

AN EXPLORATION INTO AESTHETIC ASSOCIATION OF PRODUCT FORM

Dr Hengfeng Zuo, PhD, MSc, MA, BSc

Research Fellow in Product Design

School of Design, Southampton Solent University, UK

Email: heng-feng.zuo@solent.ac.uk

Mark Jones, BA, MCSD

Principal Lecturer in Product Design

School of Design, Southampton Solent University, UK

Email: mark.jones@solent.ac.uk

Abstract

Creating a relevant and pleasing design aesthetic is a fundamental aim designers endeavour to achieve. Perception of aesthetics takes place both during the design process when the designer creates a form, and later, through the users' interpretation of the form. Within the perception process, association plays a significant role. This paper addresses the stage research results of our exploration into the associative meanings of a product. By analysing the evaluation of a series of top award winning designs, it was found that some associative meanings (represented by descriptive words) are correlated, such as 'pure-architectural-geometrical', 'delicate-curvaceous-organic' etc. By conducting a series of workshops, both in the UK and China, we have been able to explore the extent to which young designers are able to manipulate form, style and create an overall perception of a positive aesthetic. One of the main outputs during the workshops was to design a MP3 player with speaker units, styled in line with three topics of aesthetic association: topic 1 – pure, architectural, geometrical and technical; topic 2 – curvaceous, organic, and fun; topic 3 – graceful, cheerful, and powerful. Three non-correlated associative descriptors were deliberately used in topic 3. Results suggest that young designers tend to differ in their ability and success of manipulating form to match different aesthetic targets. When the descriptive words in one aesthetic topic are correlated, student designers seem to find it easier to manipulate the form matching the topic. Comparative analysis between the results from the workshops in the UK (Southampton Solent University) and in China (Tsinghua University) is also presented in the paper.

Key words: form, aesthetics, association, MP3 design, UK, China.

This project has been set up to explore the extent to which young designers are able to manipulate form, style and create an overall perception of a positive aesthetic. At the same time, we aim to explore, on a practical basis, the relationship between the formal aesthetic aspects and the associative meanings of a design expressed by verbal description. This will hopefully contribute to the development of product

language system. This system will differ from the traditional 'semiotics' or 'semantics', and although it will include these aspects, it will probe deeper into the elements of formal aesthetics such as the shape, colour, material, texture, proportion, dimensions, space, etc. This language system will be a combination of both formal/external presentation and the representative/embedded meanings of a physical product. It will enable more effective communication between the various people involved in the product development processes and in particular, the relationship between designers and consumers. We have conducted a series of practice-based design workshops for undergraduate design students both in the UK (Southampton Solent University) and China (Tsinghua University). This paper will showcase the stage results from this workshop.

1. Aesthetic experience and association

Ugly things are hard to sell. Aesthetic designs are often perceived as easier to use. What makes a product aesthetically appealing? This is an old topic but always triggers new debates in the design field. Aesthetics is usually defined as the branch of philosophy that deals with questions of beauty and artistic taste [1]. It has been recognised since antiquity and has continually evolved over time. The word *beauty* is commonly applied to things that are pleasing to the senses, imagination and/or understanding. It is often what an artist or a designer endeavours to achieve in their works, either for personal or mass interest and pleasure.

Aesthetics might have different connotations if envisaged from different perspectives, such as sensory aesthetics, functional aesthetics, technological aesthetics, formal aesthetics, psychological and cultural aesthetics etc [2]. Though, an aesthetic design may not have or not perceived to have all these connotations at the same time. However, it is widely agreed by scholars that sensory perception plays an intrinsic role in aesthetic experience [3, 4, 5]. In other words, aesthetic experience starts from pleasing the senses in the first instance. It has even been argued that aesthetic experience is restricted to the pleasure/displeasure that results from sensory perception [5]. We can perhaps say that every experience starts from our senses, as our sensory organs serve as the windows through which human beings are able to know and feel the external world, but not all experiences can be attributed to aesthetic experience. This implies that sensation does not represent the whole aesthetic experience, although representing the dominant element contributing to aesthetics; Individual isolated stimuli, either a colour, a sound, or a smell, can elicit physiological response (e.g., comfort or excitement) such as represented by the change of pulse, blood pressure. However, this cannot equal aesthetic response unless it evokes our emotions.

You might say that you find a particular curve, line or a colour to be beautiful, even when separated from any context. However, there will be something underlying your instinctive response to these stimuli that will share an association with an image or meaning you will have stored in your memory, no matter how vague the recollection. For example, the colour of green might remind you of freshness, purity, hope, or the curvaceous lines resemble organic lives or the form of a beautiful etc. This can be termed as 'association'.

Exploring the aesthetic association with designed products is one of the purposes of this research, as association plays a significant role in the process of aesthetic experience, and is connected with the formal aspect of an artwork or designed product. Fundamental forms are given meaning through association with previous knowledge of the world stored in long-term memory [6]. With certain associations, meanings and emotions added to the primary sensory experience, the overall aesthetic experience could be enriched to a greater extent.

2. Product language

In order to effectively express and communicate the perception of product aesthetics between people involved in the process of product design and development, we need to use and develop a vocabulary – product language system. Scholars in design and psychology have been trying to develop the theoretical framework of product language since 1970s. Gros Jochen [7, 8] and Richard Fischer [9] from the Academy of Art and Design Offenbach (Germany) proposed the fundamental concept & theory of product language, so-called Offenbach Theory. Gros subdivided the specific object of product language into formal aesthetic functions and the semantic functions. The latter is then divided into two constituents: indication function and symbolic function. Based on this, it is obvious that the concept of product language covers a wider range of information about a product than the concept of merely product semantic. A product can deliver and express the information per se about its own functions, forms, style, aesthetics, value, culture, personality, etc. However, most of the succeeded research in this area focuses more on the semantic aspect. The term ‘semantics’ derives from the linguistics, deals with the study of meanings [10]. Another similar term also deriving from linguistics is semiotics, which deals with the study of signs and symbols [11], not the signs as we normally think of signs, but signs in a much broader context that includes anything capable of standing for or representing a separate meaning [12]. The difference between these two terms lies in that semantics focuses on what words mean while semiotics is concerned with how signs mean. Nevertheless designers talk about them without too much differentiation due to that they have a common concern, i.e., both product semiotics and product semantics deals with the signs and meanings of the product. However, product semiotics and semantics might not always speak of aesthetics [13, P151], although there is a connection. For example, they share some commonality when addressing the symbolic /representative meanings or associations of the product.

Based on Offenbach theory of product language, the framework of product language theory is under some development. For instance, Dagmar Steffen identified 11 principles of order and complexity with regard to the formal aesthetic functions of a product [14, 15]. However, compared to semantic or semiotic features, the formal aesthetics features of design still need further exploration, with relation to the semantics/semiotics. There is little evidence to suggest that detailed vocabularies according to particular contexts (product types, subject types, etc) that describe different constituents of product language have been fully explored, including the correlations between them. Although designers are proficient when using the formal

elements such as colour, shape, materials, textures and so on, it remains ambiguous about how these elements, when applied in a particular design, be correlated with the signs and meanings, for example, the associations between a product form and aesthetic experience? How do these correlations differ when across different product categories and contexts? We are looking to formulate the details of product language system and develop a methodology for design practitioners. There is the potential for combining product semiotics and formal aesthetic features in order to establish a more complete and meaningful product language system [16].

Therefore, in this research, our second aim is to explore the 'product language' on a practical basis. Initial research was conducted to see if there is any common vocabulary used by people to describe a product's aesthetics. Also of importance are the associations the product would carry, and the possible correlation between the formal elements and the associations. This could helpfully contribute to establish a sort of formal DNA for a product or group of products. DNA (Deoxyribonucleic acid) is a nucleic acid that contains the genetic instructions used in the development and functioning of all known living organisms [17]. The DNA segments that carry the genetic information are called genes. The study of DNA, as the basis of the study of genetics, results in the cracking of the biochemical code of life. Here, we borrow the concept of DNA, as a metaphor, to imply something that can represent generative codes of an inanimate object – product form. These codes may hopefully serve as the constructive units and reference point for the design and development of any new member to the same family of products. A topology of different product types and/or different contexts will need to be established.

The next step would be to envisage how aesthetic experience and product language will be influenced by cultural background, and to further develop and compare the product vocabulary by conducting similar research under a series of differing contexts.

3. Preliminary study of aesthetic description

The method for a pilot study was to ask people to give their verbal description about the aesthetic for a range of products. At this stage, we are not going to distinguish which descriptors can be attributed to the aspect of formal aesthetics or the semiotic aspect of a product. We will try to look at this division and a possible correlation between these two aspects at a later stage. We used 10 top products that had already been selected by an international panel of judges, representing those products that were worthy of an international design award and having strong aesthetic appeal - Hannover, 2005 International Forum (IF) Design awards (see Figure 1). These products represented different product areas such as medical, domestic, technological, industrial etc and were selected as the products that would be used for product description. 113 completed questionnaires were collected from design students at Southampton Solent University. We presented students with a list of pre-selected vocabulary for their reference (see Table 1). However, participants were also encouraged to use their own descriptive words.

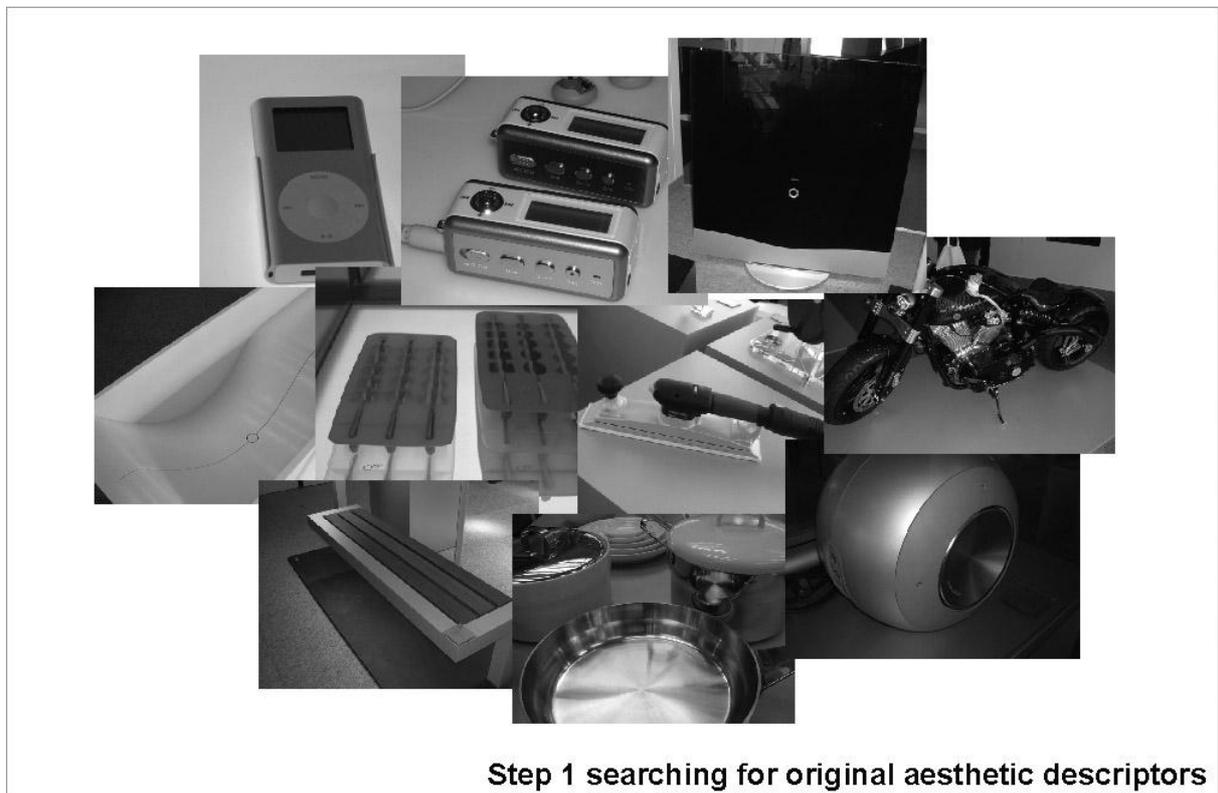


Figure 1 Top 10 designs presented to design students for aesthetic evaluation

From the results we found two phenomena. One, different products may share similar aesthetic properties. Secondly, these described aesthetic properties cover both formal aspect and symbolic aspect or associations, and the formal aesthetic descriptions are correlated to some extent with the associations.

Table 1 Vocabulary for product aesthetics description

| | | | | |
|--------------|------------|------------|------------|---------------|
| CLASSICAL | AGGRESSIVE | POWERFUL | EDGY | ARCHITECTURAL |
| CURVACEOUS | DYNAMIC | RHYTHMICAL | CONTROLLED | ROBUST |
| GRACEFUL | HUMOUROUS | WARM | RELAXED | PURE |
| SYMPATHETIC | SOFT | ORGANIC | DELICATE | SUBDUED |
| CHEERFUL | EMPOWERED | BIONIC | RETRO | CHARACTERISED |
| INTELLECTUAL | FUN | FLUID | HEAVY | LIGHT |
| HONEST | DEMURE | GRAND | SUBTLE | EXTROVERTED |
| TECHNICAL | PRECISE | INTEGRATED | HARMONIOUS | GEOMETRIC |

Usually, it seems difficult to find aesthetic properties to fit all design artefacts, and there is no sense in trying to apply the aesthetic features of one product to another [13, P.151]. Nevertheless, this does not mean that different products should not have

some commonality in the expression of aesthetic properties. It is this very commonality or similarity in aesthetic features, even if this commonality can be quite limited, that can be applied as a reference when considering the design and aesthetic of a new product. The widely used mood-board is a good example of this.

Figure 2, as an example, shows that the aesthetic descriptors 'pure', 'architectural', and 'geometrical' are shared by three different products (a bathtub, a MP3, and a bench). For a direct and simple understanding, we may regard the descriptor 'geometrical' as the description of shape, which is an element of formal aesthetics; whilst 'architectural' seems to be the description of an association or metaphor, which has more sense of semiotic property. The descriptor 'pure' can be perceived as a visual simplicity (with the opposite as 'noisy' or 'complicated'). It is hard to say that the description of 'pure' is completely a formal aesthetic feature because when we say something is pure, that includes your emotional feeling of appreciation. In other words, verbal description cannot always make a clear division between the formal aesthetics and semiotic meaning. A further statistical analysis revealed that these three descriptors are correlated to a certain extent (with the correlation efficient $r \geq 0.5$) under this research context.

Another example of such a correlation has been shown between the descriptors of 'harmonious', 'delicate', 'organic', and 'curvaceous'. Again, here 'curvaceous' may completely address the formal aspect – shape; whilst 'organic' integrates an association between the product form and the life forms found in nature, whether the human body, types of animals, or a drop of water, usually can be 'delicate' and 'curvaceous'. Accordingly, it is easy to understand that these natural forms are correlated with 'harmonious' as they reflect the results of natural evolution.

It is worth conducting further research to explore these aesthetic descriptors and their correlations at a deeper level; and to see, how these descriptors and correlations may alter when the product context changes. As we have seen, although some products used in this research share some commonality of aesthetic properties, this cannot be taken as a universal principle. It is argued that specific product language and their correlation might be different from, say electronic products, furniture, and transport tools etc.

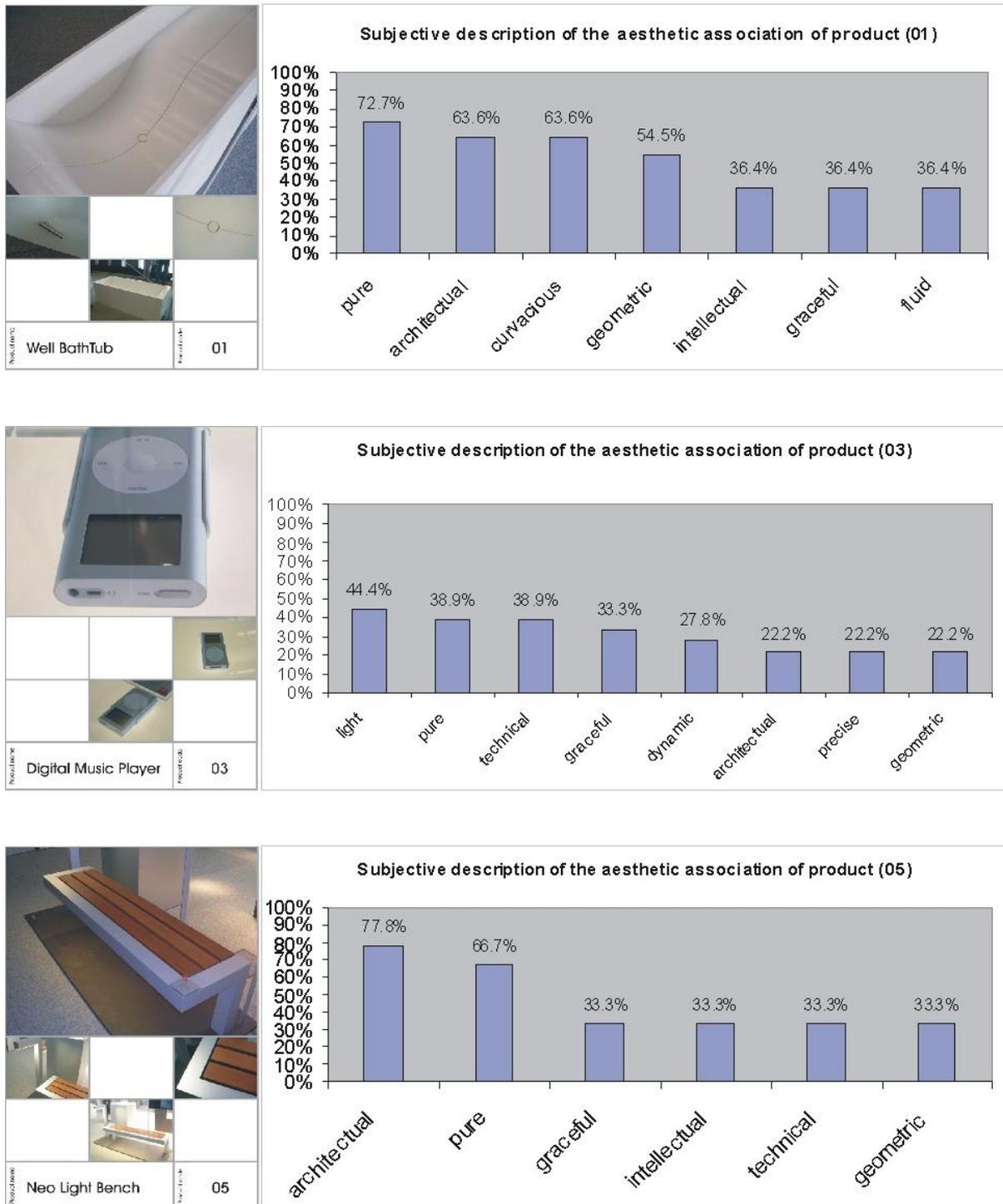


Figure 2 the aesthetic description of three different products

4. Student Design Workshop and Evaluation

The third aim of this research is to explore to what extent young designers are able to manipulate form and aesthetics. This has been conducted by running a practice-based design workshop, where students completed a series of exercises plus a six-week design project (MP3 & Speaker Unit). The MP3 project and some of the

exercises are attributed to a *top-down* process, where targeted aesthetic perception comes first and is then translated into the 3D forms designed by students. Other exercises are attributed to a *bottom-up* process, where the students are shown images of products (4 product categories and 50 images of different styled products for each category), and asked to interpret the aesthetic features into and make a judgement as to the product perception. The Workshop has been conducted at Southampton Solent University (UK) and Tsinghua University (China) respectively. Further analysis of the results will help reveal the extent to which cultural influence may impact on the design aesthetic and the level to which product language can be used cross culturally.

In this paper, we present the completed MP3 & Speaker design project and the evaluation of their aesthetic and associative features. The design brief for MP3 was based on three groups of descriptive words regarding a product aesthetic. We used the correlated descriptors found in the pilot study to constitute the groups. However, we further modified the combination of the descriptive words as follows.

- Group 1: Pure, Architectural, Geometrical, and Technical
- Group 2: Curvaceous, Organic, and Fun
- Group 3: Graceful, Cheerful, and Powerful

Within group 1, we give an extra descriptor of 'technical'. Within group 2, 'curvaceous' and 'organic' remain, but added with an extra descriptor 'fun'. Within group 3, the three descriptors, from the pilot study, do not show any correlation between each other. Students are then asked to produce designs for the MP3 & Speaker Unit in line with any of the three groups of aesthetic properties. These deliberate arrangements of design brief aim to give more challenges for young designers to manipulate and balance the formal elements (mainly form, colour and surface finish), to match a particular aesthetic target group.

Figure 3 and Figure 4 respectively show the models of MP3 & Speaker Units designed by the product design students (Level 2) at Southampton Solent University and by the Industrial Design students (Level 2) at Tsinghua University (China).

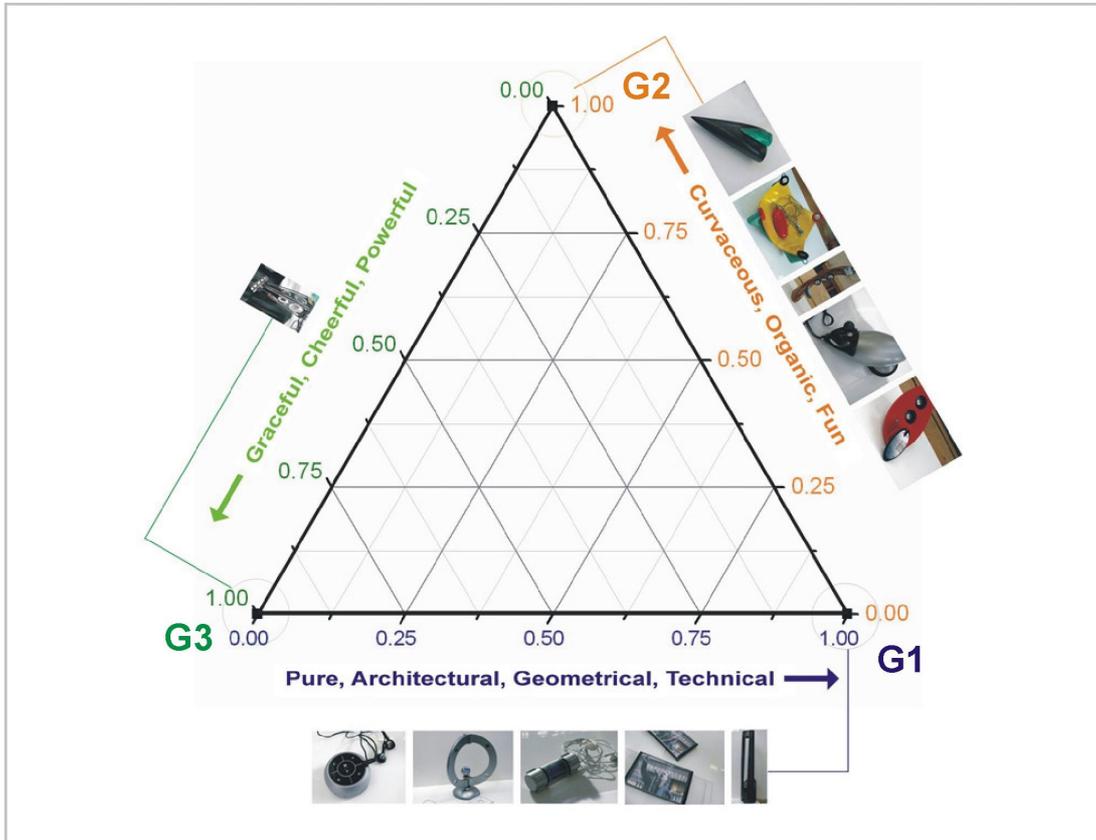
Within the workshop in the UK, students were given free choice as to which aesthetic group they were to produce designs for, although we found that most students did select for Group 1 or Group 2. In the repeated workshop in China, we therefore kept the balance in the selection for groups.



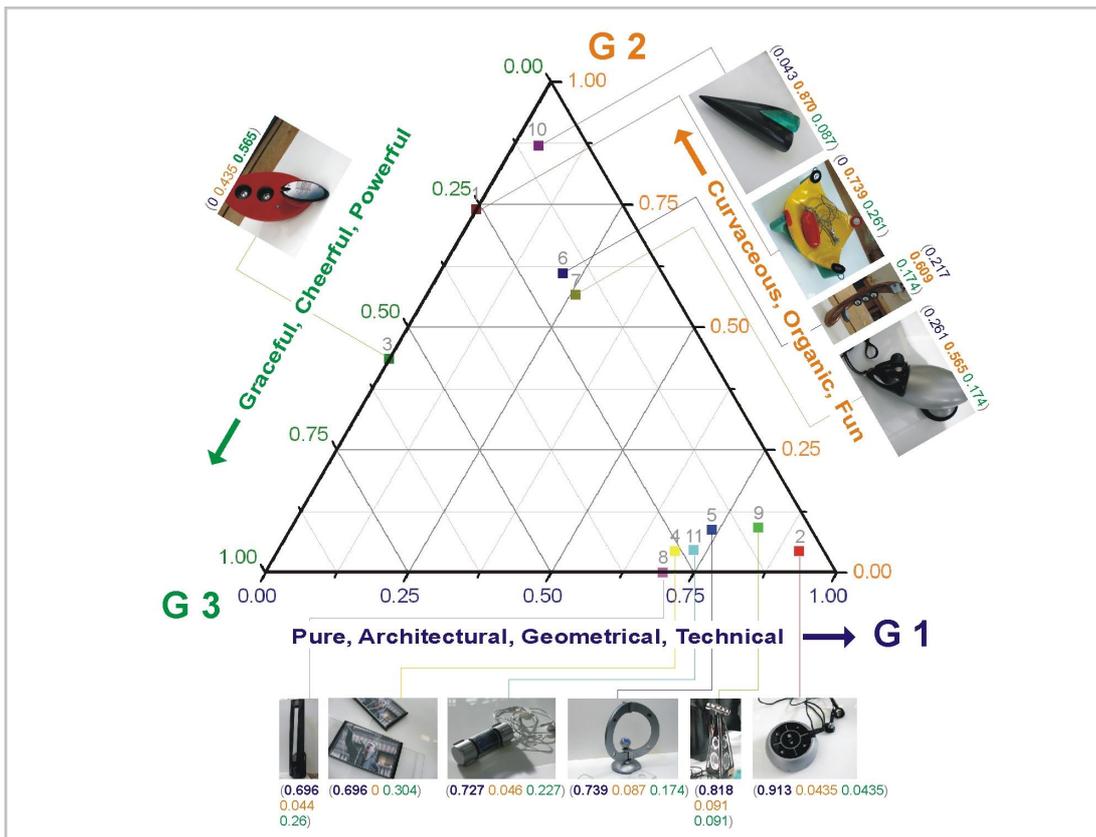
Figure 3 MP3 & Speaker Units designed by students in the UK



Figure 4 MP3 & Speaker Units designed by students in China

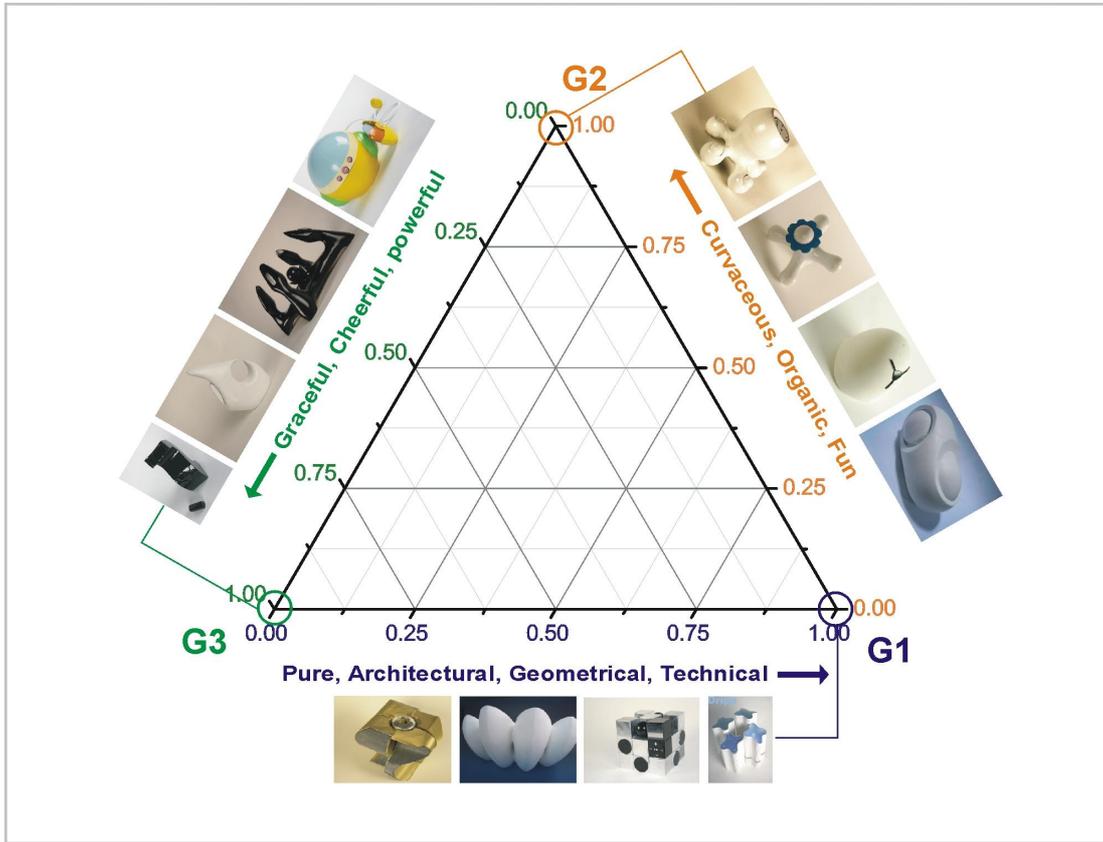


a. MP3 design (UK)

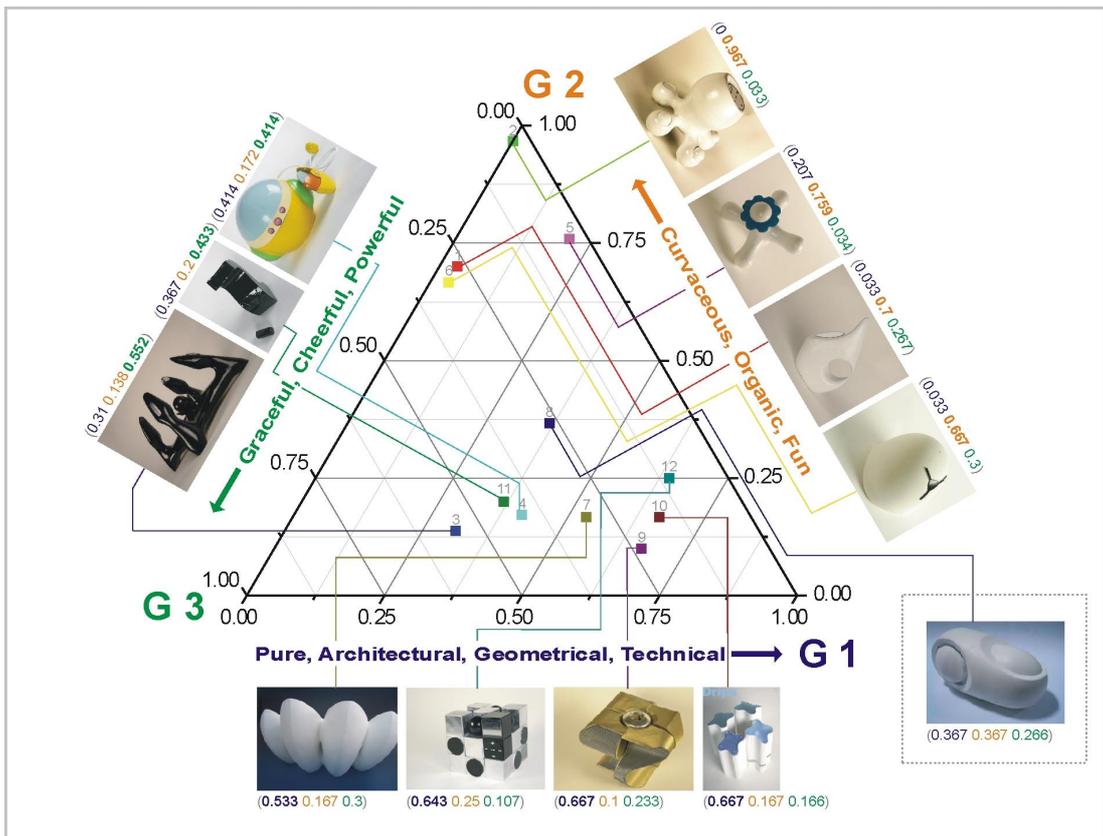


b. Evaluation of MP3 design (UK)

Figure 5 the comparison between the evaluation and the original targets (UK)



a. MP3 design (China)



b. Evaluation of MP3 design (China)

Figure 6 the comparison between the evaluation and the original targets (China)

The evaluated results shown in Figure 5 and 6 compare the original aesthetic target, as intended by the design students, with those that were perceived by an independent group of students who conducted the evaluation of the finished designs.

From the results of UK designs and evaluation shown in Figure 5 (a) and (b), it is clear that most of the designs of MP3 & Speaker are perceived to have a combination of the three groups of aesthetic features to some extent. However, the designs for Group 1 have most effectively matched the aesthetic target: pure, architectural, geometrical and technical (average matching rate 75.4%, see the marking points 2, 4, 5, 8 and 11 in Figure 5 Triangle (b) for Group 1 bunched around the bottom-right corner). Within the designs for Group 2, except for one design (marking point 3) being perceived to have more of the aesthetic features of Group 3, all the other designs have matched the target fairly well: curvaceous, organic, and fun (average matching rate 69.6%, see the marking points 1, 6, 7 and 10 in Figure 5 Triangle (b) for Group 2 positioned slightly away from the top corner). As to the designs for Group 3, only one design was selected from the very few designs in this group. Furthermore, this design was perceived to be within Group 1 rather than Group 3 (marking point 9).

From the results of Chinese designs and evaluation shown in Figure 6 (a) and (b), we can see that similar phenomena as those for UK designs occurs. Most of the designs of MP3 & Speaker are also perceived to have a combination of the three groups of aesthetic features to some extent. However, the designs for Group 1 and Group 2 have, again, more effectively matched the aesthetic target than Group 3. The four designs for Group 1 (pure, architectural, geometrical and technical) exactly remain in the same Group when evaluated, with an average matching rate 62.8%. The designs for Group 2 (curvaceous, organic, and fun), except for one design (marking point 8) standing at the centre of the Triangle, have also matched the target very well, with an averaged matching 79.8.3%, see the marking points 2, 5, and 6 in Figure 6 Triangle (b) positioned slightly away from the top corner. Particularly, the design (at marking point 2) in Group 2 has shown an extremely high matching rate (96.7%) to the target. Even including the deviated design (marking point 8), the total matching rate for Group 2 is still quite high: 69%. Whilst for designs in Group 3 (graceful, cheerful and powerful), the average matching rate is only 41.7%. Furthermore, one design in Group 3 (marking point 1) was perceived to be within Group 2.

The above results seem to imply that certain ambiguity can occur when we try to perceive the aesthetic features of a product, where the word associations have less correlation, e.g., in this case, graceful, cheerful, and powerful. On the other hand, the aesthetic features that have higher correlation appear easier to match. We may borrow a hypothesis of processing fluency of aesthetics to explain this. Rolf Reber and Norbert Schwarz proposed that aesthetic pleasure is a function of the perceiver's processing dynamics. The more fluently perceivers can process an object, the more positive their aesthetic responses [18]. In this research case, during either the *top-down* process of design following aesthetic targets or the *bottom-up* process of evaluation and perception of completed designs, the more fluently perceivers can process aesthetic features, the more effectively these features can be applied in designs and can be perceived. Group 1 and Group 2 have the

aesthetic descriptors correlated, whilst Group 3 have non-correlated descriptors. This may address the reason why the designs for the aesthetic targets specified in Group 1 and Group 2 seem more easily to manipulate by our student designers and more easily to identify when evaluate these designs. On the other hand, difficulty exists in dealing with Group 3, either in the process of design or the process of perception as there was possibility greater ambiguity in this category. What is also interesting is that these results seem consistent regardless of differing cultural background between UK and China, which provides a good support to further explore the commonality and difference in terms of cross-cultural perception in design aesthetics.

5. Conclusions

Aesthetic experience of a designed product starts from the sensory perception between the product and users. Product language covers the description of formal aesthetics and the description of associations the product carries and the symbolic or representative meanings embedded in the product. These two aspects of description in product language system can be correlated to a certain extent. However, the boundaries between these two aspects can sometimes become blurred when using verbal description. Preliminary exploration suggests some correlation between the descriptors such as 'pure-architectural-geometrical' and 'harmonious-delicate-organic-curvaceous'. Young designers tend to differ in their abilities when manipulating the form of product to match different aesthetic targets. However, when the aesthetic features in one product are consistently correlated, these greater abilities seem to be evident and are facilitated more easily. Our workshops held in the UK and China show consistent results of the above, which may imply some commonality in certain aspects of aesthetics perception regardless of cultural background.

Acknowledgement

This project was supported by the Centre for Advanced Scholarship in Art & Design - Capability Fund, Southampton Solent University.

Thanks are given to Professor Cai Jun, Professor Yan Yang, Academy of Art and Design, Tsinghua University for the arrangements of collaborative design workshop.

References

1. Catherine Soanes, Angus Stevenson, (2004), *Concise Oxford English Dictionary*, 11th Edition, Oxford University Press.
2. Hengfeng Zuo, Mark Jones, (2005), Exploration into formal aesthetics in design: (material) texture, in *Proceeding of 8th Generative Art Conference*, Milan. P.160-171.
3. Dewitt H. Parker, (2004), *The Principles of Aesthetics*, 10th Edition
4. Sven Inge Braaten, (2001), *A Framework for Analysis of Dynamic Aesthetics*, http://www.ivt.ntnu.no/ipd/fag/PD9/2001/Artikler/Braaten_I.pdf

5. Paul Hekkert, (2006), Design Aesthetics: Principles of Pleasure in Design, *Psychology Science*, Volume 48, (2), P.157-172.
6. Joseph G. Kickasola, *Cinemediacy: Theorizing an Aesthetic Phenomenon*. Baylor University. <http://www.avila.edu/journal/kick.pdf>
7. Gros, Jochen (1976): Sinn-liche Funktionen im Design, in: form, *Zeitschrift für Gestaltung*, 1st series No. 74, 2nd series No. 75.
8. Gros, Jochen (1984): Reporting Progress Through Product Language, in: innovation, *The Journal of the Industrial Designers*, Society of America, Spring 1984, p.10-11.
9. Fischer, Richard/ Mikosch, Gerda (1984): Grundlagen einer Theorie der Produktsprache. *Anzeichenfunktionen*, edited by Hochschule für Gestaltung, Offenbach am Main.
10. Wikipedia, the free encyclopedia, <http://en.wikipedia.org/wiki/Semantics>
11. Wikipedia, the free encyclopedia, <http://en.wikipedia.org/wiki/Semiotics>
12. Challis Hodge, (2003), *Semiotics: A Primer for Designers*, http://www.boxesandarrows.com/view/semiotics_a_primer_for_designers
13. Susann Vihma, (1995), *Products As Representations: a semiotic and semantic study of design products*, University of Art and Design Helsinki UIAH, UIAH Information and Publishing Unit.
14. Steffen, Dagmar (2000): Design als Produktsprache, Der Offenbacher Ansatz in Theorie und Praxis, form Publisher, Frankfurt am Main.
15. Steffen, Dagmar, *Design Semantics of Innovation, Product language as a reflection on technical innovation and socio-cultural change*, Department of Art and Design History, Bergische Universität Wuppertal, Germany.
16. Kristin H. Lower Gautvik, (2001), *Towards A Product Language: Theories and methodology regarding aesthetic analysis of design products*, http://design.ntnu.no/forskning/artikler/2001/Gautvik_1.pdf
17. Wikipedia, the free encyclopedia, <http://en.wikipedia.org/wiki/DNA>
18. Rolf Reber, Piotr Winkielman, (2004), Processing Fluency and Aesthetic Pleasure: Is Beauty in the Perceiver's Processing Experience? *Personality and Social Psychology Review*, vol.8, no.4, P.364-382.