

EXPLORING INTEREST EVOKED BY PRODUCT APPEARANCE

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AYBIKE TAMER

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Approval of the thesis:

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submitted by **AYBİKE TAMER** in partial fulfillment of the requirements for the degree of **Master of Science in Industrial Design Department, Middle East Technical University** by,

Prof. Dr. Canan Özgen
Dean, Graduate School of **Natural and Applied Sciences** _____

Assoc. Prof. Dr. Gülay Hasdoğan
Head of Department, **Industrial Design** _____

Assoc. Prof. Dr. Çiğdem Erbuğ
Supervisor, **Industrial Design Dept., METU** _____

Examining Committee Members:

Assoc. Prof. Dr. Mehmet Asatekin
Industrial Design Dept., METU _____

Assoc. Prof. Dr. Çiğdem Erbuğ
Industrial Design Dept., METU _____

Dr. Hakan Gürsu
Industrial Design Dept., METU _____

Dr. Canan E. Ünlü
Industrial Design Dept., METU _____

M.Sc. Aydın Öztoprak _____

Date: December 29, 2008

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Last Name: Aybike Tamer

Signature :

ABSTRACT

EXPLORING INTEREST EVOKED BY PRODUCT APPEARANCE

Tamer, Aybike

M.Sc. Department of Industrial Design

Supervisor: Assoc. Prof. Dr. Çiğdem Erbuğ

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Interest is a psychological construct characterized by an explorative tendency towards a stimulus. Product appearance, on the other hand, is an important aspect determining the first impression about products and highly influential on users' psychological and behavioral responses, accordingly. In this study, interest evoked by product appearance is explored with an emphasis on visual qualities of products associated with interestingness. This thesis involves arguments from literature and an empirical study.

Keywords: Interest, Interestingness, Visual Qualities, Product Appearance

ÖZ

ÜRÜN DIŞ GÖRÜNÜŞLERİNİN UYANDIRDIĞI İLGİ DUYGUSUNUN İNCELENMESİ

Tamer, Aybike

M.Sc. Endüstri Ürünleri Tasarımı

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İlgi, uyarıcı bir unsura yönelik araştırma amaçlı psikolojik bir kavram olarak tanımlanabilir. Ürün dış görünüşü de kullanıcıların ürün hakkındaki ilk izlenimlerini belirleyen ve dolayısıyla onların ürünlere karşı psikolojik ve davranışsal tepkilerinde çok etkili bir özelliktir. Bu çalışmada ürün dış görünüşü tarafından uyandırılan ilgi duygusu, ürünlerin görsel kaliteleriyle ilişkilendirilen ilgi çekicilik kavramına vurgu yapılarak araştırılmıştır. Bu tez, literatürde geçen tartışmalar ve ampirik bir araştırma içermektedir.

Anahtar Kelimeler: İlgi, İlgi çekicilik, Görsel Kaliteler, Ürün Dış Görünüşü

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CHAPTER 1

INTRODUCTION

1.1 Scope of the Study

Product appearance is an important determinant of a product's success on the market by providing the opportunity to be distinguished among the alternatives (Bloch, 1995; Hekkert, Snelders & van Wieringen, 2003). People encounter numerous products in their everyday lives. Naturally, it is impossible for them to attend to all of them. Thus, some are left not registered. It is suggested that people attend more to interesting stimuli (Coates, 2003; Schimmack, 2005). Apart from catching attention, the role of interestingness as a quality can be explained as sustaining attention resulting with a deeper processing of the so called stimuli.

Interestingness, like other qualities, can be communicated by an object or to be more specific by a designed product, through its appearance. In fact, usually the first encounter with a product takes place through its appearance affecting the first impression about the product (Berkowitz, 1987; Bloch, 1995; Pilditch, 1976, in Creusen & Schoormans, 2005). Of course, this impression is not limited with the product's aesthetics but function and usability related aspects are also communicated by product appearance. Moreover, people tend to attach several symbolic meanings to products based on their appearance characteristics (Crilly, Moultrie & Clarkson, 2004). Communicating such comprehensive information about the products, their appearance can said to be highly influential on the psychological responses towards products. These may result with positive and negative tendencies; and interest as a psychological state can be claimed as one of them providing an approach urge towards products and worth investigating in product design domain.

As expressed in the previous paragraph, product appearance can be viewed as a means for communication between designers and users through visual interaction. During the design process product designers create the form of the product by manipulating several physical determinants such as line, shape, proportion, dimension, color or material with certain intentions in mind. However, the users' interpretations, about the product appearance may be different than what is intended due to the multidimensional nature of the visual interaction. Briefly, certain contextual factors as well as personal differences can be stated as the causes of this multidimensionality (Coates, 2003; Crilly et al., 2004). Despite its multidimensional nature several commonalities can also be talked about regarding users' response to product appearance (e.g. objective concinnity, appraisal patterns). These will be covered in the next two chapters while reviewing the related literature.

1.2 Aim of the Study

Having briefly mentioned about the significance of interestingness as a visual product quality as well interest as a psychological state and also the role of product appearance in communicating information about the product; the objective of this study is to explore the dimensions of interest evoked by product appearance. Focusing on the product appearance related dimensions, the main research question to be answered can be stated as;

What makes products appear to be interesting?

The following sub-questions are also intended to be answered in this study;

- What are the approaches to interest as a construct in psychology literature?
- What are the dimensions of users' responses to product appearance?
- What kinds of visual qualities of products are associated with interestingness?
- Which physical parts of the products are considered as interesting?
- How do the visual qualities associated with interestingness differ among different product groups?

1.3 Structure of the Study

In order to answer the suggested research questions, the structure of the thesis is formalized as follows:

Chapter 2 is dedicated to the research on interest in psychology literature. The approaches and studies to the interest construct in different fields of psychology are covered in this chapter. A special focus is given on appraisal theories and the suggested appraisal dimensions of interest.

Chapter 3 reviews the product appearance related literature in the scope of suggested frameworks.

Chapter 4 and 5 present an empirical study exploring product appearance characteristics associated with interestingness. This study involves collecting two main types of data. The first is the verbal statements of the participants on their evaluations of the product images and the second one is the trackings of their gaze behavior on the product images to see which physical parts of the products evoke interest.

The last chapter aims at providing an understanding of interest in relation to product appearance, based on what has been discussed in the literature and the findings of the empirical study.

Figure 1.1 illustrates the relations between the chapters, research questions and the selected methods to provide answers to the questions.

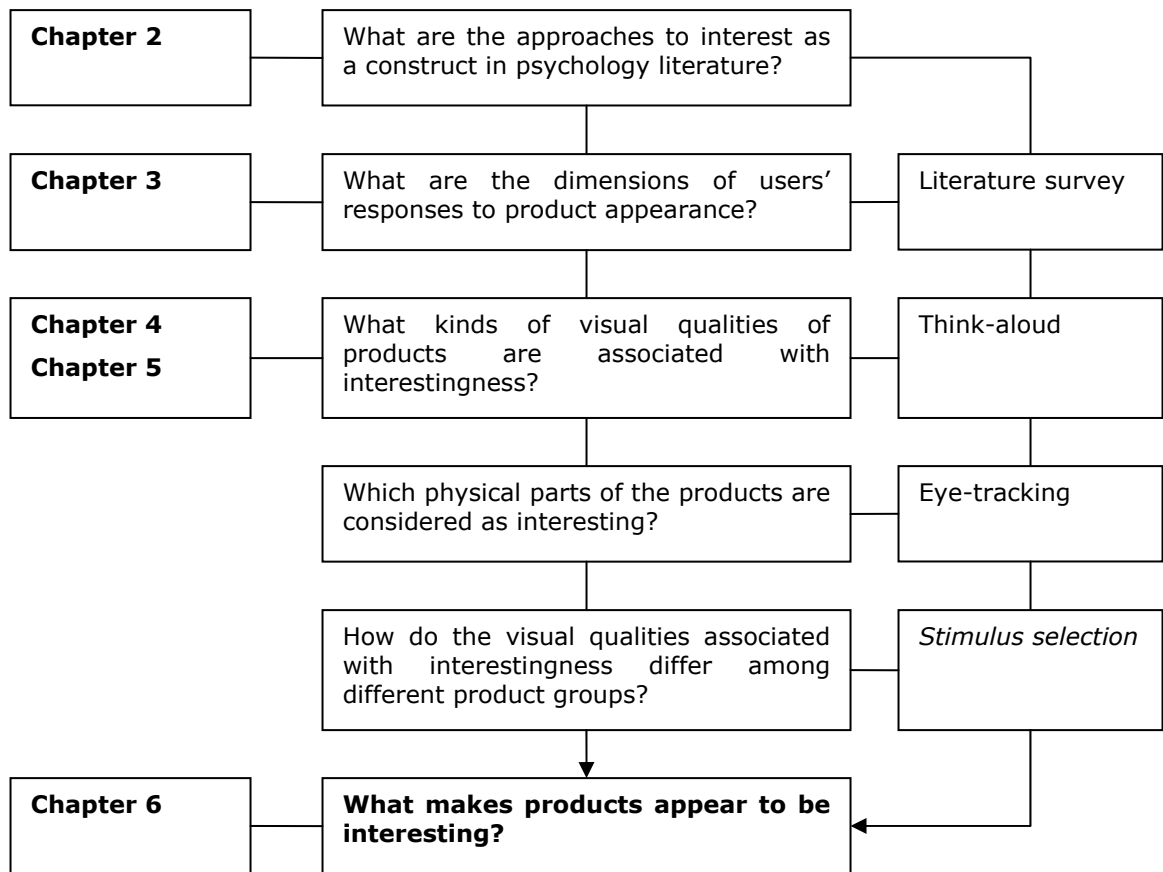


Figure 1.1 Structure of the study

CHAPTER 2

WHAT IS INTEREST?

This chapter aims at presenting an understanding of the interest construct based on a literature review. First, the dictionary definitions of the term are briefly introduced. Then, the different approaches to the concept of interest discussed in psychology literature are overviewed starting with interestingness as a stimulus characteristic and the discussions about interest as an emotion. The appraisal patterns suggested for the emotion of interest are also reviewed. Finally, interest related discussions in Design and Emotion literature are brought about.

2.1 Dictionary Definition of Interest

Interest is a word that we use very frequently in our everyday lives referring several meanings. Besides the totally irrelevant ones from fields like finance and law, the term can be used as a synonym of *sake* and *pastime*. However, the definition of *interest* in *WordNet® 3.0* online dictionary by Princeton University as "*a sense of concern with and curiosity about someone or something*" will be referred to in this thesis. The term **interestingness** as a quality of being interesting defined as "*the power of attracting or holding one's attention*" will also be in the scope (<http://dictionary.reference.com/browse/interest>).

2.2 Interest in Psychology Literature

Interest has been being studied by psychologists since the 19th century. Its contribution to attention and remembrance was first mentioned by Ebbinghaus (1885/1964, in Hidi, 2006) and James (1890, in Hidi, 2006). John Dewey (1913, in Hidi, 2006) brought about interest's role on learning. Since then, interest has been in the scope of educational psychology. The accumulation of knowledge on

interest construct in this field of research stands for a valuable guidance for other fields as well.

In the recent theories of interest in educational psychology, mainly two conceptions of interest are discussed as personal and situational (Schiefele, 1991; Schraw & Lehman, 2001; Chen, Darst, & Pangrazzi, 2001; Hidi, 2006).

Personal interest, also called individual interest, refers to dispositions specific to individuals that are relatively stable and developed over time. When personal interests are considered, the object of interest may be a topic, a subject or an activity. **Situational interest**, on the other hand, is claimed to be context-related, momentary and evoked by the things in the environment depending on their characteristics (Atthansou, 1998). Situational interest can also be defined as the actual psychological state of 'being interested' and is characterized by an affective reaction and focused attention as well as increased cognitive functioning and persistence (Hidi, 2006; Krapp 2007).

Krapp (2007) suggests interest as a phenomenon caused by a person's interaction with his or her environment. The framework proposed by Krapp, Hidi and Renniger (1992) illustrates the dimensions of this interaction (see Figure 2.1). To briefly explain, the individual (or personal) interest as a predisposition of the person can arouse interest during an interaction with an object of interest. This state is referred as the actualized individual interest. Similarly an interesting characteristic of the environment itself or an element in the environment may lead to arousal of interest which is called situational interest.

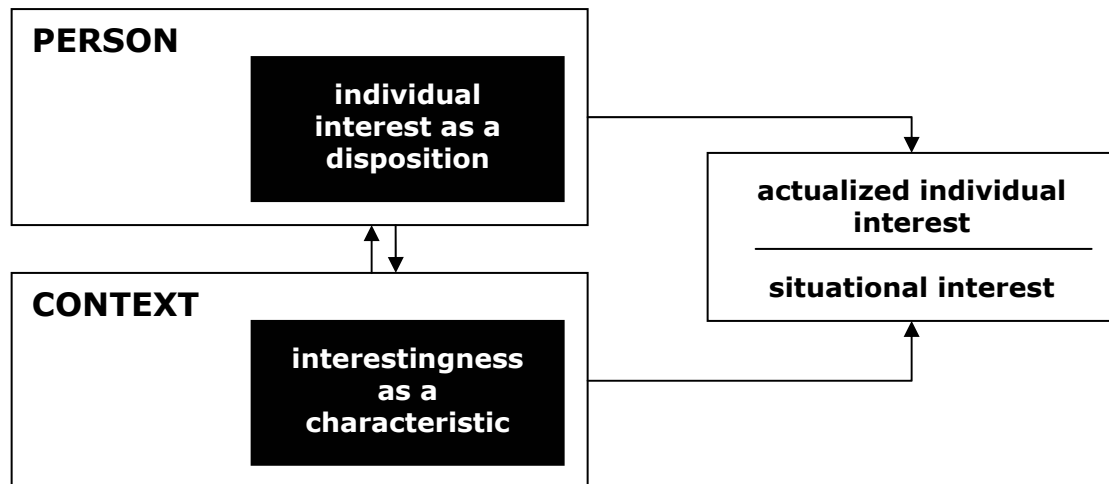


Figure 2.1 Typical interpretations of interest (adopted from Krapp et al., 1992)

Similar to personal and situational interest, Silvia (2001) suggests a distinction with the terms ***interest*** and ***interests***. Acknowledging theories of Tomkins (1962) and Fredrickson (1998), he claims interest as a basic emotion playing an important role in long-term development of human beings by cultivating knowledge throughout life. By Silvia's definition, interest as an emotion refers to the previously mentioned psychological state of interest, actualized individual interest or situational interest as a state. Interests, on the other hand, refer to personal (or individual) interests. Besides interests' potential role in eliciting interest as an emotion, Silvia (2001) asserts that the emotional interest is fundamental in development and sustaining of interests.

In relation to the previously mentioned conceptualizations, the focus of this thesis can be clarified as **situational interest evoked by the interesting characteristics of the product**. To put it out differently, *individual interest* as a disposition or by Silvia's categorization *interests* is not in the scope of this thesis, neither is actualized individual interest as a psychological state.

2.2.1 Curiosity and Interest

Curiosity, also referred in dictionary definitions, is a frequently mentioned about construct within research on interest. Thus, how this term is related to and different from the interest can aid to clarify understanding of this taken for granted yet vague construct.

Similar to interest, different conceptualizations of curiosity can be found in different fields of psychology. Silvia (2006), points out the fact that the terms interest and curiosity are used interchangeably by some researchers resulting with a considerable amount of work related to the psychology of interest under the name curiosity. He gives Daniel E. Berlyne as an example, whose empirical and theoretical studies stand for an important contribution to research on curiosity.

Suggesting curiosity was innate but also could be acquired, Berlyne (1954) categorized curiosity into two as epistemic and perceptual. Epistemic curiosity by the author's definition was a "*drive to know*" (p.187) that motivates people to learn what is not known. Perceptual curiosity, on the other hand, was suggested to be towards a certain stimulus resulting with increased perception of it. In relation to this second type of curiosity, he proposed novelty, uncertainty, challenge, complexity and conflict or what he calls collative variables to explain stimulus selection process and motivation. (Berlyne, 1954, in Reio, Petrosko, Wiswell, & Thongsukmag, 2006).

Briefly, these variables are suggested to have a curvilinear relationship to curiosity (or interest) where exploratory activity is the indicator. In other words, a novel, uncertain or complex situation (or an object) may elicit curiosity resulting with explorative activity. Too much uncertainty, however, may result with eliciting fear while too little of it with boredom (Silvia, 2006).

Berlyne (1960) has also distinguished curiosity in relation to exploratory behavior. He suggested that, specific curiosity (or exploration) aroused due to a lack of information and was associated with information seeking. Diverse curiosity (or exploration) on the other hand was about exploration for novel stimuli. Both of

these contribute to the optimization of the level of arousal (Reio, Petrosko, Wiswell, & Thongsukmag, 2006).

Another categorization of curiosity in literature is state and trait curiosity (Boyle, 1983). Litman and Jimerson (2004) suggested two types of trait curiosity as curiosity as a feeling-of-interest and curiosity as a feeling-of-deprivation. The authors claimed the former be associated with the pleasant feeling of discovering new information whereas the latter with the unpleasant feeling of tension and frustration (Litman, 2005; Litman & Silvia, 2006). It should be noted that, the difference between these two types of curiosity resembles the difference between epistemic and perceptual curiosity as well as individual and situational interest (see Table 2.1). These resemblances, however, were not compared and contrasted in detail in any of these studies.

Table 2.1 Different conceptualizations of curiosity in relation to interest

	Berlyne (1954)*	Berlyne (1960)	Boyle (1983)	Litman & Jimerson (2004)
Individual Interest	Epistemic Curiosity	Diversive Curiosity	Trait Curiosity	Curiosity as a feeling of interest (+) Curiosity as a feeling of deprivation (-)
Situational Interest	Perceptual Curiosity	Specific Curiosity	State Curiosity	

*Berlyne (1954) cited in Reio, Petrosko, Wiswell, & Thongsukmag (2006)

Briefly reviewing several theories about curiosity, the argument about the relation between curiosity and interest closest to the current study's perspective can be stated as Hidi and Anderson's (1992). Focusing on the psychology of learning and development, the authors claimed specific curiosity and situational interest be

similar constructs with a few differences. They were similar by both motivating people to interact with the environment for new information and also being strongly influenced by the environmental factors, namely the collative variables. However, the authors claimed that elicitation of interest was not limited with collative variables. They suggested that some content-specific text qualities, for example, could elicit text-based interest as well. Regarding this suggestion, situational interest was assumed to be a broader concept involving specific curiosity. The interesting product qualities in addition to collative variables are yet to be explored.

2.2.2 Interestingness as a Stimulus Characteristic

Interestingness was defined as a stimulus characteristic leading to elicitation of situational interest. A review of the discussed qualities of different visual stimuli such as visual patterns, works of art and also web pages associated with interestingness as well the conducted methodologies for their assessment was assumed to provide an insight about what makes products appear to be interesting.

Besides his studies on curiosity, Berlyne (1971) in his book *Aesthetics and Psychobiology*, suggested collative variables as one of the three dimensions contributing to the hedonic value of works of art. The author mentioned about several studies, in the scope of which he calls experimental aesthetics. These studies suggested some perspectives on the collative variables and especially about complexity and novelty in relation to pleasingness, interestingness and exploratory activity.

During the studies, subjective evaluations in terms of ratings and verbal reporting were gathered as well as the exploratory activity was observed such as the time spent on viewing. Berlyne (1971) mentioned about three different techniques to detect the time spent on looking at patterns without any motivation such as being asked to recall. These techniques, which were especially used in connection with complexity, are:

1. Key press control by the subject of a tachistoscope which exposes the pattern for an extremely short period (Berlyne, 1957, in Berlyne, 1971).

2. Displaying pairs of patterns side by side on the same screen and detecting the fixations on each one either by observation or recording (Berlyne, 1958, in Berlyne, 1971).
3. Button control by the subject to change the patterns over an automatic projector (Berlyne & Lawrence, 1964, in Berlyne, 1971).

Complexity

As study material Berlyne (1971) used several pairs of patterns sampling different variables related with complexity. These variables were irregularity of arrangement, amount of material, heterogeneity of elements, irregularity of shape, number of independent units, asymmetry and random redistribution. The pairs, which were called Berlyne patterns, involved two opposite samples with respect to the so called variables. Having conducted several experiments using these patterns with the previously mentioned techniques, Berlyne acclaimed a positive relation between the time spent viewing and complexity as well as time spent viewing and interestingness (Berlyne, 1971).

An overview into Berlyne's studies about complexity, it can be said that the relations among complexity, pleasingness and interestingness are very complicated. However, at some particular levels of complexity both high levels of pleasingness and interestingness can be observed. The increase in complexity, on the other hand, may bring about sharp declining of pleasingness while interestingness may continue to increase to a certain extent. The findings about some simple structures being evaluated as highly pleasing but uninteresting also illustrate the difference between interestingness and pleasingness.

Novelty

Berlyne and Parham (1968) manipulated shape and color trait of the stimuli patterns in an experiment about subjective novelty and suggested three findings in relation to repetition and resemblance showing how relative judgments about novelty could be (Berlyne, 1971);

- *Subjective novelty declines gradually as a stimulus is repeated several times in succession.*

- *A stimulus is rated less novel when it resembles one that has been perceived within the last few minutes than when it was not.*
- *A stimulus is rated more novel the more it differs from what has just been experienced.*

(in Berlyne, 1971, p. 187)

It was also acknowledged that, exploratory behavior suggested as the time spent looking at pictures measured by using the previously mentioned second technique, was positively correlated with novelty manipulated by repetition (Berlyne, 1958, in Berlyne, 1971). In another study using colored shapes as stimuli, the judgments of pleasingness and interestingness were reported to be both declining with repetition (Berlyne, 1970, in Berlyne, 1971). This finding can be interpreted as a positive correlation between novelty and both interestingness and pleasingness.

Knight and Pandir (2004) adopted Berlyne's (1971) experimental aesthetics approach to evaluate website homepages. Their study involved the screenshots of twelve home pages being evaluated by twelve subjects in terms of complexity, interestingness and pleasingness. The selected stimuli, which contained shapes and text together, were presented on color cards. The study procedure involved the subjects' sorting out the cards with respect to the previously mentioned variables and also reporting their reasoning. Table 2.2 shows the identified descriptors about the homepages in relation to the three variables.

Table 2.2 The descriptors identified in the study

Variable	Identified descriptors
The most interesting	<ul style="list-style-type: none"> • Appealing • Original • Intriguing • Minimal
The least interesting	<ul style="list-style-type: none"> • Unsurprising • Establishment • Expected • Confusing
The most pleasing	<ul style="list-style-type: none"> • Balanced • Stylish • Intriguing • Restrained
The most complex	<ul style="list-style-type: none"> • Overpowering • Intense • Daunting • Unordered

It was reported that, the results showed some similarities to Berlyne's (1971) findings with respect to the relation among the collative variables. The most pleasing home page was not the most or least interesting. The least pleasing homepage was not the least interesting, either. It was observed that after an initial fall in interestingness when pleasingness increases they both peak. Then pleasingness decreases as interestingness increases. It can be seen in Table 2.2 that '*appealing*' as a pleasant quality is involved in the descriptors of the most interesting home page.

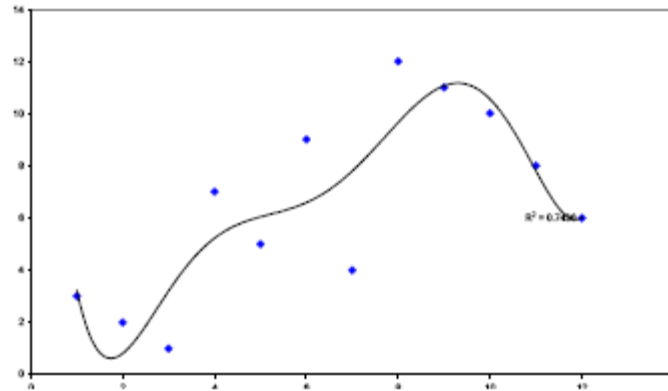


Figure 2.2 The relation between interestingness (y-axis) and pleasingness (x-axis) (Knight & Pandir, 2004)

The relation between interestingness and complexity in the study was observed to be negatively correlated. A peak in interestingness was observed as complexity increases and then it sharply decreases. Naturally, the most complex page was not the most interesting one. '*Minimal*' as a contradictory quality to complexity was involved in the four descriptors of the most interesting homepage.

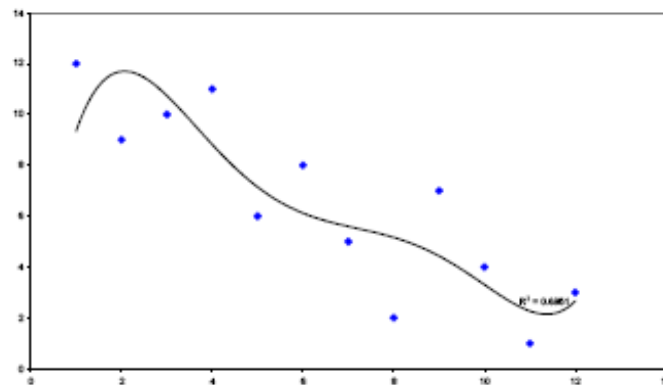


Figure 2.3 The relation between interestingness (y-axis) and complexity (x-axis) (Knight & Pandir, 2004)

Besides the relations between the collative variables, the authors suggested that the aesthetic experience of the homepages should be investigated in terms of

accessibility, usability, engagability and benefiance as an extension to the collative variables. This suggestion underlines how the type of stimuli affects people's responses.

Another empirical investigation into the interesting qualities of websites involved asking the subjects their favorite website and interviewing about their intriguing properties. This procedure was followed by a contextual inquiry while browsing the chosen website. Although not explicitly mentioned or defined, the term '*intriguing*' referred in this study can be claimed more or less synonymous with '*interesting*'. Since the evaluated website was the subject's favorite, interestingness (or intriguingness) can said to be regarded as a positive quality (Tsai, Chang, & Chen, 2006).

The browsing of the websites was conceptualized as four steps, namely arousal, attention, exploration and participation. Adding to that, the analysis of the interviews resulted with identifying intriguing properties of websites in relation to these four steps. The authors argued that the first impression about the websites were dependant on variables such as its type, visual style and overall atmosphere which may result with arousal and preference, accordingly. Then the properties of the website such as the used colors, included graphics, information and music were said to visually attract and hold the attention. The following two steps refer to actually browsing and wanting to further interact with the website in relation to changeable and unexpected, fun related features such as dynamic interfaces (variability), satisfying usability related concerns (dominance). Lastly the ability to answer social and personal needs such as communicating with others, uploading and downloading (services) may lead to engagement with the website (see Figure 2.5).

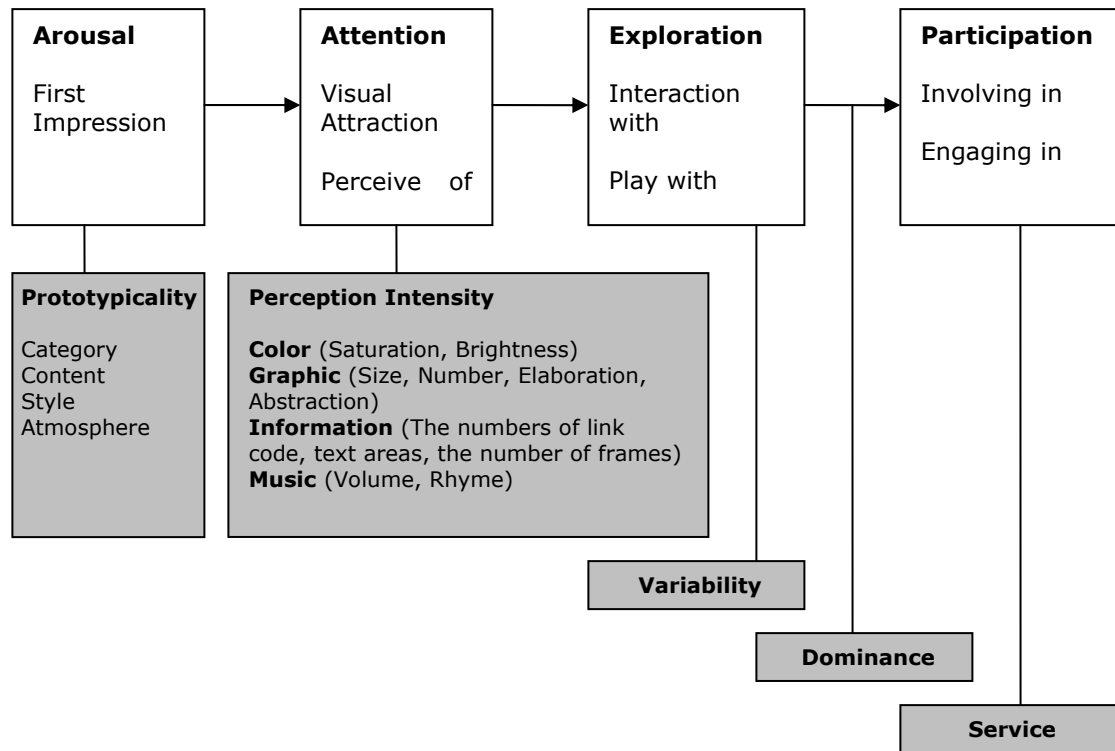


Figure 2.4 The relation between intriguing properties and browsing behavior of the websites (modified from Tsai, Chang & Chen, 2006)

Although this thesis is just concerned with visual interaction, the framework suggested in this study exemplifies how understanding of interestingness changes among different types of interaction with the same stimuli. The suggested framework for the website can also be modified for products for further studies. The overviewed steps can be interpreted as the evoked arousal turning to sustained attention may lead to engagement with the stimuli if combined with satisfaction and enjoyment.

2.2.3 Interest as an Emotion

Whether interest is an emotion or not constitutes an unconcluded discussion among emotion theorists. Izard (1971; 1977), Tomkins (1962) and Frijda (1986), for example, include interest in their basic emotion lists. Darwin (1872/1998), Carver

and Scheirer (1998), Lazarus (1991), Oatley and Johnson-Laird (1996), Ortony, Clore, and Collins (1988) and Ekman (1992), on the other hand, do not view interest as an emotion (Silvia, 2001). The fact that interest is included or not included in emotion lists can be explained by the different approaches and criteria determined to define emotions. Ortony and Turner (1990) argue that, a state should be affectively valenced to be called as an emotion. Interest, however, is more like a motivational state or a basic desire by their definition. From this point of view it is not possible to claim the state of interest either positive or negative, which is why the authors do not consider interest as an emotion. Silvia (2001), whose studies on interest will be mentioned later in much detail, suggests Griffith's (1997) emotion definition as "a psychological and biological category with a constellation of features, no single one of which is sufficient for its taxonomic classification as an emotion". Izard (1977) brought about several criteria to determine fundamental emotions as having distinct and specific facial movements or expression, organizing and motivational properties and possessing a distinct and specific feeling that achieves awareness. Similarly, Scherer (2005) remarked five modalities of emotions as expression, bodily symptoms and arousal, subjective experience, action tendencies and appraisals. There are several studies in literature regarding one of the above mentioned criteria to support interest as an emotion.

Physiological Hallmarks of Interest

To start with the physiological aspects or what Scherer calls bodily symptoms, Izard (1971) suggested that interest has a unique facial expression without relying on solid empirical evidence. Reeve (1993) investigated interest-associated behaviors in an empirical study, during which the participants were recorded while watching interesting and uninteresting films. The results showed that closing of the eyes, number and duration of the eye glances, widening of the eyelids, parting of the lips, exposed eyeball surface and head stillness were associated with interest. Before Reeve's investigation, some other researchers suggested that facial and physiological movements referring interest were observed in new born babies (Izard, 1977; Langsdorf, Izard, Rayias, & Hembre, 1983, in Silvia, 2001). The fact that signs of interest can be observed in new born babies is also related with another aspect of interest as an emotion that is its motivational component.

Function and Action Tendencies of Interest

Tomkins (1962) mentions about interest's function to divert people to the "*new, uncertain and complex aspects of the world*" resulting with accumulation of knowledge and skills, as well as engagement with the world (Silvia, 2001).

Subjective Feeling of Interest

Izard (1977) relates "*what it feels like to be interested*" with feelings of being engaged, caught-up, fascinated and curious. The feelings of willingness to explore, becoming involved and expanding oneself with new information or experiences offered by the object of interest are also asserted by the author related with the subjective feeling of interest. Furthermore, in the case of experiencing intense interest or excitement, a person is said to be feeling *alive* and *active*.

Appraisal Structure of Interest

Appraisal theories stand for another approach to emotions aiming at understanding how emotions are evoked. The concept of appraisal was first proposed by Magda Arnold (1960) and followed by some other researchers such as Roseman, 1979; Scherer, 1984; Frijda, 1986; Ortony, Clore, & Collins, 1988 and Smith & Lazarus, 1990 (Kappas, 2006). Arnold (1960) pointed out that objects (or events) around were evaluated with regard to one's values, concerns, and wishes resulting with elicitation of emotions (Kappas, 2006).

Basically, appraisals can be defined as the so called evaluations. Apart from having certain differences, appraisal theories suggest that a distinct emotion is evoked by a distinct set of appraisals. In other words, when the same appraisal pattern is evoked, the same emotion will be evoked no matter what the event is. Furthermore, the same event may be appraised differently resulting with elicitation of a different emotion by different subjects as well as the same subject at different times (Turner, 2006).

Having briefly explained what appraisal theories are about, there are a few studies on the appraisal patterns of interest. Smith and Ellsworth (1985) proposed eight appraisals to differentiate 15 emotions they had identified (e.g., happiness, interest, sadness, fear, disgust, surprise, and guilt). These appraisals are:

pleasantness,
anticipated effort,
attentional activity,
certainty,
responsibility,
control,
legitimacy and
perceived obstacle

In their study, they asked the participants to recall a past experience for each emotion and rate the proposed dimensions with respect to that experience. The results of this study showed that interest, which was assumed to be a positive emotion by the authors, was associated with *high pleasantness, high attentional activity* and *moderate certainty*. Another study performed by Ellsworth and Smith (1988a) was mainly on the unpleasant experiences of the subjects. Although considered to be positive, interest was reported to be experienced by a considerable number of people under unpleasant situations. The appraisals of interest identified in this study were *importance* and *attentional activity*. The authors stated that, although it was associated with interest *importance* was not a necessary criterion to elicit interest. Ellsworth and Smith (1988b) conducted a third study focusing on the positive emotions in their list. This time, interest was found to be distinguished by the appraisals of *pleasantness* and *high attentional activity* leaving *certainty* out. The criticism on the studies of Smith and Ellsworth (1985) and Ellsworth and Smith (1988a, 1988b) is that they were based on the self reports of the participants about their past memories associated with 15 emotions (Silvia, 2005). Turner (2006) also mentioned the problem about interpretation as the term '*interest*' might refer to enjoyment in everyday speech and the participants might have responded in that way.

Another appraisal structure of interest was proposed by Silvia (2005; 2006) who has focused on interest but other emotions in his study. This appraisal structure involved two components as appraisal of *novelty-complexity* and appraisal of *coping potential*.

Relying on Scherer (2001) and Berlyne's (1960) studies, Silvia (2005; 2006) explained *appraisal of novelty-complexity* as "*appraising something as new, ambiguous, complex, obscure, uncertain, mysterious, contradictory, unexpected, or otherwise not understood*". *Coping potential*, when appraisal of interest is considered, refers to one's ability to understand the novel and complex thing or situation. In short, Silvia (2005) suggested that interest towards a stimulus was evoked when a person found it novel and complex as well as himself to be able to understand it.

Four experiments were conducted to test this proposed structure. In the first experiment polygons varying in complexity were used as stimuli and half of the participants were asked to choose 'the most interesting' polygon while the others 'the most enjoyable' (the most pleasant) one. Coping potential was measured by self reporting the ability to understand abstract art. The results illustrated a correlation between coping potential and choice of complex polygons as interesting. Complexity, however, did not predict enjoyment supporting the hypothesis of the author. The second experiment was performed to gather more reliable data on coping potential than self-reports. The participants were asked to rate several statements measuring interest and ability to understand about an abstract poem. Half of the participants received information about the meaning of the poem, while the others did not. The poem was reported be more interesting by the participants who were in the high-ability condition. The third experiment focused on the appraisals of ability and complexity using visual arts as stimuli. People rated interestingness, comprehensibility and complexity of the stimuli varying in complexity. The results showed that appraised ability to understand was related to interest when the stimulus was appraised as complex. For the pictures appraised as simple, such a relation was not documented. The last experiment took viewing time as an indicator of interest instead of self-reported ratings. This study, in which polygons in different complexities (different number of sides) were used, showed that viewing time was longer for the complex polygons for the people high in appraised ability to understand. Having supported the appraisal proposal for interest with these four experiments, Silvia (2005) argues that it has some common aspects with the previously suggested appraisals (Smith & Ellsworth, 1985; Ellsworth & Smith 1988a; 1988b). Although not included in his appraisal model, he claims

attentional activity related to the entire appraisal dimensions he suggests. From a broad perspective, he says that something appraised as complex or novel, but has a potential to be understood would likely to be appraised as worth spending effort on.

Turner (2006) compared the previously mentioned two appraisal patterns of interest in an empirical study. The author claimed '*appraisal of pleasantness*' as the most significant difference between the two models. Two experiments were conducted to test the relevancy of pleasantness with interest. In the first experiment, the participants were asked to evaluate copies of classic and contemporary art paintings. The rating scale involved statements about interest, enjoyment, appraisal of novelty-complexity and disturbingness. The second experiment followed a similar procedure except that viewing time was also measured as a behavioral indicator of interest. The findings were parallel to Silvia's, as appraisals of coping potential and complexity predicted interest. In contrast to Smith and Ellsworth (1985), pleasantness was found to be peripheral but not in the central appraisal pattern of interest. The fact that the paintings evaluated as disturbing were also evaluated as interesting supported that proposal, proving pleasantness not a necessary condition to elicit interest.

2.2.4 Interest in Design and Emotion Literature

Pieter Desmet's thesis, *Designing Emotions* (Desmet, 2002), is one of the building block studies on emotions elicited by products. The author proposes a theoretical model to explain how emotions are evoked by products. Based on appraisal theories, Desmet's (2002) model aims to illustrate the universal principles of product emotions (see Figure 2.5).

The model implies that people have concerns which can be categorized as attitudes, goals and standards. Goals are defined as 'things we want to see happen', and standards as 'how we think things ought to be', attitudes, on the other hand, are 'our dispositional likings or dislikings'. The stimulus is appraised with relation to one's concerns and an emotion is evoked. During this appraisal process, if there is a match between the stimulus and the related concern (goal, standard or attitude) a

positive emotion is evoked. Parallel to that, if there is a mismatch the elicited emotion will be negative (Desmet, 2002).

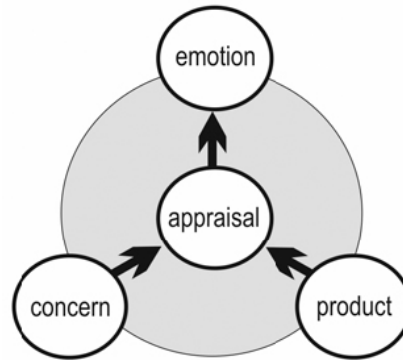


Figure 2.5 Basic model of product emotions (Desmet, 2002)

Within this research leading to a measurement tool for product emotions, Desmet (2002) identifies 7 pleasant (*desire, fascination, admiration, satisfaction, pleasant surprise, inspiration and amusement*) and 7 unpleasant emotions (*contempt, boredom, disgust, indignation, disappointment, dissatisfaction and unpleasant surprise*) and 4 appraisal types (*appealingness, motive compliance, legitimacy and novelty*) related to products. Having not included interest in his list, Desmet mentions about '*interestingness*' as an aspect of products and suggests fascination (+) and boredom (–) as relevant emotions. He refers to Frijda (1986) who assumes 'the need of curiosity' as the underlying concern in the elicitation of fascination. To explain this process with reference to the theoretical model; fascination evokes when a certain aspect of a product matches our need of curiosity or what he calls '*the need for stimulation*'. Then the question becomes "what are those aspects that might match this basic need?" Desmet (2002) claims that, those which do not fit in any of our mental representations require further exploration to find or develop a matching one. In other words, a product or a certain aspect of a product appraised as '*unfamiliar*' matches our need to explore and evokes fascination. Despite putting appraisal of '*unfamiliarity*' in the center, Desmet (2002) notes the insufficiency of it to explain the elicitation of fascination.

In another study Desmet (2003) proposes a classification of product emotions in relation to the underlying concerns and appraisals. The author's classification involves 5 classes of emotions as surprise, instrumental, aesthetic, social and interest (see Figure 2.6).

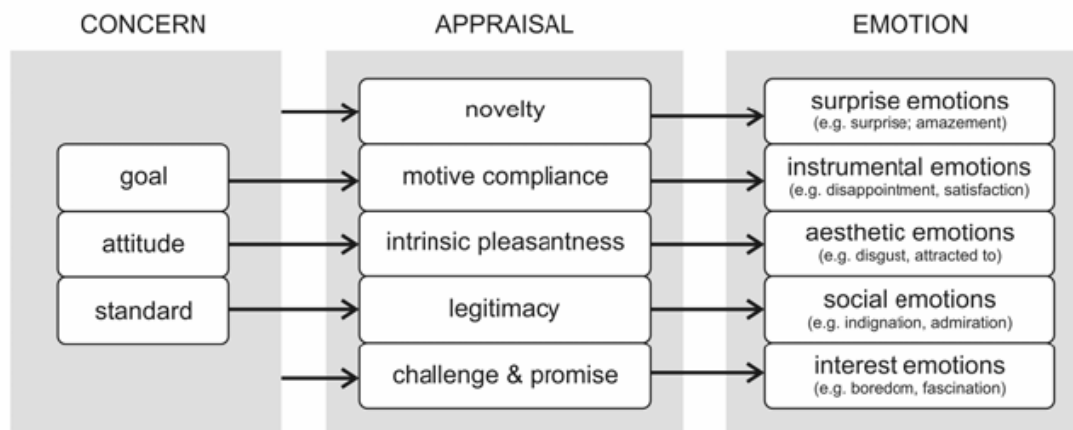


Figure 2.6 Classification of product emotions (Desmet, 2003)

Fascination, boredom and inspiration are given as examples of interest emotions and they are related with the appraisals of challenge and promise (Tan, 2000, in Desmet, 2003). These appraisal dimensions, having commonalities with Silvia's proposal of novelty-complexity and coping potential, can said to be more sufficient to explain the process compared to unfamiliarity.

Table 2.3 illustrates the proposed appraisal dimensions for interest addressed in this chapter. The ones put in the same row are considered to be referring to similar notions. For example, moderate certainty, promise and coping potential are related with a person's ability to understand. However, unfamiliarity, challenge and novelty are more arousal related appraisals.

Table 2.3 Proposed appraisal dimensions for interest

Smith & Ellsworth (1985)	Ellsworth & Smith (1988)	Tan (2000)*	Desmet (2002)**	Silvia (2005)
Pleasantness	Pleasantness	-	-	-
High Effort	-	-	-	-
Moderate Certainty	-	Promise	-	Coping Potential
Attentional activity	Attentional Activity	-	-	-
-	-	Challenge	Unfamiliarity	Novelty & Complexity

*for fascination, boredom & inspiration (appraisal dimensions suggested by Tan, 2000, in Desmet, 2003)

** for fascination

CHAPTER 3

VISUAL INTERACTION WITH PRODUCTS

In the previous chapter different views on interest as an outcome of a person's interaction with his or her environment were presented. Since the type of interaction focused on in this study is only visual, the dimensions of visual interaction with products will be introduced in this chapter. Product form, different types of user responses and the contextual factors affecting the interaction can be stated as the main dimensions to be reviewed in the following sections.

3.1 Background

The user-product interaction can be interpreted as a process of communication between the designers and users. theory on communication This process can be explained as the transmission of a message from a '*source*' to its '*destination*'. During this process, the message is encoded to a signal, transmitted through a channel and decoded by a receiver (Shannon, 1948, in Crilly, Moultrie & Clarkson, 2004).

When the user-product interaction is considered, the design team stands for the '*source*' and product the '*transmitter*' of the message. The environment where the interaction takes place matches the '*channel*' the message is transmitted through. The user, on the other hand, covers both the role of the '*receiver*' by perceiving the attributes of the product and the destination by responding to the perceived stimuli (Monö, 1997, in Crilly et al., 2004).

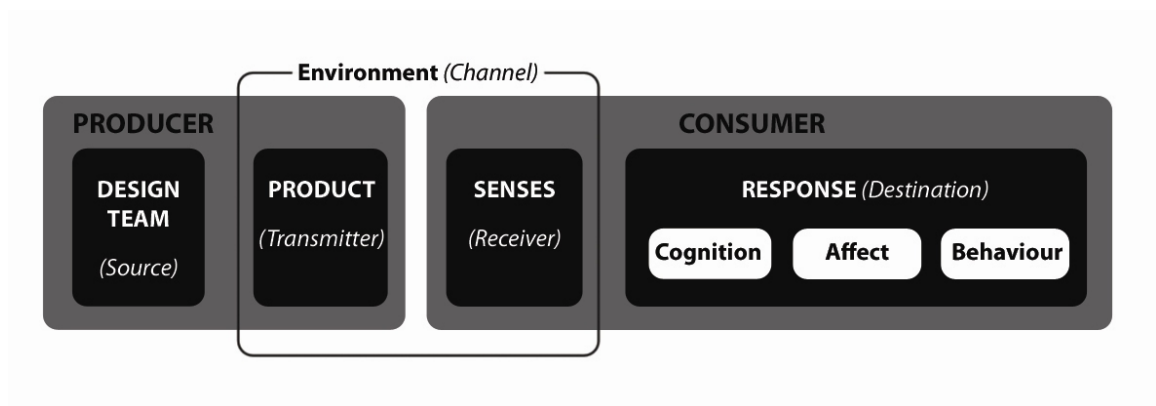


Figure 3.1 Basic framework for products as a medium of communication
(Crilly et al., 2004)

People interact with products through their senses, namely, vision, touch, audition, smell and taste. Of these 5 senses, referred as the 'receiver', vision will be in the focus of this research. Therefore, the product or the transmitter side of the interaction will be limited to the product appearance.

In an empirical study investigating the roles of different sensory modalities in product experience, vision and touch were identified to be the two sensory modalities providing more detailed information about the products than the others (Schifferstein, 2004). Moreover, vision was said to be more influential on the perception of products as visual information is processed more easily regarding the time spent and the size of the products (Heller 1982; Klatzky, Lederman & Matula 1993, in Schifferstein, 2004). The fact that the first impression about a product is usually gained by visual interaction has also been mentioned about by several authors (Crozier, 1994).

3.2 Dimensions of Visual Interaction with Products

There is a great number of literature studying user response to visual stimuli in different fields such as product design, marketing, aesthetics, psychology and HCI (Human Computer Interaction) covering theoretical approaches aiming at explaining different dimensions and the relations between these dimensions.

Warell (2005) acknowledges Sandström's (1973) theory on the visual aesthetic experience with objects which is originally in Swedish and first cited in English by Westerman (1976). Sandström (1973) identifies four functional dimensions of visual aesthetic experiences as attributive, ideolic, iconic and sensual. The attributive function is about expressing several symbolic values about the owner of the product; the ideolic function is also about symbolic values but within the object and the subject in this case; the iconic function is about communicating the tangible aspects about the product and finally sensual function refers to the feelings and emotions evoked during the experience. The author suggests that the first three can be accepted as semantics related functions of the experience.

Another categorization of the semantic features of product form is consisted of three elements as *prototypical*, *solution-typical* and *behavior-typical features*. The prototypical features refer to the basic function of the product and also its utilitarian aspects, solution-typical features refer to the orientation of physical elements in relation to one another, the dimensional, geometric and the spatial-material properties of the form and lastly behavior-typical features the product's context of use (Muller, 2001, in Warell, 2005).

Bloch (1995), from a marketing point of view, mentions about product appearance's role on consumer response and the product's success on the market, accordingly. The author suggests four ways of how its appearance affects a product's market potential. First, product form can make the product get noticed among the competitors (Berkowitz 1987; Dumaine 1991; Jones 1991, in Bloch, 1995). The keywords "*distinctive*, *unusual* and *unique*" are expressed to define the noticeable product forms while referring to several examples from the market. Secondly, product form gives some messages about certain attributes of products such as *strength* and *ease of use*. This message may also be related to a corporate identity of a certain brand. The third way is more about people's emotions as the author suggests that pleasurable forms that gratify senses are preferred more. Lastly, the examples of a car (1957 Thunderbird) and a lamp (Tiffany) are given as durable products whose aesthetic characteristics contribute to the visual environment for years affecting people's senses.

In his model of consumer response to product form, Bloch (1995) mentions about several affecting factors (see Figure 3.2). First, he remarks the pre-defined goals and constraints leading to a final product form at the end of a design process. The individual tastes and preferences of the consumers stand for one of the two factors influencing how the consumer evaluates the product. These tastes and preferences are also affected and shaped by innate design preferences, social and cultural context, and personal characteristics of the consumers. Situational factors such as where and how the interaction between the consumer and the product takes place also affect the evaluation process of the consumers. This evaluation process is indicated as '*psychological responses to product form*' and categorized into two as cognitive and affective in Bloch's model. The end chain of this framework refers to the behavioral responses occurred as approach or avoid urge towards the product.

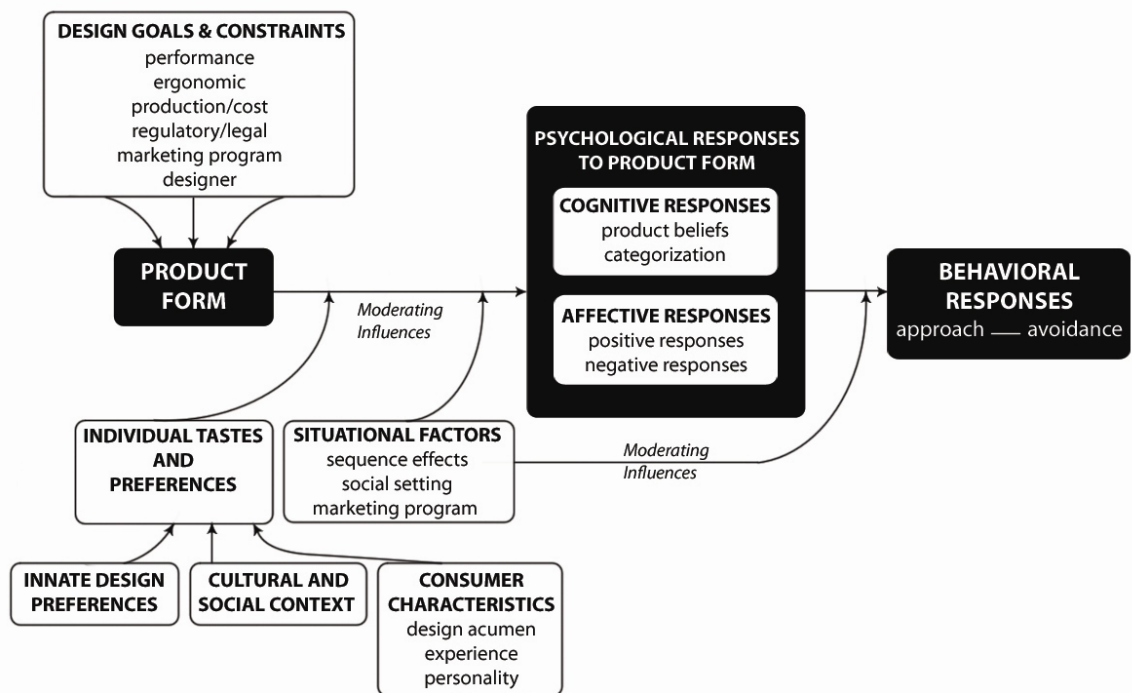


Figure 3.2 Framework for consumer response to product form (Bloch, 1995)

Crilly et al. (2004) propose a general framework for consumer response to visual form of products based on a comprehensive literature survey. Their framework adopts the perspective that views design as a process of communication (see Figure 3.3). Besides reviewing a great variety of literature by putting out their relations in detail, the main contribution of this work is the categorization of consumers' cognitive response into three as aesthetic impression, semantic interpretation and symbolic association. Aesthetic impression is about the visual attractiveness of products, semantic interpretation refers to the utility related aspects associated with visual form and lastly symbolic association covers the ascribed meanings in relation to the social context. Similar to Bloch's (1995) model, affective and behavioral responses are also addressed in this framework.

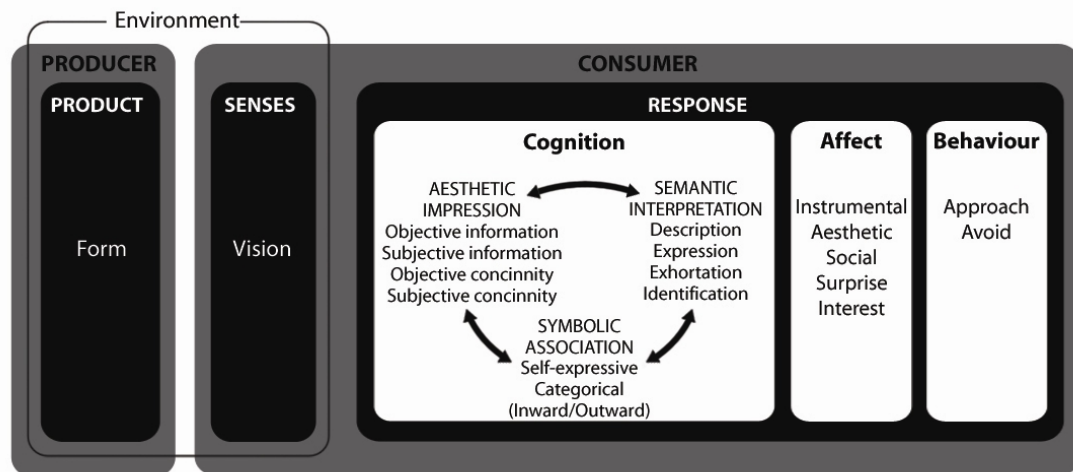


Figure 3.3 Framework for design as a process as communication with expanded cognitive response (Crilly et al., 2004)

The main dimensions to be discussed here suggested both by Bloch (1995) and Crilly et al. (2004) are the product form, consumers' responses to the product form as cognitive, behavioral and affective and lastly the influencing factors of the context of consumption. The actual design process or the intentions of the designers will not be further mentioned about as the focus of this thesis is the interpretation of the user or consumer part of this process.

3.2.1 Product Form

The terms *form*, *design* and *shape* are sometimes used interchangeably but in the wrong sense to refer to the appearance of products. Arnheim (1974) puts out the difference between *shape* and *form* in his work on visual perception of arts. The author suggests that *shape* refers to the geometry of that product which deals with the spatial features while being the *form* of some content. Eckman and Wagner (1994) define design as "*a unique combination of visual elements -line, space, shape, light, color and pattern*". It is stated that, line together with space creates shape, silhouette and pattern. Adding to that the interaction of line with color is claimed to increase or decrease the emphasis on silhouette and shape (De Long, 1987, in Eckman & Wagner, 1994). Bloch (1995) acknowledges a similar definition for the term *form* instead of *design* as "*a number of elements chosen and blended into a whole by the design team to achieve a particular sensory effect*" (Hollins & Pugh 1990; Lewalski 1988, in Bloch, 1995). The elements put together as a meaningful whole by the designers are indicated as shape, scale, tempo, proportion, materials, color, reflectiveness, ornamentation, and texture (Davis 1987; Kellaris & Kent 1993, in Bloch 1995). Regarding these definitions the terms design and form appear to be referring to a broader notion in which shape is covered as well.

As mentioned before, color is another important aspect of product form which might have a strong affect on affective responses towards products. Different dimensions of the affect of color on consumer response can be pointed out. For example, Arnheim (1974) mentions about some associations resulting with generalized expressions of some colors in different cultures. The author gives the example of the exciting nature of red because it is associated with fire, blood and revolution. Similarly, green reminds people of refreshment because it is the color of nature. Combinations of some colors are also said to be associated with some concepts specific to some cultures such as red and gold being associated with nobility (Allegos & Allegos, 1999, in Demirbilek & Şener, 2003). The fact that the color of mourning is black in Western countries whereas it is white in Far East can be given as an example to point out how the associated meanings with colors differ among different cultures. Moreover, some combinations of colors remind people of their national flags or the sports teams they support or compete with. The harmony of

the colors and where the color is used are other concerns to be mentioned in this subject matter affected by personal and social factors. Arnheim (1974) asserts that a person may prefer a specific color for his car but not for his toothbrush. The author also points out people's concern about the suitability of the color to their age, sex or social status.

Besides the previously mentioned elements of form, the quality of manufacturing might also be counted as an important aspect of product form (Pye, 1978, in Bloch, 1995). The manufacturing processes resulting with good or bad surface finishing convey certain messages just like shape, material or color does.

3.2.2 User Response to Product Form

When a person sees a product how he/she responds can be analyzed in two dimensions as psychological and behavioral where the process of psychological evaluation results with a behavioral response (Bloch, 1995; Crilly et al., 2004). Furthermore, the psychological evaluation of people can be divided into two as cognitive and affective which, in fact, happen to be experienced one after the other that is not easy to clearly distinguish (Bitner, 1992, in Bloch, 1995).

3.2.2.1 Cognitive Responses

Bloch (1995) mentions about two main types of cognitive responses to product form as product beliefs and categorization (see Figure 3.2). What the author implies by product beliefs are all the perceived attributes of products related to its brand and functioning. The second type, categorization, refers to people's tendency to evaluate the product they see with reference to the examples of an existing category. From a broader point of view, in framework of Crilly et al. (2004) this tendency was interpreted as the influence of visual references around on consumer response to product form. The visual references are said to be conceptual stereotypes of a product class, the actual products within the same class that are known by the consumer, some other products or forms in nature which can be metaphorically linked with the product form, personality characteristics, conventions within a culture and also repeatedly applied visual references that can be accepted as

clichés. Obviously, all of these visual references are shaped by the prior experience of the consumers.

As noted before, Crilly et al. (2004) suggest cognitive response to product form be analyzed in three main categories which coincide with what Bloch (1995) states as product beliefs. These are aesthetic impression, semantic interpretation and symbolic association (see Figure 3.3).

Aesthetic Impression

The cognitive processing of people on the look of a product may lead to an aesthetic impression about the product as “visually attractive, elegant or beautiful” (Coates, 2003, in Crilly et al., 2004). Aesthetics can be taken into account as a visual product quality separate from utility related aspects.

The term ‘aesthetic’ originates from the Greek word *aesthesis* or *aisthanesthai* meaning to perceive (Hekkert, 2006). It was in the eighteenth century the word aesthetics was first used as a philosophical term referring ‘gratification of the senses’ or ‘sensuous delight’ (Goldman, 2001, in Hekkert, 2006). Since then, the concept of aesthetics has been in the scope of a variety of disciplines and the term aesthetics may refer to different meanings from different point of views. From the industrial design point of view, a definition of aesthetics underlying its relation to the senses was suggested as “*the knowledge one obtains through the senses, in contrast to the knowledge one obtains through the mind*” (Monö, 1997, in Warell, 2001). Here, it should be noted that this definition covers all the sensory modalities as seeing, hearing, touching, smelling and tasting that can lead to an aesthetic experience. Thus, it can be said that aesthetics is not a concept that is only limited with seeing an object although the experience about the rest of the senses will not be addressed in this thesis.

In the online American Heritage Dictionary the terms aesthetics or esthetics as a noun have four different meanings as follows:

1. *The branch of philosophy that deals with the nature and expression of beauty, as in the fine arts.*

In Kantian philosophy, the branch of metaphysics concerned with the laws of perception.

2. *The study of the psychological responses to beauty and artistic experiences.*
3. *A conception of what is artistically valid or beautiful.*
4. *An artistically beautiful or pleasing appearance.*

(dictionary.reference.com/browse/aesthetics)

The first three definitions consider aesthetics as a field of study from different perspectives, the third one matches what is implied by the title *aesthetic impression* and the last one can be said to be defining the term as an appearance characteristic and also synonym of beauty.

As can be understood from the variety of dictionary definitions, the research concerning aesthetics is much diversified. One of them was found worth mentioning in relation to the scope of this thesis that is an important debate in history about aesthetic impression; whether it is shaped by some objective properties of the objects or more subjective (Lavie & Tractinsky, 2003; Crilly et al., 2004). The view considering aesthetics or beauty as an objective property of objects suggested that each object had an ideal form to be appraised as beautiful by everyone (Coates 2003 in Crilly et al., 2004). The proposals like the Golden Section and the Gestalt Rules can be given as examples of that view (Lavie & Tractinsky., 2003; Crilly et al., 2004). The opponents of that idea, the famous philosophers like Hume and Kant for example, the aesthetics research should study the subjects but not the properties of the objects (Sircella, 1975, in Lavie & Tractinsky, 2003). This view, which relates beauty with emotion, defines a beautiful object as a stimulator of pleasure resulting from an aesthetic experience and highly subjective (Osborne, 1968, in Lavie and Tractinsky, 2003). Crozier (1994) also mentions about the influence of the subjective experiences of people and also the context of interaction making it difficult to talk about some universal aesthetic principles.

Coates (2003) suggests that the aesthetic impression is dependent on the balance between two contradictory factors that evoke people's interest and enable them to understand the product. The former one is referred as information and the latter is

concinnity. He formalizes the previously mentioned arguments on subjectivity and objectivity of aesthetics with a four-item framework as;

- objective information,
- subjective information,
- objective concinnity and,
- subjective concinnity.

What Coates (2003) suggests by objective information is its contrast; a comparison of the product with its background and also within itself. Contrast may be achieved by using of a different color, line, texture or surface that is not included in the environment. The objectivity, according to Coates (2003), is due to the fact that the compared properties are measurable. He gives the example of conventionally known *color contrast*; black ink on a white paper. The author says that the light reflected from both colors could be measured with a light meter and a standard ratio indicating contrast between white and black can be calculated. He also gives the example of *shape contrast* with reference to two watch images. He associates shape contrast with visual complexity and claims the watch with clear, simple lines as an example of low contrast with less information while the one with more visual details (buttons and hinges) with high contrast with more information. One of the examples for the objective measurement of shape contrast proposed by Coates (2003) is that the image with high contrast, containing more information requires more memory space to be stored digitally. Despite the objective measurement techniques, the author concludes that the human eye has a tendency towards the one containing the most information and *the most interesting* one, accordingly.

Subjective information, on the other hand, is about perceived novelty and determined by the level of familiarity of people with the object. Coates (2003) relates novelty with his conception of contrast in the sense that the product is being compared with the mental image of that product type. Because the mental image of a product is highly influenced by the previous experience of the subjects, it can not be measured objectively.

Objective concinnity is about the order of the elements in a design that make it easier to perceive the object as a whole. Gestalt Rules such as symmetry, harmony, proximity and continuity are related with the order in design. According to Coates (2003), similar to objective information objective concinnity can be objectively measured and is not dependant on time or experience of the subjects. One of the examples the author gives is orthogonal relationships between the elements as a way of orientation leading the product to be described as more *normal* or *regular*. Needless to say that, 90 degrees can be mathematically measured and easier for a person to detect by just looking at than any random degree.

Similar to objective concinnity, subjective concinnity leads to the products to make sense and be easily understood. However, it is not due to the objectively measured elements of the products but matching a subject's beliefs, values and concerns.

As previously mentioned, Coates (2003) argues that in order to be evaluated as attractive, there should be a balance between the information and concinnity related factors of a product. If the information side of a product covering both the subjective and objective properties is more dominant, it will be evaluated as "*confusing, meaningless and ugly*". If the concinnity side is dominant, on the other hand, the product will be evaluated as "*simple, dull and boring*". Although in a different domain referred with different terminology, Coates' theory appears to be parallel to Silvia's (2005; 2006) proposal on the appraisal determinants of interest. Coates' '*information related components*' refer to Silvia's '*novelty-complexity*'; meanwhile '*concinnity related components*' raise the coping potential of the consumers.

Semantic Interpretation

From a broad point of view, semantics is the study of meaning. Therefore, semantics can said to be dealing with the meanings communicated by products in product design domain. When the model of Crilly et al. (2004) is considered, where this title is suggested, *semantic interpretation* refers to users' perceptions about the utilitarian aspects of products in relation to their visual form. These utilitarian aspects involve aspects related to the "*function, performance, efficiency and ergonomics*" of products. In fact, the authors bring about two categories that are

related to the meaning conveyed by the product form as semantic interpretation and symbolic association. They point out the difference between these two as the former is about the communicated visual qualities of the product itself while the latter covers the symbolic associations about the product's owner communicated by the product form (Gotzsch, 2000, in Crilly et al., 2004).

Monö (1997) refers to the semantic functions of the product form expressing the utilitarian aspects of the products. These functions are to describe, to express, to extort and to identify (in Crilly et al., 2004; Warell, 2005).

To describe, as a semantic function is product form's communication of its purpose of use, technical function as well as how to interact with it (Crilly et al., 2004; Warell, 2005).

To express is about conveying utility related qualities such as fragility and durability (Crilly et al., 2004; Warell, 2005).

To exhort is about what the product asks or directs the users to do during operation (Crilly et al., 2004; Warell, 2005).

To identify itself and communicate its identity (origin, type, manufacturer etc.) to the users is the last suggested semantic function of product form (Crilly et al., 2004; Warell, 2005).

Symbolic Association

Symbolic association is the third type of cognitive response to product form suggested by Crilly et al. (2004). As previously mentioned, visual product form can communicate symbolic meanings that can be linked with its user or owner. These meanings may be associations with some personality characteristics such as *cheerful*, *childish*, and *serious* (Govers, 2004), quality expressions as *cheap* and *expensive*, and also certain styles of cultures or periods like *traditional Turkish* or *90's style*. Moreover, specific form characteristics may be associated with a certain brand identity or it can be said that specific form characteristics can be deliberately applied to create and communicate a brand identity (Creusen & Schoormans, 2005).

3.2.2.2 Affective Responses

Affective responses are the second type of psychological responses to visual form. Several feelings may be developed towards the visual form of products or emotions can be elicited at the moment of interaction. Regarding the appraisal theory of emotions, it can be said that cognitive processing of the visual stimuli results with an emotion either positive or negative ranging in intensity depending on the subject's concern behind.

3.2.2.3 Behavioral Responses

The psychological response to products (product form in this thesis) ends up with behavioral responses. With respect to their valence as positive or negative, these responses can occur to be approach or avoidance. What is referred by the approach responses may vary from purchasing for the product, extended engagement with the product, willingness to investigate the product, presenting the product to the others and also taking care of it. The avoid responses; on the other hand, can be summarized as unwilling to interact with the product in all respects (Bloch, 1995).

Bloch suggests a linear relationship between positive psychological responses to product form with approach behavior and negative psychological responses with avoidance. Desmet (2002), however, claims products eliciting paradoxical emotions comprised of negative and positive ones be more desirable creating a richer experience for people.

3.2.3 Affecting Factors

Several factors can be mentioned about affecting a person's response to product appearance. All of these factors can be named as the context of interaction which is mainly comprised of time (when the interaction takes place) and place (where the interaction takes place). A more specified classification of the context of interaction can be made as involving social, economical and cultural factors. These factors may be directly related with understanding of product appearance or indirectly through

affecting people's general tastes and preferences resulting with individual differences. Adding to that, some situational factors can be pointed out influenced by the social, cultural and economical setting (Bloch, 1995).

Social and Cultural Factors

Cultural and social values and preferences have a considerable affect on acceptance of certain styles (McCracken 1986; Kron 1983 in Bloch, 1995). The so called culture or society may be a social class, region, an ethnic subculture or a more specified sub-group. Apart from affecting the taste and preferences for style, the understanding of certain appearance qualities may differ among cultures. For example the affect of cultural differences on associated meanings with colors has been referred to while discussing the elements of product form.

Individual Differences

Everybody has idiosyncratic tastes and preferences towards products. Their age, gender, personality, educational, socio-cultural and socio-economical background affect their personal characteristics and response to product appearance, consequently. Moreover, their previous experience with other products may also be affective in their expectations from, understanding of and response towards products. The mood of people at the time of interaction, which can also be discussed under situational factors, is another factor affecting response to product appearance.

Situational Factors

There are several points to be discussed as the situational factors affecting people's psychological and behavioral responses to product appearance. Firstly, people's concerns about the decorative fit of the objects they own may turn out to be a positive affect when matched (Solomon, 1983, in Bloch, 1995). Other people's opinions present at the time of interaction may also be affective especially in a purchase situation as one of the dimensions of owning a product is communicating a message to the others about oneself and social acceptance in a broader sense. How the product is being presented physically and also mentally is also another dimension to be pointed out (Bloch, 1995). The physical presentation involves characteristics of the physical environment such as light, cleanness, the quality of

the product's display (if there is one) and the surrounding objects. The mental presentation, from a marketing point of view, refers to how the product is advertised; its slogan and the concepts conveyed within the advertisement campaign. Adding to that, the general image of the product's brand is also an important factor. Continuing with the marketing point of view, the price of the product can also said to be an important affecting factor on response to product appearance (Crilly et al., 2004).

Defined as a psychological response to product appearance, all the above mentioned factors can be claimed as affecting the evaluations on interestingness.

CHAPTER 4

DESIGN AND CONDUCT OF THE EMPIRICAL STUDY

This chapter presents an empirical study conducted into identifying visual qualities associated with interestingness. The study was conducted in a lab environment during which several images of products were presented to the subjects. The aim of the study and the methodology are introduced in this chapter. Methodology includes information about selection of the study material and data collection methods employed in the study as well as the participants, test environment and the followed procedure.

4.1 Aim of the Study

Our everyday experiences with the objects around us result with elicitation of numerous emotions. One of those emotions is interest which creates an approach urge towards the object that evokes it. Considering this target object as a product makes it worth investigating '*what makes a product interesting*' for product design research. Besides all the other interaction types and contexts, this study focuses on interest evoked by product appearance. In other words, this study concerns with interest, evoked just by looking at a consumer product which is mostly users' first encounter with consumer products. The main research question to be answered in this study is:

What kinds of visual qualities of products are associated with interestingness?

Considering the fact that these qualities are communicated by the physical parts of the products, this study is also concerned with answering the following sub-question:

Which physical parts of the products are considered as interesting?

Moreover, it is hypothesized that the visual qualities associated with interestingness will differ among different product groups. That is why; a second sub-question is also intended to be answered:

How do the visual qualities associated with interestingness differ among different product groups?

4.2 Methodology

The design of the study required two main types of preparation as selection of the study material and deciding on the methods to be employed in order to be able to answer the raised research questions.

The final design consisted of three main sessions to be proceeded one after another. These sessions were called with respect to the data collection methods employed as free viewing, think aloud and retrospective interview (see Figure 4.1). In the following sections how the study was prepared and conducted will be explained.

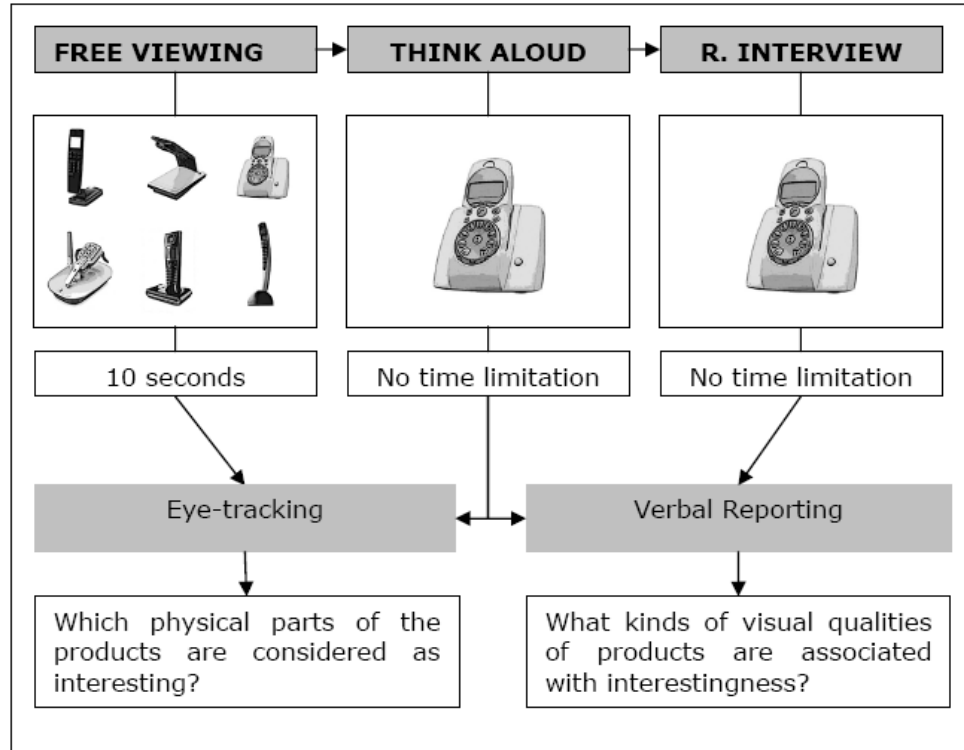


Figure 4.1 Relational diagram for the sessions of the empirical study

4.2.1 Selection of the Study Material

The context of interaction was determined to be the domestic environment of a person in order to limit the type of stimuli to be used in the study. The reason for choosing such a context was to minimize the differences in familiarity and expertise with the products among the participants. It was assumed that the participants would be acquainted with the presented images and feel competent to comment on them as all of these products were parts of their everyday life. Then, it was intended to find out product groups representing different types of interaction. The main reason behind that was not to limit the results with a specific product group but to be able to present how the associated qualities with interestingness differ among different product groups in order to be able to answer the indicated second sub-question. Finally, three groups of household products were chosen to be used as study material. These product groups are electric kettles, cordless phones and

seating units. Electric kettles are small kitchen appliances serving for a simple distinct function that is to boil water. Usually the fingers and hands interact with electric kettles while opening the lid, pressing the button to start boiling and handling it to pour the hot water. Cordless phones, on the other hand, represent home electronics with embedded software. Besides the hands and fingers to handle the product and dial the numbers, some parts of the head such as ears and mouth are involved in the interaction while talking. Moreover, it can be said that due to the embedded software, more cognitive interaction is required compared to using electric kettles. Different than the other two, during the interaction with a seating unit the whole body is involved in the interaction. Furthermore, none of the seating units used in the study required any operation or adjustment but provide stable surfaces to sit and lean on.

A number of examples for each product group were needed for the participants to make comparisons. Six for each was decided to be reasonable to present a diversity of examples to the participants and not bombarding them with a pile of images considering the structure of this extensive qualitative study lasting in 35-45 minutes for each participant.

In order to be used as study material, several images for each product group were collected from the internet. It was intended to find out examples of products that the participants have not seen before aiming at minimizing the differences in familiarity among the participants. It was assumed that a product that was seen before would evoke less interest than one which was seen for the first time. That is why the newly launched products of famous brands and commercial consumer product websites, design portals and design blogs were searched for the product images. A few examples of seating units that are regarded as design classics but not conventionally known by people who are not especially interested in this area were also included. Due to the concern about familiarity, products with Turkish brands were not included in the examples. Furthermore, a special attention was given to gather examples representing different material usages, color combinations, shape of outline components and organization of functional elements as well as having high image quality. These gathered examples were reduced to 25 for each group

and the entire brand related information including the logos and text were removed from each image. Their backgrounds were cleared if necessary (see Appendix A).

A questionnaire was conducted to determine the exact products to be presented as stimuli aiming at identifying the ones that would elicit relatively strong interest, rather than relying on a single person's evaluations. 60 people with varying backgrounds were asked to rate the 75 presented images. The two bipolar sides of the 5-point rating scales were indicated as *boring* and *interesting*. The questionnaires sent by e-mail to the participants included a thumbnail version of the product image and the rating scale by its side (see Appendix B).

The ratings of the returning 54 participants were simply calculated where the *boring* side got 1 points and the *interesting* side got 5. The first six top scoring product images for each category were chosen as the final study material. If the scores were tied or too close to each other, the frequency of being rated with the highest point (5) was taken into consideration as a second criterion (see Appendix C).

Finally, 18 product images were given new labels indicating their product type and number. 'K' was used for kettles, 'T' for cordless phones and 'C' for chairs. It should be noted that these numbers were assigned randomly to the products without considering the results of the questionnaire or any other quality. The labels were not presented to the participants during the eye-tracking sessions. Figure 4.1 shows the product images used as stimuli with their labels:

KETTLES



CORDLESS PHONES



SEATING UNITS

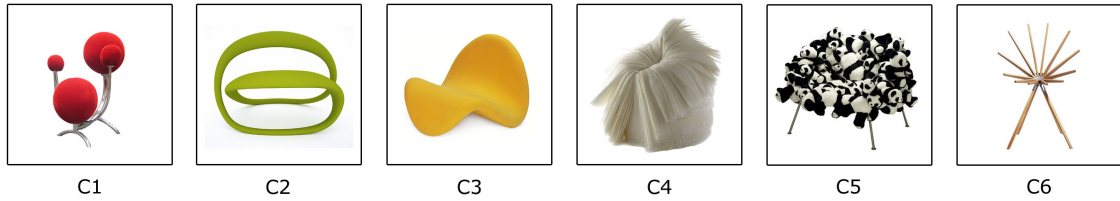


Figure 4.1 The product images used as test material

4.2.2 Data Collection Methods Employed in the Study

As mentioned before, a number of data collection methods were determined to be employed during the design of the study. These methods and their purpose of choice are summarized in Table 4.1.

Table 4.1 The data collection methods employed in the study and their purpose of choice

Data collection method	Purpose
Eye- tracking	To detect which products/ parts of the products are looked at
	To calculate the time spent on an image
Think aloud protocol	To identify visual qualities of products associated with interestingness
Retrospective interview	To identify visual qualities of products associated with interestingness
	To be able to gather comprehensive information from the participants
Numerical rating with a Likert scale	To provide the participants a reference point for discussing and comparing the presented stimuli during think aloud protocol
	To be used as a reference point during analysis as a self reported indicator of interest

4.2.2.1 Eye Tracking

When visual interaction is considered, the act of looking at is an indicator of interest. By definition, eye tracking is a method that is employed for collecting data from the eye movements of people. An eye tracker is a device that is capable of capturing where the subject is looking at and where his/her interest is focused on, accordingly. In other words, eye-tracking was employed to identify interesting stimuli that was looked at. Here, what is meant by stimuli covers the image of a product as well as the part of it that was looked at. Moreover, using an eye tracker had the potential to calculate the time spent on looking at a stimulus, which was considered as another indicator of interest.

Background

Recently, the augmented technology and increased accessibility of eye tracking methods allowed it to be used in a wide variety of disciplines including usability, cognitive science, psychology, human-computer interaction, and marketing research. Eye tracking technologies are also very beneficial for the designers since they provide an opportunity to examine the visual behavior of the users. In the late 1980's, the oculometric research lab at the University of Essen was the first to use the eye movement recording technologies in industrial design in order to determine the most attractive parts of a product (Hammer, 1991, in Sharmin, 2004). Several studies aiming to obtain information on the users' perception of products followed this research, and eye tracking has come to an increased prominence that is being used by various researchers and design firms.

Selection of the Eye Tracking Type

Basically, there are three types of eye trackers based on the technology they use. One type uses an attachment to the eye such as a contact lens; the second type uses a non-contacting, optical method for measuring the activities of the eye, and the third type places electrodes near the eyes and measures their electrical potentials. The most commonly used types of eye trackers are the optical eye trackers that send infrared light to the cornea and the back of the lens, and sense its reflection by a video camera or an optical sensor (Räihä, Koivunen, Rantala, Sharmin, Keionen, & Lahtinen, 2006). These, which are also called remote camera based systems, may be head mounted, require a head restrain such as a chin rest or may not require any hardware to be attached on the study subject (Weigle and Banks, 2008).

Two types of eye trackers were compared by conducting several short version pilot studies. The researcher, who is the present author, has experienced the two devices as a study subject as well. One of these eye trackers was head mounted and the other was free of hardware attached on the participant. The first one was observed and experienced to be irritating due to the head mounted piece while the second did not involve any unusual experience but just sitting in front of a monitor. Moreover, the time required to calibrate the second one was considerably shorter than the first one. It was also easier to proceed the calibration of the second one with more

efficient results. Lastly, the visual mapping provided by the analysis software of the second eye tracker was determined to be more appropriate to be interpreted within the current study context. Because of all the above mentioned reasons the second eye tracker, which was a Tobii 1750 eye tracker, was decided to be used. Figure 4.2 illustrates a Tobii 1750 eye tracker which has embedded diodes sending infrared lights and a camera in between.

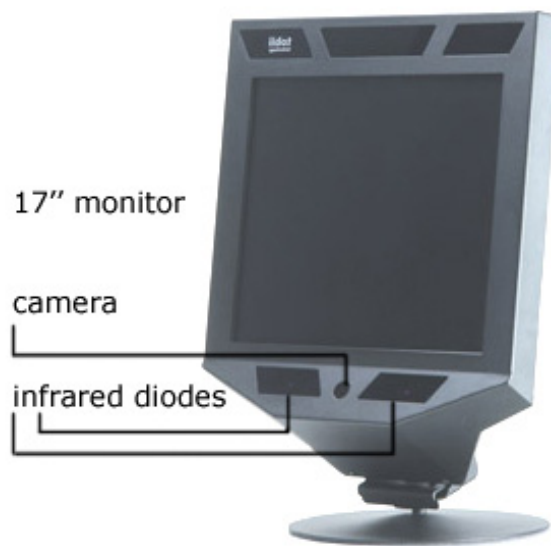


Figure 4.2 Tobii 1750 Eye Tracker

4.2.2.2 Think aloud Protocol

In order to gather what the participants were thinking while looking at a product and evaluating it in terms of interestingness, asking them to think out loud was found appropriate. Following this protocol enabled eye tracking and verbal reporting of the participants to be recorded simultaneously.

4.2.2.3 Retrospective Interview

It was decided that, the researcher would not interrupt the participant during think aloud protocol because the time spent on an image was also being tracked down.

Therefore, a retrospective interview during which the researcher would be able to ask the points and reasoning the participant had skipped without mentioning.

4.2.2.4 Numerical Rating Using a Likert Scale

It was assumed that giving a task as rating the presented products on a Likert scale would provide a basis to the participants to talk about the interestingness of the products. However, this was asked to be performed verbally unlike the conventional way of putting a check on a visual scale not to interfere the eye tracking data.

4.2.3 Participants

15 people participated in this study between ages 25-32 with an average of 27. 9 of them were females and 6 were males. They were all university graduates from different disciplines but not designers (9 graduate students and 6 working at a job). All of the participants were Turkish and none of them had an experience with an eye tracker before.

4.2.4 Test Environment

This study was conducted in the Human-Computer Interaction Research and Application Laboratory at Middle East Technical University Computer Center. The participants sat in front of the eye tracker. A keyboard was also present in front of them for proceeding to the next slide where instructed (see Figure 4.5). The researcher was present during all of the tests sitting by the side of the participants. All of the sessions were recorded by a portable video camera which was located at the back corner of the room. Adding to that, the dome camera of the laboratory was also active during the tests as a back up recorder.

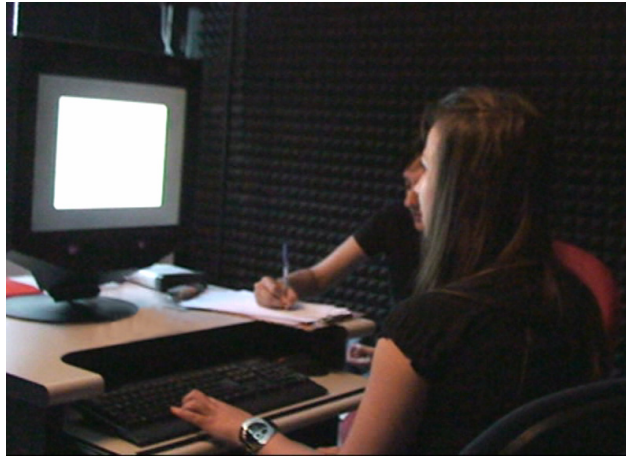


Figure 4.5 A snapshot from the think aloud session of the study

4.2.5 Procedure

The participants were shortly informed about the aim of the study, the eye tracker and the procedure to be followed in the following minutes. While informing, it was emphasized that the participant was not being tested in order to make sure that s/he was relaxed. After that, the participants were introduced to the system by following a calibration procedure. This routine involved the participants' following the pulsing 5 dots on the screen by their eyes which took about ten seconds. Then, they were instructed to start viewing the slides. Two different procedures were followed while viewing the slides as free viewing and think aloud. Lastly, a retrospective interview was performed.

Free Viewing

First, the participants were instructed to view the presented images as they wish without giving any task or keyword. These first three slides included images of products in groups of 6 with respect to their product group. The viewing time for these first three slides was limited to 10 seconds and changed automatically. Eight of the participants viewed kettles first, followed by seating units and cordless phones. The sequence for the remaining seven participants was cordless phones, kettles and seating units. The reason for presenting the products at the same time

was to find out products that were looked at the longest (as an indicator of their interest) among a number of alternatives of the same group. In order to be able to calculate the total time spent on each product in the same image, the tracked down data from each participant was required to be merged together. Because of that, in each slide in this session the placements of the products had to be fixed.

Think aloud

The following slide instructed the participants to verbally rate the product on each slide from 1 to 9 in terms of interestingness and think aloud while doing that. Then the participants started viewing the individual images of the products that were presented in groups of six in the previous section. In this part of the study the viewing time was not limited, the participants moved on the next slide by pressing the space bar on the keyboard when they were finished commenting on an image. The interviewer acted as an active listener while noting down the verbal ratings and the comments of the participants.

It was assumed that the given task which was rating the stimuli would encourage the participants to express their concerns and evaluations about interestingness of the products. The order of appearances of product groups in this session was prepared with respect to the previously mentioned orders for free viewing session.

Retrospective Interview

In this last session, the participants were further interviewed on their comments and the reasons behind their ratings. During this session, the eye tracker was off and the participants talked face to face with the researcher while the images were present on the screen.

It should be noted that, all of these 3 steps were conducted one after the other without giving any breaks and the procedure lasted in 35-45 minutes in total. The entire study was conducted in Turkish by the present author. In the end, the participants were thanked and given small presents for their participation.

CHAPTER 5

RESULTS AND ANALYSIS

This chapter reveals the results of the conducted empirical study as well as how they were analyzed. The three different types of data collected by a variety of methods during the three sessions of the study were combined and cross compared in order to provide answers to the suggested research questions.

5.1 Different types of data collected in the study

The conducted study procedure resulted with collecting three types of data as numerical, verbal and visual. Figure 5.1 shows which of these three the types of data were collected in each session of the study.

Free Viewing	Numerical (time spent)
	Visual
Think-aloud	Numerical (time spent)
	Numerical (rating)
	Visual
	Verbal
Retrospective Interview	Verbal

Figure 5.1 The types of data collected in each session of the study

The numerical data is consisted of the ratings of the participants for 18 products during think aloud session. The durations of looking at each image during free viewing and think aloud sessions, which were provided by the eye tracker, were also regarded as numerical data. The verbal data refers to the evaluations of the participants during think aloud and the retrospective interview sessions. Finally, visual data covers the gaze behavior of the participants on the presented slides recorded by the eye tracker during free viewing and think aloud sessions.

5.1.1 Results of the Numerical Data

Aforementioned, the main reason for asking the participants for rating the products was to provide a common basis for the participants to compare and comment on the product images. Thus, the ratings gathered by the participants were considered as the indicators of the participants' interest. The products perceived as interesting by each participant were marked based on their ratings. The products rated above 5 (≥ 6) were regarded as interesting.

Table 5.1 The interestingness ratings of 15 participants (P) for 6 kettles (K)

	K1	K2	K3	K4	K5	K6
P1	1	9	7	9	5	4
P2	1	6	7	4	4	5
P3	1	4	4	5	3	6
P4	3	4	2	5	4	4
P5	3	4	6	2	6	1
P6	6	8	4	6	2	5
P7	1	6	3	4	5	2
P8	1	1	8	9	7	6
P9	7	8	9	8	9	6
P10	3	8	6	3	2	6
P11	3	8	3	8	8	3
P12	4	7	6	2	2	4
P13	1	2	6	6	6	3
P14	5	5	6	7	8	1
P15	6	6	8	8	7	7
*	3/15	9/15	10/15	8/15	7/15	5/15

(*) The frequency of a particular product rated as interesting (≥ 6)

Table 5.2 The interestingness ratings of 15 participants (P) for 6 cordless phones (T)

	T1	T2	T3	T4	T5	T6
P1	4	6	7	8	9	5
P2	3	6	4	7	3	5
P3	5	6	3	4	7	7
P4	3	7	2	6	3	6
P5	2	5	6	7	6	5
P6	2	7	5	3	2	8
P7	1	1	4	5	7	2
P8	1	6	6	1	8	2
P9	4	7	4	8	8	7
P10	3	7	3	3	3	7
P11	5	8	3	3	3	8
P12	7	8	2	1	6	5
P13	1	7	3	5	7	4
P14	5	6	7	4	8	6
P15	6	7	5	5	8	6
*	2/15	13/15	4/15	5/15	10/15	8/15

(*) the frequency of a particular product rated as interesting (≥ 6)

Table 5.3 The interestingness ratings of 15 participants (P) for 6 seating units (C)

	C1	C2	C3	C5	C5	C6
P1	7	9	5	9	9	8
P2	6	6	4	8	6	5
P3	1	7	3	6	6	2
P4	6	6	3	1	6	2
P5	4	7	3	1	3	1
P6	7	8	3	6	9	1
P7	7	9	4	3	7	6
P8	8	7	2	9	9	9
P9	9	8	4	8	8	7
P10	4	7	7	4	5	4
P11	3	8	8	3	8	5
P12	4	7	7	1	3	1
P13	7	7	1	7	8	7
P14	6	7	4	8	9	8
P15	6	6	8	8	6	6
*	10/15	15/15	4/15	9/15	12/15	7/15

(*) the frequency of a particular product rated as interesting (≥ 6)

The mean values of the time spent on each product as well as their percentages to the total time spent were calculated as indicators of interest which will be referred within the analysis of the visual data in Section 5.3.

5.2 Analysis of the Verbal Data

All of the sayings in Turkish from think aloud and the retrospective interview sessions were fully transcribed, translated into English and labeled with the participant name and product. Then, they were content analyzed. The following section is dedicated to the analysis of the verbal data with respect to the participants' descriptions of their interest towards products.

5.2.1 Describing Interest towards Products

In this study the participants were asked to rate and comment on the presented images of products. Neither a context was suggested, nor a definition of '*interest*' was provided in order to be able to collect information about users' own interpretations of interestingness. While rating the presented images in terms of interestingness, some of the participants explained their interest towards products by mentioning about some positive and negative behavioural and affective tendencies. They have presumed some contexts such as coming across that product in an exhibition stand or being in a purchase decision.

These remarks associated with interest towards the presented products were categorized into three as willingness to physically interact with the product, willingness to purchase for or own the product, and liking it.

Physical Interaction

54 (32 positive and 22 negative) of these statements were covered in the first category that is about willingness to use the product or at least try it once. It should be noted that more than half of those remarks (62%, 34 out of 54) were on seating units. This can be explained with the ambiguity of seating units offering a variety of

material usages and ways of interaction compared to cordless phones and kettles. The participants (might be the same participant rating different products) indicated that they would like to sit on a particular chair 17 times. Their motivation behind was exploring to understand more about it (13), liking it (2) and perceiving it as comfortable (2). The examples for those statements are as follows:

"This has a style like a puzzle, very interesting. I would like to solve it: where do you sit on, where do you lean on...etc. I would like to see this in 3D and moreover, sit on it" (Participant 4, for C2)

"This one looks beautiful; I would like to sit on it." (Participant 10, for C2)

"This looks comfortable, I would like to sit on it" (Participant 11, for C3)

16 out of 34 comments on physical interaction with the seating units were negative attitudes on three particular chairs (C1, C4 and C6). Although rated as interesting, the participants reported that they would not like to sit on those chairs because they were uncomfortable, unreliable or irritating (9) or they disliked the product (7).

"This looks a little dangerous. I guess I would hesitate to sit on it" (Participant 9, for C6)

"This one looks very interesting and attention taking but I am not sure whether I would like to sit on it. Even if I sit on it, I would not lean on the backrest." (Participant 7, for C6)

"Hmm, really bad! I would not like to sit on it...But if you ask me whether it is interesting or not, yes interesting...in fact, very interesting." (Participant 9, for C4)

11 out of 54 expressions on willingness to interact with the products were on kettles (6 positive and 5 negative) and the remaining 10 were on cordless phones (8 positive and 2 negative). The approach urge to these product types was willingness to handle them in order to explore.

"I wonder where the receiver and the microphone is...I am also not sure where to dial, that is why this one evokes interest. I would like to handle and examine more..." (Participant 4, for T4)

"I would like to see and experience how to pour water with this one." (Participant 9, for K5)

In the case of cordless phones and kettles, the participants indicated that they would not like to use the so called product 7 times. One of them was because the participant did not like the interaction type the product suggested;

"I wouldn't like to attach something to my ear and gather around at home, I prefer to hold a telephone." (Participant 7, for T4)

Two kettles (K3 and K5) were evaluated as interesting but not products to be used;

"9 points for K3, very interesting but I wouldn't like to use it." (Participant 9, for K3)

"This one is humorous and interesting but not a product I would like to use in my daily life." (participant 13, for K5)

The rest of the remarks (4) were because the participants were not interested in the products at all and would not like to spend time, handle or use them;

"This one does not seem to be useful and everything about it is clear, there is nothing to explore...I wouldn't even handle it." (Participant 12, for K4)

"It does not look aesthetic; I would not like to use it...Not interesting, 1 point for this one." (Participant 7, for T2)

Ownership and Preference

The participants have mentioned about their intention to buy or own the product 57 times while expressing their interest towards the products. The statements about preference are also covered in this category. Because any unbalanced distributions among three different product groups were not observed, they were analyzed together. Of the 57 sayings analyzed in this category for three product groups, 11 showed a positive and 16 a negative relationship between interestingness and willingness to purchase.

(+)

"This is an interesting design; I would like to sit on it to see if it is comfortable...If so, I would like to buy one." (Participant 12, for C2)

"This looks elegant, evoked my interest...I might buy it. I have a tendency to buy things just because I like without considering whether they are useful or not." (Participant 6, for K2)

"The white phone is the most interesting in my concern...If I would have bought one; it would be the white one." (Participant 12, for T1)

(-)

"...looks interesting but I wouldn't buy such a thing." (Participant 8, for C6)

"There is no sense in using this one. It is pleasurable to look at, maybe in an exhibition. If I am to buy one, beauty is not enough." (Participant 7, for K5)

"The most interesting one is the one I disliked most because it encourages me to explore, just to understand how it is used. Even if I understand, I wouldn't buy it. This can be recalled easily like disturbing TV commercials but that's all." (Participant 12, for T4)

The participants have also described their interest towards products by mentioning their tendency to own the product and especially placing it in the home (19 times).

6 of those comments showed interestingness as a quality leading to a desire to have in the house.

"I certainly would like to have this chair in my house." (Participant 6, for C5)

Some participants have also stated that they would not like to have that product in their house although it was interesting (7 times).

"This is interesting but I would not like to have such a messy looking chair in my living room where my guests come." (Participant 6, for C4)

The rest of the comments (6 times) involved negative attitudes towards products, evaluating them neither interesting nor to be desired in the house;

"Why would I like to have a kettle in my kitchen that looks like a vase!"
(Participant 11, for K1)

The participants have also mentioned about their preference without referring to any purchase or ownership situation (8 times, 7 negative and 1 positive). Parallel to what is indicated in previous examples; some of the participants claimed that they would not prefer that product although rated high in terms of interestingness (4 times);

"This one is interesting...8 points, but definitely uncomfortable...I wouldn't prefer." (Participant 13, for C6)

"Looks aesthetically appealing...9 points, but I don't prefer something with this color." (participant 9, for T5)

Liking

Some of the participants noted whether they liked or disliked the product while reasoning their interest ratings. 16 out of those 32 comments were about liking the product matching with high ratings of interest;

"I think this is the most interesting one as well as the one I liked most."
(Participant 13, for C5)

"I liked this one at first notice, 8 points." (Participant 14, for T5)

Within these comments some of the participants have asserted their definitions of interest in relation to their tastes;

"I associate interestingness with sympathy. A product that I like evokes my interest" (Participant 3)

"No matter how distinct it is, a product that I don't like does not evoke my interest." (Participant 4)

"It is not as stunning as some others but I like T6, it has a pure design. That's why I rated it high. It means that it evoked my interest if I like it, right?"
(Participant 9)

The participants stated that the so called product did not elicit their interest because they did not like it (15 times). There was only one participant saying that she did not like the chair but rated it as highly interesting.

"This is interesting but definitely uncomfortable, I did not like it." (Participant 13, for C6)

Regarding these statements, it can be said there is a two directional relationship between interest and liking. Interestingness can be an aspect leading to liking a product and liking the product can elicit interest.

Concluding Remarks

The verbal statements of the participants in this study showed that people's interpretations of their interest evoked by products could be associated with certain behavioural and affective responses. The most significantly identified behavioural response is '*interaction with the product*'. The types of interaction covered in this

category are sitting on the chair, touching, handling or using the cordless phones and kettles. In fact, this response is also an affective one as the real response is the 'desire' to interact with the 3D product presented in the image based on its perceived qualities. The second identified response is the 'desire' for possession. Expressions like 'I would like to buy', 'I would like to have', 'I prefer' as well as 'I would like to put/place in my home/kitchen/living room' are included in this category. The last category is actually an affective state that is the likings of the participants. 'Like', 'don't like' and 'my taste' kinds of keywords constitute this group.

Although divided into three, these perspectives on interestingness are interrelated. It was observed that, a participant had mentioned about two or three of them for the same product one after another. Naturally, when a person likes something he/she might like to interact with it and own one. Of course, this relationship is not always as simple and linear as exemplified but multi dimensional. In other words, different concerns are to be matched for each decision but they might have some intersecting points. It should be noted that, what is discussed here aims to provide an insight for further studies rather than presenting solid findings. It can be interesting to see the affect of interestingness on tendency to interact, purchase decision or liking separately in specified contexts.

In conclusion, the results showed that interestingness as a visual product quality is not always positively correlated with the mentioned responses. It can be said that not only appealing visual characteristics but also repelling ones can elicit interest. The identification of these characteristics requires a more detailed analysis which will be the next step addressed in this chapter.

5.2.2 Visual Qualities Associated with Interestingness

The objective of the analysis overviewed in this section was to identify visual qualities of products associated with interestingness. First the products perceived as interesting by each participant were marked based on their ratings. The comments on the products rated above 5 (≥ 6) were put together and content analyzed. The Tables 5.1, 5.2 and 5.3 presented in Section 5.1.2 illustrate how many times the

comments on each product were included in this part of the analysis. The numbers in shaded boxes indicate that the sayings for the matching product by the matching participant were included in the analysis. In the end, 42 out of 90 comments on kettles, 42 out of 90 comments on cordless phones and 57 out of 90 comments on seating units formed the verbal data for further analysis in this section.

Free Viewing	Numerical (time spent)
	Visual
Think-aloud	Numerical (time spent)
	Numerical (rating)
	Visual
	Verbal
Retrospective Interview	Verbal

Figure 5.2 The types of data included in this part of the analysis

The analysis of the gathered comments on interesting product qualities, which were determined with respect to the participants' ratings, started with grouping the sentences with similar content. It should be noted that the keywords included in the sentences were taken into consideration meaning that a sentence might have been put in different groups. For example, if a participant had said "Beautiful, noble and comfortable; I liked it", these three qualities were considered as three separate statements. However, similar keywords like "cute, sweet" were considered as one. This procedure was performed separately for three different product groups bringing about categorizing 138 statements for kettles, 134 for cordless phones and 178 for seating units. The content analysis of these 450 statements in total had resulted with identifying 4 main groups of visual product qualities that evoke interest. The identified qualities are; *Aesthetics related*, *Utility related*, *Connotative* and *Curiosity eliciting qualities*. *Aesthetics related qualities* refer to the visual appealingness of

products; *utility related qualities*, as the name implies, refer to the perceived usability and functionality of products; connotative qualities are about the physical and symbolic associations of the users and finally *curiosity eliciting qualities* cover aspects leading to perception of *novelty* and *ambiguity* which are assumed to elicit curiosity. Figure 5.3 illustrates the distribution of the frequency of mentioning the identified quality dimensions.

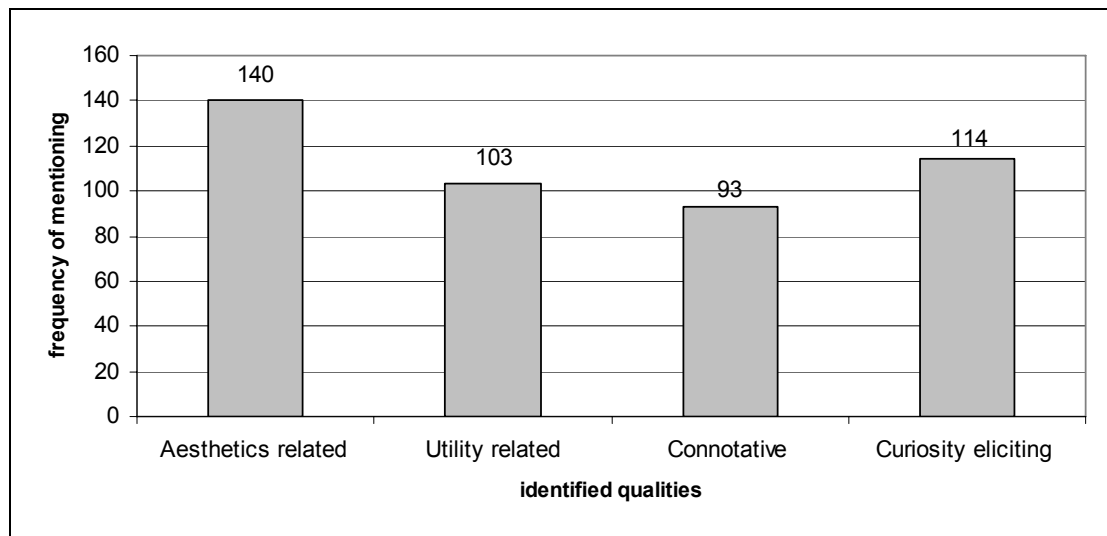


Figure 5.3 The distribution of the frequency of mentioning 4 identified quality dimensions

Another important point observed about user's comments was that they were not always positive. In other words, the results of this study showed that some negatively evaluated product appearance characteristics were claimed to be interesting as well. These constituted 18% of the total comments. The positively evaluated aspects, however, were still the majority with a percentage of 73%. There were also a few comments which indicated neither positive nor negative attitude towards product appearance which were called non-valenced qualities (9%). Table 5.4 shows the mentioned characteristics of interesting product form in relation to the previously mentioned categories and the users' attitudes as positive, negative or neutral (non-valenced).

Table 5.4 Categorization of the interesting product characteristics collected in the study

	Positively evaluated (326)	Negatively evaluated (81)	Non-valenced (39)
Aesthetics related qualities (140)	Pleasant form (67) Pleasant color (29) Pleasant material (15) Decorative fit to the environment (11)	Unpleasant form (11) Unpleasant color (3) Pleasant material (2) Exaggerated/ unnecessary features (2)	
Utility related qualities (103)	Easy to use (47) Easy to operate (17) Comfortable (28) (Easy to handle/ sit on) Safe (2) Useful (15) Space saving (6) Adequate storage capacity (2) Durable (2) Efficient (3) Functional (2)	Difficult to use (29) Difficult to operate (8) Uncomfortable (16) (Difficult to handle/ sit on) Unsafe (5) Useless (12) Space occupying (1) Inadequate storage capacity (3) Not durable (1) Inefficient (2) Non-functional (4)	*Ambiguous comfort (9)
Connotative Qualities (93)	Communicating an appreciated character or style (36) Resembling an appreciated object (32) Resembling an appreciated living thing (8)	Communicating an unappreciated character or style (9) Resembling an unappreciated object (7) Resembling an unappreciated living thing (1)	
Curiosity eliciting Qualities (114)	Novel (72) Unique form (50) Distinct color (2) Unique material (5) Creative idea (15)		Ambiguous way of interaction (21) Ambiguous comfort (9) Ambiguous material (8)

*Ambiguous comfort can also be analyzed under utility related qualities

5.2.2.1 Aesthetics Related Qualities

This category stands for the most often mentioned of the four with 31%. The overall form, color or combinations of colors, visual aspects of materials were the mentioned constructs in relation to aesthetic appeal. Some of the participants have also mentioned about their concerns about the products' fit their house decoration. Regarding their likes and dislikes, the participants have talked about the aesthetic attractiveness or the repellingness of the products.

Positively Evaluated Aesthetics Related Qualities

The results showed that characteristics grouped under pleasant form are most frequently mentioned (67). Keywords like *beautiful, elegant, chic, nice, aesthetic* or *simple* were used to indicate aesthetic appealingness of the products. The *slim* shape, *soft* contours and *unity* of the elements were mentioned to contribute the physical attractiveness of products. Apart from their instant judgments special to the presented product, the participants have also mentioned about their general preferences affecting their interest (7 times). To exemplify, three of the participants stated that they preferred *soft and curved contours* while commenting about K6 and T5; one highlighted his positive attitude towards *hook shaped handles* like K4 has and another remarked that she preferred irregular shapes rather than distinct ones like cylinders and rectangular prisms. She was attracted to the general contour of K2.

29 comments out of 111 positively evaluated aesthetics related qualities were about the color trait. Although it was argued to be a component of the form based on the literature survey, the contribution of color trait to the interestingness judgments was decided to be indicated separately. The color of the products were simply said to look *beautiful* or the color combination of the product be *harmonious*. The remaining 11 comments categorized as preferred color were about *general tastes* of the participants about color; "I like this one because it is yellow. I like yellow. ", "Its colors make it interesting, I always like the combination of red and silver."

The visual attractiveness of the material qualities were mentioned 15 times. One participant indicated the *beautiffulness* of the transparent lid of a kettle (K4) and the

rest of the statements were about the glossy finish of two telephones; T2 (10) and T6 (4).

Besides evaluating the products isolated from the environment, some participants imagined their decorative fit into their own environment or a matching place (11). For example, one of the participants who has newly purchased for a black plasma TV with glossy finishing told that T2 would be perfect for her living room. K2 was said to match a modern style kitchen equipped with stainless steel white goods. Two participants have told that they would like to place C2 in the entrance of their house to serve both as an attractive accessory and ottoman to be sit on while putting on their shoes.

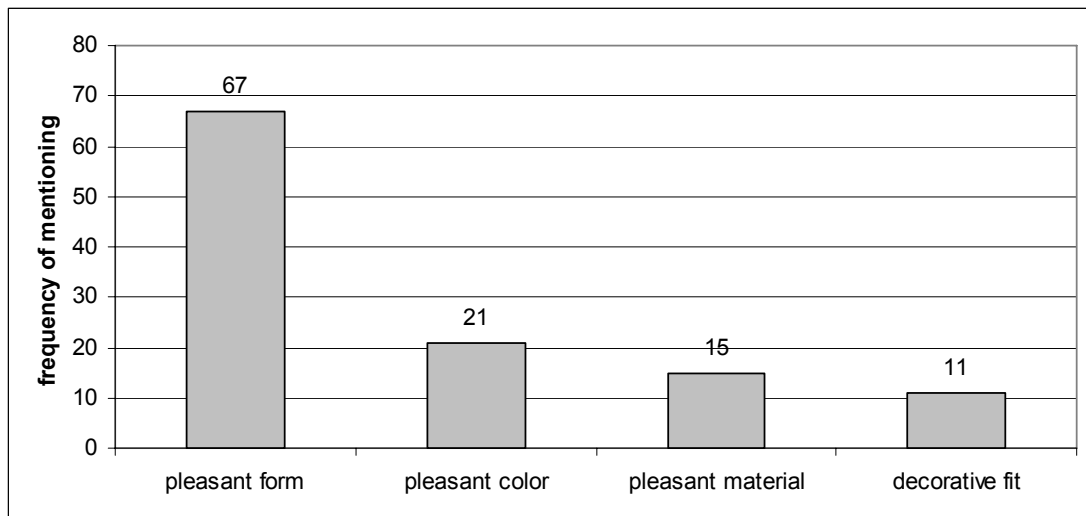


Figure 5.4 The distribution of positively evaluated aesthetics related qualities

Negatively Evaluated Aesthetics Related Qualities

Although far less frequent than pleasant ones, some products appraised as aesthetically unpleasant were claimed to be interesting. 11 out of 16 of these comments involved keywords such as *ugly*, *weird*, *unpleasant* and *irritating*. The lack of *unity* or *order* between the elements of the form was also included in this category. For example, C5-the chair whose body was made up of arbitrarily combined fluffy pandas was said to be irritating for the eyes by one of the

participants. The combination of the handle and the body of one of the kettles K1 was claimed to be an *unsuccessful* design or an *ugly* combination several times. The yellow color of T5 and the orange color of C3 were mentioned to be *disgusting* or *ugly* by three participants. These refer to the second identified characteristic within this group as unpleasant color. Two others mentioned that C4 was made of 'bad quality nylon' making it look very *ugly*. These comments were indicated as unpleasant material. The sharp contours of K5 and length of T5 were said to be unnecessarily exaggerated by two other participants.

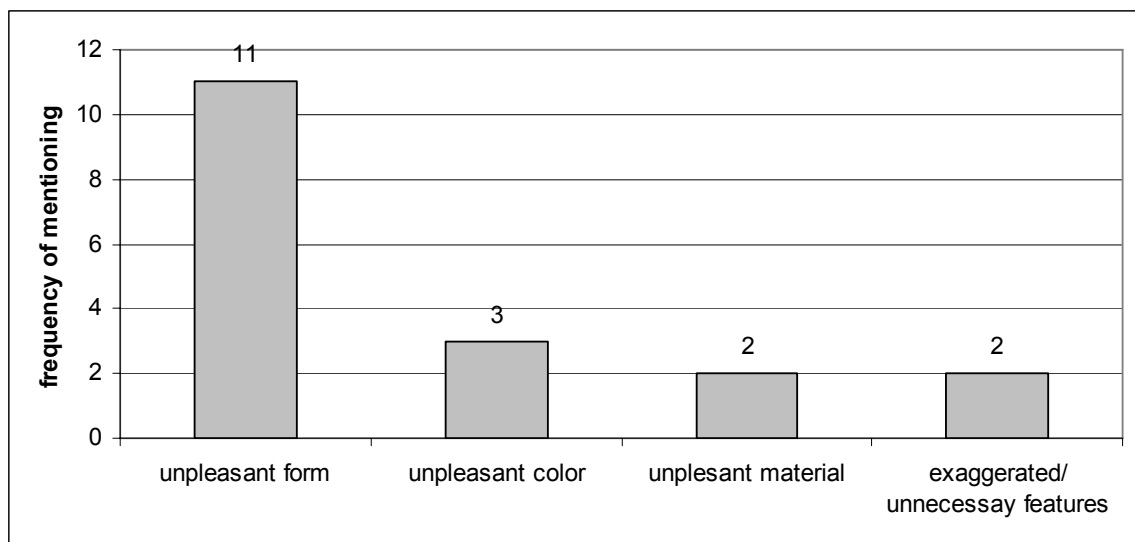


Figure 5.5 The distribution of negatively evaluated aesthetics related qualities

5.2.2.2 Utility Related Qualities

The perceived usability and usefulness of the presented products were also associated with interestingness. 96 keywords in total were collected and analyzed referring utility related concerns of the users. 60 of them were matching the concerns of the participants and 36 of them were not. Here, it should be noted that while evaluating seating units, some of the participants could not come to a conclusion whether the product was comfortable or not, based on the provided visual information (9 times). They have said that they would like to see the product

in 3D, touch or sit on it. Because of the ambiguity of visual information, they were interested and curious about the product. That is why these statements were determined to be analyzed under curiosity eliciting qualities as *ambiguous comfort*, although the concern behind was utility related.

Positively Evaluated Utility Related Qualities

Easy to Use

Perceived comfort appeared to be the most striking quality of this category which was mentioned 28 times. The fact that seating units were included in the presented products affected these results as 19 of these comments were on seating units. Perceived softness and the large size of the backrests and the seats resulted with evaluating the seating units as comfortable. C5 was claimed to be comfortable 8 times. Participants were familiar with the softness of fluffy toys and could imagine the feeling of sitting on C5. The rounded contours of the handles of kettles, *slim* and *long* shape of the handsets of cordless phones were claimed to be *easy to handle*. The shape and placement of the microphones and the receiver on the handsets in relation to the face were also claimed to be associated with ease of use.

For kettles and telephones operating on the product was an important concern which was indicated 17 times. For example, two kettles (K2 and K4) with pointed spouts were claimed to be easy to use as the participants perceived their forms helpful to pour water without spilling it around (4 times). When cordless phones are considered, on the other hand, the optimal size of the buttons and the receiver were reported to be important aspects leading to perceived ease of operation. *Familiar, clear, simple, conventional* or *normal* organizations of the operational elements were other identified keywords grouped in this category both for kettles and cordless phones. The conventional layouts of the buttons on two cordless phones (T2, T6), for instance, were appraised as easy to comprehend and use accordingly.

Safety was the last aspect included in this category which was mentioned twice, one for a kettle and the other for an armchair. The location of the handle of K2 was said to prevent hand from getting burnt by water vapor and C2 was said to be *safe* compared to others that were likely to be *unbalanced*.

Useful

There were a few comments (13) claiming the products as useful. The small radius base of K2 and T5, narrow width of K5, and small sized base of T6 were claimed to be *space saving* on the kitchen desk or table top (4 times in total). Moreover, two participants perceived C6 as *foldable* and *portable*. This aspect was also grouped under *space saving* heading.

Storage capacity was another identified characteristic of useful form special to kettles in this study. The long height of K2 and the chubby, *rounded* body of K6 have led two participants to evaluate these products as having *large water capacity*. It was mentioned twice that T2 looked *sound* and *safe*. This was because of the *perpendicular placement* of the handset on its base and the *continuous contours* between the two pieces as if they were one piece that looked as if it would not fall or break down. These sayings were related with a *durable structure*.

Opposite to T2, T6 had a weak and almost hidden attachment to its base. One participant interpreted this as if it was hanging in the air that made it *practical* to grab. Two other participants, referring the ear attachment detail on T4 mentioned that it would be *practical* to be able use their hands while talking on the phone. That piece's being small size was also said to be contributing to its practicality. The last mentioned two comments were implying *efficient ways of interaction*.

Although it was expected, none of the participants except two have mentioned about the perceived technological features of products. During test set up it was assumed that, the participants would comment on those kinds of aspects while evaluating the cordless phones with embedded software. The only comment titled as '*having high-tech*' features for cordless phones refers to the assumption that T2 might enable video conferencing due to the fact that it had a large display. The second one was about K3, assuming that it had a filter, a unique opening mechanism and chargeable which were outcomes of an advanced technology.

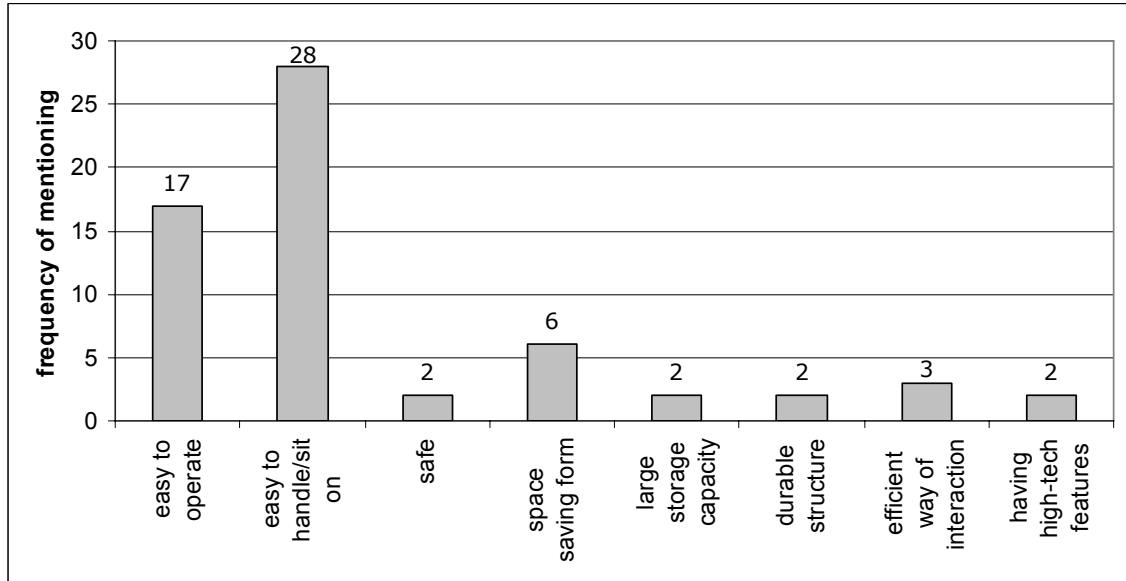


Figure 5.6 The distribution of positively evaluated utility related qualities

Negatively Evaluated Utility Related Qualities

Difficult to Use

Parallel to what was indicated in the positively related qualities; *perceived comfort* was identified to be the most frequently mentioned aspect among the other negatively evaluated utility related qualities (16). Seating units were claimed to look uncomfortable 13 times. The emptiness between the seat and the backrest failing to support the spine (for C1 and C2), narrow depth of the seat (C2) and exceeding height of the product (C4) were identified physical characteristics of seating units causing perception of *discomfort*. Moreover, some tactual properties have also been pointed out by the participants. For example, the *rough* surface of C5 caused by the eyes, noses, legs and arms of the fluffy pandas was mentioned to be uncomfortable to sit on. It should be reminded that, the same product was mentioned to be *very comfortable* several times because of the soft appeal of the fluffy toys. The very soft structure of C4 was also mentioned to be *uncomfortable* by one of the participants. She has told that she was irritated by the idea that she would swamp into the chair as soon as she sits on it. The rest of the comments indicating discomfort in use are about difficulty in handling. The *very thin* and *very long* shape of T5, the *sharp*

angled handset of T3 and *very sharp* and *thick* handle of K5 were said to be *difficult to handle*.

Operating the product was said to be difficult 8 times (2 times for kettles, and 6 times for cordless phones). Unlike the previously mentioned ones, these difficulties were due to cognition problems rather than physical. Generally, *unusual* or *unfamiliar* organizations of the operational elements were perceived as *difficult to operate*. For example, one of the telephones (T5) was mentioned to be difficult to operate 4 times as the buttons on its keypad were placed '*two in row*' different than the conventional '*three in a row*'. Similarly, the circular keypad of T1 was reported as *difficult to use*. The *unusual* appearances of the spout and handle of K3 have also led two participants to perceive it as *difficult to operate*.

The safety issue was raised in negative sense 5 times for seating units. Two of the participants anticipated themselves falling down from C1 and claimed it to be *dangerous* to sit on. Adding to that, one of them mentioned about the possibility of hitting one's head to the metal structure of it. C3 and C6 were said to be *not stable* and not *safe* to lean on, accordingly. Moreover, the sharp elements of C6 were told to be likely to be hurting people's legs.

Useless

There were a few comments (11) indicating uselessness of the products. First, some products were said to be *non-functional* (4 times). They were claimed to look like an accessory, or a piece of art to be exhibited but not to perform their basic function. One of the phones (T5) and two chairs (C1 and C5) were perceived as *non-functional*. Their common aspects were being evaluated as *uncomfortable* but *aesthetically pleasing* or *striking*.

The rest of the comments analyzed under this category are; *inadequate storage capacity* (3), *inefficient way of interaction* (2), *space occupying* (1) and *not-durable structure* (1). The bottle-like shape (*narrowing down* towards the opening) of K2 and the perceived volume of K3's container with reference to its handle and base were the reasons behind considering them as having *inadequate water capacity*. K1 was said to be too *tall* by one of the participants. He has told that it would require

effort to pour water when there is a little water left in the bottom. Another participant perceived K5 as weighting *heavy* that would also require effort to pour water. These were considered as examples of *inefficient ways of interaction*. The wide base of K3 was said to be *occupying too much space* and the transparent parts of K4 looked *vulnerable* (or fragile).

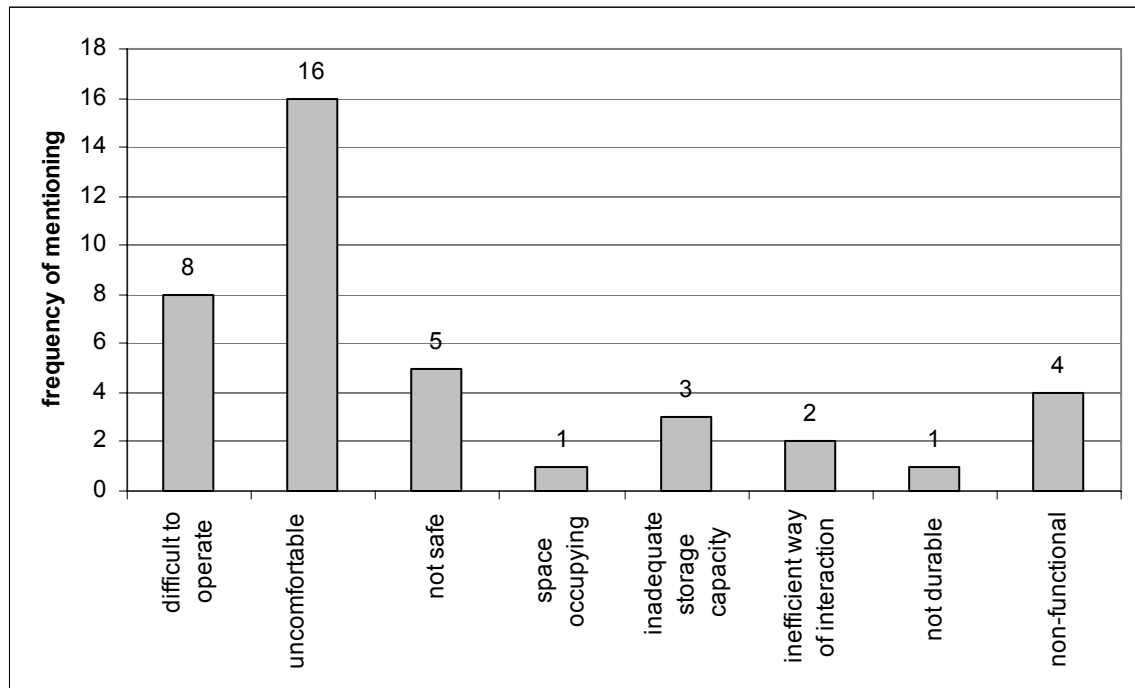


Figure 5.7 The distribution of negatively evaluated utility related qualities

5.2.2.3 Connotative Qualities

The associations of the product appearance with some personality characteristics, styles or other things around were observed to contribute to the interestingness of products. One of the participants has explicitly remarked this contribution as follows:

"C4 looks very original, it looks like a furious dog which is about to bite me...hmm, layers of fabric also reminded me of an evening dress...the fact

that it has provoked my imagination and made me comment on it this long means that it evoked my interest, doesn't it?"

The qualities communicated by the product appearance except its aesthetical appeal and utilitarian aspects were categorized as connotative qualities. These meaning related qualities could also be divided into two as positive and negative.

Positively Evaluated Connotative Qualities

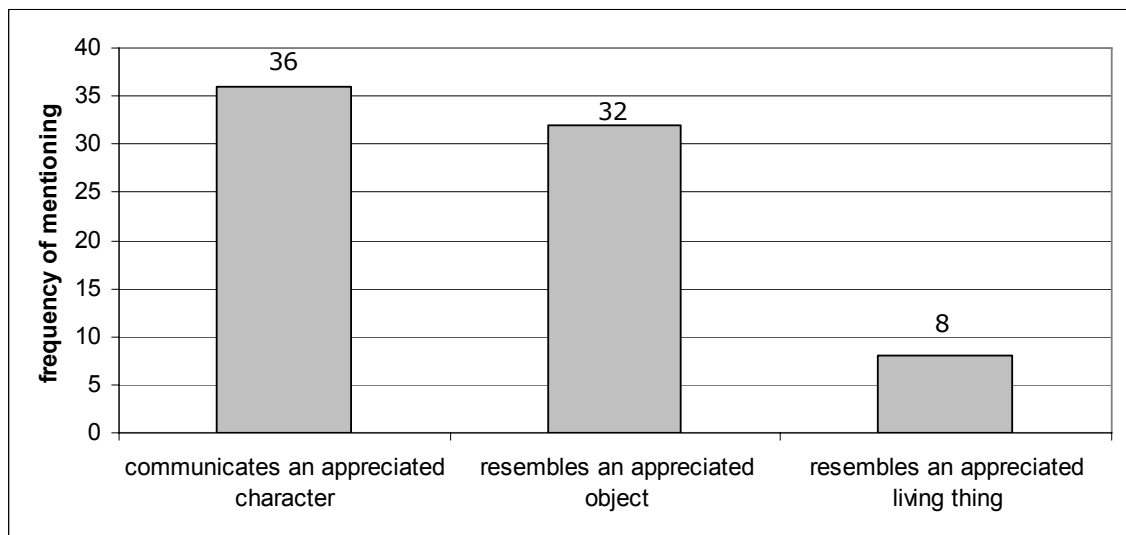


Figure 5.8 The distribution of positively evaluated connotative qualities

Communicates an Appreciated Character

The products rated as interesting were associated with a style or character in the positive sense 36 times. *Sympathetic, sweet, cute* were the characteristics mentioned most often within this group (13 times). C5, which was indicated as *sympathetic, sweet* or *cute* 7 times, was said to be *enjoyable* by one of the participants. It was also mentioned to be *beautiful* and *interesting* but not *masculine* by one of the male participants. Another participant claimed K5 to be *humorous* with its unusual look; not a product to be used in everyday life but a present to be bought for a friend. Being *flashy, striking, remarkable* or *attention drawing* was

another characteristic which was mentioned 8 times as a positive aspect. These characteristics were expressed by comments like:

"This chair (C2) has drawn my attention at first sight; a chair with such emptiness would definitely take my attention."

"I think C4 is different than the others, sympathetic and obviously very striking."

Some products were said to represent a *modern*, *classy* or *elite style*. Most often, these styles were indicated together with keywords like *beautiful*, *elegant* and *chic* implying aesthetical attractiveness. The *high-tech* or *science fictional* looks were also associated with some products (T2 and K3). Metal used as material or glossy finishing were said to bring about this impression together with *high quality*, *noble* and *serious looks*. The black color of T6 and sharp contours of T3 were also associated with *seriousness*. Opposite to the previously mentioned styles, one of the participants has found the *old-fashioned* look of K4 very interesting for a kettle.

Resembles an Appreciated Object

Some of the products evoked interest because they looked like something else (32 times). Two participants associated the perpendicular posture of T2 and the widening of the handset towards the top with a skyscraper. The rest of the associated objects discussed here are consumer products, some having similar functionalities with the associated product and some totally irrelevant. To start with the ones with similar functions, K1 was said to look like an earthenware water jug that is special to Turkish culture (2) and, K2 and K4 were associated with watering pitchers. Moreover, the transparent spout of K4 was said to look like a bottle. All of these products have a water container and a spout to pour water. T4 was claimed to look like a pager which is also an electronic device used for communication. Lastly, C6 reminded some participants of an easel or a stand for flowerpots. These two products are both used to put something on.

Because of its handle, K3 was said to look like a high heel shoe several times. It was also said to resemble an electric razor because of how it stands on its charger,

used material and colors. K5 was associated with a wide range of items such as an iron, a toy, a piece of puzzle and also a promotional product representing the initials of a company. The yellowish orange color combined with the wavy shape of C3 was said to look like a piece of crisp. The multilayered sheets of C4 reminded one of the participants of an evening dress.

Resembles an Appreciated Living Thing

The overall shape and used colors of K6 resulted with associating it with a penguin by almost all of the participants. However, only 4 of them claimed it as an interesting product quality and rated accordingly. T2 was said to look like a king with a crown on his head and T5 a bug- a sweet one like a cartoon character. T5 was also said to look like a banana. Only 8 comments in total were analyzed in this category.

Negatively Evaluated Connotative Qualities

There were a few remarks of the participants connoting a negative meaning from the product appearance (17).

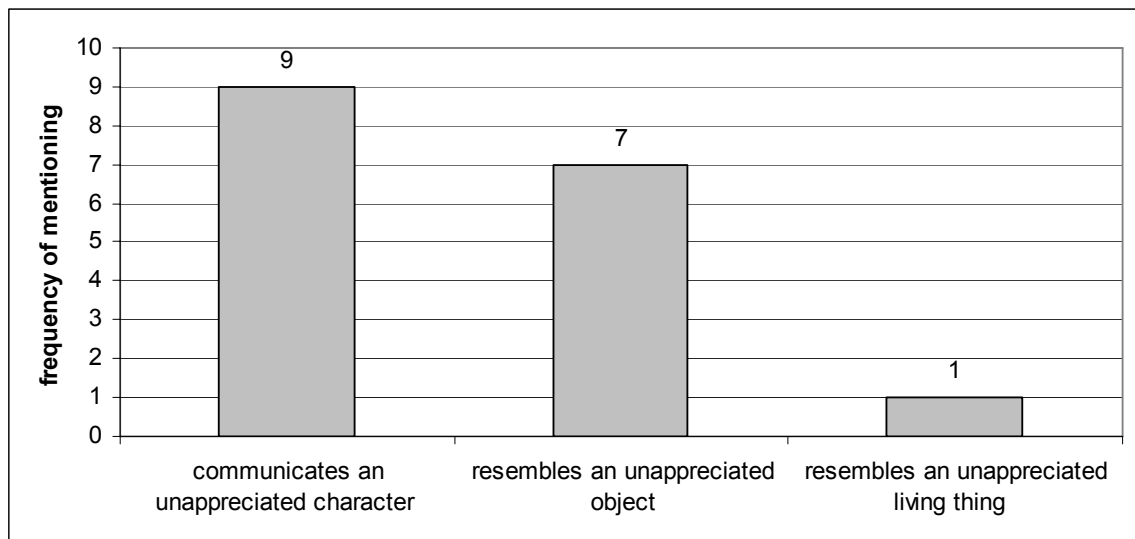


Figure 5.9 The distribution of negatively evaluated connotative qualities

Some of the mentioned qualities or associated objects were similar to the positively evaluated ones but mentioned to be a negative aspect. The more detailed explanation of these remarks is as follows:

Communicates an Unappreciated Character

The *flashy, attention taking or striking* look of some products was appraised as over assertive and claimed to be a negative quality (8 times). Similarly, K1 was said to be a *kitsch* object with its *unelaborated* features.

Resembles an Unappreciated Object

K2 looking like a pitcher and K4 a bottle were said to be interesting but *unnecessary*. K5's white *plain* surface was mentioned to look as if it was a model made of cardboard. T3's angled handset was associated with a faucet and T5's thin, curved form with a toothbrush which were also evaluated to be *meaningless* and *unnecessary*. Lastly, C4 was said to look like a rubbish bin full of wasted paper.

Resembles an Unappreciated Living Thing

C4's looking like a furious dog, which was mentioned earlier, was the only identified negative association with a living thing.

5.2.2.4 Curiosity Eliciting Qualities

Novelty and *ambiguity* are the two main keywords included in this category. It was observed that people tend to get curious about the aspects of products they are not familiar with or understand easily. The qualities leading to appraisal of novelty were identified to be positive. Ambiguous aspects of products, on the other hand, could not be categorized as positive or negative. The comments indicating *ambiguity* were about the will to learn more about the product to come to a conclusion. That is why, a third column as *non-valenced* was needed in Table 5.4.

Positively Evaluated Curiosity Eliciting Qualities

Unique form was the most frequently mentioned (50 times) aspect in this category and also the second of all the identified qualities. *Unconventional, unusual, original, not standard, new, distinct* and *atypical* were the keywords grouped under *unique*

form. Phrases like “*this is different than the others*”, “*I haven’t seen such a thing before*”, “*this is not an ordinary kettle/chair/phone*” were also covered in this group. The overall shape or the placements of the functional elements of products were defined with one of the mentioned keywords or statements. In some situations the appraised novelty was so high that the participants indicated that they would not recognize the product type if it were not indicated; “*Is this also a kettle? Very interesting because it doesn’t look like a kettle!*”, “*I wonder what this is...if you have presented this one with some other stuff, I wouldn’t be able to recognize it as a chair*”. K3, C1, C4 and C6 were the products evaluated as such by 8 participants as a positive aspect.

Some of the products’ designers were appreciated for creating a *novel*, *new*, *original*, *distinct* or *unique* product idea. There were also some products evaluated as being *conceptual* or *experiential* attempts like K3, T5 and C1. 12 out of 15 remarks within this category were about seating units. For example, C2’s seat, backrest and legs being formed out of a continuous plastic line was evaluated as an original and successfully solved design concept. The idea of putting pieces of fabric (nylon perceived as fabric by the participant) on top of another was also said to be a *novel* idea. Likewise, using toy pandas as building blocks of an armchair was considered to be a *novel*, *unusual*, *original* concept by several participants. These qualities were grouped under *creative idea*.

The using of a certain material for a certain product; stainless steel for K2 or the combination of metal and glass for K4 were claimed to be *unusual*. The material of T2 was also said to look *technological*, *new* and *distinct*. These kinds of 5 comments were gathered and indicated as *unique material*.

The yellows used in K6 were mentioned to be the only *unusual* aspect of that kettle preventing it from being ordinary by one of the participants and again the yellow color of T5 was said to contribute to its *distinct* look by another participant.

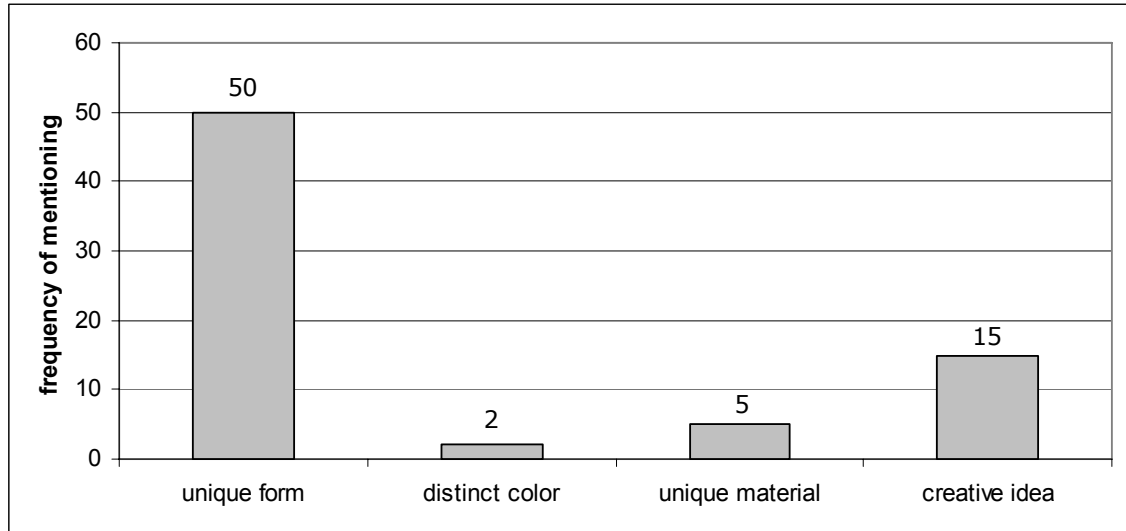


Figure 5.10 The distribution of positively evaluated curiosity eliciting qualities

Non-valenced Curiosity Eliciting Qualities

Some of the participants indicated their hesitation to evaluate the products as negative or positive in terms of different aspects. Their hesitation was sometimes due to the type of stimuli that were the visual images of products presented from just one view. Almost all of the comments categorized here were followed by the desire of the participants to view the product in 3D, touch it or try using it for further exploration.

The participants reported 21 times that they could not understand how to approach, handle, sit on or use the product. These comments were considered to be referring an *ambiguous way of interaction*. To put forward it differently, the product appearance was lacking to communicate clearly how the product was being used. For instance, the location of the power button, where and how the water is poured from K3 were said to be *unclear* or *not understood*. Moreover, one of the participants who had said that K3 looked like a high heeled shoe, was not sure where to handle it; *"I guess it is handled from its heel but I'm not sure, I couldn't understand exactly how."* Another one was not sure if there were an empty space between the container and the handle.

The fact that just the images of products were being evaluated has also declared to be providing limited information about the tactual properties such as actual *size*, *weight* or *softness*. 9 expressions were gathered specifically on the *ambiguous comfort* of several seating units like; *"this looks like comfortable but I'm not sure, I would like to sit on it to make sure"* or *"Usually these kind of things that look uncomfortable turn out to be very comfortable, so I would like to try this one first."* There were also 8 more comments about the tactual properties and most of these were indirectly related to the perceived comfort. These comments were indicated as ambiguous material. Only one of them was about the unidentified material of a kettle (K3) whether it was metal or not and what kind of a texture it had. Another one was the hesitation of a participant whether C2 was covered with fabric or bare plastic. The remaining 6 comments involved the evoked curiosity about C4's material; participants were not sure whether the layers were made of paper, tulle or plastic.

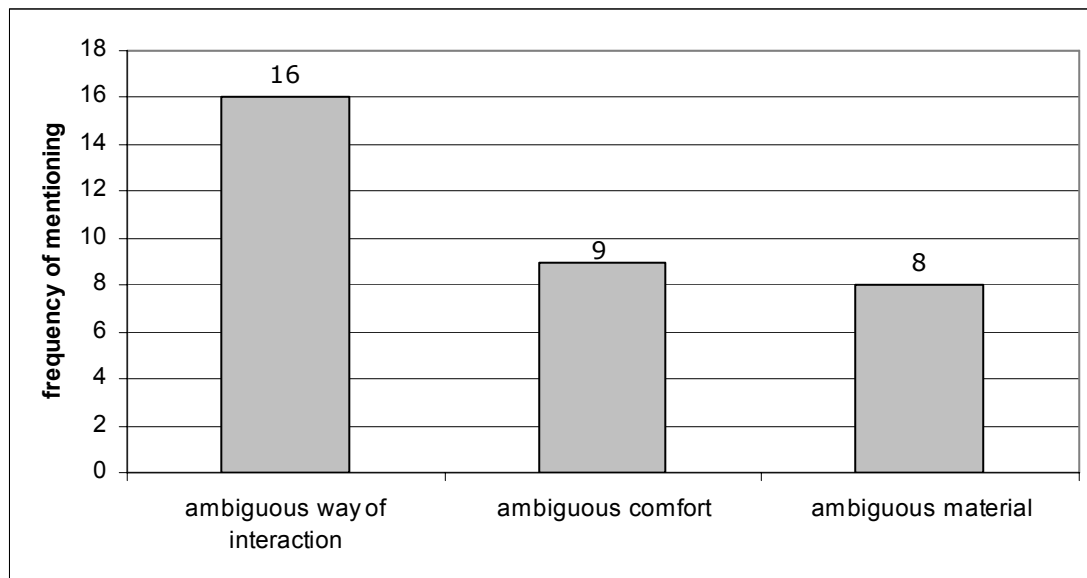


Figure 5.11 The distribution of non-valenced curiosity eliciting qualities

5.2.2.5 Comparison among Three Product Groups

Besides looking at the overall, the frequency distribution of the four identified quality dimensions within each product group was also analyzed and some differences were detected (see Figure 5.12). The results showed that the aesthetics related qualities for cordless phones (54 times) and kettles (40 times) were the most frequently mentioned. For the seating units, on the other hand, the curiosity eliciting qualities (57 times) appeared to be more frequently mentioned than aesthetics related (46 times). Moreover, looking at the distribution of the frequencies for the cordless phones reveals the gap between the frequency of mentioning the aesthetics related qualities and the other three quality dimensions. Such an obvious gap was not observed for the other two product groups.

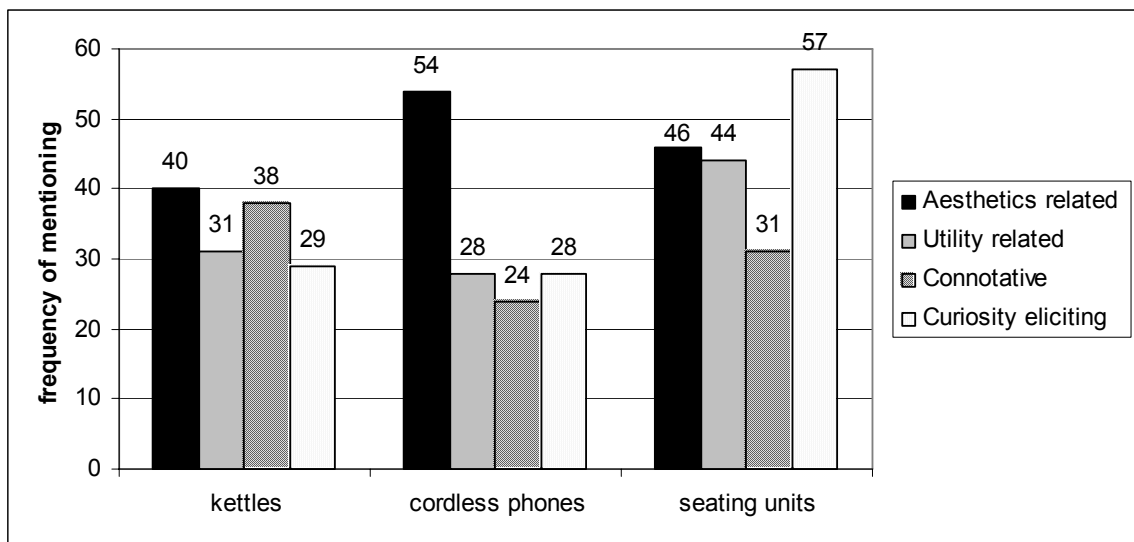


Figure 5.12 The distribution of the four quality dimensions for three product groups

The specific qualities for each product group were also sorted out. The first ten qualities starting from the most frequently mentioned are listed in the Table 5.5.

Table 5.5 The most frequently mentioned qualities associated with the interesting products for each product group

Kettles	Cordless phones	Seating Units
(+) Pleasant form (25) (+) Resembles an appreciated object (18) (+) Unique form (16) (+) Easy to use (16) (+) Communicates an appreciated character (11) (–) Useless (7) (+) Pleasant color (7) (–) Unpleasant form (5) (+) Useful (5) (+) Resembles an unappreciated object (4)	(+) Pleasant form (23) (+) Unique form (16) (+) Pleasant material (14) (+) Easy to use (11) (0) Ambiguous way of int. (9) (+) Communicates an appreciated character (9) (–) Difficult to use (8) (+) Useful (8) (+) Resembles an appreciated object (7) (+) Pleasant color (7)	(+) Easy to use / comfortable (20) (+) Pleasant form (19) (+) Unique form (18) (–) Diff. to use / uncomfortable (18) (+) Communicates an appreciated character (16) (+) Pleasant color (15) (+) Creative idea (13) (0) Ambiguous comfort (9) (0) Ambiguous material (7) (+) Communicates an appreciated character (7)

It can be seen that *pleasant form* about appealingness and unique form about perceived novelty are one of the three most frequently mentioned qualities associated with the interesting product appearances for all product groups.

The most obvious difference can be stated as *comfortable* (20 times) as a positively evaluated utility related quality being the most frequently associated quality for the seating units. Its negative version, *uncomfortable* (or *difficult to use* in general) was also mentioned more frequently (18 times) relative to the other two product groups addressing perceived comfort as an important concern about seating units. Claiming the design of the product as a *creative idea* (13 times) as an appraisal of novelty under curiosity eliciting qualities was another differentiating quality of seating units from the other two product groups.

The kettles claimed as interesting appeared to be more compared to other objects around or personality characteristics relative to the other two groups. It can be seen from Table 5.5 that *resembling an appreciated object* (18 times) stands for the most frequently mentioned quality for kettles between *pleasant form* (25 times) and *unique form* (16 times).

Pleasant material (mostly due to the glossy finishing) being one of the most frequently mentioned qualities (14 times) together with *pleasant form* (23 times),

can be given as an explanation for the previously mentioned gap between aesthetic related qualities and the other three, associated with cordless phones.

5.2.2.6 Concluding Remarks

The analysis on the statements of the participants about the products indicated as interesting resulted with identifying 37 visual qualities which could be categorized under four main quality dimensions as aesthetics related, utility related, connotative and curiosity eliciting. From a different perspective, these identified qualities could also be categorized into three as positively evaluated, negatively evaluated and non-valenced. The matching qualities with respect to these two categorizations were presented in Table 5.4. The qualities grouped under each category were explained in detail by presenting their frequencies of being mentioned, indicated keywords as well as some quotations from the participants.

The results showed that aesthetics related qualities were the most frequently mentioned followed by the qualities categorized under curiosity eliciting. Moreover, the *aesthetic appealingness* in general covering the shape, color and the material traits was identified to be the most frequently mentioned quality for the products that were evaluated as interesting (111 times). This is followed by the *perceived novelty* which was identified to be indicated 72 times in total involving qualities such as *unique form*, *distinct color*, *unique material* and *creative idea*. Under utility related qualities the *perceived ease of use* was identified to be the most frequently mentioned quality. Lastly, *communicating an appreciated character* (e.g. sweet) or *style* (e.g. modern) was the most frequently mentioned quality analyzed under connotative qualities.

Not neglecting the negatively evaluated and non-valenced qualities, it can be said that the qualities associated with interestingness were dominantly positively evaluated.

Despite the fact that the identified qualities under the four main dimensions require further research and elaboration, the presented table (Table 5.4) can guide the designers into designing products to elicit interest at first impression. *Novelty*, which

was argued to be a priority to elicit interest, can be achieved by applying *unconventional, unique shapes and contours, and distinctive colors*. Searching for new materials and conceptual ideas leading to novel looking designs can also be stated as contributing to the interestingness of products. As the most frequently mentioned response to product appearance, the aesthetic appeal directly emphasized by shapes, contours, colors as well as the *decorative fit* to the use context should be considered for any type of product. Apart from these two, some suggestions specific to the three product groups can be given. For small electric appliances serving for a simple purpose which were exemplified by kettles in the current study, considering the connotative qualities covering the associated personality characteristics, styles and resemblances to other things around can be suggested to focus on. For electronics with embedded software, on the other hand, the aesthetics and novelty related considerations can be accompanied by ease of use and usefulness in relation to the organization of the functional elements. Lastly, for the seating units the suggested physical interaction communicated by the visual material properties, size and combination of the functional elements can be stated as an essential concern.

To sum up, this part of the analysis is considered to be giving an insight about the visual qualities of products associated with interestingness as well as presenting some differences among the three product groups. Moreover, some of the physical parts of the products were also referred to while presenting the identified qualities in detail which will also be in focus within the analysis of the visual data to be discussed next.

5.3 Analysis of the Visual Data

The gaze behavior recorded by the eye tracker, which is called visual data in this study, can be analyzed and presented in several ways. One of them is Hot Spot map which represents the areas on the stimuli where the participants have been looking by highlighting with a colored scale from green to red. The Clear View software (version 2.7.1), which was used for the analysis of the eye tracking data, involves some types of Hot Spot calculations such as illustrating the frequency of the number of fixations, fixation durations and the percentage of the participants looked at on

an area. Because the time spent was an important criteria in this study, the absolute fixation length type of Hot Spot calculations were chosen for the analysis. This type illustrates "*Total fixated length on each spot of the image*" (Tobii user manual, 2006).

The absolute fixation length type of Hot Spot maps were calculated for the entire visual data collected in the first two sessions, namely free viewing and think aloud. This procedure involved merging the gaze behavior of all the 15 participants for each slide. The results and the analysis procedures are explained in more detail in the following two sections.

5.3.1 Free Viewing

Two types of data as numerical and visual were collected during free viewing session.

Free Viewing	Numerical (time spent)
	Visual
Think-aloud	Numerical (time spent)
	Numerical (rating)
	Visual
	Verbal
Retrospective Interview	Verbal

Figure 5.13 The types of data included in this part of the analysis

The absolute fixation length (AFL) type of Hot Spot maps for the three slides exposed during this session constitute the visual data referred in this section (see

Figures 5.14, 5.16, 5.18). The time spent (in milliseconds) for each product image included in each slide presentation, which were calculated by Clear View analysis software, constitutes the numerical data (see Figures 5.15, 5.17, 5.19).

The general interpretation for the Hot Spot maps can be summarized as *the redder the highlighted area is, the longer it had been looked at by the participants in total*. In the following paragraphs, these areas in relation to the gathered numerical data will be overviewed for the maps presented as kettles, cordless phones and seating units.

Kettles

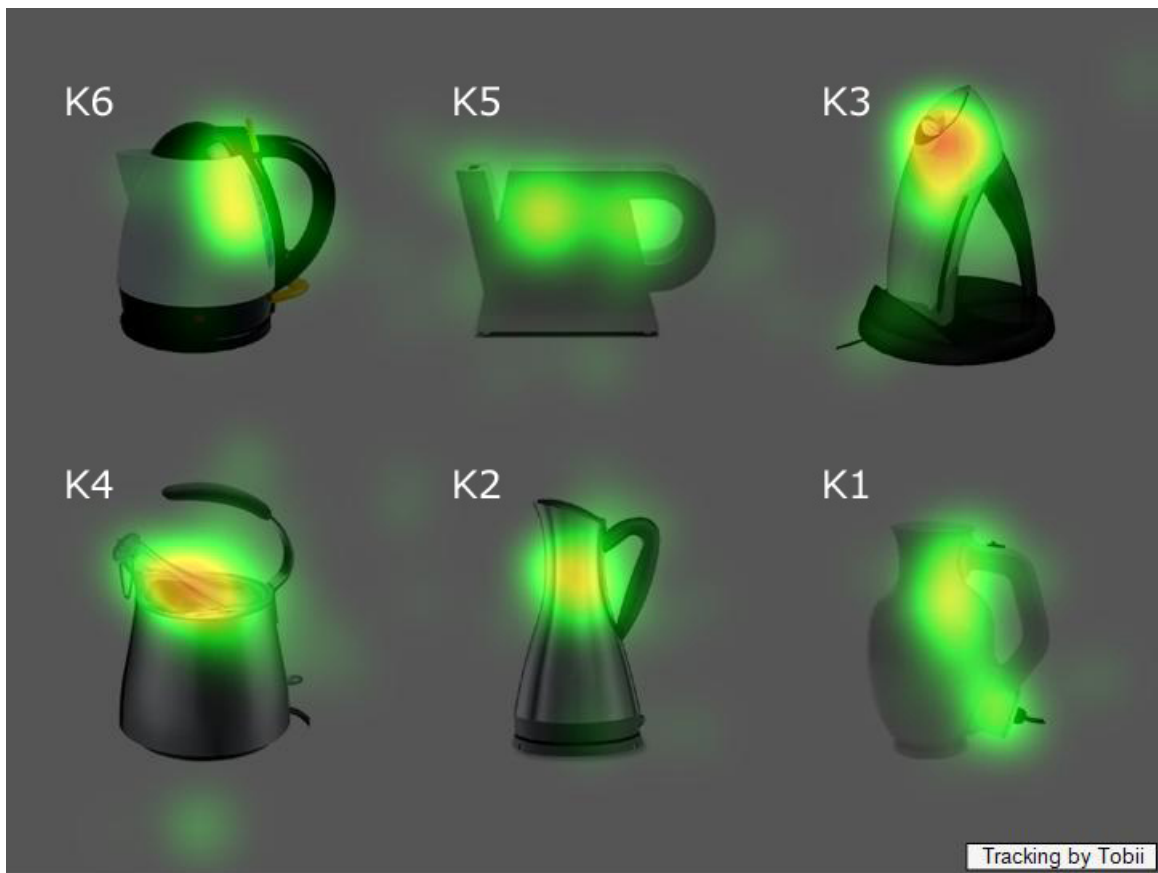


Figure 5.14 AFL type Hot Spot map for kettles (labels added later)

The reddest area on Figure 5.14 consisting of 6 kettle images was observed to be in the top right corner on K3. It can be said that the area around the spout of K3 was looked at the longest which is followed by the spout of K4. The sum of the length of the fixations of the rest of the products were relatively shorter and on several other parts of the products.

Figure 5.15 presents the mean values in milliseconds (ms) of the total gaze time spent on each kettle image. Of the total, 20% of the gaze time was spent on K3 (1461.87 ms), 20% on K4 (1439.40 ms), 17% on K5 (1243.80 ms), 17 % on K1 (1198.47 ms), 14% on K6 (1023.13 ms) and lastly 12% on K2 (862.40 ms). Moreover, when the minimum and maximum values of gaze time are considered, it was observed that all of the participants have spent time looking at K4 (min: 479 ms) and K3 (min: 220 ms). For the rest of the kettle images, however, the minimum value zero was obtained. One of the participants (P07) has not looked at K5 and K6 and another (P03) has not looked at K1 and K2 in the given ten seconds period. It should be noted that, the results gathered in this session might have been affected by the placements of the products in the image.

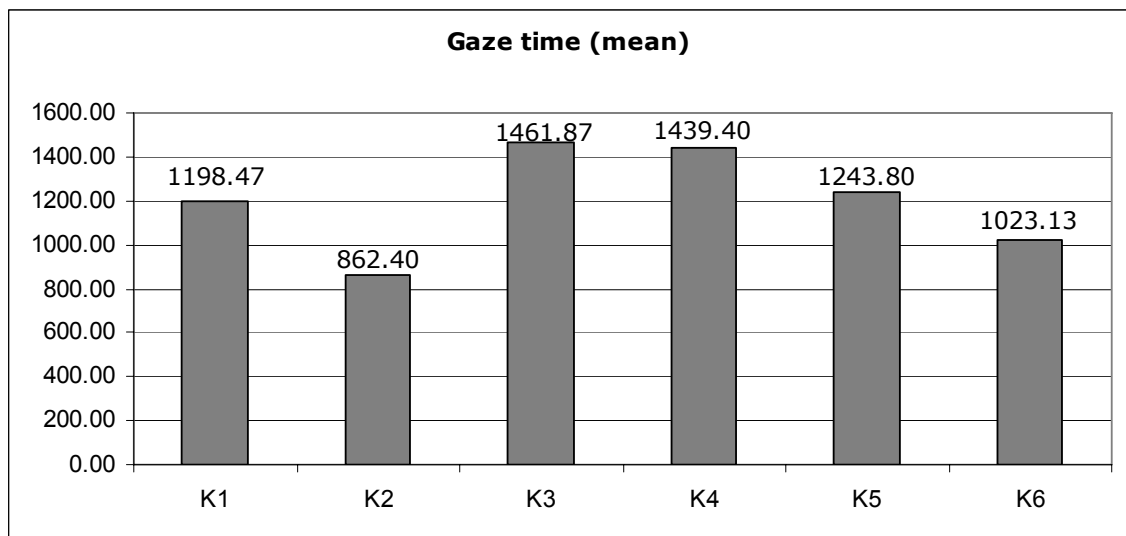


Figure 5.15 The mean values of the time spent on each kettle during free viewing

The specific part of the each product looked at the longest were also looked into with respect to the highlighted areas on the Hot Spot map in relation to the percentages of the time spent on each product. However, not a specific part can be mentioned about the kettles which was specifically looked at. However, it is the spout for the two kettles which were looked at the longest (K3 and K4). It is also interesting to note that none of the handles were looked at during this session.

Cordless Phones

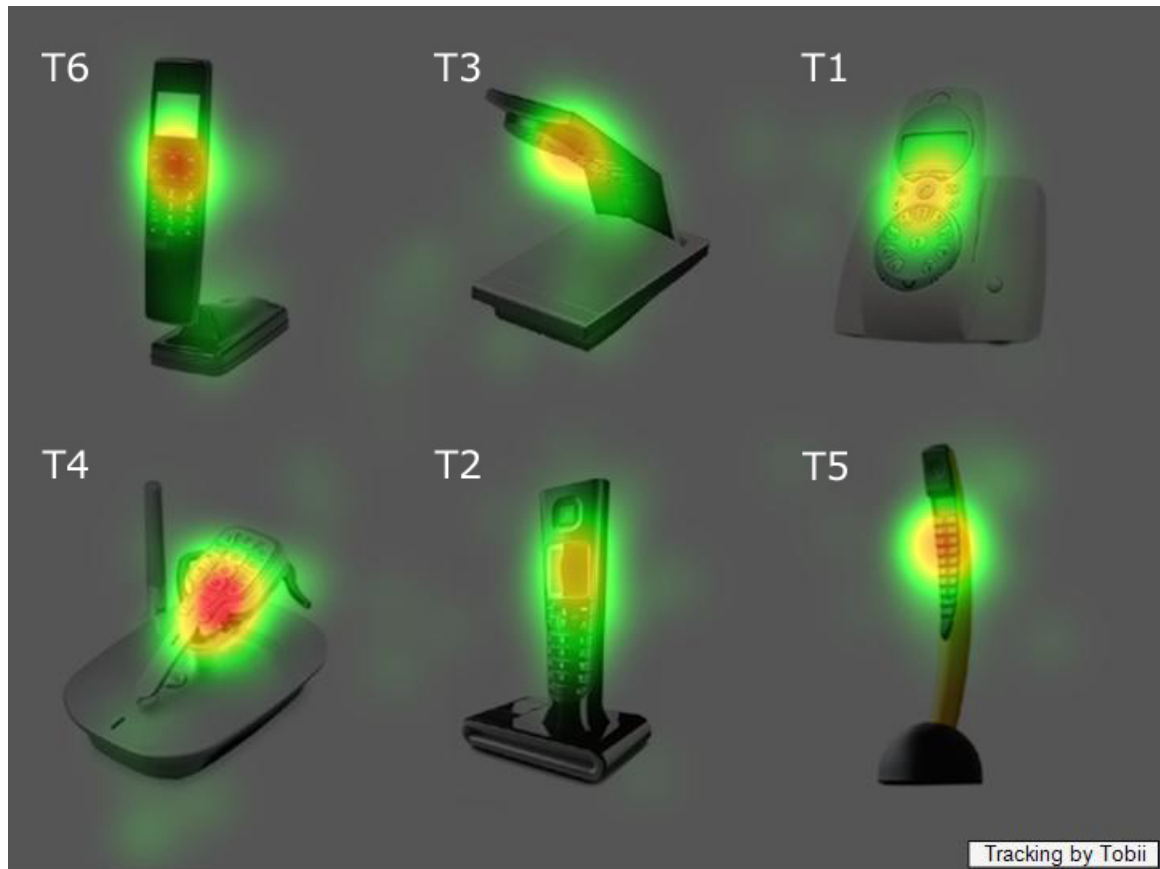


Figure 5.16 AFL type Hot Spot map for cordless phones (labels added later)

In figure 5.16 it can be seen that the fixations on T4 which are located on the left bottom corner appear to be the longest. Supporting that, the calculated time spent on T4 (1702.13 ms) consists 23% of the total time spent on this slide by 15 participants. the rest of the fixation lengths on the respective product images are as

follows; T6 (1271.00 ms) and T3 (1224.87 ms) with a percentage of 17%, T2 (1060.53) with 15%, and lastly T1 (1056.27) and T5 (998.07) with 14%.

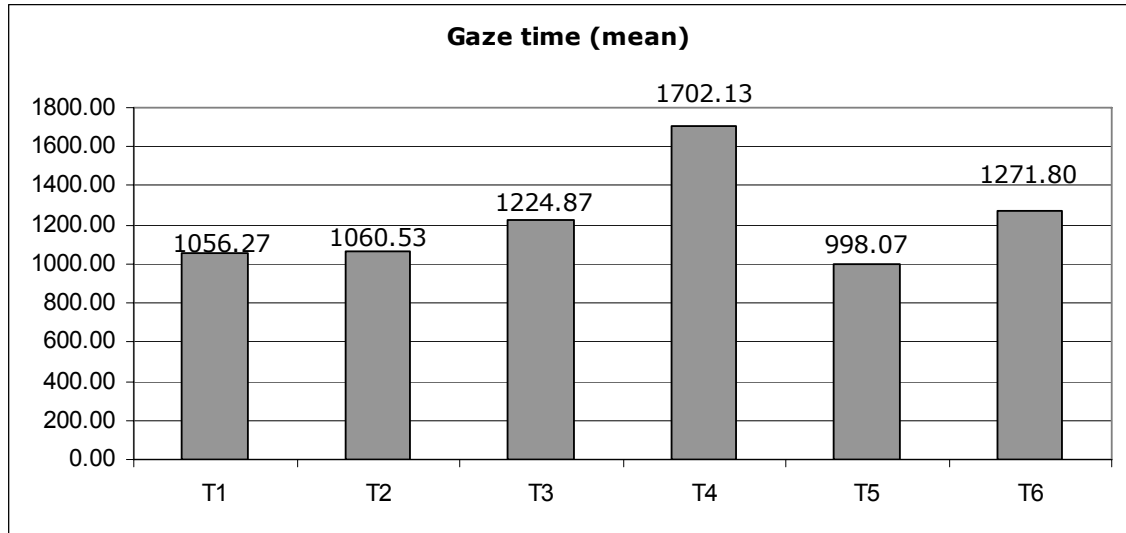


Figure 5.17 The mean values of the time spent on each cordless phone during free viewing

Different than kettles, a common functional spot was detected to be looked at for cordless phones. In Figure 5.17 it can be seen that the longest fixations on each cordless phone image are on their keypads and displays which can be named as their operational elements.

Seating Units

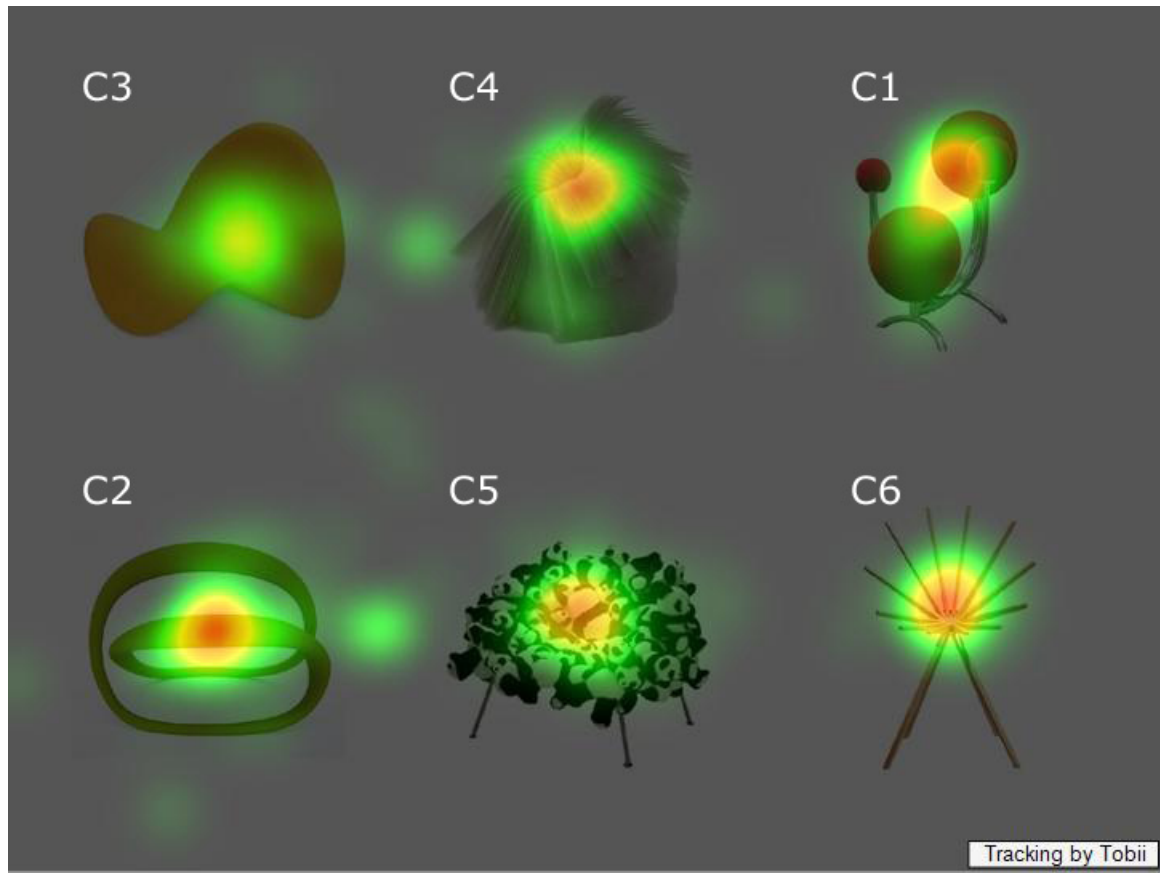


Figure 5.18 AFL type Hot Spot map for seating units (labels added later)

In the case of seating units, the fixations on the *seats* were gathered to be the longest for each presented product image. C2 (1471.07 ms), C5 (1306.53 ms) and C4 (1250.60 ms) were longer looked at relative to the other 4 products constituting 20%, 19% and 18% of the total fixation length, respectively. The fixations on C1 (1160.27 ms) mostly spotting the area around the seat, backrest and the *unusual* emptiness in between them were recorded to be the forth of all, with 17%. The fifth mostly looked at is the seat of C6 (1008.60 ms, 14%) which can also said to be the visual focal point of the chair image defined by the structural elements (a dot where all the linear sticks are combined). The last and also the shortest looked at one of all the 18 product images, is C3 with 828.87 ms 12%.

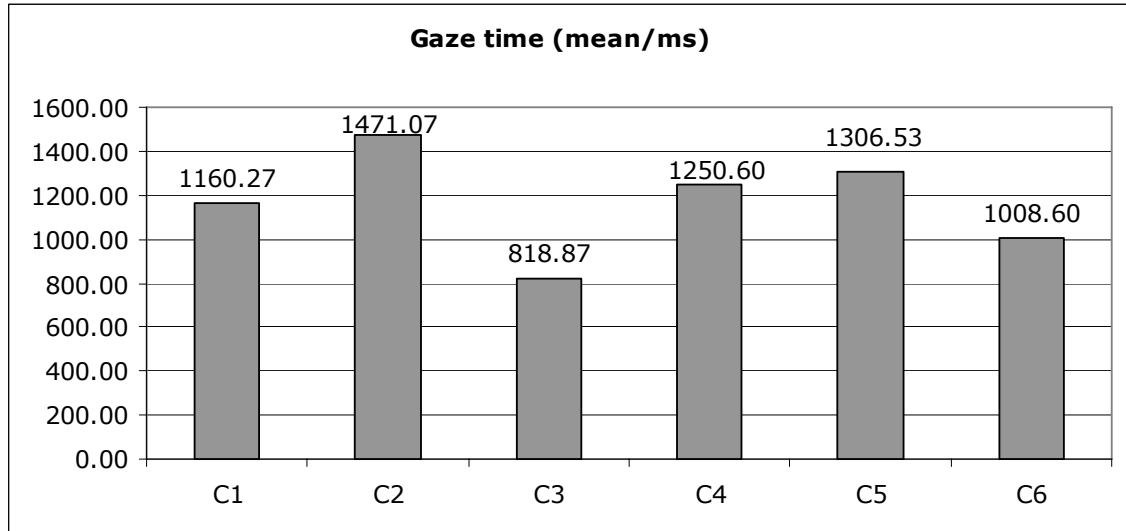


Figure 5.19 The mean values of the time spent on each seating unit during free viewing

To summarize the procedure followed in this section, the participants' gaze behavior when they viewed all the six examples of a product group in one slide in a limited ten seconds time were compared. How much time they spent on a product image (or their fixation lengths) was used as a basis for comparison. Although not strikingly different, K3 of the kettles, T4 of the cordless phones and C2 of the seating units were identified to be mostly looked at.

It was observed that generally the sum of the fixations tend to be on a single area on the product image with some exceptions like K1 and K5. Apart from that, the operational elements (keypad and display) for cordless phones and seats for seating units were noticed to be on focus. For kettles, however, such a distinct element was not observed.

The visual data about the products for each product group, identified to be the longest and shortest looked at were also combined with the indicated qualities during free viewing session. Figure 5.20 illustrates the results of this analysis procedure. Each row enables comparison within product groups while the columns present the differences and similarities among the three product groups.

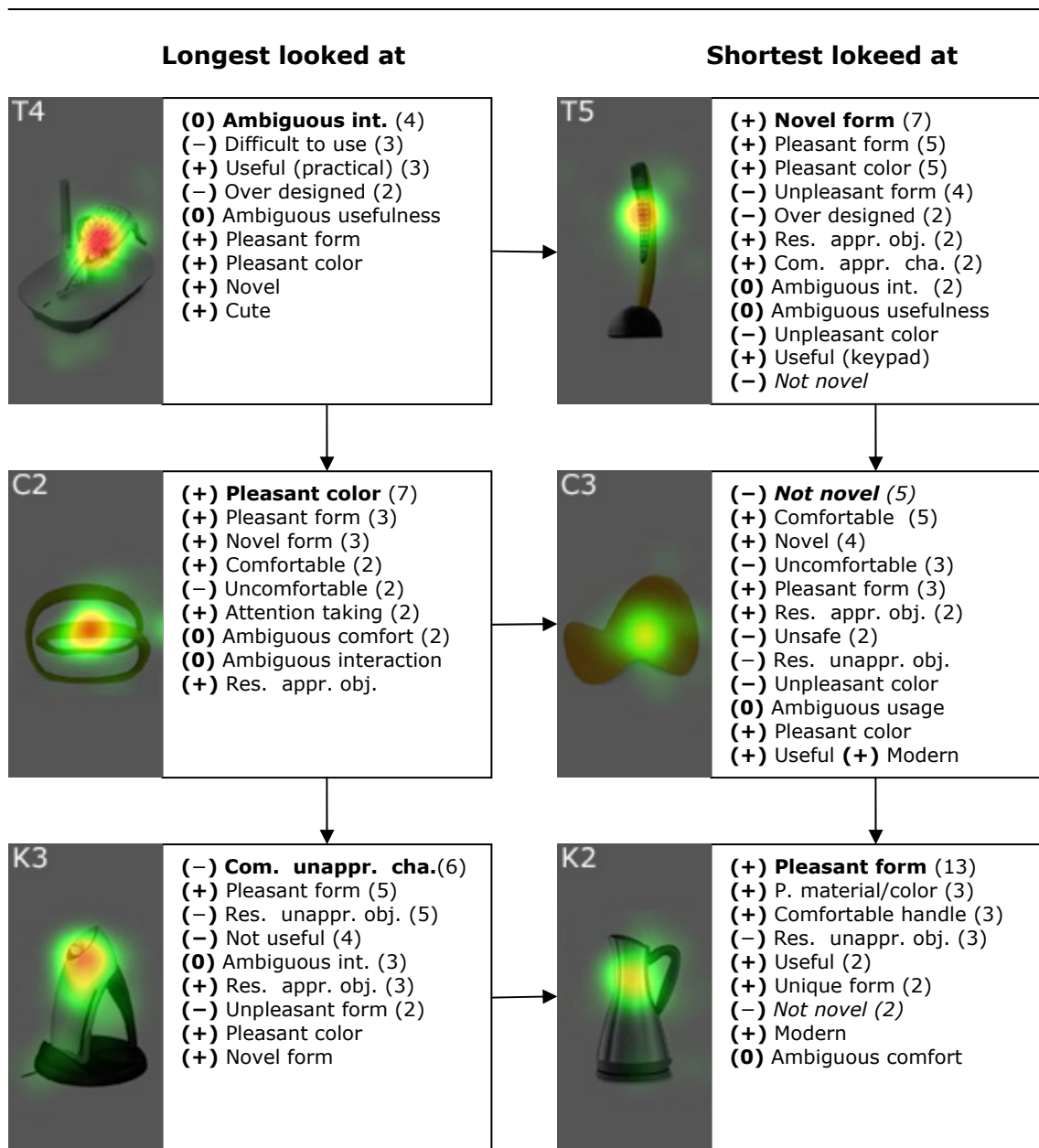


Figure 5.20 Longest and shortest looked at products during free viewing

Neither a significant similarity among the products that were the longest looked at (T4, C2 and K3) nor a common difference between the products that were the longest and shortest looked at (T4-T5, C2-C3, K3-K2), was identified regarding the associated qualities and their valence. The most frequently mentioned quality about

T4 was the *ambiguity* about its usage (non valenced Curiosity eliciting quality), it was the *appealing* green color of C2 (positively evaluated Aesthetics related quality) and K3's exaggerated and strange appearance (negatively evaluated Connotative quality). It was interesting to notice that, two of the products that were the shortest looked at were highly associated with positively evaluated qualities; T5 and K2. These two products were also rated to be interesting relative to the other products within their groups. As mentioned before, specific to product results were observed when the associated qualities for the longest and shortest looked at products during free viewing were compared.

5.3.2 Think aloud

It can be said that, the majority of the data to be analyzed in terms of variety and content was collected during think aloud session. These data, which were specific to each product, were combined and compared and the results were illustrated by diagrams similar to free viewing session's. The two determined criteria were taken into consideration separately to find out the most and least interesting products as 'the highest/lowest mean rating' and 'the longest/shortest looked at'.

To start with the **verbal ratings** as an indicator of interestingness; C2 (7.26), T2 (6.26), K2 and K4 (5.73) were identified to be the most interesting for each product group whereas; C3 (4.4), T1 (3.46) and K1 (3.06) were identified to be the least interesting. In Figure 5.18 it can be seen that, the most frequently mentioned qualities for the products in the first column indicated as 'highest rating' are positively valenced. Furthermore, all of them (except for K4's) are aesthetics related qualities as they are either about the appealingness of the shape, color or material trait or both. In contrast, it can be seen that the products in the second column under 'lowest rating' heading are more associated with negatively valenced qualities. Their being evaluated as not novel or more specifically *ordinary, usual, conventional, standard, classic, or boring* which naturally were not included during the analysis of qualities associated with interestingness.

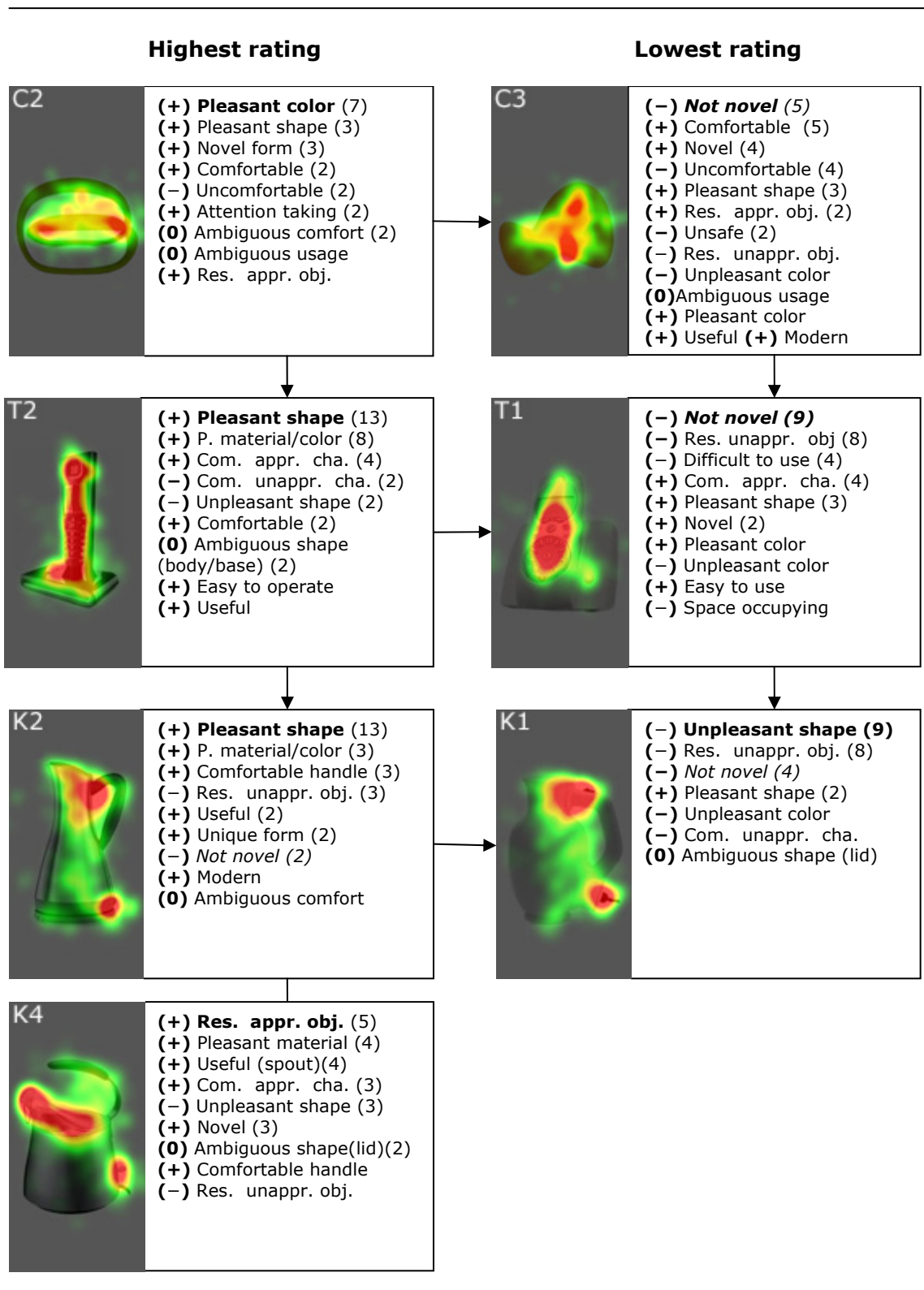


Figure 5.21 The products with the highest and lowest ratings for interestingness

In the following sections, the products in each row representing the most and least interesting products regarding the ratings will be overviewed in relation to the visual and verbal data collected during think aloud session. It should also be noted that, the sequence of these rows as seating units, cordless phones and kettles were determined with respect to the mean ratings of the products.

Seating units

A single seating unit was identified to be matching the two criteria determined to be indicating interestingness. **C2** has the highest average rating of all the 18 products since all of the 15 participants have rated this product ≥ 6 in terms of interestingness. It is also the seating unit that was longest time spent on during free viewing (20%).

The distribution of the keywords gathered for C2 showed that its most commonly agreed quality was its aesthetic appeal which was mentioned 10 times. Moreover, 7 of these comments were about the pleasantness of its green color and the rest were about its looking aesthetically pleasing in general. Nothing negative about its aesthetical appearance was mentioned by the participants.

It was noticed that, the utility related qualities of C2 were not much mentioned about compared to the other presented seating units. This might be due to the fact that liking the product in terms of aesthetics was found sufficient by some participants to evaluate it as highly interesting and not questioning about it from some other perspectives during the test. Analyzed under utility related qualities, it was claimed to look comfortable twice and uncomfortable twice, as well. Adding to that, two of the participants were not sure whether it was comfortable or not due to the ambiguous information provided by the image about the depth of the seat, the emptiness in between and its material qualities (whether soft or hard), and one was not sure how to sit on it. These statements are grouped under curiosity eliciting qualities as ambiguous comfort and usage (non-valenced) together with the keywords like *distinct*, *unusual* and *original* grouped as *novel* (positive). Novelty related keywords were only indicated 3 times during think aloud session, during the retrospective interview, however, 6 more participants mentioned about the novel form of C2.

As mentioned before, the most looked at part on C2 during free viewing was the middle of its seat which is the part of a seating unit where the physical interaction occurs at most. During think aloud, however, the two sides of the seat which bend towards the back appear to be looked at the longest. This might be interpreted as the participants' tendency to try to imagine this continuously bending spiral like body's 3D appearance. Supporting that assumption, one of the participants has stated that it looked like a 3D puzzle to be solved as the main reason of his interest. Another support to that assumption can be its being looked at the longest among the seating units despite its plain body without any detail. These can be linked with this products ability to elicit curiosity.

C3 stands for the seating unit with the lowest interestingness ratings. Similar to what was observed for most of the other seating units, the most frequently mentioned concern about C3 was its *perceived comfort*. Some of the participants perceived the sitting posture it offers comfortable (5) and some others not (4). One could not come to a conclusion about its comfort just by looking at it. The same balanced distribution was observed for its novelty as well. It was indicated to look *distinct* and *unusual* by 4 participants while '*not so original*', *conventional* and *ordinary* by some other 5.

Regarding the eye tracking data, a similar result to C2 was observed for C3. Apart from the area to be sit and lean on, where the shape bends was looked at most during this session. The duration of the time spent, however, is almost the half the time spent on C2.

Cordless phones

T2, which was indicated to be interesting by the majority of the participants (by 13 out of 15 participants), it can be said that its most pronounced quality was being aesthetically appealing. In detail, its general outlook and slimness was appraised as aesthetic and chick (8 times), how it stands on its base was indicated to be in harmony and beautiful as well (5 times) and its color or glossy finishing was indicated to be aesthetic (8 times). Only two negative aesthetics related comments were indicated about it. In the hot spot map calculated for T2, it can be seen that

not a specific area but the whole handset including where it is attached to its body was looked at. This attachment was indicated to be ambiguous twice.

There were only 2 participants rating **T1** ≥ 6 which was assumed to be indicating interest in this study and these ratings were 6 and 7. However, it can be said that most of the comments on T1 were about the circular orientation of the numerical pad varying in valence as well as the concern behind. It can be seen from the hot spot map calculated for T1 that the reddest area on this product is around the numerical keypad and buttons. Apart from usage, the circular numerical pad reminded some of the participants of an old version mobile phone as a negative connotation. It should also be noted that nearly two third (22 out of 31) of the total keywords collected for T1 were negatively evaluated. As argued for the products under 'lowest rating' column, T1 was also explicitly indicated to be not novel (9 times).

Kettles

The most significant quality associated with **K2** was identified to be its being aesthetically appealing (16 times). Its shape in general being aesthetic, beautiful, elegant, chick, plain and simple was mentioned about 11 times and its handle was said to look aesthetically harmonious with its body twice (pleasant shape). Its material or metallic color was appreciated 3 times. The most looked at part on K2 during this session appears to be the area where the handle is attached to the body followed by the small spot where the on/off button and the cable are located. The narrowing down part of the body, which can be associated with its elegant look, was also looked at but not as long as the previously mentioned two. In fact that part was identified to be the most looked at during first impression (free viewing session). About K2 it can be argued that it was looked at, the two details on the plain body were focused on and its general outlook was appreciated by most of the participants. In other words, most of the participants have looked at it, simply liked its appearance and rated as highly interesting without much questioning about any other concern. This assumption, based on the reporting of the participants as well as the observations of the interviewer explains why it was not much time spent on.

The most significant quality identified for **K4** is its appearance enabling different connotations. For example, it's looking like a bottle or a bottle in an ice-bucket was mentioned about 5 times. It was also told to be reflecting old and modern styles at the same time, sympathetic and warm. The second result gathered about K4 is that its most looked at part is its spout. Apart from the previously mentioned connotations mostly put forward looking at the spout, it was claimed to be useful while pouring the water (4 times), aesthetically pleasing (3 times), unconventional, distinct and new and also not clear how it opens (2 times). The spout being evaluated from different aspects for several times explains why it was that long looked at.

The results of the verbal data collected about **K1**, which was determined to be the least interesting of the 6 presented kettles, showed a significant negative tendency towards this product. It was indicated to look aesthetically unpleasing 5 times. Furthermore, its buttons and color were said to be specifically unpleasing 3 times and its handle not harmonious with its body twice (10 in total). It was also mentioned to resemble some other objects like a vase or a flower pot (9 times).

The products were also sorted out with respect to the time spent on each slide including the single image of the product resulting with the diagram presented as Figure 5.19.

The longest looked at products in this category also represent the products that were time spent on for commenting besides just looking at. Looking at the qualities listed in the first row, ambiguity can said to be the most striking quality for the identified cordless phone (T3) and seating unit (C4). It is the positively and negatively evaluated connotative qualities for the kettle (K3). Therefore, the unknown and unclear aspects as well as the ones provoking imagination can be claimed as positively correlated with the time spent on a product image. Some of the mentioned points during the analysis of free viewing session as T4 also being associated with ambiguity and K3 identified to be the longest looked at kettle for both of the sessions support this assumption. The following paragraphs will go over the products in the diagram row by row.

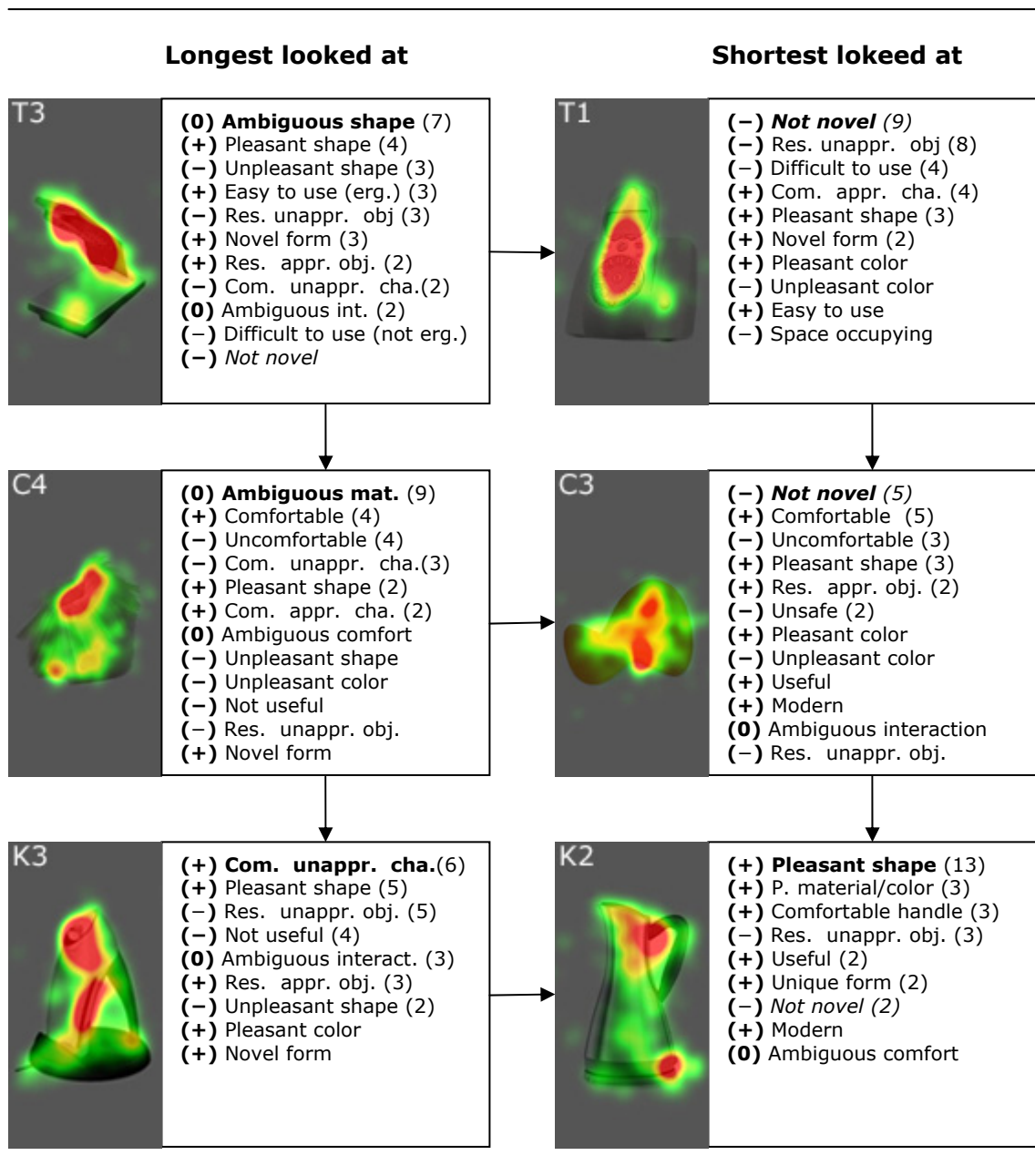


Figure 5.22 Longest and shortest looked at products during think aloud

Cordless phones

As mentioned before, the longest time was spent on **T3** during think aloud session consisting 21% of the total time spent on cordless phones by 15 participants. As mentioned several times, this may be explained by the ambiguous information the

presented image of this product communicates. In other words, due to the inclined posture of the handset of T3, neither its keypad nor its display was clearly visible. In fact, there was no clue whether a display existed and the participants have spent time trying to make guesses. The verbal statements go parallel with this assumption as 9 out of 31 keywords or the statements collected for T3 were about the ambiguity of its posture, usage, layout of its buttons as well as the location of its display. The hot spot map calculated for T3 presents that the most looked at (reddest) area on T3 is its inclined body where the so called elements appear or expected to be located.

T1 which was also poorly rated for interestingness can said to be not much associated with interestingness.

Seating units

C4 made up of thin sheets was identified to be the longest time spent on product among seating units, however it was not much highly rated for interestingness (mean score: 5.46). The so called ambiguity was due to the unclear information about the material of the sheets; whether paper, plastic or tulle. This ambiguity of the material quality also resulted with different evaluations for the perceived comfort which was identified to be an important quality associated with seating units.

Similar to T1, **C3** was identified to be the least interesting seating unit regarding the three determined criteria for two sessions.

Kettles

The qualities grouped under connotative were identified to be most frequently associated with K3. Its being evaluated as over designed, exaggerated and strange are also covered in this category. It can be said that it's looking like a high heel shoe or electric razor is the leading reason for being ranked as interesting. It is clear that a considerable number of these statements are covered under negatively evaluated qualities (11 out of 14). Although not explicitly stated in this session by the participants, it is assumed that K3's unusual and novel appearance as well as its ambiguous parts (especially the spout) has contributed its interest ratings. In other

words, the curiosity eliciting qualities of this product are assumed to be more affective than they are presented here. The gathered visual data as well as the results of the retrospective interview session support that idea as its spout is the mostly looked at part of **K3**.

Consistent with the results in free viewing, in contrast to interestingness ratings; **K2** was the shortest looked at kettle among the others.

5.4 Chapter Conclusion

Trying to combine and discuss the three types of data, which were referred as numerical, verbal and visual, specific to each product showed how varied attitudes towards products could be. Despite the variety, some commonalities that were considered to be promising to shed light into the understanding of interestingness of product appearance were identified.

The results of the analysis showed a positive correlation between the positively evaluated aesthetics related qualities of a product and rating it as highly interesting. The products rated to be the most interesting (K2, T2 and C2) for each product group the most frequently mentioned quality appeared to be its **aesthetical appealingness**. The time spent on two of these products (K2 and T2), however, was relatively shorter compared to other products within their product group. This was interpreted as the participants' liking the appearance of these products leading to rating them as highly interesting without much questioning about them.

The time spent, as another indicator of interest, was identified to be positively correlated with connotative and curiosity eliciting qualities. This may be due to the time required for cognitively matching certain qualities of a product with some other products or personality characteristics. Something that does not exist in the mental schema of a person (appraised novelty) or not clearly understood/seen (ambiguity) can said to require a relatively longer time for evaluation compared to aesthetic judgments. K3 for example, which was discussed to be representing these kinds of qualities, identified to be relatively longer time spent on.

C2 is claimed to be aesthetically pleasing and has the highest average rating for being interesting. It is also indicated to have a curiosity eliciting appearance and calculated to be the second longest time spent on after K3 among all the presented products in the study. Having been associated with those two quality dimensions explains why this product was identified to be the most interesting of all.

The results gathered in this study showed that a product's being aesthetically appreciated, matching the utility related expectations, having some curiosity eliciting qualities or enabling different connotations might lead to elicitation of interest. The attribution distributions of these qualities can be said to be product specific and also highly subjective.

Although not very significant, some different tendencies towards different product groups can be talked about in relation to the three product groups used in this study. Kettles appeared to be more evaluated in terms of their aesthetics related properties and also several characteristics are attributed to kettles more frequently than the other two product groups. The aesthetics related qualities of the cordless phones, like kettles, identified to most frequently mentioned. Different than the other two product groups, perceived comfort as a utility related quality was identified to be an important interest eliciting quality of a seating unit.

The seating units associated with utility related and curiosity eliciting qualities were identified to be rated higher for being interesting compared to kettles and cordless phones. A slight difference was also observed considering the time spent on each product group in total during think aloud session.

A definite functional area was not identified to be commonly looked at among kettles representing simple electric household products serving for a single purpose. The gaze patterns showing the areas most time spent on appeared to be product specific. The mostly looked at parts of the kettles can be listed as where two different materials are combined, or two different colors are used resulting with color contrast like a black button or a cable out on a white body, a black or blue line (water level) on a plain body and also sharp edges and cable outs which can be claimed as perceptually attention taking. This can be related with these products'

being aesthetically evaluated very frequently. Unlike aesthetics, the utility related concerns not being frequently mentioned about the kettles as well as the handles of the kettles which will be mostly physically interacted with those products not being looked at coincides with this finding.

In the case of cordless phones, however, such a smooth relation between the verbal and visual data cannot be talked about. While the keypad and the display which were considered to be mostly related with the utility related qualities of cordless phones and they were the parts identified to be mostly looked at, the most frequently mentioned quality appeared to be aesthetics related with a considerable difference. The keypad and the display standing for the most visually detailed parts of these products can be an explanation for these results. Another point to be mentioned about the cordless phones in general is that, their bases not being looked at much and treated like a visual background for the handset. The bases of T2 and T6 with the glossy finishing should be excluded from this generalization. How these products were attached to their bases and stand on them was mentioned several times and also reflected in the hot spot maps.

CHAPTER 6

CONCLUSION

In this chapter the main findings of the conducted empirical study are pointed out in relation to an adopted model showing interest as an outcome of a visual interaction between product form and a user. In conclusion, the limitations of this study and some suggestions for further research are stated.

6.1 Concluding Remarks

Adopting the main dimensions of the framework proposed by Crilly et al. (2004) in this study, ***interest*** was considered as a psychological response to product form where vision is the only sensory modality. ***Interestingness***, on the other hand, was regarded as a visual quality communicated by the product form.

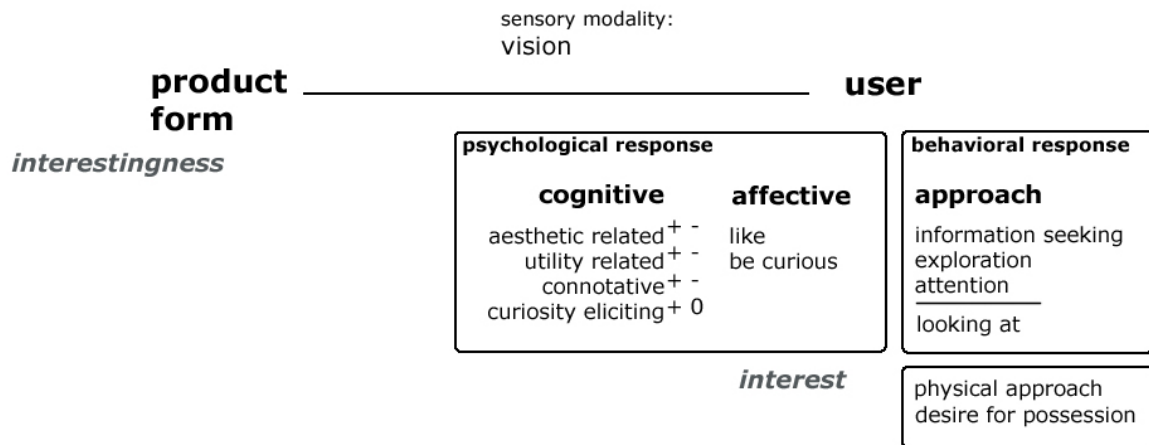


Figure 6.1 The dimensions of interest evoked by product appearance

The physical parts of the product form communicating interestingness as a quality were identified to be the most **informative** parts of the products, parallel to what Coates (2003) suggests. To exemplify, the irregular parts of the form such as the sharp edges, the parts of the body where it gets slimmer or bending surfaces giving clues about the three dimensional properties of the products were detected to be looked at. Moreover, the details giving information about the material or structural properties such as highlights and glossy spots as well as where two pieces are attached together were also on focus. Last but not least important, the functional parts associated with the anticipated interaction with the products such as the push buttons and the sitting surfaces were observed to evoke the users' interest. Here, a point to be mentioned is that the term most informative does not refer to the quality of the communicated information; the ambiguous information evoking the curiosity of the users as well the clear ones are included. It should also be noted that, the intensity of interest on those suggested physical parts of the products was found to be dependant on their product group as well as product specific.

Looking at the physical parts, users responded by associating some qualities with the products (**cognitive response**). Analysis of the verbal data collected for the products indicated as interesting resulted with identifying visual qualities associated with interestingness. These qualities were grouped under four main categories as;

Aesthetics related,
Utility related,
Connotative and,
Curiosity eliciting.

Within these qualities a second categorization was applied as;

positively evaluated,
negatively evaluated and
non-valenced.

This second categorization showed that product appearance communicating negative qualities could be regarded as interesting as well. However, the frequency

of mentioning of these negative qualities was considerably lower than the positive ones within each identified quality dimension.

Among the four identified quality dimensions associated with interestingness, aesthetics related qualities were observed to be the most frequently mentioned. The order of the remaining quality dimensions with respect to the frequency of their being mentioned about is Curiosity eliciting, Utility related and Connotative for the products rated as interesting.

The results of another analysis strategy has also shown that, the specific products presented in the study with the highest mean ratings of interestingness were most frequently indicated to be **aesthetically pleasing** highlighting the importance of the aesthetic appeal as a visual quality to evoke interest. However, some cases where the product was indicated to be aesthetically pleasing but not interesting were also observed. The collected negatively evaluated keywords under aesthetics related qualities associated with interesting products also proved the aesthetic appeal not a '*must have*' quality to evoke interest. Whereas, not any negatively evaluated curiosity eliciting qualities were collected from the products indicated to be interesting. Moreover, it was observed that the aesthetically appealing products which were not indicated to be interesting were lacking positively evaluated curiosity eliciting qualities, or more specifically **novelty**. Therefore, *aesthetic appeallingness* was determined to be a highly contributing while *perceived novelty* a necessary quality for a product to elicit interest.

It can be acknowledged that the study material being from three different product groups has contributed to the variety of collected keywords. The differences were also observed in the results of the visual data.

What interested users about the kettles can said to be their aesthetics related qualities as well as being open for symbolic associations. Thus, the areas on the kettles to be looked at were identified to be product specific.

About the cordless phones, aesthetics was the leading concern as well. The most interesting physical parts for cordless phones were observed to be the keypad and

display communicating utility related information as well as visually being the most detailed spots.

The seating units exemplified that a utility related quality, namely *perceived comfort*, could be one of the leading focus of interest as well. The gathered visual data for the seating units was consistent with the verbal data as the most looked at parts of the seating units were their seats where the information about comfort is mostly derived from.

The act of looking at an image was suggested to be the **behavioral remark** of interest in the defined study context. Therefore, the time spent on an image was regarded as an indicator of interest during analysis and discussions and found to be more related with interest evoked by the perception of curiosity eliciting and connotative qualities compared to the numerical interestingness ratings of the participants found to be more related with aesthetic appreciation.

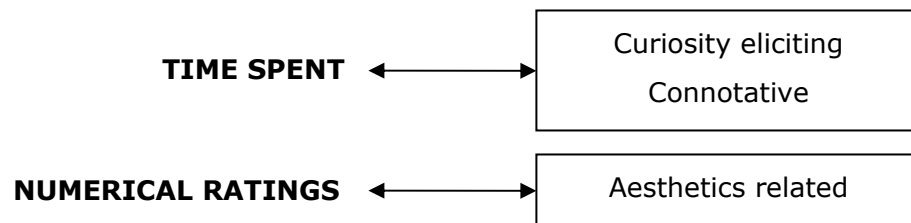


Figure 6.2 Possible relations between indicators of interest and associated qualities

Besides users' collected behavioral response, their self reporting about their interest towards products involved anticipated experience with the actual products. They have explained their interest towards products in relation to their willingness to approach the product, interact with it and also their desire for possession. These expressions were acknowledged to be underlining the important contribution of interest to the overall experience with a product.

6.2 Limitations of the Study

First, it should be noted that the findings of the empirical study addressed in this thesis can not be generalized due to the very small number of participants. Rather, what was found and discussed here should be considered to give insight for further research with larger samples. Besides the sample size, what was stated by the participants was limited with the aspects of the provided visual material. There were only six examples of three identified product groups used as study material. Although the images were intended to be in high quality, the information such as the actual dimensions, material properties as well as structural details were not as rich and clear as an actual physical product could communicate. This limitation has especially affected the results about *ambiguity* as a product quality categorized under curiosity eliciting qualities.

Another limitation of this study was that the findings about the eye tracking data rely on the researcher's interpretations. Although they were cross compared with the self reporting of the participants, it was not possible to put out clear relations between what has been told and where on the product has been looked at because of a number of reasons. First, it is very time consuming to time synchronize two types of data where one of them performs at millisecond precision. Second, it is not possible to make sure that the study subjects speak out everything they think about the product. Third, the nature of speaking requires cognitive processing resulting with some pauses while the eye continues on gazing. Last, sometimes the associated quality is communicated through the whole appearance but not a specific part making it. It should be noted that, similar limitations were brought about in other research projects employing eye tracking (e.g Rähä, K. J. et al., 2006).

6.3 Further Research

As mentioned before, this study employed an open ended data gathering technique by using a limited number of product examples. Examples of different product groups with diversified features can be investigated for further elaborating the identified quality types and the involved keywords.

Considering interest as an emotion and testing on the proposed appraisal dimensions by using product appearance as stimuli can also reveal beneficial results. Investigating interest's relationship with other product emotions like enjoyment, surprise, and disgust can be another perspective to further elaborate on understanding of interest evoked by product appearance.

To conclude, the material presented in this thesis was aiming at providing insight about interest construct for product designers and especially answering the question of "*What makes products appear to be interesting?*" It is assumed that the findings of this study would contribute to the research on visual qualities of products on the way to designing interesting products.

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APPENDIX A

IMAGES PRESENTED IN THE QUESTIONNAIRE



Figure A1. Kettle images presented in the questionnaire

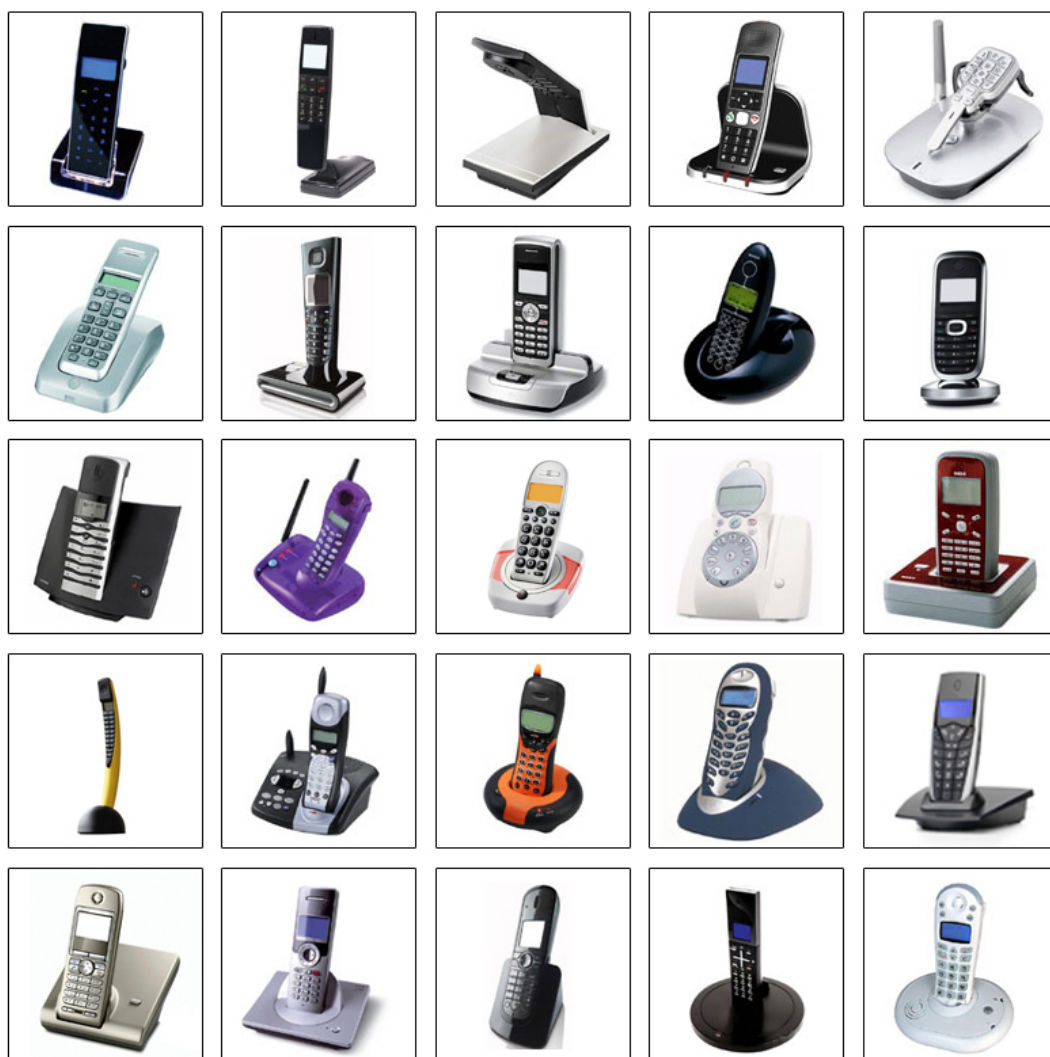


Figure A2. Cordless phone images presented in the questionnaire



Figure A3. Seating unit images presented in the questionnaire

APPENDIX B

LAYOUT OF THE QUESTIONNAIRE (IN TURKISH)

Orta Doğu Teknik Üniversitesi Endüstri Ürünleri Tasarımı Bölümü Yüksek Lisans Tez Çalışması

Bu çalışma farklı ürün gruplarında ilgi çekici ürün dış görünüşlerini saptama amacıyla yapılmaktadır. Lütfen, aşağıdaki ürünleri size ilgi çekici gelip gelmemesine göre uygun bulduğunuz kutuyu işaretleyerek (X) değerlendiriniz.

Elektrikli su ısıtıcıları



SIKICI

İLGİ ÇEKİCİ

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SIKICI



















İLGİ ÇEKİCİ

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APPENDIX C

RESULTS OF THE QUESTIONNAIRE

Table C1. The questionnaire results for the selected six products for each product group

Kettles						
Total score	214	210	207	191	172	170
Average score (1-5)	3.96	3.88	3.83	3.53	3.18	3.14
Frequency of rated as (5)	22/54	19/54	20/54	19/54	13/54	8/54
Seating Units						
Total score	225	210	209	203	200	196
Average score (1-5)	4.16	3.88	3.87	3.75	3.70	3.63
Frequency of rated as (5)	29/54	26/54	20/54	17/54	18/54	18/54
Cordless Phones						
Total score	226	200	190	185	169	157
Average score (1-5)	4.18	3.70	3.52	3.42	3.13	2.90
Frequency of rated as (5)	27/54	17/54	7/54	14/54	7/54	6/54