Investigations of Product Design Engineering Students Intentions and a Users Perception of Product Character

Saeema Ahmed and Per Boelskifte

Department of Mechanical Engineering,
Technical University of Denmark, DTU
e-mail: sah@mek.dtu.dk & pb@mek.dtu.dk

Abstract

This paper investigates the similarities and/or differences between the associations that are made by a user of a product with those that were the intentions of designers, in this case product design engineering students.

Products can be designed to have a character, i.e. a mood that is conveyed through the form of the product, the use of material and colour. Designers often design a consumer product to target a particular market segment with a particular lifestyle or age group. Therefore, the character of a product is intended to appeal to the target user group.

A total of 22 experiments with different user groups were undertaken. The aim of the experiments was to understand the correlation between the mood boards created by the designers and the associations made by the targeted user group, and also to understand the correlation between visual models of products created by the designers and the associations made by the targeted user group. During the experiments the participants were asked to describe the mood boards in their own words, and this was compared to the descriptions of the designers. They were also asked to describe the mood boards using a selection of terms which formed the coding scheme using adjective pairs. The coding scheme utilised a seven point scale using the Osgood semantic differential scales. It was found that only one of the five product tested was perceived in a similar way to that of the designer and was correctly associated with its mood board. The coherent ness of images on the mood board was also a factor. When describing their perceptions of the products, the participants' familiarity with the product range was a factor. Those who were familiar (and hence were likely to be a targeted customer) perceived the product in a more similar manner to that of the designer. In general, it was difficult for the participants to articulate why a product was perceived in a particular way, however a consensus was observed in a number of the products.

Keywords: Empirical study, industrial design, user preferences, aesthetics

Literature Review

The role of aesthetics has been discussed as contributing factor to determine the success of a product. Design was mentioned as the most important determinant of new product performance by 60% of respondents in a survey of senior marketing managers [1,2].Only 17% consider price as the most important factor. Bloch describes how the form of a product may contribute to its success:

1. The form of a product can attract customer noticed in cluttered markets and can render old competitors obsolete.

2. The form of a product can be used to communicate information.

3. The form of the product can add quality to customers' lives through providing sensory pleasure.

4. The form of the product can provide a long lasting attachment to the product, in particular for the aesthetic characteristics of more durable products.

McDonagh and Denton have conducted research investigating the use of moodboard [3]. Their focus was upon the common perception of a moodboard amongst students, as opposed to comparing the perception with that of the designer. They conducted experiments with students to understand the perceptions of masculinity and femininity. They found that there was a high percentage of agreement amongst the students on masculinity and femininity. Femininity was perceived to be soft edges, pastel colours, ovoid forms and blending of images. Harsher forms, linearity, darker/hotter colours, metallic, use of string/dividing lines between images were perceived as overtly masculine. Femininity was perceived in two different ways: the softer pastel forms, in a young feminine way and also a more sophisticated femininity, using darker tactile, luxurious images. This was recognised by both genders, there was however a difference in how these boards were described; the females tended to describe the boards using strength, while the males used more sexual words, e.g. passion, sexy, etc.

Method

A total of 22 experiments with different user groups were undertaken. The aim of the experiments was to understand the correlation between:

- The mood boards created by the designers and the associations made by the targeted user group.
- The products created by the designers and the associations made by the targeted user group.

The interviews lasted between 45 and 50 minutes and consisted of both open-ended and structured questions. Four projects were selected from an industrial design class of 56 second year undergraduate students (refer to Figure 1, Figure 2, Figure 4 and Figure 5). A fifth project by a professional industrial designer was also included (refer to Figure 5). Products 1-4 were designed by male designers and product 5 by a female designer. These projects contained image boards including: a lifestyle board for the targeted user group; a mood board with the intended mood of the project: a style board with examples of form, colour of the intended style of the product and; a usage board showing the product in use. Image boards, such as mood boards are often the inspiration for the designer to set the character of the product. Image boards may be used to: 1) create a common understanding amongst the design teams with a view to the design project and also 2) to communicate with the client to ensure a common understanding is established in the direction of the project. Image boards are not necessarily consisting solely of two-dimensional images; in addition textures, smells and physical objects may form part of the board. However, those utilised during this project were two-dimensional.

The project also resulted in a model representing the final design of the product. The five projects chosen for this research were chosen based upon the quality of the image board and product model. Prior to the experiments, the designers of the product were asked to state if their final design correlated well with the mood board and to explain, in a written form, their intended mood of the product. This was a second criteria in the selection of the projects, only those deemed to have a high correlation were utilised during the experiments.

During the experiments the participants were asked to describe the mood boards in their own words, and this was compared to the descriptions of the designers. They were also asked to

describe the mood boards using a selection of terms (refer to Appendix 1), which formed the coding scheme. The development of the coding scheme is presented in the following sections.

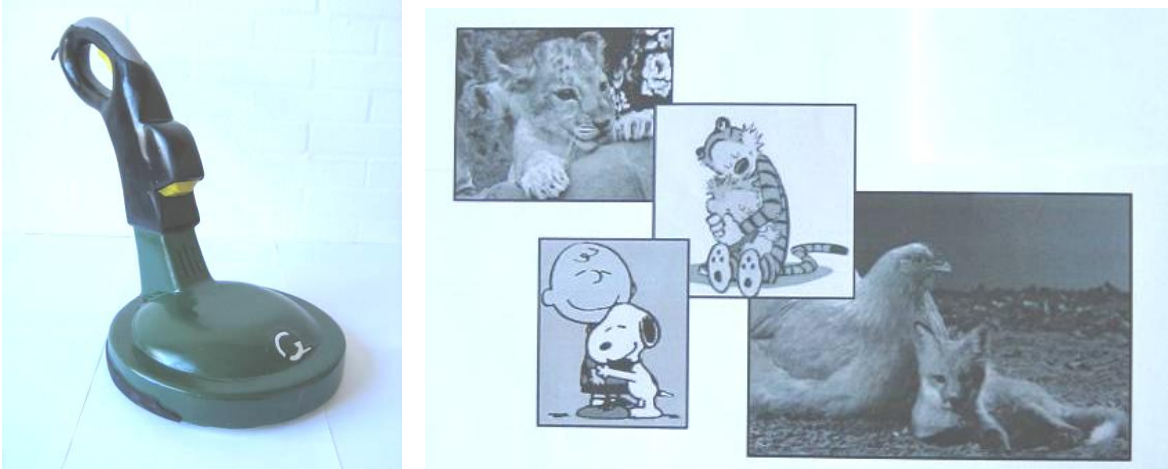**Figure 1. Product 1, Angle Grinder and Corresponding Moodboard (A)**

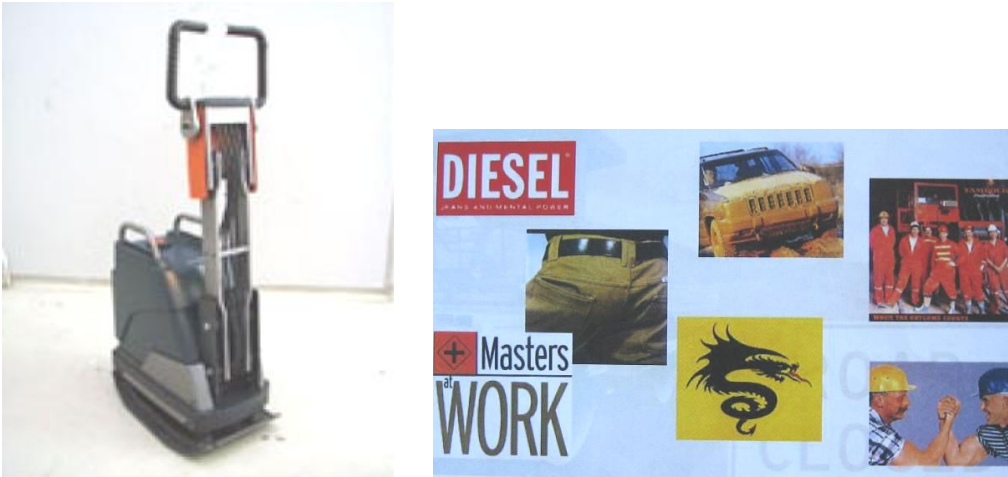**Figure 2. Product 2, Hedge Trimmer and Corresponding Moodboard (D)**

Figure 3. Product 3, Plate Compactor and Corresponding Moodboard (E)

Figure 4. Product 4, Palm Sander and Corresponding Moodboard (B)

Figure 5. Product 5, Soil Cultivator with Corresponding Moodboard (5)

A room was set up specifically for the experiments, with the original mood boards and the physical models of the product. The models were of varying standard, however the participants were asked to comment on the design and not the quality of the model. During the experiments, care was taken not to communicate any expected results to the participants and hence avoiding participant bias [4,5]. A set of instructions were utilised to ensure consistency between interviews, especially since the interviews were carried out by two persons. Four interviews were carried out with both researchers present (one observing) to ensure consistency. The participants were asked the following questions, in addition to information relating to their age, profession, etc:

1) Could you describe what you feel about this moodboard and any associations you make?

2) Could you describe what you feel about this product and any associations you make?

3) Can you state how you feel about this product? Conducted for each of the 22 pairs of adjectives (Appendix 1) and each product.

4) Each of these boards is a collection of images that represent the mood of the product? Can you place the correct moodboard with its product?

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The interviews were not audio-recorded as the answers were written down, and hence were deemed unnecessary and also for practical purposes, the participants tended to move around to pick up the objects, audio-recording was difficult to implement.

Development of Coding Scheme

The coding scheme using adjective pairs was developed by assessing a number of previous efforts [6,7]. The balance between an exhaustive list of adjectives that could be used to describe a product or mood board and a list that is practical to conduct an experiment was borne in mind. Hence a coding scheme that could be used for analysis purposes was developed, and a smaller subset of this coding scheme would be presented to the participants of the experiment. A thesaurus was then used to add synonyms for each of the adjectives, and to check the pairs of adjectives. The coding scheme was developed both in Danish and in English and the most appropriate one was used depending on the first language of the participants (refer to Appendix 1 for the completed English version). The coding scheme utilised a seven point scale using the Osgood semantic differential scales [8]. The scale ranges from -3 (one adjective extreme) through to 3 (the opposite adjective extreme), with a 0 indicating neutrality, 1 or -1 slight , 2 or -2 quite and a 3 or -3 very (refer to Figure 6)..

Very	Quite	Slightly	No	Slightly	Quite	Very
-3	-2	-1	0	1	2	3

Figure 6 Scale Employed

Participants

Participants with profiles similar to those of the intended user groups as described by the design students were selected, and also those who were not the intended target group (for comparative purposes). Four of the five products selected were targeting men between 25-49 years old (with some variation in lifestyle activities). A profile of participants, chosen for comparative purposes, is those of women between 25-40 years old.

The participants from the experiment were chosen to reflect the target group of the product (as described by the designer of the product. Four of the five products selected were targeting men between 25-49 years old (with some variation in lifestyle activities). A profile of participants, chosen for comparative purposes, is those of women between 25-40 years old.

In total 22 subjects participated in the interviews, thirteen of these were male and nine female. These were divided into four groups, which are summarised below (refer to Table 1).

Table 1. Participants

Group	Sex	Age	Number interviewed	Profession
Group 1	Male	25-49	7	Mixed-non-design background
Group 2	Female	25-49	4	Mixed Non-design background
Group 3	4 Male, 4 Female	19-25	8	First year design students
Group 4	2 Male, 1 Female	22-24	3	Non-design students

Results

Moodboard perceptions:
The participants were asked to associate each of the mood boards with the product that they thought the board belonged to. The findings are summarised and presented in Table 2. Only one of the five products (Product 5) could be correctly associated with the correct moodboard. This product was the soil cultivator designed by a female design student (refer to Figure 5). Overall 73% selected the moodboard correctly; a higher percentage of females (78% as opposed to 69%) chose the correct board. The designer described the product as luxurious, intended for people with some money who enjoyed gardening. The mood boards were described as luxury, designers taste, etc by the vast majority of the participants, only one perceived the board as 'showing-off' and this participant was unable to correctly associate the board with the soil cultivator. The coherentness of the images seemed to influence the ability to interpret the mood board.

The remaining boards were correctly associated by less than 45% of the participants. When examining the different user profile, group 2 (females between 25-49 years old) were unable to identify Product 1 and Product 4 at all. These were the angle grinder and the palm sander, group 2 were not the target user group of either of these products and had no previous experience with these products. Hence, this may explain their difficulty with interpreting the mood of the product.

Table 2. Association of Moodboard to Product

Group	Product 1	Product 2	Product 3	Product 4	Product 5
Total	32%	45%	36%	23%	73%
Females	33%	33%	44%	22%	78%
Males	31%	54%	31%	23%	69%
Group 1	29%	43%	43%	29%	71%
Group 2	0%	25%	50%	0%	75%
Group 3	50%	50%	25%	25%	75%
Group 4	33%	67%	33%	0%	67%

Overall only 23% of the participants could successfully associate product 4 (Palm Sander) with the correct board (none of group 2 or group 4 were able to do this). The moodboard was an example where one of the images provided an incoherent message to the participants. The designers perception of the board was an association of a maritime environment , trust, fresh air, colours of the ocean soft outside with a hard and a reliable shell, safety and feeling secure (safety-west).The image of the *Wunderbaum*® (a Christmas tree shape air freshener for use in a car evoked a strong reaction amongst the majority of participants. Many described it as an artificial smell, or 'tacky' and the image was singled out as being different from the rest of the board. The designer had described the *Wunderbaum*® element of the moodboard as 'dustfree'. This example highlights a difference in perception between the users and the designer.

69% of the male participants incorrectly associated moodboard E with product 3 as opposed to the only 44% of the female participants. Moodboard E contains images of an industrial environment, suggesting raw strength and masculinity, whereas moodboard C contains images suggesting masculinity and strength as described by the designer. Moodboard E belongs to the angle grinder. None of the participants from group 2 (females between 25-49 years old) were able to correctly assign the correct moodboard to the angle grinder. The

designer described the product as quite masculine (scale of 2, refer to question 10 Appendix 1), whereas the vast majority of participants disagreed with this. Overall, 77% of the participants described the product as feminine and 86% described it as either feminine or neither masculine or feminine. The main reason the participants described the product as feminine was due to the colour, a mid pastel blue that was described as not normally being associated to a power too, and that the shape was very slender. This is inline with the findings of [3], where pastel colours were perceived as feminine.

Product perceptions:

Since 73% of the participants were correctly able to associate the soil cultivator (product 5) to the correct moodboard, this product is analysed in more detail here. As designers and design educators it is interesting to understand what elements of a design signal a particular character. The designer described the soil cultivator using the coding scheme developed. The designer used a 3 or a minus 3 on a number of adjectives, indicating a strong use of the adjective and hence these are focused upon here. The designer described the cultivator as:

- very expensive (question 3 Appendix,)
- very uncommon (or exclusive, question 3 Appendix),
- very exciting (question 7 Appendix 1)
- very inviting (question 8 Appendix 1),
- very elegant (question 9 Appendix 1)
- and very stringent (as opposed to casual, question 21 Appendix 1).

The participants were in over 70% agreement for all but one of these adjectives (refer to Table 3). Inviting had a 64% agreement, this was higher almost 78% for females than for the males 54%. This may reflect the fact that the designer of this product is female. Since the images of the moodboard were used to illustrate luxury, which can be represented by both expensive and uncommon, this product was a good example of a product that was able to translate its intended mood through to the form. The product targeted both male and female users, and both sexes were able to correctly associate the moodboard of this product.

Table 3. Percentage Agreement with the Designer for Soil Cultivator

	Expensive3	Uncommon4	Exciting 7	Inviting 8	Elegant 9	Stringent 21
Total	85	91	73	64	82	77
Females	89	89	89	78	89	78
Males	77	92	62	54	77	77
Group 1	57	86	71	57	71	71
Group 2	75	100	75	75	75	75
Group 3	100	88	63	63	88	75
Group 4	100	100	100	67	100	100

Participants were asked why they had described the product at one extreme of the adjective scales (i.e. a three or a minus three). No information was collected for *stringent* or *inviting* (as they were not given a three or a minus three). The following reasons were stated:

Expensive: The reasons given for the soil cultivator to look expensive were: it looked like a designer tool, it looks like a fashionable tool for wannabe gardeners and that it will look good in a garden shed.

Uncommon: The design was described as uncommon because it was different from the other tools in the product range that the participants were familiar with.

Elegant: The reasons given for the soil cultivator to appear very elegant were: it is a clear shape, the angle chosen between prongs were 45 degrees, the form was refined, and the colours (black and silver) were also refined.

The soil cultivator was also perceived in a different view from the designers view. For example, there was 100% disagreement with the designer on whether the product was simple or complex. The designer described the product as neither simple nor complex (rated zero on the scale), whereas 21 of the 22 participants described the product as simple (one as complex). The main reasons given for the design to be described as simple were: that it was easy to understand and the design illustrated the function of the product. The other main disagreement between the perception of the designer of the product and that of the user was related to how passive/aggressive the product was. The designer perceived the product as neutral, where as 73% of the participants perceived it as aggressive, the main reason stated for this was the association of the prongs with a claw.

Conclusions

This paper has investigated the similarities and/or differences between the perception of a product and moodboard between the designer and users. A total of 22 experiments were conducted with participants with various profiles. It was found that only one of the five products tested was perceived in a similar way to that of the designer and was correctly associated with its moodboard. Even with this product, there were strong differences of opinion on certain adjectives used to describe the product, however these were all adjectives were the designer did not have a strong opinion. The coherentness of images on the moodboard was also a factor. When describing their perceptions of the products, the participants' familiarity with the product range was a factor. Those who were familiar (and hence were likely to be a targeted customer) perceived the product in a more similar manner to that of the designer. In general, it was difficult for the participants to articulate why a product was perceived in a particular way, however a consensus was observed in a number of the products.

Feed back from users/clients in early phases of a design process is important. That designs and mood boards from 2nd year product design engineering students have been tested rather than using samples from professional designers may explain the finding, that it in many cases is difficult for a customer to link a mood board to a particular design. In worst case it might come down to a question of whether the mood board and product executed by younger students are coherent and well-designed or not in a professional sense.

The findings of these experiments will be incorporated in the syllabus of a 3rd semester Industrial design course for product design engineers. The coding scheme used for analysis purposes shall be further developed based on the feed back, and new experiments will be conducted with samples from professional designers and product design engineering students.

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Appendix 1

	English	-1 -2 -3 0 1 2 3	English	If -1 or +3: Why?
1	Beautiful Stunning, pretty, gorgeous, lovely		Ugly Unsightly, hideous, grotesque	
2	Aggressive Hostile		Passive Peaceful	
3	Cheap Inexpensive, tacky		Expensive Costly	
4	Common Average, ordinary, standard		Uncommon Individual/Exclusive	
5	Cluttered		Minimal	
6	Delicate Fragile, frail		Rugged/Robust	
7	Dull Uninteresting, boring		Exciting Stimulating, thrilling, titillating	
8	Univiting		Inviting	

	Unattractive, repulsive		Friendly, tempting
9	Elegant		Clumsy
	Refined, gracious		

10	Feminine		Masculine
	Female		Male, macho

11	Formal		Informal
	Official		Casual, unofficial,
12	Anonymous		Distinct
	Unknown		

13	Happy		Sad
			Sorrowful,
	Glad		melancholic

14	Plain		Ornamental
			Embellished,
	Simple, bare,		decorative

15	Complex		Simple
			Plain, straightforward,
	Complicated		uncomplicated

16	Humorous		Serious
	Amusing, comical, witty		Sober

17	Mature		Youthful
	Developed, ripened		young, immature

18	Modest		Extravagant

19	Temporary		Permanent

20	Weak		Strong
	Fragile, frail		Solid, substantial,

21	Stringent		Casual
			Informal, unplanned, unconcerned
	Rigourous		

22	Dynamic		Static
			Unchanging, inactive