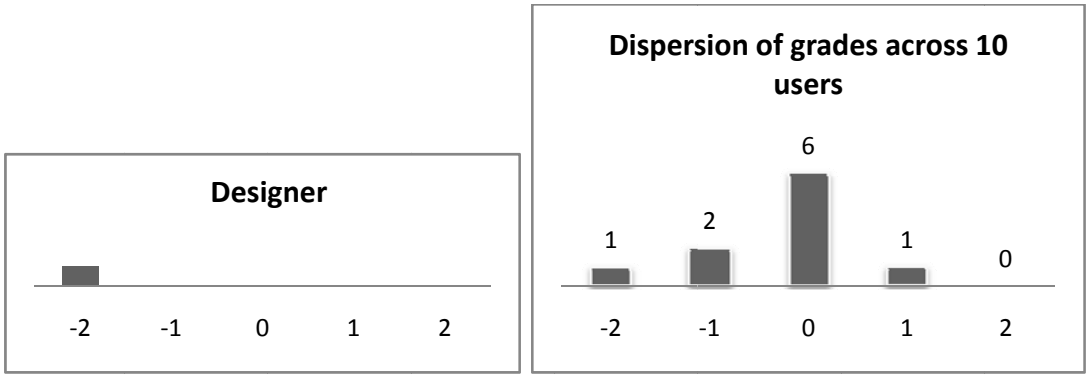


Figure 5.8.6 Designer and user evaluations for Adj.13 (Robust-Delicate)

The designer intended SS to be perceived as a very robust product: only one user agreed. Two users inclined to this view, seeing it as quite robust. However, most of the users found it difficult to evaluate this adjective pair. Six users remained neutral. One user considered it as quite delicate. The data reveals a 70% level of mismatch.

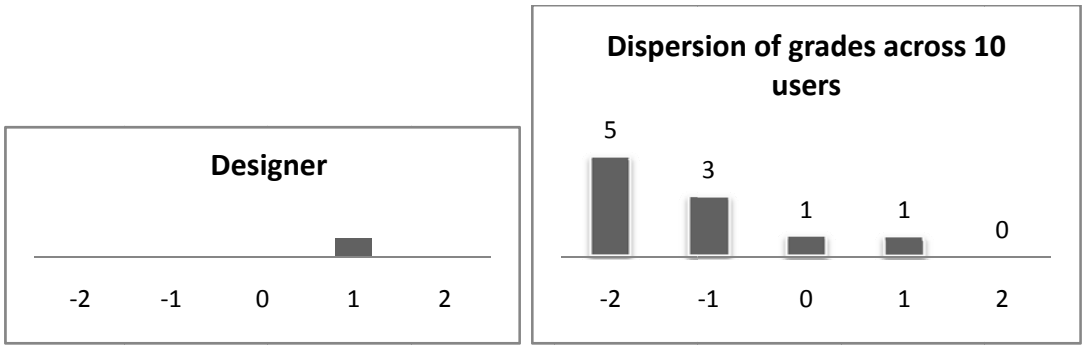


Figure 5.8.7 Designer and user evaluations for Adj.14 (Flexible-Rigid)

The designer considered SS as quite rigid in use. His evaluation was based on a physical interaction with the product. In contrast, users' evaluations show that product visual characteristics can dramatically affect perception of usability, since the majority of users stayed on the opposite side, considering SS as either quite flexible (three users) or very flexible (five users). An 80% level of mismatch existed for this adjective pair.

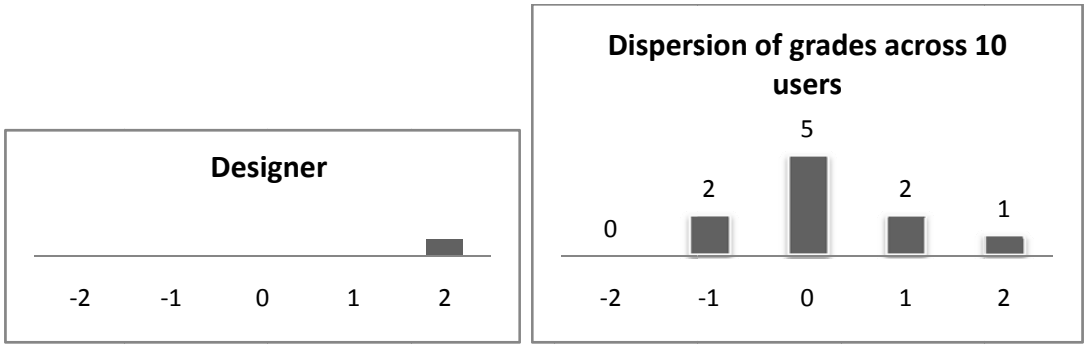


Figure 5.8.8 Designer and user evaluations for Adj.18 (Steady-Unsteady)

Although the designer's evaluation was forthright, most of the users preferred to remain neutral on the evaluation scale. The finding emphasizes the expectation that the designer's intended perception was based on a prior physical interaction with the product, and not solely on product visual form. The designer could not communicate the intended attribute of SS as being perceived as very unsteady, with the data revealing a 70% level of mismatch.

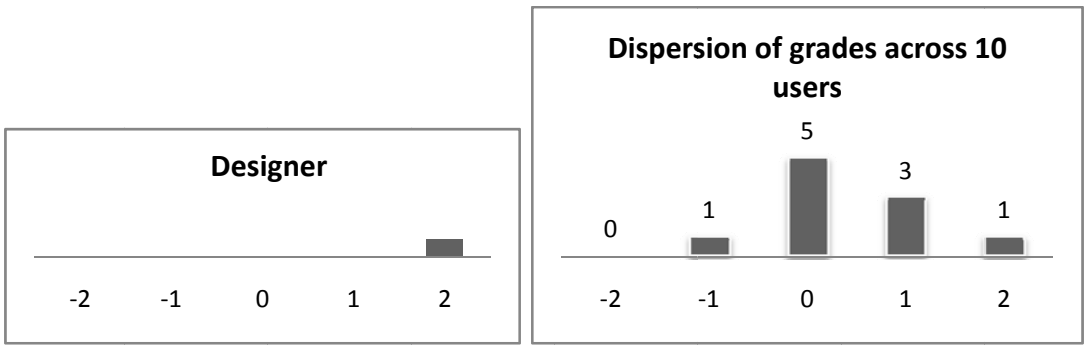


Figure 5.8.9 Designer and user evaluations for Adj.25 (Ornate-Plain)

The designer considered visual qualities of SS as very plain: one user agreed. Furthermore, three users inclined to this view, seeing it as quite plain. In contrast, one user perceived it as quite ornate. Five users stayed neutral on the evaluation scale. A 60% level of mismatch existed for this adjective pair. However, the quality of the product images may have been influential in this grading.

Significant Exact matches – further analysis (SS)

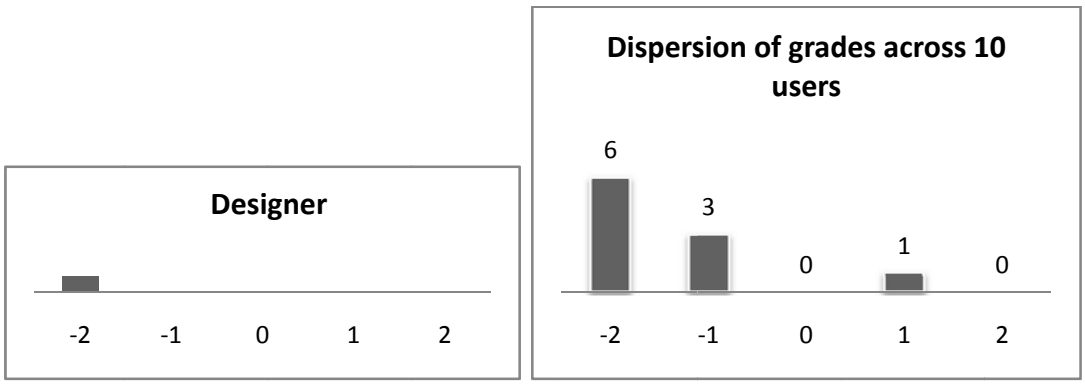


Figure 5.8.10 Designer and user evaluations for Adj.4 (Avant-garde-Conservative)

Six users found SS to be very avant-garde as the designer intended. Three users inclined to this view, regarding it as quite avant-garde. In contrast, only one user found SS to be quite conservative. The designer was successful in communicating this attribute, with the data revealing a 60% level of exact match.

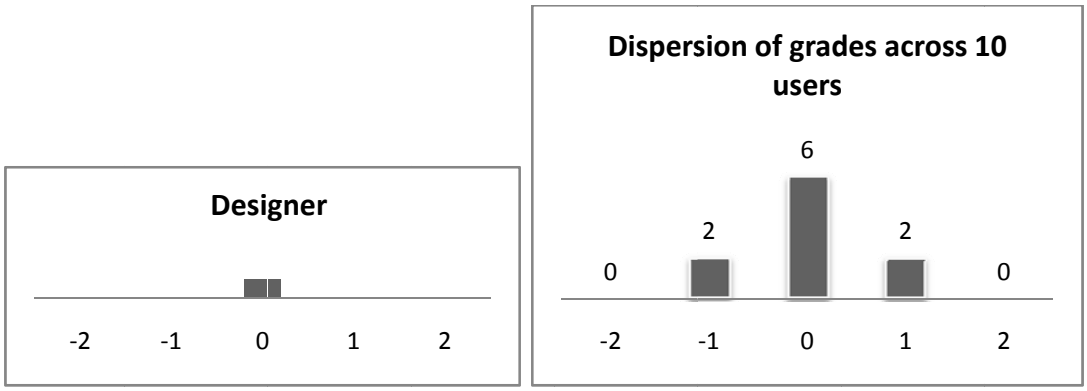


Figure 5.8.11 Designer and user evaluations for Adj.19 (Heavy-Light)

Six users and the designer stayed neutral on the evaluation of the adjective pair heavy vs. light. Other users perceived SS to be either quite heavy or quite light. A 60% level of success was achieved. This is the only adjective pair under the category of Usability & Interaction that the designer could communicate successfully.

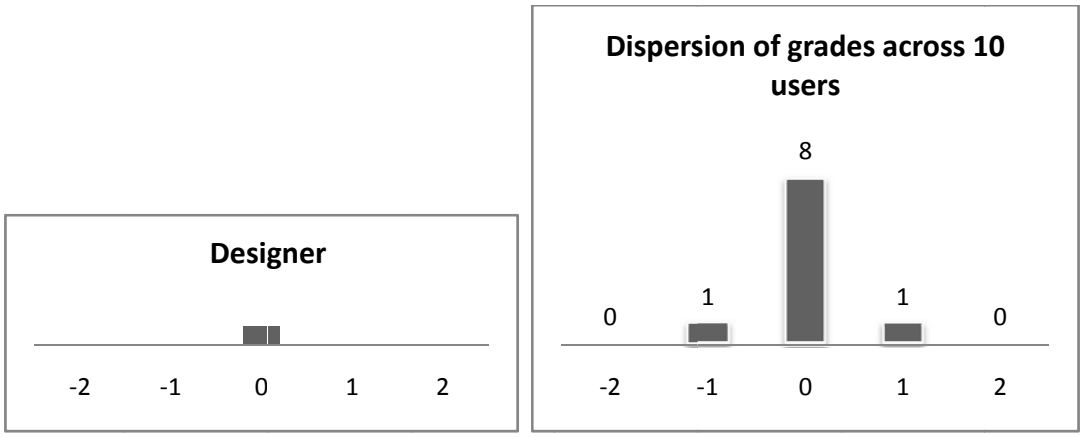


Figure 5.8.12 Designer and user evaluations for Adj.34 (Aggressive-Submissive)

The designer and the majority of users remained neutral on the evaluation of product personality regarding the adjective pair aggressive vs. submissive. One user considered SS to be quite aggressive while one user regarded it as quite submissive. An 80% level of exact match existed for this adjective pair.

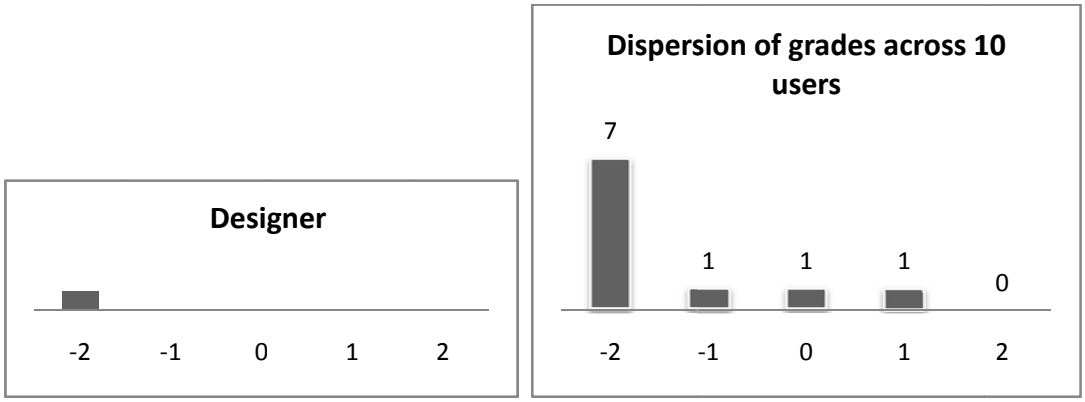


Figure 5.8.13 Designer and user evaluations for Adj.38 (Futuristic-Nostalgic)

The designer intended SS to be perceived as very futuristic: seven users agreed. One user considered it as quite futuristic while one user found it to be quite nostalgic. One user also stayed neutral on the evaluation scale. The data reveals a 70% level of exact match for this adjective pair.

The results of the study on the product SS reveal that the designer was very successful in transmitting messages that led users to understand the choice of the

product name, S Armchair. The designer was successful in evoking positive impressions in users' perceptual responses. Although he was relatively capable of communicating intended attributes related to the Personality Characteristics and Visual Qualities categories, he failed in transmitting intended attributes related to the Usability & Interaction category. However, users perceived the product attributes related to product usability quite positively, as many of them found SS to be a comfortable product. A comparative analysis of the designer's intended perceptions and users' actual (pre-usage) perceptions, over 44 adjective pairs through the SD study, indicated that users' and the designer's perceptual approaches are different in evaluating perceived usability of the product, because from 10 adjective pairs (6 significant mismatches and 4 significant matches), 6 adjective pairs (5 significant mismatches and 1 significant matches) existed in category 2 of Usability & Interaction.

5.9 Cross-comparison analysis of eight product examples

In this section the success of product meaning communication between designers and target users is examined on the basis of the eight product examples, under the following three subsections.

5.9.1 Names associated with products

All the proposed names by designers and users are reviewed to identify the kind of names together with the kinds of messages communicated through the names. Although the users were not asked to explain why they had suggested the names, the users' perceived descriptions and sketched analogies are taken into consideration to propose a reasoning for the names. Moreover, the types of names given by designers are analyzed and described separately from those of users, so that a comparison can be made between the types of names that appear in both classifications. It is assumed that the types of names identify the dominant concepts or attributes of product visual form.

Across the eight product examples, it can be identified that designers tend to select names that;

a. refer to personality aspects of the product sample's behavior: e.g. Sumo (NS), Pieta (OB), Daydream (ND), Kunt (OT);
b. refer to the resemblance between the product sample's visual qualities and familiar objects or concepts: e.g. Sledge (AS), Mushroom (AM), Chocolate (AM), Ball (SB), Boxer (OB), Globe (SB), S (SS), Spiral (SS);
c. refer to a product's identity or to a product that has a belonging to someone. In other words, these kinds of names reveal how the designer attached a personal brand to the products he/she designed: e.g. TO, stands for Tanju Ozelgin (designer of the sample OT).

On the other hand, considering the names (approximately 80 names) proposed by the users different kinds of names can be distinguished that mostly elicited by their first impressions of product visual form. These names refer to;

a. perceived personality character: e.g. Grandpa (AS), Snake (SS), Sensual (OB), Smiley (ND);
b. perceived usability of the product's behavior: e.g. Snuggle (SS), Swan-feather (OB), Rolling chair (NS), Swing (ND);
c. the assessment of product visual qualities: e.g. Contrast (OB), Bumpy (OB), Deep (OT), Cube (NS), Oval (AM), Primitive (AS);
d. the resemblance between a product's visual qualities and familiar objects or concepts: e.g. Lemon (SB), Egg (SB), Bird (OT), Kiwi (NS), Green Trunk (NS), Stamp (AM), Bobbin (AM);
e. the experience of meaning level (or; personal experiences or familiar associations triggered by the product): e.g. solmaz (OT), Ahmet (ND), Red Pilot (OB).

According to this classification, it can be observed that names related to 'the resemblance between a product's visual qualities and familiar objects or concepts' and 'personality aspects of product behavior' are offered by both designers and users. Therefore, these findings can be an applicable guide for designers to select names through which they can initially transmit intended messages, and which would lead users to understand the choice of product name and thereby what the product signifies.

5.9.2 Intended attributes versus perceived attributes

This section examines which product attributes designers use to transmit meanings and which product attributes users actually draw upon when deciphering meaning. The results were intended to reveal those attributes of product visual form that were important or dominant for the designers to act as agents in meaning communication. Equally, it was anticipated that dominant attributes of product visual form influential in evoking users' perceptions would be identified. As already described in the thesis, four classifications of attributes were used to help in the analysis (social values and positions; usability and interaction; visual qualities; personality characteristics).

In order to evaluate the kinds of the messages embodied in product form and to identify some hierarchy across the messages, a frequency analysis was made (Table 5.9.1). The larger the number of occasions a particular attribute was mentioned or addressed by users or designers, the greater the importance that was considered placed on that attribute. Accordingly, if the attributes related to a particular category are found to be less important (with 1-5 statements), the value of 1 is placed in the intersecting box. The value of 3 is placed in the intersecting box if the category is found to be more important (with more than 10 statements) relative to the other categories. The value of 2 is used for the category with considerable importance (with 6-10 statements) but not the highest importance. Attributes marked with 0 value were either not of concern to designers in their communication of messages, or were not influential in evoking users' perceptions toward product form.

The total scores indicate the level of importance of each category across the eight products. Considering the designers' total scores, it can be observed that the category of Personality Characteristics (100%) is ranked most important, followed by Visual Qualities (70.83%), Usability & Interaction (54.16%), and Social Values & Positions (12.5%). It reveals that the meanings designers attribute to product form are encoded mostly through personality characteristics and visual qualities. Based on the content analysis of data for each product, it was found that all of the attributes mentioned by designers under the Personality Characteristics category are considered as positive attributes. In this regard, it can be shown that designers (form givers) intend to reach an overall product form embodying positive appearance-based attributes mostly

describable as personality characteristics, then aesthetic values, and then usability aspects.

Table 5.9.1 frequency analysis revealing attributes of visual form involved in communicating meanings

Product Examples	Social Values & Positions		Usability & Interaction		Visual Qualities		Personality Characteristics	
	Designer	Users	Designer	Users	Designer	Users	Designer	Users
AS	0	1	3	3	1	2	3	3
AM	0	0	2	3	3	3	3	3
ND	0	1	1	3	1	3	3	3
NS	1	2	2	3	2	3	3	3
OB	1	1	1	2	2	3	3	3
OT	1	1	2	3	2	3	3	2
SB	0	1	1	3	3	3	3	3
SS	0	1	1	3	3	3	3	3
Total	3/24 12.5%	8/24 33.33%	13/24 54.16%	23/24 **95.83%**	17/24 70.83%	23/24 **95.83%**	24/24 **100%**	23/24 **95.83%**

Considering users' perceived attributes and their relevant categories, it can be observed that users regarded product form attributes under the Personality Characteristics, Visual Qualities, and Usability & Interaction categories as most important to their perceptions of meaning (each 95.83%). The Social Values & Positions category (33.33%) commanded users' attentions much less.

Reviewing the importance values designers and users give to each category of attributes, it can be pointed out that in all cases except personality characteristics, users regard the attributes as more important in conveying meanings than do designers.

These findings give an indication of the degree to which designers and users are allied in the importance they give to certain categories of product attributes in evoking meanings. So, although the findings provide an overview at a category level, they cannot be used to determine if designers are successful in transmitting the specific meanings to users that fall within the categories. For example, the content analysis of product AS (sledge), for which the category of Usability & Interaction was found as very important both to designers and users (see Table 5.9.1), identifies

that design team could not communicate all the intended attributes related to this category (see section 5.1.2). Accordingly, these findings only reveal that the identified three categories (Personality Characteristics, Visual Qualities, and Usability and Interaction) are most important in designers' and users' perceptual approaches.

5.9.3 Semantic Differential study

Using the SD method, which studies product semantics, the designers' intended perceptions and the users' actual visual perceptions of product form were quantified on a 5-point Likert scale featuring 44 opposite adjective pairs. The 44 adjective pairs, which were utilized in this study, were defined under the four categories just mentioned (social values and positions; usability and interaction; visual qualities; personality characteristics).

The results of the SD study for each of the eight product examples were analyzed in depth previously (see sections 5.1.3- 5.8.3). In this section, the results are cross-compared. The cross-comparisons examine the levels of significant mismatches, significant exact matches, and non-significant findings across the product examples.

All the adjective pairs identified as significant mismatches or significant exact matches at the individual product analysis stage were counted and constructed into a matrix of product versus attribute category. Total values for each row (product example) and each column (attribute category) were then counted and expressed as percentages (see Tables 5.9.2 and 5.9.3).

5.9.3.1 Unsuccessful transfer of meaning

Table 5.9.2 identifies the adjectives (meanings) that designers intended (but failed) to be perceived by users. These adjectives are highlighted in red. There are some other significant mismatches, highlighted in yellow, that designers preferred to stay neutral on (however, the designers did not indicate that the adjective pairs were non-applicable to their design). In these cases, users' perceived meanings are underlined; it can be noticed that the users' evaluations for the 'neutral' designer intentions were all, with one exception, for the adjective positioned on the left side of the Likert

scale and related to attributes of seating that one would generally regard as positive (easy to use, practical, young, clear, comfortable).

Table 5.9.2 adjective pairs with significant mismatches

Product Examples	Category 1; **Social values & positions** (n=8)	Category 2; **Usability & interaction** (n=11)	Category 3; **Visual qualities** (n=11)	Category 4; **Personality characteristics** (n=14)	**Total significant mismatches (product-based)**
AS (Sledge)	Formal-Casual 1/8 **12.5%**	Heavy-Light 1/11 **9.09%**	Organic-Geometric 1/11 **9.09%**	Exciting-Calm Mature-Immature 2/14 **14.29%**	 5/44 **11.36%**
AM (Mushroom)	- 0/8 **0%**	Easy to use-Difficult to use Practical-Impractical 2/11 **18.18%**	Dynamic-Static Orderly-Disorganized 2/11 **18.18%**	Exciting-Calm Extraordinary-Ordinary Feminine-Masculine 3/14 **21.43%**	 7/44 **15.9%**
ND (Daydream)	Contemporary-Traditional High technology-Low technology 2/8 **25%**	Practical-Impractical Steady-Unsteady 2/11 **18.18%**	Soft-Hard 1/11 **9.09%**	Feminine-Masculine Mature-Immature Young-Old Futuristic-Nostalgic 4/14 **25.57%**	 9/44 **20.45%**
NS (Sumo)	- 0/8 **0%**	Clear-Confusing 1/11 **9.09%**	Simple-Complex Ornate-Plain Organic-Geometric 3/11 **27.27%**	Quiet-Noisy Truthful-Exaggerated Proud-Humble 3/14 **21.43%**	 7/44 **15.9%**
OB (Boxer)	- 0/8 **0%**	Comfortable-Uncomfortable Steady-Unsteady 2/11 **18.18%**	- 0/11 **0%**	- 0/14 **0%**	 2/44 **4.54%**
OT(To armchair)	- 0/8 **0%**	Safe-Dangerous Robust-Delicate 2/11 **18.18%**	- 0/11 **0%**	Young-Old 1/14 **7.14%**	 3/44 **6.81%**
SB (Ball)	- 0/8 **0%**	Safe-Dangerous Steady-Unsteady 2/11 **18.18%**	- 0/11 **0%**	- 0/14 **0%**	 2/44 **4.54%**
SS (S armchair)	- 0/8 **0%**	Easy to clean-Difficult to clean Safe-Dangerous Robust-Delicate Flexible-Rigid Steady-Unsteady 5/11 **45.45%**	Ornate-Plain 1/11 **9.09%**	- 0/14 **0%**	 6/44 **13.63%**
Total significant mismatches (category-based)	3/64 **4.68 %**	17/88 **19.31%**	8/88 **9.09%**	13/112 **11.6%**	41/352 **11.64%**

Adjectives intended by designers but not received by users

Designers stayed neutral about it, but the adjectives picked up by users are underlined

According to Table 5.9.2, it can be observed that the most significant mismatches between designers' intended perceptions and users' actual perceptions across all eight products existed in the usability and interaction category (19.31% adjective pairs were significantly mismatched). The levels of significant mismatch for the other categories were considerably less but still prominent: personality characteristics (11.6%), visual qualities (9.09%), and social values and positions (4.68%). This finding can be used by designers to focus their efforts on the weaker categories to better communicate intended meanings to users.

When cross-comparing the total number of significant mismatches *per product*, a range from 20.45% (product ND, greatest number of mismatches) to 4.54% (products SB and OB, lowest number of mismatches) was found. So, it can also be stated that the designer of ND was least successful in conveying intended messages through product visual form, having a failure rate of approximately 1 in 5. The intervening findings, in rank order, were quite distributed: AM and NS (15.9%), SS (13.63%), AS (11.36%) and OT (6.81%). Considering evaluations over all product examples and all categories, a 11.36% level of significant mismatch existed in designers' intended perceptions and users' actual perceptions.

The empirical study was aimed to explore the *level of mismatches* between designers' and users' product form perceptions. However, not all mismatches may affect the product form quality and the designer' success since designers' perception approaches are different from users'. Accordingly it is needed to investigate each mismatch to identify the rational reasons so that decision can be relevant to say whether designer were poor designer or not.

5.9.3.2 Successful transfer of meaning

Table 5.9.3 identifies the adjectives that designers succeeded in evoking from users. These adjectives are referred to as significant exact matches and are highlighted in green. There existed some adjective pairs that designers and users alike preferred to stay neutral about; these also qualified as significant exact matches but are

highlighted in yellow. There existed some adjective pairs that designers and users alike preferred to stay neutral about; these also qualified as significant exact matches but are highlighted in yellow. These neutral evaluations were important because it reveals that either the attribute pairs were not relevant to product visual form or product form didn't provide subjects (designers and users) with enough information to express their perceptions through the opposite adjective pairs. In former possibility, designers' intended messages should be taken into consideration. However, none of the designers found those adjective pairs with neutral evaluations to be not applicable to their design. In the contrary they found them applicable. Therefore, considering second possibility, matches on the neutral scale can be regarded as significant matches.

According to Table 5.9.3, it can be observed that the most significant exact matches existed in the social values and positions category (26.56% adjective pairs were significantly matched) and visual qualities category (20.45%). Far fewer significant exact matches existed for personality characteristics (9.82%) and usability and interaction (7.95%). As with the results of Table 5.9.2, these findings show that meaning communication is lowest for visual product attributes related to personality characteristics and usability and interaction, and that these are priority areas for improved message transmission.

When cross-comparing the total number of significant matches *per product*, a range from 22.72% (products OB and OT, greatest number of matches) to 2.27% (product AS, lowest number of matches) was found. So, on this basis, it can be stated that the designers of OB and OT were most successful in conveying intended messages through product visual form, having a success rate approaching 1 in 4. The intervening findings, in rank order, were quite distributed: SB (20.45%), NS (18.18%), AM (15.9%), ND and SS (9.09%).

Considering evaluations over all product examples and all categories, a 15.05% level of significant exact match existed in designers' intended perceptions and users' actual perceptions.

Table 5.9.3 adjective pairs with significant exact matches

Product Examples	Category 1; **Social values & positions** (n=8)	Category 2; **Usability & interaction** (n=11)	Category 3; **Visual qualities** (n=11)	Category 4; **Personality characteristics** (n=14)	**Total exact matches (product-based)**
AS (Sledge)	In fashion-Out of fashion 1/8 **12.5%**	- 0/11 **0%**	- 0/11 **0%**	- 0/14 **0%**	1/44 **2.27%**
AM (Mushroom)	In fashion-Out of fashion 1/8 **12.5%**	Clear-Confusing Steady-Unsteady 2/11 **18.18%**	Simple-Complex Ornate-Plain Compact-Large Symmetrical-Asymmetrical 4/11 **36.36%**	- 0/14 **0%**	7/44 **15.9%**
ND (Daydream)	- 0/8 **0%**	Clear-Confusing 1/11 **9.09%**	Ornate-Plain Orderly-Disorganized Symmetrical-Asymmetrical 3/11 **27.27%**	- 0/14 **0%**	4/44 **9.09%**
NS (Sumo)	Contemporary-Traditional Avant-garde-Conservative Formal-Casual Expensive-Cheap 4/8 **50%**	- 0/11 **0%**	Dynamic-Static Symmetrical-Asymmetrical 2/11 **18.18%**	Futuristic-Nostalgic Interesting-Boring 2/14 **14.29%**	8/44 **18.18%**
OB (Boxer)	In fashion-Out of fashion Contemporary-Traditional Global-Local Expensive-Cheap 4/8 **50%**	Safe-Dangerous Robust-Delicate 2/11 **18.18%**	Symmetrical-Asymmetrical Organic-Geometric 2/11 **18.18%**	Extraordinary-Ordinary Interesting-Boring 2/14 **14.29%**	10/44 **22.72%**
OT(To armchair)	High class-Low class Contemporary-Traditional Avant-garde-Conservative Expensive-Cheap 4/8 **50%**	- 0/11 **0%**	Innovative-Imitative Orderly-Disorganized Symmetrical-Asymmetrical 3/11 **27.27%**	Attractive-Repulsive Quiet-Noisy Interesting-Boring 3/14 **21.43%**	10/44 **22.72%**
SB (Ball)	In fashion-Out of fashion High technology-Low technology 2/8 **25%**	Clear-Confusing 1/11 **9.09%**	Innovative-Imitative Simple-Complex Ornate-Plain Orderly-Disorganized 4/11 **36.36%**	Feminine-Masculine Truthful-Exaggerated 2/14 **14.29%**	9/44 **20.45%**
SS (S armchair)	Avant-garde-Conservative 1/8 **12.5%**	Heavy-Light 1/11 **9.09%**	- 0/11 **0%**	Aggressive-Submissive Futuristic-Nostalgic 2/14 **14.29%**	4/44 **9.09%**
Total exact matches (category-based)	17/64 **26.56%**	7/88 **7.95%**	18/88 **20.45%**	11/112 **9.82%**	53/352 **15.05%**

Adjectives intended by designers and successfully received by users

Both designers & users stayed neutral about it

5.9.3.3 Importance and influence of findings

To examine the overall importance and influence of these findings, it is helpful to consider the relative size of the 'extreme' data (i.e. the occurrences of significant exact mismatches, significant mismatches) compared to the occurrences of 'middle ground' data (non-significant findings). For this purpose, Table 5.9.4 and Figure 5.9.1 were constructed. Table 5.9.4 presents data on the ratio between the number of significant exact matches and number of significant mismatches for each product. Figure 5.9.1 gives a quick visual representation of the data. Products with a ratio greater than 1:1 were considered to have been successful in communicating intended meanings, whilst those with a ratio lower than 1:1 were considered not so successful. Using this system, OB (5:1), SB (4.5:1) and OT (3.3:1) were identified as the most successful products. Accordingly, ND (1:2.2) and AS (1:5) were considered least successful. Products NS (1.1:1), AM (1:1) and SS (1:1.5) were middle ranked. Considering the ratio across all products (1.3:1), it can be said that the number of significant exact matches slightly outweighs the number of significant mismatches, showing that on balance designers tend to avoid significant mismatches between their intended meanings and users' received meanings.

An important final observation is that the proportion of non-significant findings (i.e. findings that were neither a significant exact match nor a significant mismatch) was quite high (seven products in the range 65-77%), and especially high for product AS (86%). Thus the majority of designers' intended messages fall within a sizeable middle ground of 'somewhat correctly received', or 'received incorrectly but only to a modest degree'. In other words, the extreme occurrences are relatively rare events and that most commonly there exists some misalignment between designers' intended perceptions and users' actual perceptions. If designers are to more efficiently and effectively communicate their intended messages through product visual form, this 'grey zone' of discordance must be reduced in size through a user research and design strategy targeted at increasing the number of significant exact matches.

It can be assumed that designers are more sensitive and discriminating on the evaluations of semantic attributes of a product form compared to users. Another

point to be considered is that designers evaluated the product form based on a real product, together with their professional experiences, and possibly benefited from feedback from users during development, whilst users evaluated it after a very short acquaintance as a figurative product. This situation is acknowledged to have possibly influenced the subjects' perceptual responses and thereby slightly affect the final results.

Table 5.9.4 Comparison of significant exact matches with significant mismatches (according to ratio rank order)

Product samples	Significant Exact Matches	Significant Mismatches	Non-Significant Findings	Ratio Significant Exact Match to Significant Mismatch
OB (Boxer)	10/44 **22.72%**	2/44 **4.54%**	32/44 **72.73%**	5 to 1
SB (Ball)	9/44 **20.45%**	2/44 **4.54%**	33/44 **75.00%**	4.5 to 1
OT (To armchair)	10/44 **22.72%**	3/44 **6.81%**	31/44 **70.45%**	3.3 to 1
NS (Sumo)	8/44 **18.18%**	7/44 **15.9%**	29/44 **65.91%**	1.1 to 1
AM (Mushroom)	7/44 **15.9%**	7/44 **15.9%**	30/44 **68.18%**	1 to 1
SS (S armchair)	4/44 **9.09%**	6/44 **13.63%**	34/44 **77.27%**	1 to 1.5
ND (Daydream)	4/44 **9.09%**	9/44 **20.45%**	31/44 **70.45%**	1 to 2.2
AS (Sledge)	1/44 **2.27%**	5/44 **11.36%**	38/44 **86.36%**	1 to 5
TOTAL	53/352 **15.05%**	41/352 **11.64%**	258/352 **73.29%**	1.3 to 1

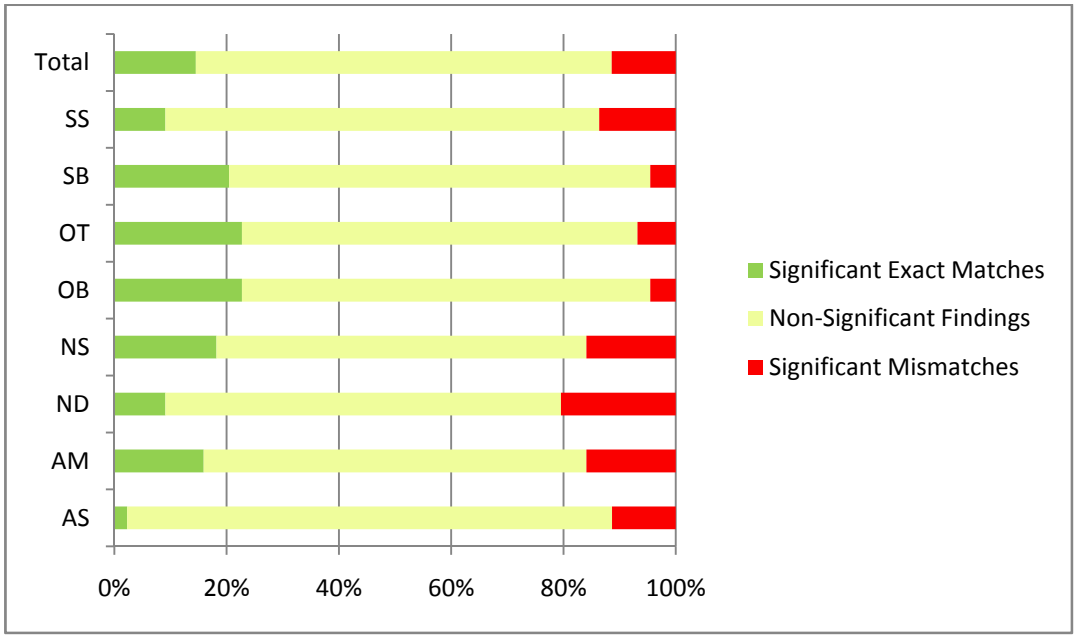


Figure 5.9.1 Comparison of extreme data with middle ground data

CHAPTER 6

CONCLUSION

Having argued the values of product visual form and the communicative perspective in product design, an empirical study has been conducted to explore designers' intended messages and users' perceived messages embodied in product form, and to validate the arguments proposed in the thesis. This chapter now begins by discussing how the findings of the empirical study provide answers for the research questions proposed in Chapter 1. The limitations of the study are then stated together with suggestions and directions for future research.

6.1 Concluding Remarks

The main purpose of this study was to investigate the relationship between designers' intended perceptions and users' actual perceptions related to the visual appearance of products and their associated messages and meanings. This study has posed the question: *Q1 Do users perceive the same meaning from product appearance as designers intended, or is there a level of mismatch?* The challenge was to investigate the subject while seeing product visual form as a medium of communication. The primary issue of this research was addressed through the following sub-questions.

The first sub-question (Q1.1) examined what designers have in mind when creating new form and what kinds of messages they wish to transmit. Through the literature review, it is acknowledged that product visual form reveals designers' communicative behavior, and each product form indicates a type of behavior and style. Through the style of product form, the visual elements of design such as shape, color, texture, shade and light, pattern, and ornament together with material qualities are combined to express designers' imaginations, intentions or messages.

It is argued that unique characteristics of product form make products overall desirable, as they play to personal preference and exclusive taste. In the marketing literature, it is discussed that innovative and exclusive forms are probably generated to attract users' attentions and create subtle or pronounced discriminations between products serving basically the same function. Accordingly, product form needs to evolve over time to meet users' psychological needs and thereby improve a product's competitive edge in the marketplace. An important point to be considered is that product visual form should be consistent with emerging social and cultural trends.

The role of the designer (as constructor of product visual form) is highly relevant since product form mostly signifies or transmits designer' intentions. A designer incorporates aesthetic, semantic, and symbolic values into product form to communicate to target users. These values or messages are subjectively interpreted and realized through the designer's personality characteristics and preferences, professional experience and design skills. However, there exist some external factors that more or less moderate designers' behavior in achieving a certain product form; examples are the manufacturing company's mission and strategy, current trends or fashions in society, and users' behaviors and feedbacks learnt from previous products.

Based on the literature and the results of the empirical study, it can be pointed out that designers (form givers) adopt visual language based on styling to represent themselves, their ideas or intentions, and their ability to push the boundary of form as a way to differentiate their products from those of rivals. Although the conceived ideas and intended messages hidden in product form are subjective or differ among products, most designers intend to evoke positive beliefs and impressions in receivers, who visually interact with products. In this regard, designers intend to reach an overall product form embodying positive appearance-based attributes mostly describable as personality characteristics, aesthetic values, and usability considerations.

The second sub-question (Q1.2) tried to identify to what extent designers pay attention to users' expected perceptions whilst devising product form. In the

literature review it is argued that the style attributable to a product form should take into account users' likely interpretations, expectations and reactions. Users' perceptions of product form are indicators of how they interpret and attribute meanings to products. However, it is discussed that users' perceptions depend strongly on the context of use. Perception and interpretation are related to the receiver's personality characteristics and experience, together with the cultural and social context through which the receiver interacts with a product. It is the designer's responsibility to translate users' feelings and expectations of a product into detailed design elements. Accordingly, it is found very important for designers to understand target users' way of perceiving in response to product visual form, in order to clearly communicate intended meanings to those users. However, designers conventionally justify the visual form of their product by attributing such positive meaning to the product form on the basis of their professional experiences, intuitive feelings and imaginations. They interpret the product appearance in the absence of users.

In the empirical work, the studied designers (of eight product examples) claimed that they were aware of design visual languages, their expressive qualities and associated meanings. They also stated that they took users' perceptions and interpretations into account while generating new product form. They argued that users would receive the messages that they had intended. Their claims were based on their professional experience, artistic inspirations, and constant observation of users' behaviors and responses towards products falling into broadly the same categories as those used in the empirical work. However, the results of the conducted semantic differential study do not entirely support the designers' claims, since the results showed some differences between designers' intended perceptions and users' actual perceptions. This reveals that designers are not fully understanding of users' perceptions of meanings hidden in product form, although with current working methods designers do generally avoid very large mismatches between intended meanings and received meanings.

The third sub-question (Q1.3) aimed to identify the visual attributes of product form (i.e. aesthetic, personality, usability, socio-cultural) that have the same meaning, or different meaning, to both designers and users. Perceived meanings are stimulated by

values held by users and delivered or evoked by visual attributes of product form. To provide an answer to this question, a semantic differential (SD) study was performed to investigate differences in the attribution of meanings to visual product form from designers' and users' perspectives. The subjects' perceptions were quantified on a 5-point Likert scale featuring 44 polar opposite adjective pairs. The 44 adjective pairs were grouped under four categories (social values and positions; usability and interaction; visual qualities; personality characteristics).

The results revealed that the most significant mismatches between designers' intended perceptions and users' actual perceptions across all eight products existed in the usability and interaction category (19.31% adjective pairs were significantly mismatched), followed by the personality characteristics category (11.6%). Concomitantly, the most significant exact matches existed in the social values and positions category (26.56% adjective pairs were significantly matched) and visual qualities category (20.45%). Although the levels of significant mismatches and significant exact matches are not high (designers mostly achieve a moderate level of success in effectively communicating their intentions), the findings show that meaning communication is lowest for visual product attributes related to usability and interaction and personality characteristics. These can be considered priority areas for research into improved message transmission. Accordingly, designers can use this finding to focus their efforts on the weaker categories to better communicate intended meanings to users.

The fourth sub-question (Q1.4) was posed to explore the differences between designers and users in perceiving product form and its concealed meaning. According to results from the empirical study, especially the non-significant findings, and in combination with the literature review, two important differences were identified, which are discussed as follows.

1) Perception approaches of users and designers are different. Designers are more sensitive and discriminating regarding individual elements of product form, while users mostly perceive the form as a whole. Designers are aware of visual language, and their knowledge is based on their design education

and professional experiences. However, users are not clear about the 'vocabulary' or meaning of visual elements.

2) Such attributes as personality characteristics ascribed to product appearance are based on designers' own perceptions. Designers make judgments about product characteristics in the absence of user trials. They create an object, and in doing so impart meanings based on personal judgments and concepts. However, since these meanings are rarely developed in cooperation with users, it is understandable that a degree of mismatch exists between designers' intentions and users' received meanings.

The fifth sub-question (Q1.5) tried to identify which values of product visual form are important for designers to communicate to users. The first part of the empirical study was conducted to explore, and then compare, the kind of values or messages designers intended to communicate to target users, with the kinds of messages target users received through product visual form. The generated data were processed using a content analysis method, and presented in Chapter 5. Designers' intended messages and statements, and users' perceived messages and descriptions were taken into consideration. The content analyses revealed that intended and perceived attributes of product form can be usefully grouped into four categories; social values and positions; usability and interaction; visual qualities; personality characteristics. It is also observed that positive attributes in relation to personality characteristics were dominant in designers' message communication through product visual form. In contrast, users regarded product form attributes under three categories (personality characteristics, visual qualities, usability and interaction) to be most important in shaping their perceptions of meaning.

So, if we consider design as a humanistic discipline, it is the designer's responsibility to 1) generate product form based on users' tastes and needs, rather than based on the designer's tastes and needs, and 2) provide users with products possessing honest and understandable forms. The successful integration of meanings into the form creation process requires designers to thoroughly understand target users and through user studies to encourage their participation in product design activities. In

this way, users may more readily see or understand what it is the designer encoded in product visual form.

Herein a circular communication model for product design and development is proposed (Figure 6.1). Communication depends on what is happening physically and cognitively with the recipient. Users' perceptions and responses to product visual form could be simply considered as a source of feedback to be transmitted to the original designers or communicators. Users' feedback (both positive and negative) on the product form enables designers (form givers) to identify points of failure or success. Moreover, the feedback helps designers to gain insights into users' current semantic needs and expectations.

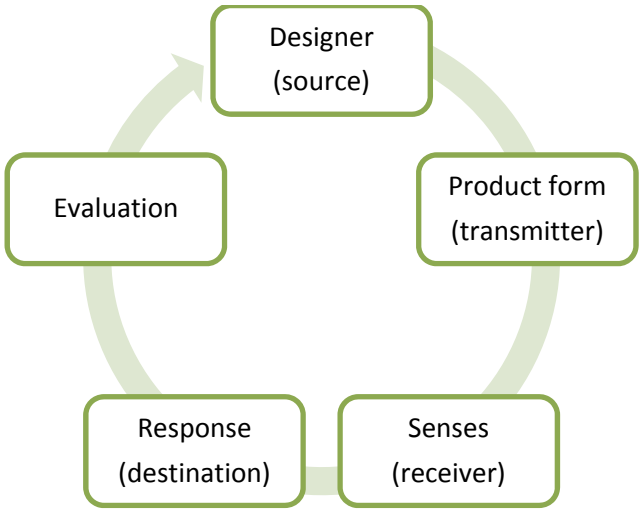


Figure 6.1 Circular communication model in design

6.2 Limitations of the Study

There are some limitations that may have affected the participants' perceptual evaluations during the empirical study. The major limitation of this study is that designers evaluated the product form based on a real physical product, together with their professional experiences, and possibly benefited from feedback from users during development, whilst users evaluated it after a very short acquaintance only with product images. This situation is acknowledged to have possibly influenced

both sets of participants' perceptual responses and thereby slightly affect the final results. A figurative (image) representation of a product, depending on its quality, may not convey properties of product form in a very lifelike or authentic way. That is to say, the sensorial information emanating from an image of a product can differ from that emanating from a physical encounter with the actual product. Poor picture quality may mislead users. Therefore, although the results of this study are still valuable, it would be beneficial given time and resources to undertake evaluations through products as physical artifacts, as the resultant data would be closer to real life evaluations and would help level any remaining disparities between the designer and user evaluations.

On another matter, the author of this study tried to reach *target users*, as defined by the designers of the sample products. However, the influence of product form differs between each user. Previous research supports that even within a defined culture or social setting, people vary in their tastes and preferences. So, although ten users were involved in evaluating each of the eight product examples, it is thought that the results would be more confidently generalized if the empirical study had been conducted with a larger number of participants.

Comparing designers' intended messages (investigated in first part of the questionnaire) with their intended perceptions (investigated in semantic differential study) such mismatches could be observed. Accordingly, it is assumed that the designers' evaluations on semantic scales were based on both their expectations and intentions. Through the 'expected evaluation', they expressed product form perceptions based on how they *expected* target users to perceive product form. Through the 'intended evaluation', designers expressed product form perceptions based on how they *intended* target users to perceive product form. Since this study aimed to investigate the relationship between designers' intended perceptions and users' visual perceptions, designers' evaluations may affect the reliability of findings.

6.3 Further Research

Throughout the study, several side issues related to the subject of the thesis were aroused. These side issues can be considered as directions for future studies, as follows.

The present study investigated the communication process between the designer and target users through an empirical study on eight product examples. Based on the semantic differential data, successful and unsuccessful products, based on effectiveness in communicating intended meanings, were identified. For further research it would be helpful to examine designers' work methods and approaches to see how they went about embedding meaning into those eight products (e.g. through a retrospective interview). The goal would be to try to establish 'critically successful steps', concentrating on the most matched semantic differential data, or to establish 'where things go wrong', concentrating on the most mismatched semantic differential data.

The question remains as to what extent the perception that subjects mentioned on the basis of product appearance generalize to other products. Since the study investigated product from perception of seat furniture with the single function of sitting, it is estimated that the results of this study cannot be applied to far more complex and technologically advanced products. Different findings mostly related to *usability and interaction* attributes are also expected as product appearance providing complex function probably evokes different visual perceptions. So, examples of different product groups within which product form plays an important role in users' perceptions and approach behaviors can be studied, for example cars, kitchen appliances, personal products, cell phones and display-based products can all be candidates for future studies.

Follow-up research could also focus on relationships between product visual characteristics and mental images that users construct at first glance, in order to elicit a product form's immediate and primary signals and to see if these compare closely or distantly with the designer's intentions.

It is also suggested to introduce the dimension of pre- and post-use perceptions of products, as it is expected that after using products, users' perceptions would differ from those they held when evaluating a product solely on the basis of images. This point is important since the vast majority of our acquaintance and investment with a product is during ownership and use, and not during the pre-purchase phase.

Studies similar to that carried out in this thesis can be contemplated for just one of the physical product attributes, such as material and material properties, or simple overall shape (colored or non-colored), in order to look in more depth at individual elements of product form.

Finally, it may be beneficial to undertake a comparative cross-cultural study, to ascertain localized differences that may arise from designers or users within different socio-cultural contexts of use. Through such a study, a conceptual framework that can be generalized across cultures can be contemplated.

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APPENDIX A

QUESTIONNAIRE: EXPLORING DESIGNERS' INTENDED MESSAGES

A.1 English Version:

MIDDLE EAST TECHNICAL UNIVERSITY

The objective of this questionnaire is to measure designers' and users' pre-usage perceptions toward visual appearance of furniture items. The results will be used in a master's thesis applied in the Department of Industrial Design, Middle East Technical University.
Thank you in advance for your assistance.

SUMO Designer: Alp NUHOĞLU

Age: under 18 ☐ 18-24 ☐ 25-36 ☐ 37-48 ☐ 49-64 ☐ 65+ ☐

Graduated from: ……..

Graduation year: …….

Professional experience in the field:

Employed in:	Position:	From:	Until:

Part 1. Designer's Intentions;

A. Did you name the product?

……

B. If you did not name the product, who decided on its name?

……

C. What were the reasons for the product to be given that name?

……

……

……

D. Give a new name to your design that describes the visual characteristics of the product.

……

E. Did you have an intended user group in mind when designing?

……

F. What are the intended messages that you have encoded in product form to communicate to the users? Or what did you aim to communicate with users in visual language?

……

……

……

……

G. Through which attributes of the product did you hope to convey these messages to the target users?

……

……

……

H. Do you believe that the intended users will understand the messages you identified in the previous question? How do you support your expectations?

……

……

……

……

I. Identify the intended user group in terms of gender, age, income level, and educational level (you can choose more than one).

Gender : non-specific ☐ male ☐ female ☐

Age range: under 18 ☐ 18-24 ☐ 25-36 ☐ 37-48 ☐ 49-64 ☐ 65+ ☐

Income level: low ☐ moderate ☐ high ☐

Level of Education: some school ☐ high school graduate ☐ some college ☐

undergraduate ☐ graduate ☐ doctoral ☐

J. Describe the target users' lifestyle and characteristics you have identified in your design scenario.

……

……

……

……

K. To what extent are your intentions in relation to product form realized in the manufactured product? Cross(x) the one that best reflects your opinion.

Nonexistent	-2	-1	0	+1	+2	Existent

Part 2. Semantic Differential Study;

At first, identify the image-words that best fit to your design intent for the product. And then, select the rating scale that most closely expresses the perceptions you intend users to have toward the product based on its appearance, according to a 5-point scale. If you do not think that a pairing of image-words is applicable, move on to the next pairing.

0 Neutral on the scale

\+ Somewhat related to one side on the scale

++ Extremely related to one side on the scale

e.g.	Beautiful	✓ ++	+	0	+	++	Ugly

Group **1**: Adjective pairs related to **social values and positions**							
1	In fashion	++	+	0	+	++	Out of fashion
2	High class	++	+	0	+	++	Low class
3	Contemporary	++	+	0	+	++	Traditional
4	Avant-garde	++	+	0	+	++	Conservative
5	High technology	++	+	0	+	++	Low technology
6	Formal	++	+	0	+	++	Casual
7	Global	++	+	0	+	++	Local
8	Expensive	++	+	0	+	++	Cheap

Other: If there are additional descriptive image-words matching to this category, write them in the boxes below and then grade them.

1	……	++	+	0	+	++	……
2	……	++	+	0	+	++	……
3	……	++	+	0	+	++	……
4	……	++	+	0	+	++	……
5	……	++	+	0	+	++	……

Group **2**: Adjective pairs related to **usability and interaction**							
1	Easy to use	++	+	0	+	++	Difficult to use
2	Easy to clean	++	+	0	+	++	Difficult to clean
3	Reliable	++	+	0	+	++	Unreliable
4	Safe	++	+	0	+	++	Dangerous
5	Robust	++	+	0	+	++	Delicate
6	Flexible	++	+	0	+	++	Rigid
7	Comfortable	++	+	0	+	++	Uncomfortable
8	Clear	++	+	0	+	++	Confusing
9	Practical	++	+	0	+	++	Impractical
10	Steady	++	+	0	+	++	Unsteady
11	Heavy	++	+	0	+	++	Light

Other:

1	……	++	+	0	+	++	……
2	……	++	+	0	+	++	……
3	……	++	+	0	+	++	……
4	……	++	+	0	+	++	……
5	……	++	+	0	+	++	……

Group **3**: Adjective pairs related to **visual qualities**							
1	Elegant	++	+	0	+	++	Inelegant
2	Dynamic	++	+	0	+	++	Static
3	Innovative	++	+	0	+	++	Imitative
4	Consistent	++	+	0	+	++	Inconsistent
5	Simple	++	+	0	+	++	Complex
6	Ornate	++	+	0	+	++	Plain
7	Compact	++	+	0	+	++	Large
8	Soft	++	+	0	+	++	Hard
9	Orderly	++	+	0	+	++	Disorganized
10	Symmetrical	++	+	0	+	++	Asymmetrical
11	Organic	++	+	0	+	++	Geometric

Other

1	……	++	+	0	+	++	……
2	……	++	+	0	+	++	……
3	……	++	+	0	+	++	……
4	……	++	+	0	+	++	……
5	……	++	+	0	+	++	……

Group **4**: Adjective pairs related to **personality characteristics**							
1	Attractive	++	+	0	+	++	Repulsive
2	Exciting	++	+	0	+	++	Calm
3	Extraordinary	++	+	0	+	++	Ordinary
4	Aggressive	++	+	0	+	++	Submissive
5	Feminine	++	+	0	+	++	Masculine
6	Mature	++	+	0	+	++	Immature
7	Young	++	+	0	+	++	Old
8	Futuristic	++	+	0	+	++	nostalgic
9	Quiet	++	+	0	+	++	Noisy
10	Truthful	++	+	0	+	++	Exaggerated
11	Proud	++	+	0	+	++	Humble
12	Warm	++	+	0	+	++	Cold
13	Interesting	++	+	0	+	++	Boring
14	Friendly	++	+	0	+	++	Unfriendly

Other:

1	……	++	+	0	+	++	……
2	……	++	+	0	+	++	……
3	……	++	+	0	+	++	……
4	……	++	+	0	+	++	……
5	……	++	+	0	+	++	……

A.2 Turkish Version:

ORTA DOĞU TEKNİK ÜNİVERSİTESİ

Bu çalışmanın amacı tasarımcının ve kullanıcının mobilya dış görünümüne dair kullanım öncesi algılarını değerlendirmektir. Sonuçlar Orta Doğu Teknik Üniversitesi Endüstri Ürünleri Tasarımı Bölümünde yürütülen bir yüksek lisans tezinde kullanılacaktır.

Çalışmaya katılarak katkıda bulunduğunuz için şimdiden teşekkür ediyorum.

SUMO Tasarımcı: Alp NUHOĞLU

Yaşınız: 18 altı ☐ 18-24 ☐ 25-36 ☐ 37-48 ☐ 49-64 ☐ 65+ ☐

Mezun olduğunuz eğitim kurumu: ……

Mezun olduğunuz yıl: ……

Profesyonel deneyimleriniz:

Çalıştığınız yer:	Göreviniz:	Ne zamandan:	Ne zamana:

1.Aşama; Tasarımcının Hedefleri

A. Tasarladığınız ürüne siz mi isim verdiniz?

……

B. Eğer cavabınız hayır ise kim sizin tasarladığınız ürüne isim vermiştir?

……

C. Hangi sebeplerden dolayı bu isim ürüne verilmiştir?

……

……

……

D. Tasarladığınız ürüne onun görsel karakteristiklerini tanımlayan yeni bir isim veriniz.

……

E. Ürünü tasarlarken bir kullanıcı grubu aklınızda hedeflediniz mi?

……

F. Kullanıcılara iletmek için ürünün formuna kodlamış olduğunuz mesajlar nelerdir? Ya da görsel dil aracılığıyla kullanıcıya iletmek istediğiniz mesajlar nelerdir?

……

……

……

……

G. Hedeflenen mesajları ürünün hangi niteliklerile kullanıcıya iletmeği ümüt ediyordunuz?

……

……

……

H. Size göre hedef kullanıcı bir önceki soruda tanımladığınız mesajları alabilir mi? Düşüncelerinizi nasıl destekliyorsanız?

……

……

……

……

I. Hedeflenen kullanıcı grubunun özelliklerini aşağıdaki faktörlere göre belirtiniz. (birden fazla seçenek işaretleye bilirsiniz)

Cinsiyet : belirtilmemiş ☐ erkek ☐ bayan ☐

Yaş grubu: 18 altı ☐ 18-24 ☐ 25-36 ☐ 37-48 ☐ 49-64 ☐ 65+ ☐

Gelir Düzeyi: düşük ☐ orta ☐ yüksek ☐

Eğitim seviyesi: okul mezunu ☐ lise mezunu ☐ kolej mezunu ☐

lisans ☐ yüksek lisans ☐ doktora ☐

J. Tasarım senaryosunda belirttiğiniz hedef kitlenin özellikleri nelerdir? Nasıl bir hayat tarzına sahiptir?

……

……

……

……

……

……

K. Size göre ürün formuyla ilgili ümüt ettiğiniz hedefler, üretilmiş üründe gerçekleştirilmiş mi? Size en uygun gelen seçeneği işaretleyiniz.

Gerçekleştirilmemiş	-2	-1	0	+1	+2	Gerçekleştirilmiş

2. Aşama; Semantik Diferansiyel Çalışması

Bu aşamada mobilya formunun algısını ifade eden dört grup zıt sıfatlar belirlenmiştir. Öncelikle sadece ürün formu aracılığıyla kullanıcıya iletmeyi hedeflediğiniz messajları dikkata alarak uygun sıfatları belirtiniz, (ve kuulanıcı ve ürün arasındaki fiziksel etkileşim ya da ürün performansından kaynaklananları işaretlemekten kaçınınız). Ardından, ürün dış görünümüne dair kast ettiğiniz algıyı, verilen ölçekteki zıt sıfat çiftlerine göre size en uygun gelen seçeneği işaretleyerek değerlendiriniz. Eğer ürünün formu ve sıfat arasında bir ilişki bulamadıysanız ya da sıfatı anlamadıysanız hiçbir şey işaretlemeden diğer sıfatlara geçiniz.

0 Nötr,yansız

\+ Ölçekte az çok bir tarafa eğilimli

++ Ölçekte tam olarak bir tarafa eğilimli

Örn.	Güzel	++	+	✓ 0	+	++	Çirkin

1. grup: **sosyal değerler ve konumlarla** ilgili sıfatlar							
1	Moda	++	+	0	+	++	Demode
2	Üst sınıf	++	+	0	+	++	Alt sınıf
3	Çağdaş	++	+	0	+	++	Geleneksel
4	Yenilikçi	++	+	0	+	++	Tutucu
5	Yüksek teknoloji	++	+	0	+	++	Düşük teknoloji
6	Resmi	++	+	0	+	++	Gayri resmi
7	Evrensel	++	+	0	+	++	Yöresel
8	Pahalı	++	+	0	+	++	Ucuz

Eğer bu kategoriye uyan başka tanımlayıcı sıfat çiftleri önermek istiyorsanız aşağıdaki kutuya yazın ve puanlayın.

1	……	++	+	0	+	++	……
2	……	++	+	0	+	++	……
3	……	++	+	0	+	++	……
4	……	++	+	0	+	++	……
5	……	++	+	0	+	++	……

2. grup: **kullanılabilirlik ve etkileşimle** ilgili sıfatlar;							
1	Kullanımı kolay	++	+	0	+	++	Kullanımı zor
2	Temizlemesi kolay	++	+	0	+	++	Temizlemesi zor
3	Güvenilir	++	+	0	+	++	Güvenilmez
4	Emniyetli	++	+	0	+	++	Tehlikeli
5	Dayanıklı	++	+	0	+	++	Narin
6	Esnek	++	+	0	+	++	Bükülmez
7	Rahat	++	+	0	+	++	Rahatsız
8	Anlaşılır	++	+	0	+	++	Kafa karıştırıcı
9	Kullanışlı	++	+	0	+	++	Kullanışsız
10	Sabit	++	+	0	+	++	Oynak
11	Ağır	++	+	0	+	++	Hafif

İkinci grup için belirtmek istediğiniz diğer sıfatlar:

1	……	++	+	0	+	++	……
2	……	++	+	0	+	++	……
3	……	++	+	0	+	++	……
4	……	++	+	0	+	++	……
5	……	++	+	0	+	++	……

3. grup: **görsel niteliklerle** ilgili sıfatlar;							
1	Zarif	++	+	0	+	++	Zarafetsiz
2	Hareketli	++	+	0	+	++	Durağan
3	Yenilikçi	++	+	0	+	++	Taklitçi
4	Tutarlı	++	+	0	+	++	Tutarsız
5	Yalın	++	+	0	+	++	Karmaşık
6	Süslü	++	+	0	+	++	Sade
7	Az yer kaplayan	++	+	0	+	++	İri
8	Yumuşak	++	+	0	+	++	Sert
9	Düzenli	++	+	0	+	++	Düzensiz
10	Simetrik	++	+	0	+	++	Asimetrik
11	Organik	++	+	0	+	++	Geometrik

Üçüncü grup için belirtmek istediğiniz diğer sıfatlar:

1	……	++	+	0	+	++	……
2	……	++	+	0	+	++	……
3	……	++	+	0	+	++	……
4	……	++	+	0	+	++	……
5	……	++	+	0	+	++	……

4. grup: **kişilik karakteristiklerle** ilgili sıfatlar;							
1	Çekici	++	+	0	+	++	İtici
2	Heyecan verici	++	+	0	+	++	Sakin
3	Olağan dışı	++	+	0	+	++	Sıradan
4	Saldırgan	++	+	0	+	++	Uysal
5	Kadınsı	++	+	0	+	++	Erkeksi
6	Olgun	++	+	0	+	++	Toy
7	Genç	++	+	0	+	++	Yaşlı
8	Gelecekçi	++	+	0	+	++	Nostaljik
9	Sessiz	++	+	0	+	++	Gürültülü
10	Gerçekçi	++	+	0	+	++	Abartılı
11	Iddialı	++	+	0	+	++	Gösterişsiz
12	Sıcak	++	+	0	+	++	Soğuk
13	İlginç	++	+	0	+	++	Sıkıcı
14	Samimi	++	+	0	+	++	Gayri samimi

Dördüncü grup için belirtmek istediğiniz diğer sıfatlar:

1	……	++	+	0	+	++	……
2	……	++	+	0	+	++	……
3	……	++	+	0	+	++	……
4	……	++	+	0	+	++	……
5	……	++	+	0	+	++	……

APPENDIX B

QUESTIONNAIRE: EXPLORING USERS' PERCEIVED MESSAGES

B.1 English Version:

MIDDLE EAST TECHNICAL UNIVERSITY

The objective of this questionnaire is to measure designers' and users' pre-usage perceptions toward visual appearance of furniture items. The results will be used in a master's thesis devised in the Department of Industrial Design, Middle East Technical University.

Thank you in advance for your assistance.

Javad KHALAJ

Gender: male ☐ female ☐

Age range: under 18 ☐ 18-24 ☐ 25-36 ☐ 37-48 ☐ 49-64 ☐ 65+ ☐

Level of Education: some school ☐ high school graduate ☐ some college ☐

undergraduate ☐ graduate ☐ doctoral ☐

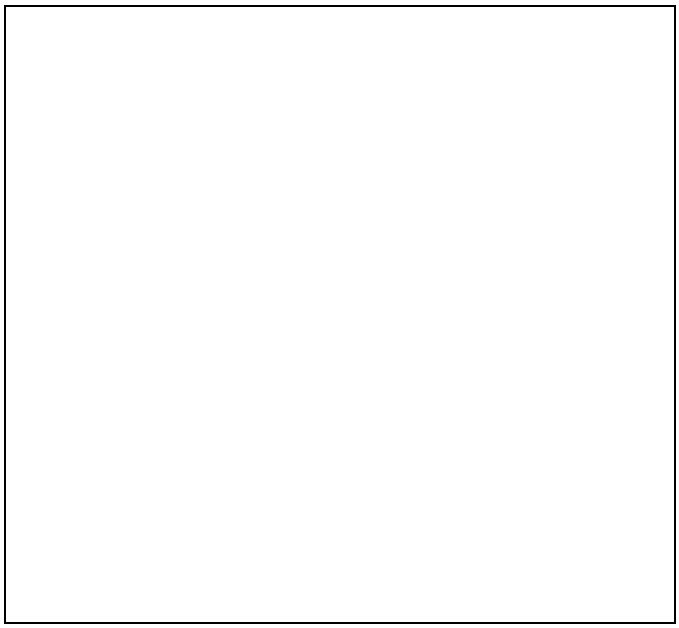
Occupation: ……

If you are interested in the result of this study, let me know your address.

Name, Surname:

E-mail:

Product Code: ☐



In this box, you may draw your first impression of the product form.

A. Give a name to the product that comes to your mind at first glance. It should describe the visual characteristics of product.

……

……

B. What does the product form tell to you? (You may explain what the designer wanted to tell you about his/her design).

……

……

……

C. Through which attributes of the product did you get the designer's messages you described in the previous question?

……

……

……

D. Semantic Differential Study;

Select the rating scale that most closely expresses your perception toward the product form according to a 5- point scale. In taking this test, please make your judgments on the basis of what these visual attributes of the product mean to you. If you do not think that a pairing of image-words is applicable, move on to the next pairing.

0 Neutral on the scale

+ Somewhat related to one side on the scale

++ Extremely related to one side on the scale

e.g.	Beautiful	~~++~~ √	+	0	+	++	Ugly

Group **1**: Adjective pairs related to **social values and positions**							
1	In fashion	++	+	0	+	++	Out of fashion
2	High class	++	+	0	+	++	Low class
3	Contemporary	++	+	0	+	++	Traditional
4	Avant-garde	++	+	0	+	++	Conservative
5	High technology	++	+	0	+	++	Low technology
6	Formal	++	+	0	+	++	Casual
7	Global	++	+	0	+	++	Local
8	Expensive	++	+	0	+	++	Cheap

Other: If there are additional descriptive image-words matching to this category, write them in the boxes below and then grade them.

1	……	++	+	0	+	++	……
2	……	++	+	0	+	++	……
3	……	++	+	0	+	++	……
4	……	++	+	0	+	++	……
5	……	++	+	0	+	++	……

Group **2**: Adjective pairs related to **usability and interaction**							
1	Easy to use	++	+	0	+	++	Difficult to use
2	Easy to clean	++	+	0	+	++	Difficult to clean
3	Reliable	++	+	0	+	++	Unreliable
4	Safe	++	+	0	+	++	Dangerous
5	Robust	++	+	0	+	++	Delicate
6	Flexible	++	+	0	+	++	Rigid
7	Comfortable	++	+	0	+	++	Uncomfortable
8	Clear	++	+	0	+	++	Confusing
9	Practical	++	+	0	+	++	Impractical
10	Steady	++	+	0	+	++	Unsteady
11	Heavy	++	+	0	+	++	Light

Other:

1	……	++	+	0	+	++	……
2	……	++	+	0	+	++	……
3	……	++	+	0	+	++	……
4	……	++	+	0	+	++	……
5	……	++	+	0	+	++	……

Group **3**: Adjective pairs related to **visual qualities**							
1	Elegant	++	+	0	+	++	Inelegant
2	Dynamic	++	+	0	+	++	Static
3	Innovative	++	+	0	+	++	Imitative
4	Consistent	++	+	0	+	++	Inconsistent
5	Simple	++	+	0	+	++	Complex
6	Ornate	++	+	0	+	++	Plain
7	Compact	++	+	0	+	++	Large
8	Soft	++	+	0	+	++	Hard
9	Orderly	++	+	0	+	++	Disorganized
10	Symmetrical	++	+	0	+	++	Asymmetrical
11	Organic	++	+	0	+	++	Geometric

Other

1	……	++	+	0	+	++	……
2	……	++	+	0	+	++	……
3	……	++	+	0	+	++	……
4	……	++	+	0	+	++	……
5	……	++	+	0	+	++	……

Group **4**: Adjective pairs related to **personality characteristics**							
1	Attractive	++	+	0	+	++	Repulsive
2	Exciting	++	+	0	+	++	Calm
3	Extraordinary	++	+	0	+	++	Ordinary
4	Aggressive	++	+	0	+	++	Submissive
5	Feminine	++	+	0	+	++	Masculine
6	Mature	++	+	0	+	++	Immature
7	Young	++	+	0	+	++	Old
8	Futuristic	++	+	0	+	++	nostalgic
9	Quiet	++	+	0	+	++	Noisy
10	Truthful	++	+	0	+	++	Exaggerated
11	Proud	++	+	0	+	++	Humble
12	Warm	++	+	0	+	++	Cold
13	Interesting	++	+	0	+	++	Boring
14	Friendly	++	+	0	+	++	Unfriendly

Other:

1	……	++	+	0	+	++	……
2	……	++	+	0	+	++	……
3	……	++	+	0	+	++	……
4	……	++	+	0	+	++	……
5	……	++	+	0	+	++	……

B.2 Turkish Version:

ORTA DOĞU TEKNİK ÜNİVERSİTESİ

Bu çalışmanın amacı tasarımcının ve kullanıcının mobilya dış görünümüne dair kullanım öncesi algılarını değerlendirmektir. Sonuçlar Orta Doğu Teknik Üniversitesi Endüstri Ürünleri Tasarımı Bölümünde yürütülen bir yüksek lisans tezinde kullanılacaktır.

Çalışmaya katkıda bulunduğunuz için şimdiden teşekkür ediyorum.

Javad KHALAJ

Cinsiyet: erkek ☐ bayan ☐

Yaş grubu: 18 altı☐ 18-24☐ 25-36☐ 37-48☐ 49-64☐ 65+☐

Eğitim seviyesi: ilk okul ☐ orta okul ☐ lise ☐ yüksek okul ☐

lisans ☐ yüksek lisans ☐ doktora ☐

Meslek: …….

Eğer bu araştırmanın sonucunu merak ederseniz, lütfen adınızı ve E-mail adresinizi yazınız.

Ad, Soyad:

E-mail:

Ürün Kodu: ☐

Soldaki kutuda, üründen aldığınız ilk izlenimlerinizi çizgiler veya sözler ile ifade edebilirsiniz.

A. Ürüne aklınıza gelen ilk isimi veriniz. Verdiğiniz ismin, ürünün görsel karakteristiklerini tanımlaması gerekir.

……

B. Ürünün formu size ne anlatıyor? Size göre tasarımcı ürün formu aracılığıyla size ne anlatmayı hedefliyor?

……

……

……

C. Ürünün hangi nitelikleriyle bir önceki soruda tanımladığınız mesajları elde ettiniz?

……

……

……

D. Semantik Diferansiyel Çalışması;

Bu aşamada mobilya formunun algısını ifade eden dört grup zıt sıfatlar belirlenmiştir. Ürün dış görünümüne dair algılarınızı, verilen ölçekteki zıt sıfat çiftlerine göre size en uygun gelen seçeneği işaretleyerek değerlendiriniz. Lütfen anketi ürünün görsel niteliklerinin size ne anlama geldiğini göz önünde bulundurarak cevaplayınız. Eğer ürünün formu ve sıfat arasında bir ilişki bulamadıysanız ya da sıfatı anlamadıysanız hiçbir şey işaretlemeden diğer sıfatlara geçiniz.

0 Nötr,yansız

\+ Ölçekte az çok bir tarafa eğilimli

++ Ölçekte tam olarak bir tarafa eğilimli

Örn.	Güzel	++	+	0 ✓	+	++	Çirkin

1. grup: **sosyal değerler ve konumlarla** ilgili sıfatlar							
1	Moda	++	+	0	+	++	Demode
2	Üst sınıf	++	+	0	+	++	Alt sınıf
3	Çağdaş	++	+	0	+	++	Geleneksel
4	Yenilikçi	++	+	0	+	++	Tutucu
5	Yüksek teknoloji	++	+	0	+	++	Düşük teknoloji
6	Resmi	++	+	0	+	++	Gayri resmi
7	Evrensel	++	+	0	+	++	Yöresel
8	Pahalı	++	+	0	+	++	Ucuz

Eğer bu kategoriye uyan başka tanımlayıcı sıfat çiftleri önermek istiyorsanız aşağıdaki kutuya yazın ve puanlayın.

1	……	++	+	0	+	++	……
2	……	++	+	0	+	++	……
3	……	++	+	0	+	++	……
4	……	++	+	0	+	++	……
5	……	++	+	0	+	++	……

2. grup: **kullanılabilirlik ve etkileşimle** ilgili sıfatlar;							
1	Kullanımı kolay	++	+	0	+	++	Kullanımı zor
2	Temizlemesi kolay	++	+	0	+	++	Temizlemesi zor
3	Güvenilir	++	+	0	+	++	Güvenilmez
4	Emniyetli	++	+	0	+	++	Tehlikeli
5	Dayanıklı	++	+	0	+	++	Narin
6	Esnek	++	+	0	+	++	Bükülmez
7	Rahat	++	+	0	+	++	Rahatsız
8	Anlaşılır	++	+	0	+	++	Kafa karıştırıcı
9	Kullanışlı	++	+	0	+	++	Kullanışsız
10	Sabit	++	+	0	+	++	Oynak
11	Ağır	++	+	0	+	++	Hafif

İkinci grup için belirtmek istediğiniz diğer sıfatlar:

1	.....	++	+	0	+	++	.....
2	.....	++	+	0	+	++	.....
3	.....	++	+	0	+	++	.....
4	.....	++	+	0	+	++	.....
5	.....	++	+	0	+	++	.....

3. grup: **görsel niteliklerle** ilgili sıfatlar;							
1	Zarif	++	+	0	+	++	Zarafetsiz
2	Hareketli	++	+	0	+	++	Durağan
3	Yenilikçi	++	+	0	+	++	Taklitçi
4	Tutarlı	++	+	0	+	++	Tutarsız
5	Yalın	++	+	0	+	++	Karmaşık
6	Süslü	++	+	0	+	++	Sade
7	Az yer kaplayan	++	+	0	+	++	İri
8	Yumuşak	++	+	0	+	++	Sert
9	Düzenli	++	+	0	+	++	Düzensiz
10	Simetrik	++	+	0	+	++	Asimetrik
11	Organik	++	+	0	+	++	Geometrik

Üçüncü grup için belirtmek istediğiniz diğer sıfatlar:

1	.....	++	+	0	+	++	.....
2	.....	++	+	0	+	++	.....
3	.....	++	+	0	+	++	.....
4	.....	++	+	0	+	++	.....
5	.....	++	+	0	+	++	.....

4. grup: **kişilik karakteristiklerle** ilgili sıfatlar;							
1	Çekici	++	+	0	+	++	İtici
2	Heyecan verici	++	+	0	+	++	Sakin
3	Olağan dışı	++	+	0	+	++	Sıradan
4	Saldırgan	++	+	0	+	++	Uysal
5	Kadınsı	++	+	0	+	++	Erkeksi
6	Olgun	++	+	0	+	++	Toy
7	Genç	++	+	0	+	++	Yaşlı
8	Gelecekçi	++	+	0	+	++	Nostaljik
9	Sessiz	++	+	0	+	++	Gürültülü
10	Gerçekçi	++	+	0	+	++	Abartılı
11	Iddialı	++	+	0	+	++	Gösterişsiz
12	Sıcak	++	+	0	+	++	Soğuk
13	İlginç	++	+	0	+	++	Sıkıcı
14	Samimi	++	+	0	+	++	Gayri samimi

Dördüncü grup için belirtmek istediğiniz diğer sıfatlar:

1	……	++	+	0	+	++	……
2	……	++	+	0	+	++	……
3	……	++	+	0	+	++	……
4	……	++	+	0	+	++	……
5	……	++	+	0	+	++	……

APPENDIX C

ANALYSIS OF DATA SETS (AS)

Table C.1 Category 1; Social Values and Positions (n=8)

AS	adj1	adj2	adj3	adj4	adj5	adj6	adj7	adj8
Designer	**-1**	**-1**	**-2**	**-1**	**1**	**2**	**-2**	**-2**
User1	**1**	**0**	**1**	**2**	**1**	**-1**	**0**	**1**
User2	**-1**	**-1**	**-2**	**-2**	**0**	**1**	**-1**	**1**
User3	**-1**	**-2**	**-1**	**-1**	**0**	**0**	**0**	**-1**
User4	**-1**	**-1**	**0**	**0**	**0**	**-2**	**-1**	**0**
User5	**-1**	**-2**	**-2**	**-1**	**0**	**1**	**-2**	**-1**
User6	**1**	**0**	**0**	**1**	**2**	**2**	**0**	**-1**
User7	**-1**	**0**	**-1**	**1**	**2**	**-1**	**-1**	**0**
User8	**1**	**-1**	**0**	**-1**	**2**	**-1**	**-2**	**-1**
User9	**-2**	**-2**	**-1**	**-1**	**0**	**1**	**-1**	**-2**
User10	**-1**	**0**	**-1**	**-1**	**1**	**-1**	**0**	**-1**
Count v=d+1	0	4	4	1	3	0	4	5
Count v=d	6	3	2	5	2	1	2	1
Count v=d-1	1	3	0	1	5	3	0	0
Count Match TOTAL	**7**	**10**	**6**	**7**	**10**	**4**	**6**	**6**
Count Mismatch TOTAL	**3**	**0**	**4**	**3**	**0**	**6**	**4**	**4**
Over 50% (5) Mismatch?						**YES**		
Over 50% (5) Match (v=d)?	**YES**							

Table C.2 Category 2; Usability and Interaction (n=11)

adj9	adj10	adj11	adj12	adj13	adj14	adj15	adj16	adj17	adj18	adj19
-2	**-2**	**-2**	**-2**	**-2**	**2**	**-2**	**-1**	**-1**	**-2**	**1**
-1	**-2**	**-1**	**-1**	**-1**	**1**	**1**	**-1**	**-1**	**-1**	**-1**
1	**-2**	**1**	**2**	**0**	**1**	**-1**	**-2**	**1**	**-2**	**-2**
-1	**-2**	**-1**	**-1**	**-2**	**1**	**-1**	**-1**	**-1**	**-1**	**-1**
-1	**0**	**-1**	**0**	**-1**	**2**	**0**	**-2**	**-2**	**-1**	**-1**
-2	**-1**	**-1**	**-1**	**0**	**0**	**-1**	**-2**	**-2**	**-2**	**-1**
2	**0**	**-1**	**-1**	**-1**	**1**	**1**	**-2**	**1**	**-2**	**-2**
-1	**1**	**0**	**-2**	**-2**	**1**	**-1**	**0**	**-1**	**-1**	**-2**
-2	**-2**	**-2**	**-2**	**-2**	**-2**	**-1**	**-2**	**-1**	**-2**	**-1**
-2	**-2**	**-2**	**-2**	**-2**	**-1**	**-1**	**-2**	**-2**	**0**	**-1**
1	**0**	**1**	**-1**	**-1**	**1**	**-1**	**1**	**1**	**1**	**-1**
4	1	5	5	4	0	7	1	0	4	0
3	5	2	3	4	1	0	2	4	4	0
0	0	0	0	0	6	0	6	3	0	0
7	**6**	**7**	**8**	**8**	**7**	**7**	**9**	**7**	**8**	**0**
3	**4**	**3**	**2**	**2**	**3**	**3**	**1**	**3**	**2**	**10**
										YES

Table C.3 Category 3; Visual Qualities (n=11)

adj20	adj21	adj22	adj23	adj24	adj25	adj26	adj27	adj28	adj29	adj30
-1	-1	0	-2	-2	1	0	-1	-1	-1	-1
1	2	2	1	-1	1	1	2	-1	-1	1
-2	-1	-2	-1	0	1	1	2	-1	0	1
-1	-1	0	-1	-1	1	0	1	0	-1	1
0	-1	-2	-2	-2	2	-2	1	-2	-2	-1
-1	1	0	-1	-2	2	1	-1	0	-2	2
2	2	0	1	0	-1	1	1	1	0	1
1	-1	0	1	0	1	1	0	0	-2	-1
-1	1	-1	0	-2	2	2	-1	0	-1	2
-2	-1	-1	-2	-1	1	1	-1	-1	-2	0
0	1	0	0	1	0	1	-1	0	-1	1
2	0	0	3	3	3	7	1	5	2	1
3	5	5	2	3	5	1	4	3	4	2
2	0	2	0	0	1	0	0	1	4	0
7	5	7	5	6	9	8	5	9	10	3
3	5	3	5	4	1	2	5	1	0	7
										YES

Table C.4 Category 4; Personality Characteristics (n=14)

adj31	adj32	adj33	adj34	adj35	adj36	adj37	adj38	adj39	adj40	adj41	adj42	adj43	adj44
-2	-2	-1	1	0	2	-2	0	-2	0	-2	-2	-1	-2
1	2	2	0	2	-1	2	2	-2	-1	1	1	2	1
-2	-1	0	0	-1	-2	-2	-2	2	1	1	-2	0	-1
-2	-1	0	-1	1	-1	1	2	0	0	-1	-1	-1	-1
2	1	0	-1	1	-2	2	-2	-2	0	-2	1	-1	2
-1	2	0	1	1	-1	-1	0	-1	-1	0	-1	0	-1
0	0	0	0	0	0	1	0	1	1	0	1	1	1
1	0	-1	1	-1	-1	-1	0	0	1	0	-1	0	0
-1	0	-1	1	1	-2	1	0	-2	0	-2	-1	-2	-1
-2	1	-1	0	0	-1	-1	0	-1	-1	-1	-1	-1	-1
1	1	0	1	1	1	-1	-1	1	1	-1	1	0	0
2	2	6	0	5	0	4	0	2	4	3	5	4	5
3	0	3	4	2	0	1	5	3	3	2	1	3	0
0	0	0	4	2	1	0	1	0	3	0	0	1	0
5	2	9	8	9	1	5	6	5	10	5	6	8	5
5	8	1	2	1	9	5	4	5	0	5	4	2	5
	YES				YES								

APPENDIX D

ANALYSIS OF DATA SETS (AM)

Table D.1 Category 1; Social Values and Positions (n=8)

AM	adj1	adj2	adj3	adj4	adj5	adj6	adj7	adj8
Designer	-1	-2	0	0	1	2	-1	-2
User1	-1	-2	-2	-1	0	1	-1	-1
User2	-1	-1	-1	-1	0	0	-1	-1
User3	-1	-1	0	0	0	1	-1	-1
User4	-1	0	-2	-1	-1	2	-2	-2
User5	-2	-1	-1	0	0	2	-2	-2
User6	-2	-1	-1	-2	-2	0	1	-1
User7	-1	0	-1	0	0	1	-2	1
User8	-1	-1	-2	-2	0	1	-1	-1
User9	-2	0	-2	-1	0	2	-2	0
User10	-1	0	0	0	1	-1	0	-1
Count v=d+1	0	5	0	0	0	0	1	6
Count v=d	7	1	2	4	1	3	4	2
Count v=d-1	3	0	4	4	7	4	4	0
Count Match TOTAL	**10**	**6**	**6**	**8**	**8**	**7**	**9**	**8**
Count Mismatch TOTAL	**0**	**4**	**4**	**2**	**2**	**3**	**1**	**2**
Over 50% (5) Mismatch?								
Over 50% (5) Match(v=d)?	**YES**							

Table D.2 Category 2; Usability and Interaction (n=11)

adj9	adj10	adj11	adj12	adj13	adj14	adj15	adj16	adj17	adj18	adj19
0	-1	0	-2	-2	2	-1	-2	1	-2	-2
-2	-1	-2	-2	0	2	-2	-2	-1	-2	-1
-2	0	-2	-2	-2	2	-1	-2	-1	-1	1
-2	-1	-2	-2	-2	2	-1	-2	-2	-2	-1
-2	-2	-1	0	-1	-2	1	1	-1	1	2
-2	-2	-2	-2	-2	0	-2	-2	-2	-2	0
-1	-1	-1	-1	-1	2	-1	-1	-1	-1	-1
-2	-2	-1	-1	-2	-1	-2	-2	-2	-2	2
0	-1	-1	0	-1	-2	-1	-2	0	-2	1
-2	-2	-2	-2	-2	2	0	-2	-2	-2	-2
-1	-1	-1	-1	-1	1	-1	0	0	-1	-2
0	1	0	3	4	0	1	1	0	3	3
1	5	0	5	5	5	5	7	0	6	2
2	4	5	0	0	1	3	0	2	0	0
3	**10**	**5**	**8**	**9**	**6**	**9**	**8**	**2**	**9**	**5**
7	**0**	**5**	**2**	**1**	**4**	**1**	**2**	**8**	**1**	**5**
YES								**YES**		
							YES		**YES**	

Table D.3 Category 3; Visual Qualities (n=11)

adj20	adj21	adj22	adj23	adj24	adj25	adj26	adj27	adj28	adj29	adj30
-1	2	0	-1	-2	2	-2	-2	1	-2	-2
-2	2	0	-1	-2	2	-2	-1	-2	-2	-1
-2	-2	-2	-1	-1	2	-2	-1	-1	-2	-2
-1	1	0	0	-2	2	-2	-1	-2	-2	-2
-2	-2	2	-2	-2	2	-2	0	-2	-2	0
0	0	-1	-2	-2	2	-2	-2	-2	-2	-2
-1	1	-1	-1	-1	1	-1	1	-1	-1	1
-1	-2	-2	0	-2	2	-1	0	-2	0	0
0	-2	-2	-1	0	-1	-2	-1	0	-2	2
-2	-1	0	-2	-2	2	-2	-1	-2	-2	2
1	0	0	-1	-1	1	-1	0	-1	-2	-1
2	0	0	2	3	0	3	5	0	1	2
3	1	4	5	6	7	7	1	0	8	3
4	2	2	3	0	2	0	0	1	0	0
9	**3**	**6**	**10**	**9**	**9**	**10**	**6**	**1**	**9**	**5**
1	**7**	**4**	**0**	**1**	**1**	**0**	**4**	**9**	**1**	**5**
	YES							**YES**		
				YES	**YES**	**YES**			**YES**	

Table D.4 Category 4; Personality Characteristics (n=14)

adj31	adj32	adj33	adj34	adj35	adj36	adj37	adj38	adj39	adj40	adj41	adj42	adj43	adj44
-2	-1	1	2	-2	0	0	0	-1	-1	-1	-2	0	-2
-2	2	1	2	-2	-2	1	-1	-2	-1	-1	-2	-2	-2
-1	-2	-1	0	-1	-1	-1	0	1	0	-1	-2	-1	-1
-2	1	-1	0	0	-1	0	0	-1	-2	1	-1	-1	-2
-1	1	-1	0	1	-1	0	2	-2	-2	-1	1	-1	1
0	0	0	2	-1	-2	2	-2	-2	-2	2	-2	0	-2
-1	1	-1	1	1	1	-1	-1	-1	-1	1	-1	-1	-1
-2	-1	-1	-2	0	0	-1	0	-2	-2	-1	-2	-1	-2
-1	-2	-2	0	0	-1	-1	-2	-2	1	-2	1	-1	1
-1	2	0	1	-2	-2	-1	0	-2	-2	-1	-2	-1	-2
-1	1	0	2	1	-1	0	0	-2	-1	1	0	1	-1
6	1	0	0	2	1	1	0	0	1	0	2	1	3
3	1	1	3	2	1	3	5	2	3	5	5	1	5
0	2	3	2	0	5	5	2	7	5	1	0	7	0
9	**4**	**4**	**5**	**4**	**7**	**9**	**7**	**9**	**9**	**6**	**7**	**9**	**8**
1	**6**	**6**	**5**	**6**	**3**	**1**	**3**	**1**	**1**	**4**	**3**	**1**	**2**
	YES	**YES**		**YES**									

APPENDIX E

ANALYSIS OF DATA SETS (ND)

Table E.1 Category 1; Social Values and Positions (n=8)

ND	adj1	adj2	adj3	adj4	adj5	adj6	adj7	adj8
Designer	**-1**	**-1**	**1**	**0**	**2**	**1**	**-1**	**-1**
User1	**-2**	**-1**	**-2**	**-2**	**0**	**2**	**-1**	**-1**
User2	**1**	**0**	**-1**	**1**	**2**	**2**	**-1**	**0**
User3	**-1**	**-2**	**-2**	**0**	**1**	**-1**	**0**	**-2**
User4	**-2**	**-2**	**-2**	**0**	**0**	**1**	**-1**	**-2**
User5	**-2**	**-2**	**-2**	**-2**	**-2**	**2**	**0**	**-2**
User6	**-1**	**-1**	**-2**	**-2**	**0**	**0**	**-1**	**-1**
User7	**-2**	**-2**	**-1**	**-2**	**0**	**1**	**0**	**-1**
User8	**-1**	**-1**	**-1**	**-1**	**0**	**1**	**-1**	**0**
User9	**-2**	**-1**	**-2**	**-2**	**-1**	**2**	**-2**	**-1**
User10	**-2**	**-2**	**-2**	**-1**	**-1**	**2**	**-2**	**-1**
Count v=d+1	0	1	0	1	0	5	3	2
Count v=d	3	4	0	2	1	3	5	5
Count v=d-1	6	5	0	2	1	1	2	3
Count Match TOTAL	**9**	**10**	**0**	**5**	**2**	**9**	**10**	**10**
Count Mismatch TOTAL	**1**	**0**	**10**	**5**	**8**	**1**	**0**	**0**
Over 50% (5) Mismatch?			**YES**		**YES**			
Over 50% (5) Match (v=d)?								

Table E.2 Category 2; Usability and Interaction (n=11)

adj9	adj10	adj11	adj12	adj13	adj14	adj15	adj16	adj17	adj18	adj19
-1	**0**	**-1**	**-2**	**-1**	**1**	**-2**	**-2**	**0**	**2**	**0**
-2	**0**	**-1**	**-2**	**-1**	**-2**	**-2**	**-2**	**-2**	**-2**	**1**
-1	**0**	**-1**	**-1**	**-1**	**0**	**-1**	**-2**	**-1**	**1**	**1**
-2	**-2**	**0**	**0**	**0**	**-1**	**-2**	**-2**	**-2**	**0**	**0**
-1	**2**	**-2**	**-2**	**-2**	**2**	**-1**	**-2**	**-2**	**-2**	**-2**
2	**-2**	**1**	**1**	**-2**	**2**	**1**	**0**	**0**	**0**	**1**
-2	**-2**	**-2**	**-2**	**-2**	**-2**	**-2**	**-2**	**-2**	**-2**	**-2**
-1	**1**	**0**	**0**	**-1**	**2**	**-1**	**-1**	**0**	**2**	**2**
-1	**-1**	**-1**	**-1**	**-1**	**0**	**1**	**0**	**1**	**0**	**-2**
-2	**0**	**-2**	**-1**	**0**	**-1**	**-2**	**-2**	**-2**	**0**	**1**
-2	**-1**	**-1**	**1**	**1**	**-1**	**-2**	**-2**	**-2**	**2**	**1**
0	1	2	3	2	3	3	1	1	0	5
4	3	4	3	4	0	5	7	2	2	1
5	2	3	0	3	2	0	0	1	1	0
9	**6**	**9**	**6**	**9**	**5**	**8**	**8**	**4**	**3**	**6**
1	**4**	**1**	**4**	**1**	**5**	**2**	**2**	**6**	**7**	**4**
								YES	**YES**	
							YES			

Table E.3 Category 3; Visual Qualities (n=11)

adj20	adj21	adj22	adj23	adj24	adj25	adj26	adj27	adj28	adj29	adj30
-1	-2	0	-1	-1	2	1	-1	-2	-2	1
-2	-2	-1	-2	-2	2	1	-1	-2	-2	2
0	-1	1	-1	-1	1	1	2	-1	-1	1
-2	-1	-2	0	0	2	-1	1	1	0	-1
-2	0	0	2	-2	2	0	2	0	-1	2
-2	-2	-2	-2	-2	0	1	2	-2	-2	1
-1	0	-1	-1	-1	0	1	2	0	-1	1
0	0	-1	-1	-1	2	-2	2	-2	-2	2
0	-1	-1	-2	-2	0	-1	0	-2	-2	0
-2	-2	0	-2	-2	2	0	-2	-2	-2	1
-2	-2	-1	-1	-2	2	-1	1	-2	-2	-1
3	3	1	1	1	0	0	1	1	3	3
1	4	2	4	3	6	4	1	6	6	4
6	0	5	4	6	1	2	1	0	0	1
10	**7**	**8**	**9**	**10**	**7**	**6**	**3**	**7**	**9**	**8**
0	**3**	**2**	**1**	**0**	**3**	**4**	**7**	**3**	**1**	**2**
							YES			
					YES			**YES**	**YES**	

Table E.4 Category 4; Personality Characteristics (n=14)

adj31	adj32	adj33	adj34	adj35	adj36	adj37	adj38	adj39	adj40	adj41	adj42	adj43	adj44
-1	0	0	2	-2	-1	0	1	-2	-1	-1	-1	-1	0
-2	-2	-1	0	2	1	-2	-2	1	-1	-2	0	-1	-2
0	0	1	1	0	1	-1	0	-1	0	1	-1	1	1
-2	-2	0	0	0	1	-2	-2	-1	-1	1	1	0	-1
-2	-2	0	2	0	1	-1	0	-2	-1	0	0	-1	-2
-2	-2	-2	-2	-2	2	-2	-2	-2	2	-2	-2	-2	2
-1	-1	1	1	0	-1	-1	-1	-1	-2	-1	-1	-1	0
-1	-1	-1	1	-2	-1	-2	0	0	1	-1	1	-1	1
0	-1	-2	0	0	1	-2	-2	-1	1	-1	0	-2	0
-2	-2	-1	1	-2	1	-2	-2	-2	-2	-2	-2	-1	-1
-2	-1	-1	0	0	-1	-2	-1	-1	-1	0	-2	-2	-2
2	0	2	0	0	0	0	0	5	1	2	3	1	2
2	1	2	1	3	3	0	0	3	4	3	2	5	2
6	4	4	4	0	0	3	3	0	2	3	3	3	2
10	**5**	**8**	**5**	**3**	**3**	**3**	**3**	**8**	**7**	**8**	**8**	**9**	**6**
0	**5**	**2**	**5**	**7**	**7**	**7**	**7**	**2**	**3**	**2**	**2**	**1**	**4**
				YES	**YES**	**YES**	**YES**						

APPENDIX F

ANALYSIS OF DATA SETS (NS)

Table F.1 Category 1; Social Values and Positions (n=8)

NS	adj1	adj2	adj3	adj4	adj5	adj6	adj7	adj8
Designer	**-1**	**-1**	**-2**	**-2**	**-1**	**2**	**-2**	**0**
User1	**-2**	**-2**	**-2**	**-2**	**-1**	**2**	**-1**	**-1**
User2	**-2**	**-2**	**-2**	**-1**	**-1**	**2**	**-1**	**0**
User3	**-2**	**0**	**-2**	**-2**	**0**	**-1**	**-2**	**0**
User4	**-1**	**0**	**-1**	**0**	**1**	**2**	**-1**	**1**
User5	**-2**	**-1**	**-2**	**-2**	**0**	**2**	**-2**	**0**
User6	**-2**	**-2**	**-1**	**-2**	**-2**	**-2**	**0**	**-2**
User7	**0**	**0**	**-2**	**-2**	**1**	**2**	**2**	**0**
User8	**0**	**-1**	**-1**	**1**	**-1**	**2**	**-2**	**0**
User9	**-2**	**0**	**-2**	**-1**	**0**	**1**	**-2**	**0**
User10	**-1**	**-1**	**-2**	**-2**	**-2**	**2**	**-1**	**-2**
Count v=d+1	2	4	3	2	3	0	4	1
Count v=d	2	3	7	6	3	7	4	6
Count v=d-1	6	3	0	0	2	1	0	1
Count Match TOTAL	**10**	**10**	**10**	**8**	**8**	**8**	**8**	**8**
Count Mismatch TOTAL	**0**	**0**	**0**	**2**	**2**	**2**	**2**	**2**
Over 50% (5) Mismatch?								
Over 50% (5) Match(v=d)?			YES	YES		YES		YES

Table F.2 Category 2; Usability and Interaction (n=11)

adj9	adj10	adj11	adj12	adj13	adj14	adj15	adj16	adj17	adj18	adj19
-2	**-2**	**-2**	**-2**	**-2**	**1**	**-1**	**0**	**0**	**1**	**0**
-1	**-2**	**0**	**1**	**-1**	**-1**	**0**	**1**	**0**	**2**	**2**
-2	**-2**	**-2**	**-2**	**-2**	**2**	**0**	**-2**	**-2**	**-1**	**-1**
-1	**-2**	**-2**	**-2**	**-2**	**-2**	**-1**	**-2**	**-1**	**-1**	**2**
-1	**-1**	**2**	**1**	**-1**	**0**	**-1**	**-1**	**-1**	**1**	**2**
0	**-1**	**0**	**0**	**0**	**0**	**0**	**-2**	**0**	**-1**	**1**
1	**-1**	**0**	**-1**	**-2**	**-2**	**2**	**1**	**0**	**-1**	**-2**
0	**-2**	**0**	**-2**	**-1**	**1**	**0**	**0**	**0**	**1**	**0**
-2	**-2**	**-1**	**1**	**-2**	**1**	**-2**	**-2**	**1**	**1**	**0**
1	**-1**	**-1**	**-2**	**-2**	**-1**	**-1**	**-2**	**-1**	**1**	**1**
-1	**-1**	**-1**	**-1**	**-1**	**2**	**-1**	**-2**	**0**	**1**	**-1**
4	5	3	2	4	2	4	2	1	1	2
2	5	2	4	5	2	4	1	5	5	2
0	0	0	0	0	2	1	1	3	0	2
6	**10**	**5**	**6**	**9**	**6**	**9**	**4**	**9**	**6**	**6**
4	**0**	**5**	**4**	**1**	**4**	**1**	**6**	**1**	**4**	**4**
							YES			

Table F.3 Category 3; Visual Qualities (n=11)

adj20	adj21	adj22	adj23	adj24	adj25	adj26	adj27	adj28	adj29	adj30
-2	-1	-2	-1	1	0	2	2	-1	-2	-2
0	-1	-1	1	-1	2	2	2	0	2	0
-2	-2	-2	-2	-2	2	-1	-2	-1	-2	-1
0	-1	-1	-1	-2	2	0	1	-1	-2	2
-1	-1	-1	0	-2	1	-2	1	-1	2	-2
-2	-1	-2	-2	-2	2	0	2	-2	-2	2
0	-1	-2	-1	2	0	2	2	1	-2	1
2	-2	0	0	1	2	2	0	0	-2	1
-1	-1	0	-1	-1	2	-1	2	0	-2	2
-1	-2	-1	-1	1	1	2	-1	-1	1	-1
0	-2	-1	-1	-2	2	2	-2	-2	-2	-1
3	0	5	2	1	2	0	0	3	0	3
2	6	3	5	2	1	5	4	4	7	1
0	4	0	2	0	0	0	2	2	0	0
5	10	8	9	3	3	5	6	9	7	4
5	0	2	1	7	7	5	4	1	3	6
				YES	YES					YES
	YES								YES	

Table F.4 Category 4; Personality Characteristics (n=14)

adj31	adj32	adj33	adj34	adj35	adj36	adj37	adj38	adj39	adj40	adj41	adj42	adj43	adj44
-2	-1	-1	-1	-1	2	-2	-1	2	2	-2	1	-2	-1
0	-1	-1	0	0	2	-2	-1	2	0	-1	-1	-1	-1
-1	-1	-1	2	-2	1	-2	-1	-2	0	0	-1	-2	-2
-2	0	0	-2	-1	1	-2	-1	-2	-2	-2	1	-2	0
-1	1	-1	0	-1	1	-1	-1	-1	-1	-1	0	0	-1
-2	-2	-1	2	-2	-2	-2	-2	-1	0	0	2	-2	-1
0	-1	-2	-2	1	0	-1	-2	0	1	-2	1	-2	1
-1	-2	1	-2	1	1	1	0	2	2	1	1	-2	1
-1	0	0	2	-2	0	0	-1	-2	-2	0	-1	0	-1
-1	-2	-1	1	-1	1	-2	-1	-2	-1	1	-1	-1	-2
-2	1	0	2	1	2	-1	-2	-2	1	2	-2	-2	-2
5	2	3	2	1	0	3	1	0	0	2	1	2	1
3	3	5	0	3	2	5	6	2	1	2	3	6	4
0	3	1	3	3	5	0	3	0	2	0	1	0	3
8	8	9	5	7	7	8	10	2	3	4	5	8	8
2	2	1	5	3	3	2	0	8	7	6	5	2	2
								YES	YES	YES			
							YES					YES	

APPENDIX G

ANALYSIS OF DATA SETS (OB)

Table G.1 Category 1; Social Values and Positions (n=8)

OB	adj1	adj2	adj3	adj4	adj5	adj6	adj7	adj8
Designer	**-2**	**-2**	**-2**	**-2**	**-1**	**2**	**-2**	**-1**
User1	**-1**	**-1**	**-1**	**0**	**0**	**2**	**0**	**-1**
User2	**-2**	**-1**	**-2**	**-2**	**0**	**-1**	**-2**	**-2**
User3	**-2**	**-2**	**-2**	**-2**	**-1**	**2**	**-2**	**-2**
User4	**-2**	**-1**	**-2**	**-2**	**-1**	**1**	**-2**	**-1**
User5	**-2**	**-2**	**-1**	**-1**	**-2**	**2**	**-1**	**-1**
User6	**-2**	**-1**	**-2**	**-2**	**-1**	**2**	**-1**	**-1**
User7	**-2**	**-2**	**-1**	**0**	**-1**	**1**	**-2**	**-2**
User8	**-1**	**-2**	**-2**	**-1**	**-1**	**0**	**-1**	**-1**
User9	**-1**	**-1**	**-1**	**-1**	**0**	**0**	**-2**	**-2**
User10	**-1**	**-1**	**-2**	**-1**	**0**	**2**	**-2**	**-1**
Count v=d+1	4	6	4	4	4	0	3	0
Count v=d	6	4	6	4	5	5	6	6
Count v=d-1	0	0	0	0	1	2	0	4
Count Match TOTAL	**10**	**10**	**10**	**8**	**10**	**7**	**9**	**10**
Count Mismatch TOTAL	**0**	**0**	**0**	**2**	**0**	**3**	**1**	**0**
Over 50% (5) Mismatch?								
Over 50% (5) Match (v=d)?	**YES**		**YES**				**YES**	**YES**

Table G.2 Category 2; Usability and Interaction (n=11)

adj9	adj10	adj11	adj12	adj13	adj14	adj15	adj16	adj17	adj18	adj19
-1	**-1**	**-1**	**-1**	**-1**	**-1**	**0**	**0**	**0**	**2**	**0**
-1	**-1**	**0**	**-1**	**-1**	**0**	**-2**	**1**	**0**	**0**	**-1**
-1	**-2**	**1**	**0**	**0**	**-1**	**-1**	**1**	**-1**	**0**	**2**
-2	**-2**	**-2**	**-1**	**-1**	**-2**	**-2**	**-2**	**-2**	**2**	**2**
-1	**0**	**-1**	**-1**	**-1**	**0**	**-2**	**-1**	**-1**	**2**	**-1**
-2	**-1**	**-1**	**1**	**-1**	**0**	**-2**	**-1**	**-1**	**1**	**-2**
-2	**1**	**0**	**-1**	**1**	**-2**	**-2**	**1**	**0**	**2**	**2**
-1	**2**	**-1**	**-1**	**-1**	**-1**	**-2**	**-2**	**1**	**-2**	**-1**
0	**-1**	**0**	**-1**	**0**	**0**	**-1**	**-1**	**0**	**0**	**1**
1	**1**	**-1**	**0**	**-1**	**-1**	**-2**	**-2**	**1**	**-1**	**-1**
-2	**-2**	**1**	**1**	**0**	**-1**	**-1**	**-1**	**2**	**-2**	**1**
1	1	3	2	3	4	0	3	2	0	2
4	3	4	6	6	4	0	0	3	3	0
4	3	1	0	0	2	3	4	3	1	4
9	**7**	**8**	**8**	**9**	**10**	**3**	**7**	**8**	**4**	**6**
1	**3**	**2**	**2**	**1**	**0**	**7**	**3**	**2**	**6**	**4**
						YES			**YES**	
			YES	**YES**						

Table G.3 Category 3; Visual Qualities (n=11)

adj20	adj21	adj22	adj23	adj24	adj25	adj26	adj27	adj28	adj29	adj30
-1	-1	-2	-1	-1	0	0	0	0	-2	-2
2	0	0	2	1	0	1	1	2	0	0
-2	0	-2	-1	-1	2	1	-1	0	-2	-2
-2	-2	-2	-2	-2	2	-2	-2	-2	-2	-2
-1	-2	-2	0	-2	2	-1	-2	-2	-2	-2
-2	-1	-1	1	1	1	1	-1	-1	-1	-2
-1	-2	-1	-2	-1	1	2	-2	-1	-1	-2
-2	-1	-2	-1	0	-1	1	-2	-1	-2	-2
-1	-2	-1	-1	1	0	-1	-1	-1	-2	0
-2	-1	-2	-1	2	0	-1	-2	-1	-2	-1
-1	-1	0	1	0	-1	2	-1	-1	-2	-1
0	2	3	1	2	2	4	1	0	2	2
4	4	5	4	2	3	0	0	1	7	6
5	4	0	2	2	2	3	4	6	0	0
9	10	8	7	6	7	7	5	7	9	8
1	0	2	3	4	3	3	5	3	1	2
									YES	YES

Table G.4 Category 4; Personality Characteristics (n=14)

adj31	adj32	adj33	adj34	adj35	adj36	adj37	adj38	adj39	adj40	adj41	adj42	adj43	adj44
-2	-2	-2	0	0	0	0	-2	0	0	-2	-1	-2	0
1	0	0	0	0	1	-1	0	1	0	-1	-1	0	0
-1	-2	-2	1	0	-1	1	0	-1	1	0	-2	-2	-2
-2	-2	-2	0	-2	0	-2	-2	-2	-2	-2	-2	-2	-2
-1	-1	-2	1	-2	1	-2	-2	0	0	-2	-2	-2	-2
-2	-1	-1	0	-1	-1	-2	0	-1	0	-1	-2	-2	-2
-2	-1	-1	2	-2	1	-2	-1	-2	1	-1	-2	-2	1
-1	0	-2	0	0	-1	-1	-1	-1	-1	-2	-1	-1	-1
-1	-1	-2	0	-2	0	-1	-2	0	0	-1	-1	-2	-1
-2	-2	-2	-2	0	0	-2	-2	2	1	-2	-2	-2	-2
1	-1	1	1	-2	1	-1	-1	1	1	-1	-2	0	0
4	5	2	3	0	4	1	3	2	4	5	0	1	1
4	3	6	5	4	3	0	4	2	4	4	3	7	2
0	0	0	0	1	3	4	0	3	1	0	7	0	2
8	8	8	8	5	10	5	7	7	9	9	10	8	5
2	2	2	2	5	0	5	3	3	1	1	0	2	5
		YES										YES	

APPENDIX H

ANALYSIS OF DATA SETS (OT)

Table H.1 Category 1; Social Values and Positions (n=8)

OT	adj1	adj2	adj3	adj4	adj5	adj6	adj7	adj8
Designer	-2	-2	-2	-2	-1	0	-2	-1
User1	-1	-2	-2	-2	0	-1	-2	-1
User2	-1	-2	-2	-2	-1	0	-1	-1
User3	-1	-1	-1	-1	0	0	-1	-2
User4	0	-1	0	-1	0	0	0	-1
User5	-2	-2	-2	-2	-1	2	-1	-1
User6	-2	-2	-2	-2	-1	1	-2	-1
User7	-1	-2	-1	-2	-2	-2	0	2
User8	-1	-2	0	-1	-1	0	0	0
User9	-1	-1	-2	-2	0	0	-1	-2
User10	-1	-2	-2	-2	0	2	-2	-1
Count v=d+1	7	3	2	3	5	1	4	1
Count v=d	2	7	6	7	4	5	3	6
Count v=d-1	0	0	0	0	1	1	0	2
Count Match TOTAL	**9**	**10**	**8**	**10**	**10**	**7**	**7**	**9**
Count Mismatch TOTAL	**1**	**0**	**2**	**0**	**0**	**3**	**3**	**1**
Over 50% (5) Mismatch?								
Over 50% (5) Match(v=d)?		**YES**	**YES**	**YES**				**YES**

Table H.2 Category 2; Usability and Interaction (n=11)

adj9	adj10	adj11	adj12	adj13	adj14	adj15	adj16	adj17	adj18	adj19
-1	-1	-2	1	1	0	0	0	-2	0	0
-1	-1	0	-1	-1	1	-1	-1	-2	-1	-1
1	-2	-1	-1	-1	-1	0	0	0	-1	-1
-2	-2	-2	-2	-1	-1	-1	-1	-1	-2	-1
0	-1	0	0	-1	1	0	-1	0	-1	0
-2	-2	-1	-1	-2	-1	-1	-1	-1	-1	1
-2	-2	-2	-2	2	-1	-2	-1	-2	-2	1
1	-2	-1	0	-1	1	1	2	-1	0	2
-2	-2	-1	-1	0	0	-1	-2	0	-1	0
2	0	0	1	0	1	-1	1	0	1	-1
-1	-1	0	1	0	2	1	-1	0	0	-2
1	1	4	0	1	4	2	1	3	1	2
2	3	2	2	0	1	2	1	2	2	2
4	6	0	2	3	4	5	6	0	5	4
7	**10**	**6**	**4**	**4**	**9**	**9**	**8**	**5**	**8**	**8**
3	**0**	**4**	**6**	**6**	**1**	**1**	**2**	**5**	**2**	**2**
			YES	**YES**						

Table H.3 Category 3; Visual Qualities (n=11)

adj20	adj21	adj22	adj23	adj24	adj25	adj26	adj27	adj28	adj29	adj30
-2	1	-2	-2	-1	1	0	1	-1	-2	2
-2	-2	-1	0	-1	1	0	0	1	-2	2
1	1	-2	-1	-1	0	1	1	-1	-1	2
-1	-2	-2	-1	-2	-1	-1	0	-1	-2	2
0	1	1	0	-1	1	-1	0	-1	-1	1
-2	-1	-2	-2	-2	2	-1	-1	-2	-2	1
-1	-1	-2	-2	-1	1	-1	-1	-2	-2	2
-2	1	-2	0	1	1	-2	1	-2	-2	2
-2	0	-2	-1	-2	1	1	-1	-1	-1	0
0	-1	-2	-1	1	0	1	-1	-1	-1	1
-2	2	-2	-1	-1	0	2	1	-1	-2	1
2	1	1	5	0	1	3	0	0	4	0
5	3	8	2	5	5	1	3	6	6	5
0	1	0	0	3	3	4	3	3	0	4
7	5	9	7	8	9	8	6	9	10	9
3	5	1	3	2	1	2	4	1	0	1
		YES						YES	YES	

Table H.4 Category 4; Personality Characteristics (n=14)

adj31	adj32	adj33	adj34	adj35	adj36	adj37	adj38	adj39	adj40	adj41	adj42	adj43	adj44
-2	-2	-2	0	1	-1	1	-1	-1	0	-2	0	-1	0
-2	-1	-1	-1	1	-1	0	-1	1	-1	-2	-1	-1	0
0	-1	-1	0	1	1	-1	0	1	1	-1	0	-1	-1
-2	-1	-2	0	0	0	-1	-2	-1	-1	-2	-1	-2	-2
-1	1	0	1	-1	-1	-1	-1	-1	-1	-1	0	-1	-1
-2	-2	-2	1	-1	-1	-1	-1	-1	1	1	-1	-2	-1
-2	-2	-1	1	0	-1	-2	-2	-1	1	-1	-1	-1	-1
-2	-2	-1	1	-1	-1	-2	-2	-2	-1	-2	2	-2	-1
-1	-2	1	1	0	0	-1	0	0	-1	-1	-1	-1	-1
-2	-1	0	1	2	0	-1	-1	-1	0	-1	-1	-1	0
-1	-2	-2	-2	0	0	-2	-1	-1	2	-2	-2	-1	1
3	4	4	6	1	4	0	2	1	3	5	0	0	1
6	5	3	2	2	5	0	5	6	1	4	2	7	2
0	0	0	1	4	0	1	3	1	5	0	6	3	6
9	9	7	9	7	9	1	10	8	9	9	8	10	9
1	1	3	1	3	1	9	0	2	1	1	2	0	1
						YES							
YES								YES				YES	

APPENDIX I

ANALYSIS OF DATA SETS (SB)

Table I.1 Category 1; Social Values and Positions (n=8)

SB	adj1	adj2	adj3	adj4	adj5	adj6	adj7	adj8
Designer	**-1**	**0**	**-1**	**-1**	**0**	**2**	**-2**	**0**
User1	**-1**	**-2**	**-2**	**-2**	**-2**	**2**	**-1**	**-2**
User2	**-2**	**-2**	**-2**	**-2**	**0**	**1**	**-2**	**-1**
User3	**-2**	**-1**	**-1**	**-2**	**-1**	**1**	**-1**	**1**
User4	**-1**	**0**	**-1**	**0**	**0**	**0**	**-1**	**0**
User5	**-2**	**-2**	**-2**	**-2**	**-2**	**2**	**-2**	**-2**
User6	**-1**	**-1**	**-2**	**-1**	**-1**	**0**	**0**	**0**
User7	**-1**	**-1**	**-2**	**-2**	**0**	**1**	**-1**	**0**
User8	**-1**	**-1**	**-1**	**-1**	**0**	**1**	**0**	**0**
User9	**-1**	**-1**	**1**	**-1**	**0**	**2**	**-1**	**0**
User10	**-2**	**-1**	**-2**	**-2**	**0**	**1**	**-1**	**-1**
Count v=d+1	0	0	0	1	0	0	6	1
Count v=d	6	1	3	3	6	3	2	5
Count v=d-1	4	6	6	6	2	5	0	2
Count Match TOTAL	**10**	**7**	**9**	**10**	**8**	**8**	**8**	**8**
Count Mismatch TOTAL	**0**	**3**	**1**	**0**	**2**	**2**	**2**	**2**
Over 50% (5) Mismatch?								
Over 50% (5) Match(v=d)?	**YES**				**YES**			

Table I.2 Category 2; Usability and Interaction (n=11)

adj9	adj10	adj11	adj12	adj13	adj14	adj15	adj16	adj17	adj18	adj19
-2	**-1**	**-2**	**-2**	**-2**	**-1**	**-1**	**-2**	**-2**	**2**	**0**
-1	**0**	**0**	**0**	**1**	**0**	**-2**	**-1**	**-1**	**-2**	**0**
0	**-2**	**-2**	**-2**	**-2**	**2**	**2**	**-2**	**2**	**1**	**-1**
1	**-2**	**-1**	**-1**	**-2**	**0**	**1**	**-1**	**0**	**1**	**1**
-1	**0**	**0**	**0**	**-1**	**-1**	**-1**	**-1**	**-1**	**0**	**0**
-2	**0**	**-1**	**0**	**0**	**-2**	**-2**	**-2**	**-2**	**2**	**0**
-2	**-2**	**-2**	**-1**	**-1**	**0**	**1**	**-2**	**0**	**-2**	**1**
-2	**-1**	**1**	**1**	**-1**	**-2**	**-2**	**-2**	**-1**	**-2**	**-1**
-1	**0**	**0**	**0**	**-2**	**-1**	**-2**	**-2**	**-1**	**0**	**1**
-2	**-2**	**-1**	**1**	**0**	**-1**	**-2**	**-2**	**-2**	**-2**	**0**
-1	**0**	**-1**	**-2**	**-1**	**-1**	**-2**	**-2**	**-1**	**-2**	**0**
4	5	4	2	4	3	0	3	5	0	3
4	1	2	2	3	4	1	7	2	1	5
0	4	0	0	0	2	6	0	0	2	2
8	**10**	**6**	**4**	**7**	**9**	**7**	**10**	**7**	**3**	**10**
2	**0**	**4**	**6**	**3**	**1**	**3**	**0**	**3**	**7**	**0**
			YES						**YES**	
							YES			

Table I.3 Category 3; Visual Qualities (n=11)

adj20	adj21	adj22	adj23	adj24	adj25	adj26	adj27	adj28	adj29	adj30
-1	-2	-2	-2	-2	2	-1	-2	-2	-2	1
-2	0	-2	0	-2	2	0	-1	-2	0	0
0	-1	-2	0	-1	2	1	2	0	-1	1
-2	-2	-2	0	-2	2	-2	2	-2	-2	2
-1	-1	0	-1	-1	1	-1	-1	-1	0	-1
-2	-2	-2	-2	-2	2	0	-2	-2	-2	2
0	0	-2	-2	-2	2	0	2	-2	0	-2
-1	1	-1	-1	-2	2	-1	-1	-2	-1	0
0	0	-1	1	-2	1	-2	-1	-1	-1	0
-1	-1	-2	0	-2	2	-2	-2	-2	-2	2
-2	0	-2	-1	0	2	-1	-2	-1	0	0
3	3	2	3	2	0	3	4	3	3	3
3	2	7	2	7	8	3	3	6	3	1
4	0	0	0	0	2	3	0	0	0	4
10	5	9	5	9	10	9	7	9	6	8
0	5	1	5	1	0	1	3	1	4	2
		YES		YES	YES			YES		

Table I.4 Category 4; Personality Characteristics (n=14)

adj31	adj32	adj33	adj34	adj35	adj36	adj37	adj38	adj39	adj40	adj41	adj42	adj43	adj44
-1	-2	-1	2	0	1	-2	-1	0	0	-1	-2	-2	-2
-2	-2	-1	0	0	0	0	-2	-2	0	0	0	-1	0
0	0	-1	0	0	0	-2	-1	0	0	-1	-1	-1	-1
-1	0	1	2	1	2	-2	-2	-2	0	1	-1	0	-2
-1	0	1	0	0	0	-1	0	0	0	0	-1	0	0
-2	-2	-2	2	-2	2	-2	-2	-2	-2	-2	-2	-2	-1
-1	-1	1	0	0	0	-1	-1	0	0	0	1	1	0
-2	-2	-2	-1	0	1	1	-2	-1	-2	-2	-2	-2	-2
0	0	1	2	0	-1	0	0	-1	0	0	0	-1	-1
-1	-1	-1	1	-1	1	-1	-2	0	-1	-1	-1	-1	-1
-2	-1	-1	1	0	1	-2	0	2	0	0	-2	-2	-2
2	3	0	0	1	2	3	3	0	0	5	4	4	4
4	3	4	3	7	3	4	2	4	7	2	3	3	3
4	0	2	2	1	4	0	5	2	1	2	0	0	0
10	6	6	5	9	9	7	10	6	8	9	7	7	7
0	4	4	5	1	1	3	0	4	2	1	3	3	3
				YES					YES				

APPENDIX J

ANALYSIS OF DATA SETS (SS)

Table J.1 Category 1; Social Values and Positions (n=8)

SS	adj1	adj2	adj3	adj4	adj5	adj6	adj7	adj8
Designer	**-2**	**-2**	**-2**	**-2**	**-1**	**2**	**-2**	**0**
User1	**-2**	**-2**	**-2**	**1**	**0**	**1**	**0**	**1**
User2	**-1**	**-1**	**-1**	**-2**	**0**	**2**	**0**	**-1**
User3	**-1**	**-2**	**-1**	**-2**	**0**	**1**	**-1**	**0**
User4	**-1**	**-1**	**-1**	**-1**	**-1**	**1**	**-2**	**-2**
User5	**-1**	**-1**	**-1**	**-1**	**0**	**1**	**-1**	**0**
User6	**-2**	**-2**	**-2**	**-2**	**-2**	**1**	**-1**	**-2**
User7	**-1**	**-1**	**-1**	**-2**	**1**	**1**	**0**	**-1**
User8	**-2**	**-2**	**-2**	**-2**	**-2**	**1**	**-2**	**-1**
User9	**-2**	**-2**	**-1**	**-1**	**0**	**-1**	**-1**	**-2**
User10	**0**	**0**	**-2**	**-2**	**-1**	**0**	**-1**	**-2**
Count v=d+1	5	4	6	3	5	0	5	1
Count v=d	4	5	4	6	2	1	2	2
Count v=d-1	0	0	0	0	2	7	0	3
Count Match TOTAL	**9**	**9**	**10**	**9**	**9**	**8**	**7**	**6**
Count Mismatch TOTAL	**1**	**1**	**0**	**1**	**1**	**2**	**3**	**4**
Over 50% (5) Mismatch?								
Over 50% (5) Match(v=d)?				**YES**				

Table J.2 Category 2; Usability and Interaction (n=11)

adj9	adj10	adj11	adj12	adj13	adj14	adj15	adj16	adj17	adj18	adj19
-2	**-2**	**-2**	**-2**	**-2**	**1**	**-1**	**-2**	**-1**	**2**	**0**
-1	**1**	**-1**	**-1**	**0**	**-2**	**-2**	**-2**	**-2**	**0**	**1**
-1	**0**	**-1**	**-1**	**0**	**-1**	**-1**	**-2**	**-1**	**1**	**-1**
0	**0**	**0**	**0**	**0**	**0**	**0**	**-2**	**0**	**0**	**0**
1	**1**	**1**	**1**	**1**	**1**	**-1**	**1**	**1**	**-1**	**-1**
0	**0**	**-1**	**0**	**0**	**-1**	**-2**	**-2**	**-1**	**0**	**0**
-1	**-1**	**-1**	**1**	**0**	**-2**	**-2**	**1**	**-1**	**1**	**0**
-2	**0**	**-1**	**0**	**0**	**-1**	**-1**	**1**	**0**	**-1**	**1**
-1	**-2**	**0**	**0**	**-2**	**-2**	**-1**	**-2**	**-2**	**0**	**0**
-1	**0**	**-1**	**0**	**-1**	**-2**	**-1**	**-1**	**-1**	**0**	**0**
1	**0**	**1**	**1**	**-1**	**-2**	**-2**	**0**	**-1**	**2**	**0**
5	1	6	2	2	0	1	1	2	0	2
1	1	0	0	1	1	5	5	5	1	6
0	0	0	0	0	1	4	0	2	2	2
6	**2**	**6**	**2**	**3**	**2**	**10**	**6**	**9**	**3**	**10**
4	**8**	**4**	**8**	**7**	**8**	**0**	**4**	**1**	**7**	**0**
	YES		**YES**	**YES**	**YES**				**YES**	
										YES

Table J.3 Category 3; Visual Qualities (n=11)

adj20	adj21	adj22	adj23	adj24	adj25	adj26	adj27	adj28	adj29	adj30
-1	-2	-2	-2	-2	2	0	-1	-2	-2	-2
0	-1	-1	-1	-2	2	2	-2	-2	2	0
-1	-1	-2	-1	-1	0	1	-1	-1	-2	-2
-2	-1	-2	-1	1	1	-1	0	0	1	-1
-1	-2	-2	-1	-2	1	1	-2	-2	-2	-1
-1	-1	-1	0	0	0	0	-1	0	-1	0
0	-1	-1	0	0	1	-1	-1	-2	-2	0
0	-1	-1	-1	1	0	0	-1	-1	-1	0
1	-2	-2	0	-1	0	2	1	1	-2	-1
-2	-2	-1	0	-1	0	-1	0	-1	-1	-1
-1	-1	-2	0	-1	-1	0	-2	0	-1	0
3	7	5	5	4	0	2	2	3	4	4
4	3	5	0	2	1	3	4	3	4	1
2	0	0	0	0	3	3	3	0	0	0
9	10	10	5	6	4	8	9	6	8	5
1	0	0	5	4	6	2	1	4	2	5
					YES					

Table J.4 Category 4; Personality Characteristics (n=14)

adj31	adj32	adj33	adj34	adj35	adj36	adj37	adj38	adj39	adj40	adj41	adj42	adj43	adj44
-2	-2	-2	0	0	0	-2	-2	0	0	-2	-2	-2	-2
0	0	-1	0	1	0	-2	-2	0	-2	0	1	1	-1
-1	0	-1	0	0	0	-1	-1	-2	-1	-2	-2	-2	-1
-2	-2	-2	0	-2	1	-2	-2	0	-1	-2	-1	-2	1
-1	-1	0	-1	1	1	-2	-2	2	2	-1	-1	-1	-1
0	0	-1	0	-1	-1	0	-2	0	0	0	0	0	0
-2	-2	-2	1	-2	-2	-2	-2	2	1	-1	-1	-2	-2
-1	-1	0	0	0	0	-1	1	0	1	1	-1	-1	0
-1	-2	-2	0	0	-1	-2	-2	1	0	-2	-2	-2	0
-2	-1	-1	0	-1	-1	-1	-2	-1	-1	-2	-1	-2	-2
-2	-1	0	0	-2	-1	-1	0	1	0	-1	-1	-1	-1
4	4	4	1	2	2	4	1	2	2	3	6	3	4
4	3	3	8	3	3	5	7	4	3	4	2	5	2
0	0	0	1	2	4	0	0	1	3	0	0	0	0
8	7	7	10	7	9	9	8	7	8	7	8	8	6
2	3	3	0	3	1	1	2	3	2	3	2	2	4
			YES				YES						