Visual perception and preferences of depicted mobile telephones

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The visual design of twelve mobile telephones was studied and compared. Thirteen university students completed sorting tasks and were also interviewed. Significant correlations were found for most phones between ranks of beauty and desire to possess. Preferences varied among participants. Multi Dimensional Scaling of pile sorting data implied that phones were compared on the basis of prototypicality and trendiness. Four themes were found in the motivations of possession ranks: aesthetic judgements, symbolic perceptions and associations, conclusions of functions and practical conclusions. The results suggest that making sense of visual design determines aesthetic experiences and partly desire to possess, thus giving support to the applicability of appraisal theories of emotion to the study of design.

In the research field of ergonomics and human factors one main concern is to discover ways to design products so that they are better adjusted to the people that use them. The main traditional focus has been to prevent products that are physically harmful to people or result in erroneous uses, thus avoiding problems of different sorts. There is however also another aspect of human factors, namely to discover designs that enhance the pleasure people derive from the usage and viewing of different products (Khalid, 2004).

Berlyne (1971, p 75-81) argued that pleasure is an important component of aesthetic appreciation. Depending on stimuli properties, the appearance of a painting for example, different levels of aesthetic pleasure are experienced. Relevant stimuli properties were listed by Berlyne as “novelty-familiarity, simplicity-complexity, clarity-obscurity, expectedness-surprisingness” and could be studied experimentally (Berlyne, 1971; page 81).

Silvia (2005) wrote that the experimental aesthetics launched by Berlyne gave rise to a new wave of aesthetic experiments. A body of research, however, indicates flaws in the model, mainly because the Berlyne theory disregards any role of cognition. Silvia argued that the relationships between stimuli variables and aesthetic, emotional experience could be better studied using cognitive psychology and an appraisal theory of emotion.

Such a theory was presented by Lazarus (1991), according to which qualitatively different conscious or unconscious cognitive appraisals of situations give rise to different emotions. There are two types of appraisals; primary and secondary. Primary
appraisal concerns goal relevance and goal congruence. If there is no goal relevance there is no emotion at all. Goal congruent appraisals give rise to positive emotions and goal incongruent appraisals give rise to negative emotions. Secondary appraisal concerns consequences, for example anticipated future emotions and determines what exact positive or negative emotion is experienced.

An example can be presented to illustrate how emotional theory may be used to understand aesthetic emotional experiences. Anna is shopping. She sees a new bag. She likes the design and considers buying it. This may according to the appraisal theory be because Anna has a goal to appear trendy (primary appraisal) and that she envisions that this bag will be noticed by her friends, who will complement her so that she’ll feel good as a consequence of buying the bag (secondary appraisal). Anna thus is involved in a cognitive process. Berlyne, however, would say that the bag has a stimulus configuration that arises aesthetic pleasure as a matter of stimuli-response. Maybe the bag had an optimal combination of novelty and simplicity in its design. Berlyne was not very concerned if it is Anna or Lena that is on the receiving end, since reactions to stimulus configurations are thought to be general.

There is some evidence from research in the field of consumer psychology that gives support to the view of the appraisal theory. Congruence between consumer self image and perceived product image has been showed to influence product preferences positively (see for example Quester, Karunartna and Goh, 2000). Upholding the current self image or reaching an ideal self image can be considered goals. Appraisal on to which degree a product design helps attain this goal would then elicit positive or negative emotions, which then in turn define preferences.

Perception of industrial design is however a special case of aesthetics, wherefore specific theories can be used to understand it. In the following two such perspectives are presented, both which are discussed in relation to the earlier presented general perspectives on aesthetic perception.

**Emotions, aesthetics and product preferences**

To consider aesthetic experience as an emotional experience is also interesting since emotions have been shown to have a great impact on decision making. Damasio (1999) showed that people are virtually unable to think of options in terms of good or bad if they have damages to the emotional systems in the brain. Without emotions, making relevant decisions is therefore very hard.

In the “feelings-as-information” paradigm emotions are thought of as carrying important messages, especially if goals are non-instrumental (Pham, 2004). The theory predicts that emotions (“how do I feel about it?”) have a great impact on decision making, especially when it concerns emotional goals. In the decision making process emotions are considered as one type of information alongside other types of information, such as for example product specifications.

In differentiation and consolidation theories of decision making it is held that one decision alternative is selected early in the decision making process as a prime
candidate. The rest of the process is then directed at restructuring the problem and altering decision rules, so that the preferred alternative appears to be sufficiently superior to the others (differentiation). After a decision has been made this process continues (consolidation). The model thus implies that decision-making processes are highly emotional and aimed at creating peace of mind, rather than strictly rational (Svenson, 1996).

**Industrial design and perception**

Norman (2004) discerned three different levels of design, connected to three different levels of psychological processing; *visceral design*, *behavioral design* and *reflective design*. The visceral level concerns stimuli-response to the appearance, a certain stimuli configuration gives rise to a certain reaction automatically and unconsciously. The behavioral level is about how pleasurable and effective something is to use. And finally, the reflective level relates to cognition; to self-image, satisfaction and memories. The reflective level thus has a social dimension to it, lacking in the former two.

There are clear similarities between the visceral level as described by Norman and the aesthetic perception theory of Berlyne; objective and general properties give rise to a specific reaction. It is however harder to draw parallels between the model of Norman to the appraisal theories of emotions, since the latter entail cognitive processing on several levels in parallel (Lazarus, 1991).

Another perspective on design is represented by the concept of *Kansei Engineering*, described by for example Schütte, Eklund, Axelsson and Nagamachi (2004). The idea behind Kansei Engineering is that different designs of a product element has different connotations, which in turn cause different emotional reactions. Through statistical analysis of semantics of meaning derived from existing products and new concept ideas, a model can be created that connects a semantic space with a physical one. On the basis of a desired product image certain designs can then be selected to create a product that has the desired connotations. An example is a beer can that is black and has a non-oval logo is perceived as bitter (Ishihara, 1998 referred in Schütte et al., 2004). According to Schütte et al. (2004) Kansei engineering has been used successfully by Japanese firms in product development of for example cars, home electronics and clothes.

Since emotional semantics is considered more than just stimuli-response in this model, Kansei engineering can be considered more congruent with appraisal theories of emotion than the theories of Berlyne. An important aspect is that the Berlyne perspective is aimed at what is considered beautiful *in general*, while the Kansei engineering is less concerned with beauty than what message a product communicates in relation to a certain target group (Schütte et al., 2004). This is also where the congruence with the appraisal theories is apparent. If a certain design is liked or not can be thought to be a function of the match between goals of the individual (for example when it comes to self presentation) and the design's connotations. The appraisal theories of emotion as well as the theoretical foundations of Kansei engineering thus explain why two persons have different aesthetic experiences of the same product.
There is also some evidence that there are regularities in the connotations that people abstract from product designs. Hsiao and Chen (2006) studied emotional perceptions of products from three categories. Four common dimensions were found when separate factor analyses were made for each category. They were called the trend factor (for example contemporary-traditional), the emotion factor (soft-hard), the complexity factor (simple-complex) and the potency factor (strong-weak).

Studies of mobile telephones

A few studies have been made on perception of mobile telephone designs and its importance to users. Katz and Sugiyama (2006) studied mobile phone design from a fashion perspective in a survey of college students in the U.S.A. and Japan. In both countries more fashion attentive persons purchased a mobile telephone earlier in time, changed phones more often and were more frequent users. The same group also had higher demands on phone style than only battery life.

Others have studied design properties that in general enhance users’ perceptions. This includes lists of critical design features important to user satisfaction (Yun, Han, Hong and Kim, 2003 and Han, Kim, Yun, Hong and Kim, 2004) and preferred overall image perceptions (Chuang, Chang and Hsu, 2001).

Purpose and research questions

The purpose of this article was to investigate what determines the emotional experience of desiring to possess a phone on the basis of its visual design. This implies how images of mobile telephones are compared to each other, which ones are preferred and how people think about such selections.

Studying perception and preferences of the design of mobile telephones by the use of pictures has several advantages. Pictures of telephones are often used in advertisements for and catalogues of mobile telephones. A number of mobile telephones are also sold online each year.

The use of pictures also eliminates a number of other types of design, for example tacit design, interface design, subtle material properties and weight to influence the results. Since the use of pictures enables manipulations, brand preferences can also be controlled for. Naturally, results found with depicted mobile telephones cannot be fully generalized to real-world telephones although it is credible that this research design may be considered a good approximation.

There are three research questions:

1. How are mobile telephones compared and categorized on the basis of their visual design?
2. What is the connection between aesthetic experiences and the desire to possess a certain mobile telephone based on its visual design?
3. What kinds of cognitive processes influence or are influenced by the desire to possess a certain mobile telephone?
Method

Participants

Participants in the study were psychology students at Stockholm University. Students interested in participating in the study filled in a form posted on the department notice board. The participants were not given monetary compensation, but were given credit as part of mandatory research participation. In total 13 students participated, 6 men and 7 women. Age was not noted but the participants were judged to be between 20 and 35 years old.

Material

Pictures of 12 different mobile telephones were selected as stimuli. The phones were selected to represent distinctly different types of design. The images of the selected mobile phones were manipulated so that attention grabbing screen images were blacked out and shadows in the background were deleted. Brand names were also removed, since it has been shown that brands can effect product perception in a dramatic way (see for example Allison & Uhl, 1964). A measuring scale was also added, with 1 cm ticks for width and height to indicate that each phone was depicted in real size.

The pictures of the phones were processed at a photographic laboratory to obtain maximum image quality. Each phone was with one exception reproduced to scale 1:1 frontside, profile and backside. The images are depicted in the Appendix.

Procedure

The session lasted between 35 to 65 minutes for each participant, depending on the speed of performing tasks and the length of the interviews. Sound from all sessions was recorded. Two similar seminar rooms, both with good lighting conditions, were used for the study.

After a short introduction had been read up, the participants performed three sorting tasks:

1. Rank-order sorting, where the mobile telephones were sorted “in the order from the one [the participant thought was] most beautiful to the one [the participant thought was] least beautiful” (quote from instructions read out loud)

2. Rank-order sorting, where mobile telephones were sorted “in the order from the one [the participant] most would like to own to the one [he or she] least want[ed] to own”.

3. Pile sorting, where mobile telephones were sorted into a, by the participant selected, number of piles on criteria of similarity for phones in each pile and dissimilarity between the piles. There had to be at least two piles. After the sorting had been performed a headline was written down for each pile by the participant.

The order of sorting tasks 1 and 2 was balanced, so that half the group started with each
sorting. Pictures were always randomized before a new sorting was performed.

The participants were asked to “think aloud” during the sorting tasks. If it was apparent that a participant, for example, sorted on the ownership criteria when the task was to sort on beauty the task at hand was clarified. The participant could work at his or her own pace, but was told to try to work reasonably fast. Most participants completed each task in two to five minutes.

After each sorting task, a short interview was conducted about the mobile telephones selected for discussion by the participant, as well as the mobile telephones with highest and lowest rank in the case of the rank order sortings. The interviews were focused on finding out why the person liked or disliked a certain phone and what meaning was attributed to its design. Open questions were asked, in the first couple of sessions questions from a guide was used, on for example why a phone was sorted in a certain position, which words would describe it in an appropriate way, what kind of person could possibly possess a similar phone and whether the design was perceived as reminding of something else. However, in the majority of the interviews the participants were just asked to tell why they placed a certain telephone in a certain rank-order position. This change was done to decrease the risk that participants were lead on by the interviewer. The participants were not pressed if they had trouble coming up with concrete answers on the questions. Instead the next task was introduced.

Finally, there was a short de-briefing interview where the participant was asked about brand knowledge of the phones, general attitude on the importance of mobile phone design when making a purchase decision and other reflections on the study. The guide used during the sessions can be found in the Appendix.

Results

Differences in beauty and ownership ranks among the phones

A Friedman Test showed a significant difference in perceived beauty of the phones (Chi-Square=25.53; df=11; p=0.008). As shown in figure 1, phone E had the highest median rank, followed by phones A, G and I. Phone B was judged least beautiful, followed by phones J and H. Lower numbers in the graph indicates that a telephone is judged more beautiful, meaning 1 is more beautiful than 12.

There was also a significant difference in the desire to possess the phones (Chi-Square=23.07; df=11; p=0.008). As shown in figure 2, phone G had the highest median rank, followed by phones E and K. Phone B was judged least desirable, followed by phones C and J.

As indicated by figures 1 and 2 there was a great dispersion of preferences for each phone in both dimensions. Half of the phones were judged among both the most and least beautiful, as well as desired to be and not to be possessed by different participants.
Figure 1. Boxplot of beauty ranks for all phones. Lower figures indicate a higher judgement of beauty. Box represents quartile two and three, line within box represents the median rank. Vertical lines represents quartiles one and four, with circle and star representing outliers.

Figure 2. Boxplot of ownership ranks on all phones. Lower figures indicate a higher desire to possess. For explanation, see figure 1.

A closer study of the distributions revealed that although rank distribution followed a bell-shaped curve for most phones (see figure 3 for an example), some other distributions were common as well. Phones B, C and G demonstrated what can be interpreted as bimodal distributions on both dimensions (see figure 4 for an example), with both low and high ranks. Phone E demonstrated a somewhat positively skewed
distribution on beauty and phone J an approximate negatively skewed distributions on both desire to possess and beauty (see figure 5 for an example).

Figure 3. Histogram of beauty ranks for phone D, demonstrating a distribution approximately bell shaped; frequency refers to number of rank order sortings in a certain position.

Figure 4. Histogram of beauty ranks for phone C, demonstrating a bimodal distribution.

Figure 5. Histogram of beauty ranks for phone E, demonstrating a somewhat positively skewed distribution.

There was a significant and strong Spearman correlation between ranks for beauty and ranks for the desire to possess. Correlations calculated separately for each phone were significant for eight of twelve phones, as shown in table 1. Correlations for phones E, F, G and H were not significant (p>0.05). For phone E ranks on beauty were higher than
ranks on the want to possess. For phone F the dispersion of ownership ranks in the sample were greater than for beauty ranks. For phone G the dispersion of beauty ranks was greater than the dispersion of possession ranks.

Table 1. Significant correlation coefficients between beauty and ownership ranks.

<table>
<thead>
<tr>
<th>Phone</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>r</td>
<td>0.585</td>
<td>0.740</td>
<td>0.833</td>
<td>0.797</td>
<td>0.647</td>
<td>0.682</td>
<td>0.668</td>
<td>0.576</td>
<td>0.699</td>
</tr>
<tr>
<td>p</td>
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<td>0.004</td>
<td>&lt;0.001</td>
<td>0.001</td>
<td>0.017</td>
<td>0.010</td>
<td>0.013</td>
<td>0.039</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

*MDS-analysis of pile sorting data*

Multi Dimensional Scaling on the pile sorting data was performed using the program Proxscal as adopted in SPSS version 16. The analysis was done on the basis of a proximity matrix where the number of co-occurrences within the same pile was counted for all the possible pairings of phones. The data was treated as ordinal by the MDS algorithm. A scree plot indicated that two dimensions were optimal. Stress was low (Normalized Raw Stress = 0.027; S-Stress = 0.0696) and a very large proportion of the dispersion in the material was explained by the model (Dispersion Accounted For, D.A.F. = 0.973).

The solution, presented in figure 6, was congruent with comments made by participants in the sessions and with the pile headlines written by the participants. It was also intuitively reasonable. The horizontal dimension was interpreted as representing a trend factor (Hsiao and Chen, 2006) while the vertical dimension was interpreted as reflecting prototypicality; to what degree a certain phone looked like a “typical” mobile telephone.

![Proxscal MDS plot](image-url)

Figure 6. Proxscal MDS plot, where points represent each phone's perceived position in relation to the other phones.
When images of all phones are superimposed onto the MDS plot, as shown in figure 7, the two dimensions can be demonstrated by means of visual inspection. Furthermore, when phones are marked on the basis of ownership ranks, there is a clear pattern; the phones preferred by participants in the study had designs that were either prototypical or relatively trendy. The phones with low ranks on the desire to possess were sorted as non-trendy and less prototypical. This result is however only descriptive, not statistically tested.

**Analysis of interview statements**

Interviews following the sorting on the desire to possess as well as the closing questions were transcribed. Recordings from three participants were eliminated because of low recording quality and because statements were similar to already transcribed interviews. Statements were marked with keywords. The keywords were sorted into four coherent categories. These were aesthetic judgements, symbolic judgements and associations, practical judgements and judgements regarding functions of the phones. All the transcripts were then analysed category by category and appropriate statements were categorized. When this had been done for all four categories the statements belonging to each category were analysed with the use of the hermeneutic circle to extract the common meaning represented by them.

**Aesthetic judgements**

Aesthetic judgements were subjective judgements about general beauty and aesthetic pleasure of viewing the pictures of the phones. Participants’ comments were often made from the viewpoint of a perceived prototypical design of a mobile telephone, focusing on either prevalence or absence of salient features such as eye-catching details, strong
colours or unconventional overall shapes. Absence of salient features and lots of details means that a phone often was perceived to be discrete or simplistic, something that was much appreciated by some of the participants.

Examples of statements, translated from Swedish:

“But yet, I think that a phone should look like a phone”

“It’s ugly. It’s lilac and has some diamond thingy.”

**Symbolic perceptions and associations**

Symbolic perceptions and associations was a separate category from general aesthetic judgements in that associations and perceptions of meaning were made in the actual statements. The participants thus tried to make sense of the messages perceived from the design. That includes associations to other similar things, to earlier phones, identification and reflections on the phone versus the participant’s personal style.

To clarify, a statement such as “it has nice lines” is an example of a purely aesthetic judgement, while a statement like “it has a childish look” is an example of a more symbolic perception. This should however not be interpreted as these former perceptions are non-evaluative; rather, at most times these symbols are talked about in terms of good or bad. The two categories were also often linked to each other; for example a participant could say that a phone was ugly (an aesthetic judgement) and motivate the opinion by saying that it looked like something a fourteen year old would have (a symbolic perception/association).

Another difference to general aesthetic experience is that symbolic perceptions and associations were more linked to the self. Participants talked about their personal style and if they would be proud to possess a phone or not. They were also able to make judgements of what kind of target group a certain design was directed at. In some cases this target group, often defined in terms of demographic variables like age and sex, did not include the participant, although he or she was talking about the phone he or she most wanted to possess.

Some of the depicted phones, with non-prototypical appearance and highly salient features, appealed to persons who expressed a desire to have a distinct trendy appearance, judging these phones interesting and modern. Other participants judged the same phones as too loud and ugly. The opposite can be said of the phones low on the trend factor in the MDS, some participant interpreted this look as saying “I don't care about shallowness and design”, while others couldn't understand why anybody could like such an ugly phone. All in all, identification appears to be a key word when it comes to symbolism. Each phone design sent out a specific message that was commonly understood, but interpreted and evaluated in different ways by different persons. This result is congruent with earlier findings (see for example Quester, Karunaratna and Goh, 2000).
Examples of statements, translated from Swedish:

“… does not appeal to me. But I guess I’m not their target group for this phone, so it probably is not that strange.”

“Ungainliness and lack of taste” (Sw: klumpighet)

“But lilac is not my favourite colour, plus when they have that diamond it gets… It’s a little too feminine for my taste, simply…”

“It radiates teenage, little loud colours. Here I come, I want to be seen!”

Judgements of functions

The participants made inferences about both how technically advanced a phone was in general and what specific functional features it had, for example ability to play music, take photographs and connection to the internet. These conclusions were made on the basis of the phone’s design. Functions can be seen as positively motivated features of a phone, meaning things that bring a value and abilities to the owner.

For some participants the abilities of the phone were a main concern. Others were only interested in basic functions, like text messaging and making phone calls, which they assumed all phones could handle.

Examples of statements, translated from Swedish:

“Really, the functions are good, one can see.”

“…edgy, not that glaring, but has probably a whole lot of functions which can help people in work kinda, who can move around.”

Practical judgements

Practical judgements were about “hard issues” such as price, size, functional design, user-friendliness and durability. In comparison with the former category, inferences of functions, these are negatively motivated – meaning that they are about avoiding displeasure in different forms. The participants wanted a small phone so that it would not take up much space in the pocket, they wanted an inexpensive phone so they wouldn’t have to spend a lot of money, they wanted a user-friendly interface so they could use their phone without trouble and they wanted a phone that would not get worn easily.

Especially judgements of durability were made on the basis of design. When phones were made of plastics and rubber they were seemingly judged more durable than phones made of glossy material like metal and plastic glass.

The practicality dimension also reflects that all participants were somewhat experienced mobile phone users. Although most of them were not very interested in or knowledgeable about mobile telephones, all had owned and used mobile phones for some years. Their experience of the product guided their judgement, since they were aware of weak spots and possible problems.
Examples of statements, translated from Swedish:

“Yes, looks kinda sturdy. It can probably stand to be dropped on the floor and so on. Will probably work for many years, it looks like.”

“Really, what I can’t understand is why one would make phones with that small buttons.”

“I would really like to have that one. But I would almost be a bit afraid to use it … I take such bad care of them, they get broken…”

**Discussion**

The purpose of the study was to investigate what determines the emotional experience of desiring to possess a mobile telephone on the basis of its visual design. Depicted phones were used as stimuli in sorting tasks and the following interviews. Results showed a strong connection between beauty and the desire to possess a phone, but also that other considerations than aesthetic were important in the selection of mobile a telephone. The result can be summarized as follows:

1. **How are mobile telephones compared, categorized and preferred on the basis of their visual design?**

   There were significant differences in ranks on both beauty and the desire to possess between the phones. MDS analysis of pile sorting data indicated that the depicted phones were compared on two dimensions: a prototypicality factor (how alike is this phone a typical mobile telephone?) and a trend factor (how edgy and novel is the design?). Depicted phones high on the trend factor and relatively prototypical were more popular in the sample than phones with non-prototypical and non-trendy designs.

2. **What is the connection between aesthetic experiences and the desire to possess a certain mobile telephone, based on its visual design?**

   For most phones there was a positive and significant correlation between ranks on beauty and the desire to possess. The mismatches can be understood as influence of functional and practical considerations. The opinion on which phones were more beautiful and desirable differed among the participants. Thus, the participants often desired to possess the phones they thought were beautiful, but had different opinions on what was a beautiful phone.

3. **What kinds of cognitive processes influence or are influenced by the desire to possess a certain mobile telephone?**

   Participants’ motivations on the desire to possess rankings were categorised into four recurring themes: aesthetic perceptions (is it beautiful?), symbolic perceptions and associations (what does it remind me of? who is it for?), conclusions of functions (what can I do with it?) and practical conclusions (will it work well for me?).
Consumer psychology aspects

Berlyne (1971) argued that objective qualities of a stimulus determine the level of aesthetic pleasure and beauty experienced. The assumption of this theory is that all persons have similar aesthetic experiences given the same object configuration. The model would therefore imply bell-shaped distributions of ranks on each phone, where differences in ranks mainly would stem from random measurement error or lack of reliability. That was however not the case in the study. As described there were a number of distributions of ranks evident, even some that could be described as bi-modal or highly skewed. Also, more than half of the phones were both given very high and very low ranks providing further evidence that the visual design of mobile telephones may be more fruitful to study using other theoretical perspectives.

The different types of distributions of ranks found in this study indicate that there are some generalities in how a phone is perceived. Some phones were controversial (bimodal distributions), some were generally liked or disliked (skewed) and some were of ambiguous visual quality (normal). One reasonable conclusion is that emotional reactions to mobile telephone design are individual to some degree, but that some reactions are more common than others. In other words: some preferences were more popular or are held by more people than other preferences.

Silvia (2005) criticised the theory of Berlyne and proposed that appraisal theory of emotion could be used to better understand aesthetic experiences. Lazarus (1991) wrote that emotions arise as the result of two types of cognitive appraisals of the individual, focused on goal-relevance and consequences. Thus, the theory of Silvia/Lazarus can explain why different persons experience different emotions towards the same object, as was the case in this study.

This reasoning is also congruent with the results of a smaller unpublished study (Scharf, 2008) where it was demonstrated in a regression model that perceived match with personal style had much greater power to predict the degree of desire to possess a mobile telephone than perceived beauty.

One example illustrative example from the present study is that relatively few participants preferred phone B, an orange Nokia phone made of plastics and rubber. As described in the results section, that type of telephone design communicated to them that they do not care about superficial things such as a having a trendy mobile phone. Thus, these participants did not choose a phone that the majority thought was ugly because they thought appearance was unimportant, but rather to communicate to themselves and others that they did not care about such shallow things. Aesthetics matters, it is just that there are different types of aesthetics that conveys different messages that are interpreted in dramatically different ways by different persons.

When participants were asked about their associations to a certain phone, they were highly coloured by the rank order position. If a phone was chosen as desired to be possessed in the sorting task, associations were often expressed in a positive manner. If asked about a low-ranked phone, participants gave more or less only negative judgements. All participants were asked similar open questions about what the phone
reminded them about and things similar to the phone. The data suggests that a first impression leads further thinking regarding a phone in a positive or negative direction as predicted by the feelings-as-information (Pham, 2004) and differentiation-consolidation (Svenson, 1996) theories of decision making, underlining the emotional nature of design perception.

To summarize, the study highlights the importance of personal interpretations of industrial design in relation to personal style. This conclusion is not congruent with the three-level model of Norman, since sense-making is considered a part of the reflective level while aesthetics belongs on the primitive visceral level. The importance of functions and practical issues represented by the behavioral level is however evident in interview statements and may explain the discrepancies between beauty and ownership ranks found for some phones. The findings are more consistent with the Kansei engineering approach to industrial design (Schütte et al., 2004) and the use of appraisal theory of emotion to study aesthetic experiences.

Validity

The internal validity of the study can be considered satisfactory, owing to the mixed qualitative and quantitative method, that allowed data to be cross validated. For example participants spoke aloud while performing quantitative sorting tasks which guaranteed that they were using the correct sorting criteria. The quantitative results were further validated through the interviews, which also added additional insights and a deeper understanding of the quantitative results.

The greatest threat to internal validity probably lies with the qualitative analysis, since time restrictions meant that only a few parts of the sessions were transcribed and analysed. Since the analysis was performed by the same person that made interviews, the memory of all sessions could possibly have increased the risk of unconsciously “filling in gaps”. The systematic method for analysis should however counteract this tendency.

Another potential threat to internal validity is brand-biased judgements, contaminated by earlier preferences and experiences. When asked to guess which brand each phone was from, most participants said that they “could tell” that at least a few phones were made by specific manufacturers. No participant did however make correct guesses on all phones. No particular brand was more popular than any other and the MDS does not display any brand-based groupings of phones. Even if the participants to some extent identified the phones with certain brands, the absence of logotypes helped frame the sortings not as brand sortings, potentially reducing the brand influence.

Some points can also be made regarding external validity, primarily on basis of the sample of participants. Most results may probably be generalized to a population of 20 to 35 year olds in countries with similar mobile phone history as Sweden. All of the participants had experience of owning and using mobile telephones for some years, but apart from that they had widely different opinions, tastes and knowledge. There are good reasons to believe that the participants were at least from a qualitative perspective representative of a relatively young target group for mobile telephones, especially in the
sense that the participants had differing interest in and knowledge of mobile telephones. The generalizability may also hold truer for the qualitative analysis as well as the MDS analysis, when compared to the ranking data. The latter can be thought of more a matter of different tastes and personal styles and the former more has to do with product perception and cognitive schemas which may be more similar among people since they are partly socially created.

There are naturally some limitations on the ecological validity of the study, since the study was performed in a laboratory and pictures rather than real mobile telephones were used. Focus was only on depicted visual design and mobile phone customers in general have access to more information. In many countries it is a common practice that customers can play with dummy telephones in stores. This enables them to get a fuller picture of the design, a better sense of size and weight as well as tactile sensations. The trend in mobile telephones is also towards larger screens with higher definition, which may mean that user interface plays an increasingly more important role for the experience of a certain phone. It is therefore important to understand that there is a whole array of other factors, besides visual appearance of the phone shell, that have an impact.

Regarding the Multi Dimensional Scaling algorithm used, Proxscal was selected because the SPSS version could handle the proximities generated by the sorting data. Alscal, the more popular of the programs, could not perform proximity calculations in its SPSS version. The MDS plot is clearly interpretable and congruent with the qualitative findings, indicating its validity.

**Implications**

Perception of design must be considered as a function of individual attributes and preferences on for example self-presentation, rather than from a general one-fits-all perspective. What could be referred to as general aesthetics appear to be of less importance than the meaning that each person attributes to a certain configuration of design elements and how that meaning is interpreted. When other factors, such as functions and practicalities, are highly salient they may have a considerable influence on which mobile telephone is preferred. The implications of this result may be that framing of advertisements and product descriptions is important, especially for phones that are perceived as fragile. If counterarguments to such judgements are presented, people may to a greater extent choose phones they perceive as beautiful.

Further research can experimentally test preferences on self-presentation in relations to perceived meaning of mobile telephones. The influence of non-design factors can also be tested experimentally by for example framing a decision situation with different types of information. The implicit association test could be used to test if people perceive that beauty and good functionality/reliability are opposites.

Finally, the results indicate that the appraisal theory of emotion (Lazarus, 1991) can be used to understand perception and judgement of product design, which also enables the use of theories on emotional impact on decision making to understand purchase decisions.
References


Appendix: Pictures of phone front sides
CHECKLISTA
FÖRSÖK MED BEDÖMNINGAR AV MOBILTELEFONERS FORMGIVNING

1. Notera kön:
   - Man
   - Kvinna

2. Notera:
   Datum: ____/____ 2008   Tid: ____:____


4. Läs information:


   Hela vår session spelas in, så att det som sägs sedan kan analyseras på ett systematiskt sätt. Men det du säger här behandlas sedan avidentifierat.

   Du är välkommen att när som helst under försöket ställa frågor om du upplever att något är oklart eller otydligt. Har du några frågor nu innan vi börjar?

5. Ge instruktion om sortering 1:


   Under tiden som du sorterar telefonerna vill jag att du ”tänker högt”, det vill säga uttalar de tankar du har.

   Har du några frågor?

5. Notera ordningen när fp är klar:

<table>
<thead>
<tr>
<th>Mest vacker</th>
<th>1</th>
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<th>4</th>
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<th>10</th>
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<th>12</th>
<th>Minst vacker</th>
</tr>
</thead>
</table>

6. Fråga:

- Önskar du tillägga något som du inte hann säga under tiden som du genomförde sorteringen?
- Vad tänker du när du tittar på den färdiga ordningen?

7. Val av diskussionsobjekt. Fråga:

- Är det någon eller några av telefonerna som du skulle vilja kommentera?

8. Lägg bilderna på bästa, sämsta och önskade telefoner enligt ovan i en hög och lägg resten av bilderna i en egen hög vid sidan om.

9. Gå igenom de valda bilderna. Fråga:

1. Var det något särskilt hos telefonens utseende som du fastnade för?
2. Vilka ord tycker du bäst beskriver telefonen? Hur tänker du då?
3. Om du skulle tänka på en person som i någon bemärkelse påminner om telefonen, vem skulle det vara då? Varför?
4. Vem tror du har en sådan här telefon? Varför då?

10. Kontrollera tiden. Samla ihop och blanda runt bilderna. Läs information:

    Nu ska vi gå vidare med en helt annan uppgift.

    Nu vill jag vill att du sorterar telefonerna i ordningen från den som du helst skulle vilja äga till den du allra minst vill äga.


    Under tiden som du sorterar telefonerna vill jag att du också den här gången ”tänker högt”, det vill säga uttalar det tankar du har.

    Har du några frågor?

12. Notera ordningen när fp är klar:

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<th>11</th>
<th>12</th>
<th>Vill ej äga</th>
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13. Fråga:

- Önskar du tillägga något som du inte hann säga under tiden som du genomförde sorteringen?
- Vad tänker du när du tittar på den färdiga ordningen?

14. Val av diskussionsobjekt. Fråga:

- Är det någon eller några av telefonerna som du skulle vilja kommentera?

15. Lägg bilderna på bästa, sämsta och önskade telefoner enligt ovan i en hög och lägg resten av bilderna i en egen hög vid sidan om.

16. Gå igenom de valda bilderna. Fråga:

1. Var det något särskilt hos telefonens utseende som du fastnade för?
2. Vilka ord tycker du bäst beskriver telefonen? Hur tänker du då?
3. Om du skulle tänka på en person som i någon bemärkelse påminner om telefonen, vem skulle det vara då? Varför?
4. Vem tror du har en sådan här telefon? Varför då?

17. Samla ihop alla bilder och blanda om dem. Läs instruktioner:


Tanken är att telefonerna i varje hög ska vara så lika varandra som möjligt, men att de olika högarna ska vara så olika varandra som det går.

Precis som förut finns det inga korrekta eller felaktiga sorteringar och du får gärna arbeta snabbt utifrån det intryck du får av varje telefon.

Tänk högt under tiden som du genomför sorteringen. Har du några frågor innan vi börjar?

19. När fp är klar med sin sortering. Läs instruktion:


Har du några frågor?

20. Notera sorteringen av telefoner:

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</table>

21. Gå igenom varje hög. Ställ frågor:

Vad är det som dessa telefoner har gemensamt?

Vad finns det för skillnader mellan telefonerna i den här högen och de andra telefonerna?

Vilka är de största olikheterna mellan telefonerna i den här högen?

Vilken typ av person tror du äger någon av telefonerna i den här högen? Varför då?

21. Kontrollera tiden. Ställ avslutande frågor om tid återstår:

Vad tycker du är viktigt med en mobiltelefons utseende?

Vilka är dina reflektioner efter att ha genomfört försöket?
22. Spara inspelningen.