The study of shape elements in conveying pleasurable image

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Abstract

People’s lifestyle and living quality have changed dramatically in the 21st century. Nowadays, more and more consumers are concerned about looking for a product which is not only for functional and aesthetic pleasure but also emotional satisfaction. Products are objects that can make people happy, angry, proud or ashamed, secure or anxious. Products can empower, infuriate or delight – they have personality (Marzano 1998). This new trend has pushed the market toward a more emotionally-orientated approach in the manufacture of many future products. Today, consumers have a desire to see the extra value for the satisfaction at emotional level. Therefore, the study of product value at emotional pleasure will be a benefit to the future design for product designers. As we know, the frame structure of creating a pleasurable product has involved many aspects: cognition, cultural value, and the expression of physical feature on such a product. This paper tries to focus on the study of product’s physical form towards pleasure. The major issues in this study focus on the contours and complexity of the product form to the pleasurable emotion. The research includes visual psychology and perception. Arnheim’s theory of pictures, symbols and signs has provided a basic concept of designing the experiment. An experiment is conducted to demonstrate the relation between complexity and contours in product form. Hopefully, the result of this study will make a contribution to the future study in design areas.
The study of shape elements in conveying pleasurable image

The motivation and background OR introduction
With the growth of the lifestyle quality, consumers have a dramatic change in the needs of product quality in terms of more sophisticated concepts and emotional attached products. In other words, consumers require a new product, which has not only functional intelligence, economic fit, but also emotional satisfaction. Mr. Marzano, the manager of Phillips Corporation, believes that products are objects that can make people happy or angry, proud or ashamed, secure or anxious. Products can empower, infuriate or delight – they have personality (Marzano, 1998). This has implied that products should be able to carry an emotional function in order to fulfill the trends in the future market. A designer should notice the sensation, perception, and feeling in consumers’ minds in order to ensure their satisfaction and psychological happiness in both function and aesthetics. Facing this new marketing, manufacturers should pay more attention to the consumers desire and needs, and also, the product’s image, which has become more important in ensuring a high corporation identity in comparative markets. Nowadays, it is believed that the research in pleasurable products becomes more convincing and important during the design process.

Pleasurable products psychologically and physiologically affect our daily lives in many aspects. For instance, the impact of iMac demonstrates a success in computer market. Through a transparent material and an elegant form, the passion derived from iMac conveys a fresh, sweet like jelly-look image which arouses the warm and sweet feeling of the users when they confront it. This is a very convincing example to a designer in approaching pleasurable design, especially the cool High-Tech products. The warmth and friendliness of a material or of a shape can provide a magnificent sensation to replace the traditional feeling of the cool technology products. The same successful product, new Beetle, has also shown the power of its elegant shape, cultural meaning, and memory connection to the users. The streamline body with soft and bright pastel colors gives a pleasure element to the drivers. Compared with the heavy industrial environment of other automobiles, new Beetle demonstrates a perfect sample to connect with nature by using the metaphor of a bug shape and bright colors, which appears to be more harmonic, peaceful and pleasurable. Hence, if a designer can take advantage of these affective elements and integrate them into a design, it can create extra value in a product (Jordan 2000 & Desmet 2001).

President of Frog design, Mr. Hartmut Esslinger, believes that form should follow emotion. All products without emotional elements cannot be durable in the comparative market. (Sweet, 1999) The challenge to a designer in the future is how to create a product with a pleasurable factor.

Study purpose
This paper purposes to focus on the study of visual elements to a shape towards the affection in pleasurable vocabularies such as cute, pleasure, happy, friendly and so on. The experiment tries to focus on the study of information delivering in the difference of contours and complexity related to the pleasurable vocabularies. The study realms include three different typical contours and five different levels of elements. These five levels of complexity are created by using facial elements, since facial changes can reflect the emotion directly deep in the mind and also people can detect easily through a physical change of the mouth, eyes, muscle of the cheeks and so on.

Literature reviews
The process of reaching a goal involves a lot of emotional reaction and experiment retrospection, and it can bring out pleasure, sadness, depression and many other reactions. Those emotional
reactions can be detected through the changes of the face. The facial change appears more physical reaction in terms of skin movement, which can be easy to identify (Butler: 1999).

Eyes and mouth have been considered to be the best expression features and emotion reaction on our face. In the combination of all the facial features such as eyes, eyelashes, nose, and mouth, it is able to express the complicated emotion: happiness, enjoyment, anger, sadness and so on. In 1992, Aronof, a psychologist, uses 12 adjectives as the keywords to describe the emotion such as friendly, good, pleasure, harmony, simple and brightness in design. Lundqvist (1999) uses these 12 pairs of adjectives for the study of facial emotion. The result of the experiment proved that the features combination of eyes and mouth on the face have the most powerful intergradient of delivering very strong emotion.

As we know, there are many emotional interactions between people and people, and between people and objects. It can be reflected through consumers’ decision making when they purchase a product. Thus, to create a good strategy, the study of consumers’ emotion has become more and more important in the field of marketing research. A case study in personal mobile phone conducted by telecommunication research center in Holland (KPN) tends to analyze the emotional factors of the consumers. And the result is valuable for the guidelines of the future design. In the study, EMOcard are applied to the emotional measurement in order to evaluate the value for the products. The result of that experiment demonstrates that consumers’ emotion and attitude are directly connected with the affective elements appearing on the product shapes. A positive conclusion goes to those products carrying these factors: Pleasant, Professional, Enjoyment, and Sophisticated appear to be more emotional affection to the consumers (Desmet: 2001).

Kansei Engineering is a new method to evaluate the image to a product. Furthermore, it allows designers to control or understand users’ emotion and perception to a product, through systematic processes. This method becomes more useful for researchers in doing emotional study. With the research results, a designer can take advantage of understanding lifestyle as well as the consumer’s behaviour, and finally integrate these fragments into his products. This process definitely can help corporations win a lot of marketing share.

The images, somehow conceived by a different person, can communicate different levels of meaning. They can demonstrate a realistic object or represent a highly abstract social meaning through visual shape. They also can describe the things of our environment themselves. Like abstract paintings, they commonly show the style that is more abstract than the way these people, or happenings would register on a photographic plate. Images deliver the meaning of the reality in two opposite directions. They can demonstrate between the realm of practical and abstract things. The interpretation/decoding process to the images involves many factors, for instance, the culture and the age of viewers. A young boy rationally may see images in a more realistic way, while adults can see the same images with more abstract minds. Thus, the different level of this mind process will create a different interpretation of the things/ images.

Visual psychologist, Arnheim states that the image can be served as a picture or as a symbol. They can also be used as mere signs. The theory consists of three functions of images: sign, picture, and symbol. A simple line can state a visual form or structural quality through a created image. Hence, it can represent an abstract social meaning in our living environment. For instance, it can be represented as a nice-marriage through a created form with very smooth curves, to represent a bad-marriage through a zigzag shape. It is because, when people perceive the image, the image constructed by lines can represent three levels of meaning: sign, picture and symbol. Those three functions will not stand only into one particular image, but some other images, which can also represent the above three functions at the same time. For example, a triangle can mean a sign of
danger, or a picture of a mountain, or a symbol of a tree-hierarchy. In this case, the image itself does not tell which function is intended.

An image serves merely as a sign to the extent to which it stands for a particular content without reflecting visually its characteristics, words, and alphabets (ex. “a”, “b” and so on). The letter and words are considered as a sign because, in this case, they are created for serving similar purposes of identification and distinction. This is also shown to the portrayal. It is because the portrayals operate as the references to the particular figures for whom they stand.

Images are pictures to the extent to which they portray things located at a lower level of abstractness than they are themselves (Arnheim, 1969). The pictures are created by catching or rendering the relevant elements- shape, color, movement- of the objects or activities they depict. For instance, a child may draw a rough circle and two straight lines to identify the papa’s head and two legs. He does not describe all the details of the face features on the head, but we still can understand it. It is because we can complete the image in our mind based on the past experience or knowledge we have. The fact is that a picture or image can be completed at any level of abstractness, even if different viewers perceive with different interpretations.

An image acts as a symbol to the extent to which it portrays things which are at a higher level of abstractness than is the symbol itself (Arnheim, 1969) for instance, a portrait of King Henry III, is a picture of king. At the same time, it can stand as a symbol of kingship and of the quality of strength, and brutality.

The human mind can be forced to produce replicas of things, but it is not naturally geared to it (Arnheim, 1969). This has implied that the shape of a product could confuse a user through appearance since visual perception of a user is connected to the significant form of a product. The complexity of line construction and line shape can cause part of the affections through the form generation, and this has given the user a random imagination during the visual interaction. It is also true that the smoothness of a swelling curve tends to be more friendly, soothing, warm, and pleasurable.

To the extent of visual perception, the different degrees of abstractness in product shape could deliver different levels of function in three categories: sign, picture and symbol. And each level will cause different arousal or meaning to a user when perceiving it. In other words, all the details of the product shape should deliver some sorts of meaning to the users, both in a still image and in a dynamic interaction. In product design, being a designer, we should know what the shape means to the users. The different scale of abstraction of product shape is associated with the cultural difference, contours and complexity of the form. To clarify the meaning of the shape, designers have to understand the needs and the perception of consumers to the products. This study tends to answer this question through a theoretical research and an experiment.

**Methods**

**Selected subjects**
Thirty subjects including 17 females and 13 males were involved in this experiment. The average age is 20 years old. They are second year college students currently studying in industrial design department (10 persons), medical management (10 persons), and industrial engineering management department (10 persons). All subjects consented to the experiment.
Stimuli
Fifteen stimuli were used in this experiment, which include three columns and five levels (3x5). (See Fig. 1) At vertical columns, three basic contour shapes were created for each column: rectangular, circle, and the combination of straight line and curve. Within each column, there are five levels from very simple feature to very complicated feature. Level V is considered to be the most complicated feature in this experiment. It contains two eyes, a nose, and a mouth. Level IV is considered to be less complicated than level V. It contains two eyes, and a mouth. Followed with the sequence, level I does not carry any detail on the top surface. (See Fig 1)

Each stimulus was generated in the 3D Allias software. Each stimulus is created with almost the same amount of volume and surface, and presented with the same view angle and the same quality of light source in the screen. When processing the experiment, stimuli were randomised to appear in the computer screen at the front of subjects. Thirty subjects were divided into two groups. The second group started with the test from the opposite sequence of the first group in order to avoid peer/learning affect.

![Figure 1](image)

Questionnaire
The adjectives adopted in the questionnaire were quoted from Aronoff’s research, a psychological research study in facial emotional psychology (Lundqvist, 1999). Some adjectives were derived from author’s previous study in emotion to the can opener project. In the questionnaire, it includes seven pair of adjectives: boring/ fun, not pleasure/ very pleasure, unfriendly/ very friendly, unfamiliar/ very familiar, not cute/ very cute, ugly/ pretty, and dislike/ like. Seven scaling measurement evaluation system is used to evaluate the subjects’ emotion to the stimulus.

Experiment procedures
In the experiment, every 15 subjects were arranged in the same room at an appropriate distance where subjects can see the computer image clearly. The subjects were asked to watch the stimuli in the computer screen for enough time, and then answer the identical questions “intuitionally” in the questionnaire. The sequence of stimulus had been randomized organized. Two groups of subjects (15 each) took the test followed with the opposite order of the randomized stimulus.


**Data mining and analysis**

After gathering 30 questionnaires, MANOVA software in Window SPSS is given to analyze the difference between the contours of shape and the complexity of elements. In addition, the Duncan’s Multiple Range Test is used to test if there is a significant difference within the complexity between each two of the levels.

**Result and analysis**

**a) The result of statistic**

The result of MANOVA test demonstrates as follows:

1. Six pairs of adjectives (cute, fun, like, friendly, pleasurable, pretty) to the type of contours and complexity of elements do not have a statistic significant difference. The result states that there is no interaction between the type of contours and complexity of line elements. Although P value is less than .05 only in “familiar” adjective, it shows that there is a significant difference (See Table 1).

2. The statistic result shows that seven pairs of adjectives to the complexity have a significant difference (See Table 2). In addition, the result shows that six pairs of adjectives to the contours have a significant difference (See table 3).

<table>
<thead>
<tr>
<th>Not cute/Very Cute</th>
<th>F</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Interest/Very Interest</td>
<td>1.36</td>
<td>.211</td>
</tr>
<tr>
<td>Not Familiar/Very Familiar</td>
<td>2.24</td>
<td>.024</td>
</tr>
<tr>
<td>Not Friendly/Very Friendly</td>
<td>1.44</td>
<td>.178</td>
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<tr>
<td>Dislike/Very Like</td>
<td>1.29</td>
<td>.244</td>
</tr>
<tr>
<td>Not Pleasurable/Very Pleasurable</td>
<td>1.43</td>
<td>.183</td>
</tr>
<tr>
<td>Not pretty/Very Pretty</td>
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Table 1: Complexity and contours

<table>
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<tr>
<th>Not cute/Very Cute</th>
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</thead>
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<tr>
<td>Not Interest/Very Interest</td>
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<td>.000</td>
</tr>
<tr>
<td>Not Familiar/Very Familiar</td>
<td>17.43</td>
<td>.000</td>
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<tr>
<td>Not Friendly/Very Friendly</td>
<td>2.11</td>
<td>.122</td>
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<td>Dislike/Very Like</td>
<td>16.86</td>
<td>.000</td>
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<td>Not Pleasurable/Very Pleasurable</td>
<td>10.17</td>
<td>.000</td>
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<tr>
<td>Not pretty/Very Pretty</td>
<td>8.90</td>
<td>.000</td>
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Table 3: Contours
3. Duncan’s Multiple Range Test is given to test if there is any significant difference between each two levels of complexity.

(A) Based on the statistic result of “cute” adjective on table 4, the average demonstrates that the more complex stimulus is, the cuter stimulus is. Among five levels of element complexity, the average of the max. and min. value between (group 1, 2), (group 2, 3), and (group 4, 5) shows no significant difference. Hence, it can be concluded that there is a significant difference in the complexity among 1, 3, 5 levels.

(B) Based on the statistic result of ‘familiar’ adjective on the table 5, the average of statistic result demonstrates that the more complex stimulus is, the more familiar stimulus is. Among five levels of element complexity, the average of the max. and min. value between (group 2,3), and (group 1,4,5) shows no significant difference. Hence, it can be concluded that there is a significant difference on the complexity between 2, 3 and 4, 5 levels.

(C) Based on the statistic result of “fun” adjective on the table 6, the average of statistic result demonstrates that the more complex stimulus is, the more fun stimulus is. Among five levels of element complexity, the average of the max. and min. value between (group 1), (group 2, 3) and (group 4, 5) shows no significant difference. Hence, it can be concluded that there is a significant difference on the complexity among 1, 3,5 level.

(D) Based on the statistic result of “like” adjective on the table 7, the average of statistic result demonstrates that the more complex stimulus is, the more likeness stimulus is. Among five levels of element complexity, the average of the max. and min. value between (group 1, 2), (group 2,3) and (group 4, 5) shows no significant difference. Hence, it can be concluded that there is a significant difference on the complexity among 1, 3,5 level.

(E) Based on the statistic result of “pleasurable” adjective on table 8, the average of statistic result demonstrates that the more complex stimulus is, the more pleasurable stimulus is. Among five levels of element complexity, the average of the max. and min. value between (group 1), (group 2,3) and (group 4,5) shows no significant difference. Hence, it can be concluded that there is a significant difference on the complexity among 1, 3, 5 level.

(F) Based on the statistic result of “pretty” adjective on table 9, the average of statistic result demonstrates that the more complex stimulus is, the prettier stimulus is. Among five levels of element complexity, the average of the max. and min. value between (group 1, 2), (group 4, 5) shows no significant difference. Hence, it can be concluded that there is a significant difference on the complexity among level 1,2, 3, and 4, 5.

(G) Based on the statistic result of “friendly” adjective on table 10, the average of statistic result demonstrates that the more complex stimulus is, the friendlier stimulus is. Among five levels of element complexity, the average of the max. and min. value between (group 1, 2, 3) and (group 4, 5) shows no significant difference. Hence, it can be concluded that there is a significant difference on the complexity among level 1, 2,3 and level 4,5.
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<thead>
<tr>
<th>Cute</th>
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<th>Complexity</th>
<th>Attribution</th>
<th>Familiar</th>
<th>Average</th>
<th>Complexity</th>
<th>Attribution</th>
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<td>L1</td>
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Table 4

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<th>Attribution</th>
<th>Like</th>
<th>Average</th>
<th>Complexity</th>
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Table 5

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<th>Attribution</th>
<th>Pretty</th>
<th>Average</th>
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Table 6

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Table 10
The result of statistic analysis
(a) According to the MANOVA result, the adjective “familiar” does not have significance to contours. It is assumed that the complexity of elements is more dominated than contours are. Therefore, subjects might lose the focus, and lay more stress on the complexity when tested.

(b) Within 7 pairs of adjectives, 4 pairs of adjectives (cute, fun, likeness, pleasurable) are grouped into 3 levels (level 1,3,5), which suggest 3 levels of stimuli can represent 5 levels in this case.

(c) It is shown that there is a positive relation between complexity and adjective. In other words, the more abstract (the less complexity), the more fun, cute, pleasurable, and likable is. Beside “familiar” adjective, it proves, the more concrete, the better expression is (See table 11). This result can refer to Arnheim’s theory.

Conclusion
In this study, three conclusions were found. First, the complexity of product shapes can affect consumer’s perception to the product. Based on Arnheim’s theory, less complexity shape can provide more imagination spacing, while more complexity shape can provide more concreted form to the product and also give clearer image to the consumers. This result is confirmed through a toy design, which requires a funny shape and perhaps a smile feature, which catch many attentions from children. Second, the result of statistic shows that pleasurable adjective has a positive relationship with others (Fig. 2). For instance, the cuter, the more pleasurable. The more friendly, the more pleasurable. Third, the complexity of the product shape has a positive relation with seven adjectives. The less complexity shape has lack of demonstrating a pleasurable semantic, such as cute, friendly, fun and so on. For example, in Florida, a facade of Disney’s hotel designed by a famous architect, Michael Gray, is constructed by seven figures in snow-white story, which demonstrate the happiness and pleasure to the customers. Fourth, the consumer’s emotion has a preference of liking more complexity shape in this case. Fifth, based on this result, it will be more efficient by illuminating some of stimulus for the future experiment. Therefore, simply, level 1,3,5 are suggested to represent the whole range of 5 levels in the future experiment.

Figure 2: 1 Cute, 2 Familiar, 3 Fun, 4 Like, 5 Pleasurable, 6 Pretty, 7 Friendly
In this study, because of the limitation of using facial features as stimuli, it is lack of the representation of whole aspects of a product shape such as general cognition and visual perception. In the reality, far more complicated factors within a product shape such as the color affection, material sensitivity, and operation cognition should also be involved. In order to understand the meaning of form completely, the study of compound factors will be the suggestion for future research.
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