

Product design, semantics and emotional response

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Abstract

This paper explores theoretical issues in ergonomics related to semantics and the emotional content of design. The aim is to find answers to the following questions: how to design products triggering 'happiness' in one's mind; which product attributes help in the communication of positive emotions; and finally, how to evoke such emotions through a product. In other words, this is an investigation of the 'meaning' that could be designed into a product in order to 'communicate' with the user at an emotional level. A literature survey of recent design trends, based on selected examples of product designs and semantic applications to design, including the results of recent design awards, was carried out in order to determine the common attributes of their design language. A review of Good Design Award winning products that are said to convey and/or evoke emotions in the users has been done in order to define good design criteria. These criteria have been discussed in relation to user emotional responses and a selection of these has been given as examples.

Keywords: Emotional products; Happiness in design; Emotional content of design.

1. Introduction

Contemporary life is synonymous with accelerating social and technological change. Similarly, product design is being rapidly transformed through materials technology, production technology, information-processing technology and other processes. The changes in technology are occurring at a speed and scale beyond any expectation. The digital revolution is progressively turning the objects with which we interact into smaller and more intelligent black boxes, making it difficult for us to understand the mechanism or the working method (Bolz 2000).

Design therefore occurs in a different framework than before, with reference to social change, the conservation of resources and energy, emerging environmental problems, and customer-oriented trends (Ohira 1995, Jones 1997). Accordingly, whether driven by advertisement and marketing strategies, or by trends, fashion, and social events, users' expectations from consumer products have been also changing. Functionality, attractiveness, ease-in-use, affordability, recyclability, and safety are all attributes that are expected to already exist in a product. Users are expecting more from everyday products. Recent design trends show an inclination towards objects that inspire users, enhance their lives, help in triggering emotions or even in evoking dreams (Jensen 1999, Alessi 2000). Jensen predicts that the Dream Society is coming soon, following a society based on data, called the Information Society (1999). He adds that, as information and brainpower are becoming the realm of computers and high-tech, society will place new value on a human ability that has not been automated yet: emotion. Functionality is more and more taken for granted in products, and users are looking for fulfillment at an altogether different level of appreciation. Imagination, myths, and rituals (being the language of emotion) will have an effect on our behaviors, ranging from our buying decisions to our communication with others (Jensen 1999). Furthermore, Khalid (2001: 196) points out that 'the decision to buy can be momentary, so customer needs can then be created very quickly, while other needs are long established'.

Consequently, emotions and 'affect' in general, have received increasing attention over the last few years (Velásquez 1998). 'Affect' being defined as the consumer's psychological response to the semiotic content of the product. Approaches to emotions and affect can be studied at many different levels and all offer different insights. As Velásquez points out, several models have been proposed for a variety of domains and environments. Some examples that he gives include the use of emotions to create synthetic agents with lifelike qualities and personalities (Bates 1994, Kline and Blumberg 1999, Elliott 1992, Reilly 1996) systems that reason about emotions in narrative (Elliott *et al.* in Velásquez 1998), systems that rely on emotional processing to mediate social interactions (Breazeal in Velásquez 1998), and architectures that model the influences of emotions in behavior and learning (Cañamero 1997, Kitano 1994, and Seif El-Naser *et al.* in Velásquez 1998). Different approaches work best in different domains, and the decision to follow one or the other depends greatly on the specific goals and purposes of these models.

Design directed by emotional content can be regarded as the heart of current design practices, research, and education. As Paul Hekkert (2002), the chairman of the Design & Emotions Society, says: "It is no longer sufficient to design good products or services; we all

want to design experiences and generate pleasurable or exciting sensations.” “...But what do we really know about these experiences and products' ability to evoke emotions? Can affective interactions be designed and how do designers and industries deal with this new design paradigm?” The goal of this study is to reveal the semiotic nature of emotional responses in design products, as well as to explore affect programs concerning the relationship between product design and human experience.

2. Product semantics at the physical and cognitive level

Product semantics was developed and introduced by Krippendorff and Butter (1984: in Riley 2001) and is defined as the study of symbolic qualities of man-made shapes, in the cognitive and social context of their use. Thus, according to this definition, product semantics is concerned with the relationship between the user and the product on one hand, and the importance that objects assume in an operational and social context on the other hand. Intentionally or not, all manufactured products make a statement through shape, form, color, texture, etc. They communicate with users and can never be contextually neutral. It is widely recognized that visualization is important when it comes to assessing the feasibility of a product in terms of appearance, functionality, production feasibility, product semantics, ergonomics and social factors (Johanson 2000). Regardless of how designer use color, shape, form, and texture in designing the product, messages are being sent through products via a part of language structures that deal with meaning, called semantics. This implies that designers and ergonomists should not only know what message(s) they wish to transmit and the sort of response(s) that can be expected from the user being the receiver, but also the symbols and attributes forming that language.

A product tells us something, about itself and in certain cases also about the human being who owns it. Through its design and function, the product expresses values, whose importance individuals then interpret and value in relation to a certain social context in terms of acceptance or rejection, liking or disliking. However, the product can, through its semantic content and expression, either strengthen or weaken this role, in this way creating positive or negative perceptions, emotions, values and associations within the individual person (Wikström 1996).

The products that we encounter have different functions, e.g. technical, practical and semantic. Monö (in Wikström 1996) defines four semantic functions of products:

- To describe - The product gestalt describes facts (e.g. its purpose = define the task), way of use, handling.
- To express - The product gestalt expresses the product's values and qualities.

- To signal - The product gestalt urges the user to react in a specific way, for example to be careful and to be precise in his/her work.
- To identify - The product gestalt identifies (e.g. the purpose = establish similarity), origin, nature and product area (connection with system, family, product range etc as well as the function and placement of individual parts).

The semantic functions provide the designer with the possibility to communicate a clear message through the product. This means that the designer has to make clear to him/herself what should and what should not be communicated through the product (Wikström 1996).

Butter (Krippendorff and Butter 1984:4), who first made up the phrase product 'semantics', claims that designers and ergonomists with an awareness of the how to use function of design can 'demystify complex technology, improve the interaction between artifacts and their users and enhance opportunities for self-expression'. According to Wikström (1996), the semantic functions should make the product comprehensible. Both the whole products and its individual parts should communicate the intended message, so that the user knows how the product should be handled merely by looking at it. For example, a knurled knob says 'turn me'; a button so designed to say 'press me'; a form that invites a particular handgrip, like a jack-plane; a teapot or kettle that says 'hold me here and I'll pour for you'; a chair that softly welcomes your relaxed posture; a shape or form that indicates 'I move in this direction' or 'I fit into that part of your body'. The user's reaction to what something is and how this something should be handled is an effective and immediate (semantic) indication of the extent to which a product's design is self-instructing. Complicated products require a manual, but simpler products ought to be self-instructing. In cases where pictures, labels, or instructions are needed for simple things, arrows or labels to differentiate push from pull; designers have failed to communicate through the form of the object (Norman 1988).

However, the requirement for comprehensibility varies with the context. In some cases, as Wikström (1996) mentions, the product should even be incomprehensible to a certain user group, for example medicine bottles and medicine cabinets to children, in order to prevent them from accessing to these. In public milieus, however, information-carrying products should be self-instructing. The user group focused upon here should be able to identify the product's purpose, be able to use it, and be motivated to use it without the need for additional information (e.g. manuals, text).

Being one of the most important trends in design in the US, product semantics is an approach to developing a visual vocabulary in products in order to give them an immediately

identifiable set of mainly visual clues (sometimes tactile and auditory), which become tools available to the designer to communicate through their products, helping to reflect function and underlying cultural associations (Zaccai 1990). In other words, product semantics is an attempt to identify appropriate visual, tactile and auditory messages and incorporate them into product design. Understanding how people assimilate unfamiliar products is crucial to the application of semantics in Industrial Design (Griffin 1999). It combines various disciplines, such as art, ergonomics, semiotics, communication, logic, philosophy, and psychology. When product semantics is properly applied, products can become more emotionally and psychologically comfortable for users, with eloquent and expressive shapes or details, allowing them to make emotional connections with otherwise impersonal objects. These become intuitive products where the user knows how it works and what it does without instructions. The two fundamental principles of Norman (1988) to assist users in constructing a mental model of the product are first, providing a good conceptual model, and second, making important features visible.

3. Products as communicators and reflectors of meaning

According to Griffin (1999), the process of interpreting and decoding the unfamiliar products' semantic content involves two different reactions. The first one based on knowledge and dependent on social and cultural background, and the second reaction being emotional. Meaning is then interpreted based on associations drawn from prior experience. Furthermore, emotions are closely related to human psychology. If we were to look at a simple psychological definition of these factors that activate emotions, we would see that emotions are not triggered by situations or events, but by our thoughts, beliefs, values and attitudes about the situations or events. The emotional response is not an automatic response to an object, a thing, or a situation. It is an automatic response (deep inside our brain) to the thoughts that we have associated with the situation or the object. The following diagram shows the flow of an emotional response (Figure 1).

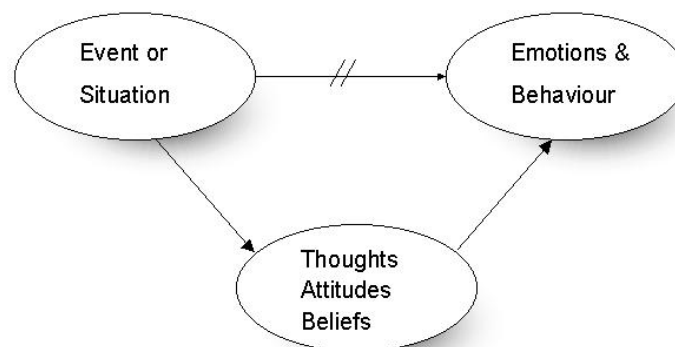


Figure 1. Emotional response flow.

Griffin (1999) is separating knowledge (thoughts, beliefs, values, and attitudes) and emotions into two different categories of reactions. These are closely related and cannot function without each other. People learn through their experiences and their culture. This learning process starts very early in childhood and is an ongoing process (Piaget 1990). People's thoughts, attitudes, beliefs, and values can change over time. The emotional response, or reaction to meaning, triggered by a product, varies for people with different backgrounds, e.g. social class, educational level, religion, etc.

4. 'Happiness' and pleasure in product use

Some general definitions for pleasure, 'happiness' and 'joy' may be given as follows:

- Pleasure: the agreeable emotion accompanying the expectation, acquisition, or possession of something good or desirable. Related Word bliss, felicity, happiness, and thrill.
- Happiness: a state of well-being and contentment.
- Joy: a pleasurable or satisfying experiences; the emotion evoked by well-being, success, or by the prospect of possessing what one desires.

The four different categories of pleasure in product use given by Jordan (1997) are:

1. Physio-pleasure --related to touching and holding a product.
2. Social-pleasure --related to social relationships and communication that a product enables.
3. Psycho-pleasure --gained when a product helps the user to establish a task.
4. Ideo-pleasure --related to values that a product and its use represent or support.

Satisfaction is one of the usability attributes in Nielsen's definition (1993) and is related to how pleasant the product is to use. Usability and functionality are undeniably very important attributes of products but are not sufficient on their own to convey pleasure and 'happiness' to users. Positive emotions have proved to have important role e.g. in decision-making, motivation, and social interaction (DeCatanzaro 1999, Isen 1993, Mäkelä 1999) needed for task-based activities. Functionality is more and more taken for granted in products (commodities), and users are looking for something 'more'.

Another way to approach and gain an understanding on these issues is to study opposite feelings and emotions, as in Jordan's study (1996) on displeasure in the use of commodities. In his study users were asked to select a product that was 'displeasurable' to use and to talk about design properties of the selected products and the emotions they aroused in them. Lack of

usability, poor performance, lack of reliability and poor aesthetics have been the main factors associated with 'displeasurable' products. Philosophically, there are no 'displeasurable' products, but only 'displeasurable' emotional responses. Associated feelings aroused were annoyance/irritation, anxiety/insecurity, contempt and exasperation (Jordan 1996).

Buchanan (1989) relates the emotional appeal of products, ranging from the trivial to the profound, with the different styles and design purposes of designers. He states that some designers are using emotion in a superficial and coercive way. Furthermore, he explains that they try to excite the passions of potential customers with trivial gimmicks that have little connection with technological reasoning or character. Their concern is not to ensure that the product accomplishes the purpose for which it was intended, but to impose unexamined attitudes and marketing messages on audiences (Buchanan 1989).

Buchanan (1989) adds that designers might rely on emotions that are adapted to the existing tastes of audiences and to popular beliefs about what is good in terms of design. However, the strongest designers, he believes, being among those who are the most articulate if not always persuasive, are concerned with discovering new aspects of the utility of emotional expression in practical life. The reason being that their products attract and hold audiences in surprisingly different ways, thus the importance of emotion lies here as a mode of persuasion.

Thoroughly considered design is not restricted to individual products. Visitors to shopping malls and online stores also want attractive surroundings. Products can be designed in order to reflect the company's identity. Today, many design companies are aware of the power of emotions and are trying to differentiate their products in the competitive market by employing semantics in their design and marketing strategies. Examples of such companies are Frog Design, Alessi and Swatch (Langrish and Lin 1992).

Frog Design is one of world famous design companies having a design strategy based on a motto devised by the company's founder Esslinger: "Form Follows Emotion". Esslinger says that, even if a design is elegant and functional, it will not have "a place in our lives unless it can appeal at a deeper level, to our emotions" (Esslinger in Sweet 1999: 9). He thinks that consumers do not just buy a product, but they buy a value in the form of entertainment, experience and self-identity. And along with his philosophy form following emotion, Esslinger also believes that people will keep the product longer and take care of it if it has built in emotional value (Esslinger in Sweet 1999). In 1996, before the Apple's iMacs debuted, MacWorld Magazine commissioned Frog Design to send Apple a message: "give us something

new to love!” The result achieved great success (Figure 2) since the desktop unit was friendly, and emotionally appealing. Frog Design also helped many brands to create the value of emotional positioning by asking, and allowing consumers to make emotional connections with the brand, such as Sony, Lufthansa and Ford.



Figure 2. MacWorld Frogintosh.

The Italian product design company Alessi typified the eighties design decade, and there is no place for their products in the caring sharing nineties. However, Alessi has risen beyond the critics with their philosophy of a design factory. As Gabra-Liddell (1994:6) describes “a hotbed of creative ideas, making the company function more as a collective of designers...” or as Alberto Alessi says the House of Happiness that was intended as ‘house of happy projects’. The Alessi Company is indeed the Fun Factory. At the beginning of 1990’s, the company started to work on a project with young designers to explore the ‘emotional structure’ of objects called Metaproject. The project was focusing on the most delicate, intimate and sensory human needs, and the objects became playful comic tools telling charming little stories.

The Swiss watch-making company Swatch manifests its philosophy by saying that they are selling emotional products. Carlo Giordanetti, director of Swatch Creative Services, says that Swatch conveys something personal, not being just about nice color or fitting to the outfit, but by saying something about the personality of the wearer (Hayek 1994). Hayek who conducts analysis for Swatch marketing, adds that an emotional product is something that you get involved with. He gives the examples of wristwatches, mobile phones, and cars (Hayek 1994). He also adds that because we wear a watch on our wrist, against the skin, and have it there for 12 to 24 hours a day, it becomes an important part of one’s self-image. Hayek defines fashion

and emotional product design, the first being about image; the second about a strong, distinct, and genuine message that tells people about one's personality (Swatch 2000). In other words, people are aspiring to give messages to others and this can be done easily with the products that they own, use or wear. These messages are most of the time related to aspirations of status or life styles.

Emotional needs have been the source of influence for high-tech products having a balanced combination of all the above stated attributes, robot-like products and companions' creation. After the Tamagoshi crisis of the 90's came the Aibo digital pet syndrome. Now, an emotionally interactive vehicle call Pod has been recently designed, based on the emotional attachment one can have with his/her own car (Reuters 2001), to show emotions and learn from driver experience. It has been developed by Japan's Toyota Motor and electronics giant Sony. In real life, Pod will smile, frown and cry, take one's pulse and measure one's sweat amongst many other things. The emphasis on the form is more on 'cute' rather than robotic. The attributes of 'cuteness' evoke 'happiness' and the feeling of protection, and that has been widely used in product design (Demirbilek and Sener 2001). Both Aibo and Pod possess an interactive personality that develops according to its relationship with different users.

5. Emotional response systems or affect programs

The emotional response systems, based on inherent psychological structures, values and processes, bear resemblance to some of the aspects in which the interactions between neural systems involving the amygdale, the hippocampus, and the prefrontal cortices have been considered to mediate emotions, such as assigning an emotional valence to different stimuli, activation of emotional behaviors, and emotional learning (Damasio 1994, LeDoux 1996, Panksepp 1995, in Velásquez, 1998). Based on work from different theorists (Ekman 1992, Johnson-Laird and Oatley 1992, Panksepp 1998) and subsequent to a previous study on design criteria to assess good design related to award winning products (Demirbilek and Park 2001), six different types of affect programs involving 'happy' feelings, joy, or evoking dreams have been identified such as follows: senses, 'fun', 'cuteness', familiarity, metonymy and color. The following part gives brief explanations for each one of them.

5.1. Senses

The Dream Society (Jensen 1999) shows us that we have to trust our senses again. Shedroff (1994) says that Sensorial Design is employing all techniques that we use to communicate to others through our senses. Sound design and engineering, musical, and vocal performance are also useful in the appropriate circumstances, sometimes being the only appropriate media for communicating a particular message. Tactile, olfactory, and kinesthetic senses are still rarely

employed (often due to technological or market constraints), but are just as valid and can add enriching detail to an experience. These include the appropriate use of media, style, and technique, applicable to the technology of the situation, as well as an understanding of the human senses (Shedroff 1994).

5.2. 'Fun'

Attributes contributing to conveying 'fun' in objects can be expressed as having great humor and humanity, helping to humanize the product, and conveying a sense of 'happiness'. As Doyle (1998) mentions it, if something is 'funny', warm or friendly, it actually reaches out to people: it begins a dialogue.

'Fun' is associated with amusing; pleasurable; entertaining; enjoyable, all being part of play and playfulness. Playing with something is to play rather than to work because there is no real resistance, necessity, or limitations. Play is basically not serious and therefore not boring. Having trouble is unknown to play, and that is what makes it 'fun' (Mullin 2000). The playful shapes used in the Koziol collection of cleaning products make the dull task of cleaning much more enjoyable.

5.3. 'Cuteness'

Papanek (1995) points out that the composition of child physiognomy induces a feeling of warmth and protectiveness in humans. The power of a baby's smile offering us instant and unconditional 'happiness', as well as the strength to go on in life, is reinforced by Dissanayake (1988). Variations in proportions and roundness in forms contribute to the visual perceived 'age' of products (Figure 3). 'Cuteness' is the resulting attribute that seems to evoke 'happiness' and the feeling of protection (Figure 4), and that has been widely used in product design.

Therefore, the expressive aspects of human postures, gestures, and facial expressions may be used in equivalence as a semantic resource. We intuitively understand the expressive language of the human body (e.g. facial expression, posture, and gesture). We can tell how someone is feeling by how they carry themselves (Griffin 1999), their body posture, and their facial expressions. Providing a familiar experience in a product will allow a truly intuitive interface with the user (IBM 2000).

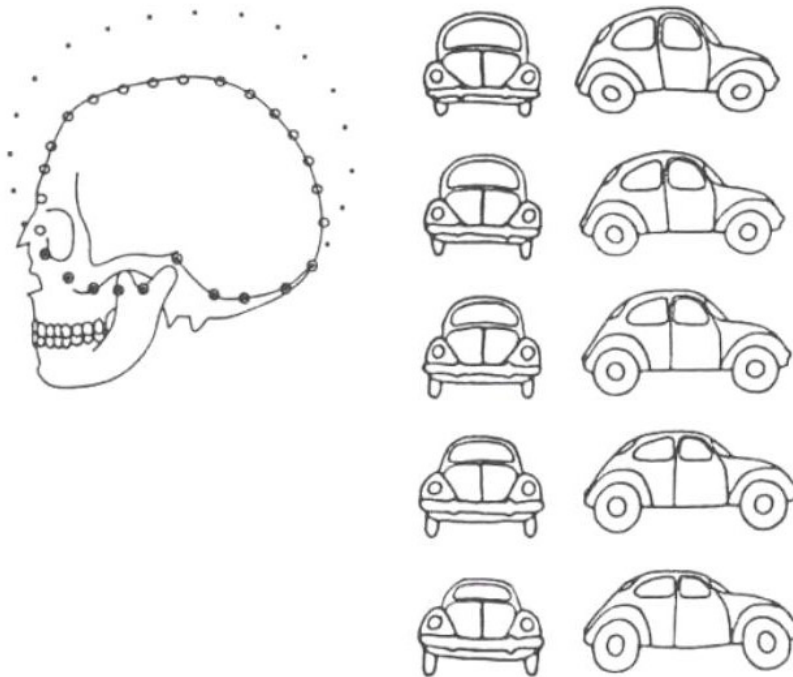


Figure 3. Drawings showing how changes in proportions can age a car (Papanek 1995).

5.4. Familiarity

Norman (1988) points out that a design has failed when simple things need pictures, labels, or instructions. Successful products will then be intuitively designed, when the user knows how it works and what it does without any instructions. Basic design principles may be based on our own past experiences in life, on insights from semantics and psychology (IBM 2000).

All things in nature have a shape telling us what they are. Consequently, designers must build on the prior knowledge of users, gained from experience in the real world (IBM 2000). One way of doing that is by the use of metaphors or by mirroring or abstracting the human body, or any other living-being parts, also called referential semantics. The latest is the designer's most powerful, and most frequently used, semantic resource. Forms can then express their use by relating to various parts of the human body (Figure 5). By doing so, designers are making forms speak of their use mainly through relating them to the human body.

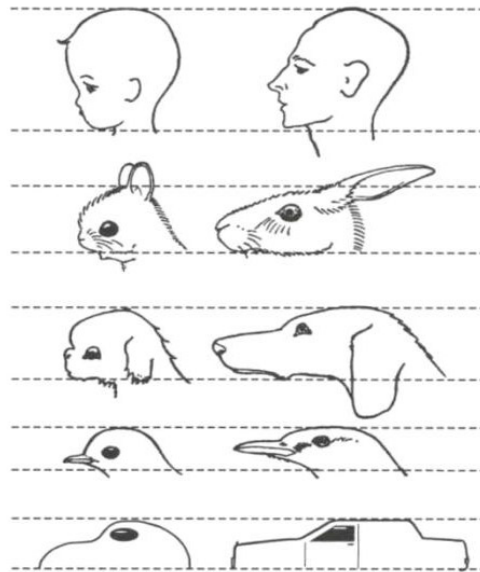


Figure 4. Baby features and 'cuteness' in living beings and objects (Papanek 1995).

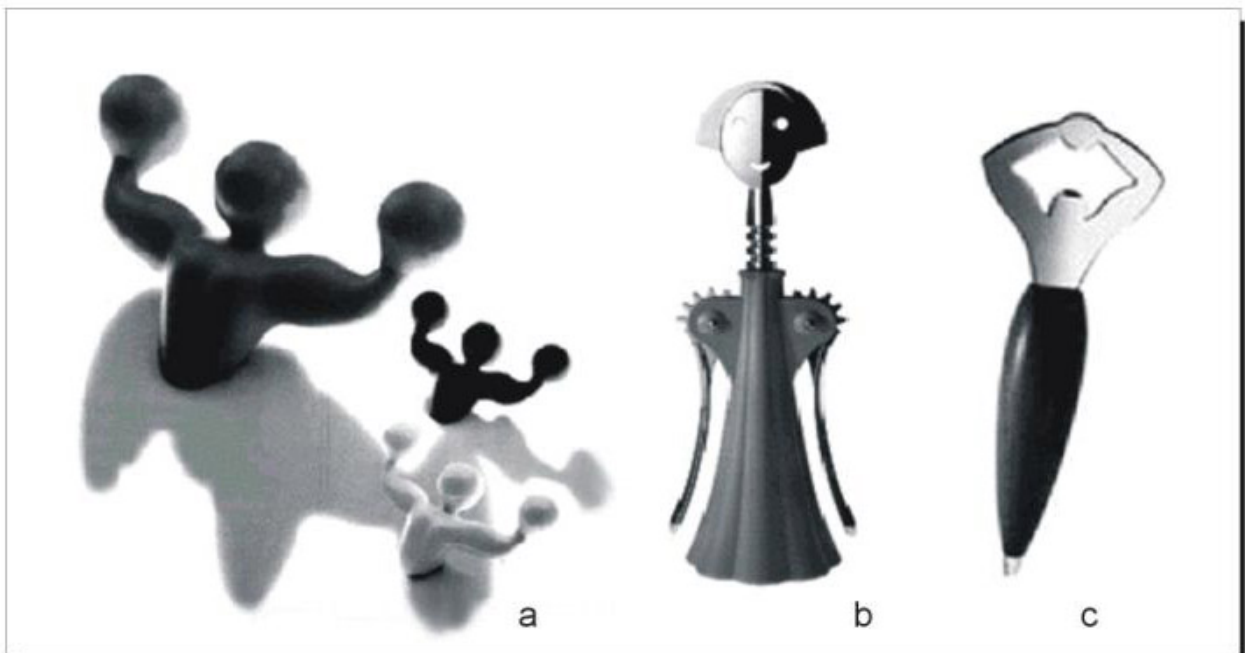


Figure 5. Objects with human body references from Alessi. (a) Venturini, clothes-rack, (b) Mendini, corkscrew; (c) Branzi, bottle opener (Alessi 2000).

5.5. Metonymy: sense and function

A distinction that makes a difference, exclusivity, and spirituality of consumption can be listed among the factors that can make a product more emotionally desirable. Spirituality of consumption can be explained as a cult of consumption where the items consumed are relating users to worshiped individuals, e.g. Michael Jordan for Nike products, various rock stars for Addidas sport equipments, etc. Krippendorff (1992:38) says "metonymy explains or overcomes

the difference created by drawing a distinction between something and wherein it resides...” and “...something makes sense when we understand the role it plays in a particular context, when we have metonymic understanding of what we see it does.”

Marketing strategies and advertisement campaigns reinforce all these factors. There are several good examples of efforts to change the definition of products by presenting them in new contexts for TV viewers. For example, in the TV screen the frame story and the realistic product image are often separated or indirectly related even when they are presented in the same advertisement. The message transmitted by an advertising image is considerably more than the message transmitted by the product (Päivi 1992), such as deodorants in the context of romantic success or expensive cat food in the context of treating someone special. Through this form of advertising the objective is to create metonymies that encourage viewers to make sense out of it that can be generalized to a belief in buying. The deodorant stands out as an interpersonal success rather than being a chemical that removes odors. In the second example, it is a way of cultivating companionship rather than being just food to feed a cat (Krippendorff 1992).

Bolz (2000) also gives similar examples of the uses and the power of metonymy (interchanging trademarks with emotions or other idea names), and talks about the power of advertising that can free itself from the product and becomes self-relating. Among the examples he is giving are the following: Mondeo, Stuyvesant, United Colors of Benetton, and Marlboro. The first one is not a vehicle anymore but the avenue for a new experience of driving; the second one is not simply a cigarette but a medium of world communication; the third one no longer simply sells clothes, but allows one to enter world society; and for the last one, red is not a color anymore, but Marlboro (Bolz 2000).

According to Jensen (1999), companies will need to understand that their products may be less important than their stories. Storytellers specialized in the art of transmitting human emotions, will then need to have a voice in the design process. He adds that designers and engineers may abandon ingenious technical enhancements, if they cannot be integrated into a product's story.

5.6. Color

Colors have the ability to impact on the emotional well-being of human beings, either by stimulating or tranquillizing, exciting or depressing, or to provoking and antagonizing (Pavey 1980:132, Fontana 1993:66). According to Allegos and Allegos (1999), it is the contrast

between colors that allows them to generate an emotional response. Specific combinations of colors are said to produce the best results in terms of appeal and meaning.

Complimentary colors like blue and orange, yellow, and violet, and red and green all act as intensifiers of each other (Fabri 1967:27). Color combinations can also create different symbolic associations, unrelated to these colors when depicted on their own. Allegos and Allegos (1999) give examples of red and white, the colors of Sydney Swans, signifying immortality; red and gold, representing nobility; and red and yellow indicating a desire for experience and expansion. Colors that were simply seen as symbolic in the past are now seen as symbolic and psychological (Allegos and Allegos 1999). Color is often related with the 'fun' aspects of product design.

6. Conclusion and future plans

The emotional content of design is gaining more and more importance for Ergonomics and Design Science. So far, there are no direct methods for predicting, evaluating and measuring this human-product phenomenon. This paper shows that more knowledge is needed in analyzing the relationship between the basic trio: emotion, user, and product design. People's emotional responses to products seem to vary between different generations, social groups, nationalities and cultures. The attributes that ergonomists and designers could use to enhance desired feelings and emotions in products may well be hidden in childhood socialization, when their main beliefs, values and thoughts are taking shape. This complex topic needs to be studied in a cross-disciplinary manner, involving cognitive ergonomics, psychology, product semantics, and design studies.

Further research is also required in order to determine the perceptions of 'happiness', 'joy', well-being, relaxation, and related feelings and emotions in everyday environments. This research should include real users from different backgrounds and focus on their automatic thoughts and dreams related to 'happiness', more precisely, pleasurable feelings/experiences. Such a study would provide useful guidance on the attributes of such emotional responses in the context of product design for designers and ergonomists. It is envisaged that the study would take the form of the combination of a survey and an interview to be completed with users.

Emphasis has to be placed on recording the users' own description, (i.e. in their own words), in order to provide important insights for design professionals regarding the (design) elements contributing to the feelings outlined above. In addition, the childhood experience needs to be analyzed in order to understand the mechanisms and the factors that influence the development

of the thought system, which in turn, influences our emotional relationship with our environment and the products we chose to buy and use. The information resulting from such experimental research would also give important feedback on future consumer trends related to preferences in product design.

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