Explore the relationship between the preferences and shape typicality cognition of consumers

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Abstract: This study aims to explore the relationship between the preferences and shape typicality cognition of consumers. Chairs were used as example. The objectives are: 1.) To find out if age and gender affect the ranking of shape typicality. 2.) To find out if the relationship between preference and shape typicality is a Wundt Curve (Berlyne, 1960). 3.) To find out if Wundt Curves are different because of age and gender. Two sets of bipolar adjectives, typical-unique and like-dislike, were used in a Likert scales to measure the typicality and preference toward 32 chair pictures. 180 subjects were recruited to do the test. The SPSS was used to analyze the data. The age and gender of the subjects related to the shape typicality and preferences were discussed. Finally, a quadratic curve to describe the relationship between typicality and preference was identified. The results include: 1.) Age might have no significant effect on ranking shape typicality. 2.) The relationship between preference and typicality exhibits a Wundt Curve as expected. Chairs with medium-level of typicality have higher scores in preference; whereas highly typical or novel chairs near the two extremes on typicality have lower scores in preference. 3.) The older the age of the subjects seem to prefer the more typical shape. 4.) Female subjects seem to be able to accept the unique design more than male does.

Key words: The Wundt Curve, Typicality, Preference, Human Behaviors, and Emotion

1. Introduction

In current product design practices, the anticipated life cycle of products has been reduced because of more rapid changes in information; therefore, design has a crucial role in this process, because it can alter an item’s appearance and not its essence. Under the excessive consumption of capitalism, new shapes and forms have been continually created to provide consumers with new visual experiences. However, compared to continuously evolving fashion trends, a specific type of product design shape or form has developed based on the trend of timeless styles, representing the major concept of “original form” or “archetype” (Chao, 2008). Designers of these styles are concerned with anthropological norms or constants. Particularly, people have certain cognitive impressions with regard to specific forms and categories of items or objects. These impressions are firmly established in conceptual systems, and designers attempt to return to the unchanging essence of these items. Because of this trend, product shapes that are produced using this design method maintain their aesthetic appeal even with the passage of time.

Typicality may be considered as a point of reference for the design of a product. In this study, we hope to understand whether, in practical daily life, because designers create designs based on a product’s typical shape, different consumer age groups have identical cognitions regarding a product’s shape typicality. If so, do the shape
typicality cognition and preference levels of different consumer age groups form an inverted U-shape as in the Wundt Curve established by Berlyne (1960)?

Based on results of previous studies in this field, we hypothesize that preference is a linear function of aesthetics, and that preference is an inverted-U function of typicality. We examine the combined influence of product aesthetics and shape typicality on preference responses by using chairs as a sample product.

2. Literature

2.1 Curious agent architecture

As far as product form is concerned, a subtle design can evoke a pleasurable feeling within consumers. If a product looks good or feels right, it gives the observers a type of visual comfort. (Chang, 2008) Saunders (2004) proposed the architecture of the curious agents as a design evaluation tool (Fig. 1). The architecture of curious agents comprises the following six primary functions: (a) sense ; (b) learn ; (c) detect novelty ; (d) calculate interest ; (e) plan ; and (f) act. In addition, each agent requires a long-term memory to store category prototypes.

![Figure 1. Architecture of a curious agent](image)

Sensing involves sampling the world to produce a stimuli pattern that characterizes its environment according to the abilities of the agent. Learning involves updating prototypes that are stored in long-term memory to better reflect an agent’s experiences as new types of stimulus patterns are produced. The differences between a novel stimulus pattern and the closest matching prototype category are used to calculate a measure of the novelty for the experience. A measure of the interestingness of the current situation is then calculated based on a psychobiological model of preference to arousing stimuli. The goals of the agent are then updated to reflect the agent’s current interest in its surroundings, and forces are generated to propel the agent in an appropriate direction.
After reviewing the discussed literature, we realized that numerous factors contribute to a product’s aesthetic appeal, including the psycho-logical interaction between people and product form. The aesthetic appreciation of a product’s form may be related to the way people interrelate shape, aesthetic evaluation, structure, and individual life experience.

2.2 The Wundt curve

Typically, a person’s cognitive response to a product’s form involves all of their senses, with visual communication occurring in multiple modalities (Takahashi, 1995). However, the way people interact with a product’s form is typically referred to as a type of visual response. Regarding visual object recognition, Arnheim (1974) indicated that perception is a matter of resolving the tensions of concerted forces. Product form simplification is invariably constrained by other tensions in the perceptual field and related factors. For example, product designers must work within the constraints of function, safety, size, shape, materials, budget, and marketing. Designers attempt to produce the best possible design within these constraints (i.e., to produce a product that looks or feels right).

Regarding aesthetic responses and form principles, Berlyne (1971) proposed that the Wundt curve (Fig. 2), which is a non-linear function, could be employed to model the typical response that organisms have to many numerous types of stimuli, including novelty. The Wundt curve is calculated as the sum of two non-linear functions that model the reward and punishment generated internally by an agent in response to stimuli. The Wundt curve peaks at a maximum value to represent a moderate degree of stimulation, implying that the most interesting forms of novelty are those that achieve a sense of “similar-yet-different” in comparison to previously encountered forms.

![The Wundt Curve](image)

For a given stimulus, the novelty detector described above generates a value for the novelty of the stimulus pattern (n-). Using the Wundt curve, this is transformed to the hedonic value, h= r+ p, where r is the reward generated for the discovery of a novel stimulus, and p is the punishment generated for the discovery of a highly novel stimulus. The hedonic value of a stimulus represents how interesting the novelty of an experience is. For
moderate \( n \)-values, the hedonic value is positive, although as \( n \) increases, the hedonic value can fall below zero, indicating that the novel stimulus is repellent to some degree. For very large \( n \)-values, the hedonic value of the experience approaches \( H = R + P \), where \( R \) and \( P \) are the most positive reward and most negative punishment values, respectively. This is another critical characteristic of the Wundt curve as a model of interest based on novelty, because it is a familiar observation that too much novelty in a design can result reduce its appeal to an audience.

Regarding product aesthetics, typicality, and preference, Hung (2009) indicated that shape typicality, aesthetics, and preference may form a crescent moon-shape, inclined surface in three dimensions. The relationship between preference and shape typicality is an inverted-U function, where the most preferred chairs are those with a moderate level of typicality.

Based on the discussed studies, it is clear that the visual response to product form is not a purely perceptual behavior, but is affected by numerous psychological factors. For product form, visual comfort appreciation is a highly implicit and abstract individual feeling that extant literature demonstrated can be measured directly. Therefore, in this study, we considered whether the relationship between different age groups’ perception of typicality and preference can be expressed as a Wundt curve.

3. Method

3.1 Stimulus

Before identifying the relationship between preference and shape typicality, it is necessary to confirm that consumers have a shared perception of a typical chair’s shape. We commenced by conducting a pilot study to obtain an operational definition for the shape of a “typical chair”. We questioned 180 people with non-design backgrounds to provide a sketch in response to the question “what is the first image that comes to mind as soon as the word ‘chair’ is mentioned?” Because a typical chair’s shape in the consumer mind is a fixed shape, the examination time was 30 s.

The results are shown in Fig3. An examination of the 180 sketches shows that a majority of the chairs (157 were similar in form; all had 4 legs perpendicular to the floor, a flat seat connected to the 4 legs, a vertical back connected to the flat seat, and a side-view “L-shape”, and only one without arms. The remaining 23 chairs were diverse in shape, although still similar to the main form.

Based on this pilot study, we designated the shape most commonly illustrated (Fig. 3, upper right) as a “typical chair” for collecting stimuli.
We used the “typical chair” design (Fig. 3, upper right) as the basis, from the book “1000 Chair” (Fiell & Fiell, 1997) to cover a wide range of chairs from typical to unique. Five industrial design students used card sorting and hierarchical clustering methods to produce the final 32 set of representative chairs. We asked 5 experienced designers (with more than 2 years of field experience) to select a sufficiently representative sample from each group. Finally, we compiled 32 representative chairs from the book “1000 Chair”, and converted them into paper questionnaires.

3.2 Participants

The following 2 adjective-pairs were selected as the rating scales to operationalize shape typicality and preference:

1. Shape typicality: typical-unique
2. Preference: dislike-like

At the beginning of the task, each of the discussed 32 representative chairs was assigned a corresponding set of adjectives using a 7-point Likert scale on a paper questionnaire. To reduce cognitive loading, the question’s sequence was randomized. The contents of the questionnaire were divided into the following 2 parts: (a) the first part comprised basic data of the survey testers; and (b) the second part comprised the content which was answered by testers, and the complete questionnaire (see Appendix). The experimenter was required to inform testers of the purpose of this research prior to testing. Subsequently, the testers were given the 32 representative samples and requested not to consider the chairs’, material, color, or price while completing the test. In addition, the experimenter considered the answer paper’s size restrictions and the high number of chair samples; consequently, during testing, the experimenter will be provided an enlarged image on A4 paper (Fig. 4) for each representative sample for the reference of the participants.
4. Results

4.1 Explore various groups with shape typical cognition differences

The goal in this stage was to understand whether the representative samples’ shape typicality levels or values differed among the 3 age groups (i.e., adolescents, young and middle-age adults, and middle-age and older adults), or between genders. Therefore, we categorized the cognitive scores between the groups and examined whether any significant differences occurred among the corresponding groups.

Figure 5 shows the line charts representing the average values of the samples’ shape typicality regarding adolescents, young and middle-age adults, and middle-age and older adults. The results show that the scores for the same samples among the 3 age groups are similar. This indicates that the scores for each sample tested do not show a “very atypical” or “very typical” rating difference based on age. Consequently, shape typicality cognition is identical, regardless of age group.

The line charts in Fig. 5 show the average data for the youth, middle-age, and middle-age to older adult age groups with sample typical shape. The 3 age groups for the same sample have similar scores. Consequently, age has no effect on typical cognition.

Figure 4. Completing the questionnaires

Figure 5. Each group line charts
After further dividing each age group by gender, a line chart of the average values for the samples’ shape typicality regarding the gender groups was produced, as shown in Fig. 5. The results demonstrate no significant differences in shape typicality scores for the same sample, regardless of gender within the varying age groups. Subsequently, we determined that age does not cause any difference regarding shape typicality cognition.

4.2 Comparative analysis of shape typicality and preference trend graphs by group

We first tested the hypothesis that preference is an inverted-U function of shape typicality. By using the SPSS quadratic curve model, we identified the best fitting quadratic curve for the relationship between shape typicality and preference. The result shows that all groups’ quadratic relationships are significant, confirming our hypothesis. Figure 6 shows the scatter diagram and inverted-U curve.

Overall, the test participants were divided into adolescents, young and middle-age adults, and middle-age and older adults. Comparing the trend graphs of the 3 age groups on the same coordinate scale, the paths of the 3 curves differ. Based on the initial point of the trend curve, adolescents had the lowest preference score for the shape with the most extreme typicality, whereas the middle-age and older group had the highest preference score for this shape. This supports our assertion and perception that adolescents prefer shapes and designs including fashion and creativity more than middle-age and older people.

Using gender to examine the participant groups’ trend curves, the trend curves for men and women both fit an inverted-U shape. However, when the groups’ trend curves are observed simultaneously on the same coordinate system, it is clear that women are more accepting of atypical shapes compared to men, regardless of age group.
5. Conclusion

5.1 Cognition of chair shape typicality in different groups

Although some differences exist in the sample typicality rankings for adolescents, young and middle-age adults, and middle-age and older adults, the differences among samples were non-significant after the samples were analyzed using statistical software. Consequently, the 32 sample chairs in this study did not demonstrate significant differences regarding typicality cognition for the various age groups.

The age groups were divided into gender groups, and the sample scores obtained from these two genders were averaged and ranked. Although men and women showed minor differences in the sample typicality ranking of the 32 chairs (in all age groups), the statistical software analysis of each sample showed that the differences between
samples were non-significant. Therefore, there were no differences in typicality cognition for the different age groups regarding the 32 sample chairs.

5.2 Chair preference level among various consumer groups

By locating values derived for sample typicality and preference level on separate axes to observe the variations between the two factors, the analysis diagram shows that when a group’s preference value is at its highest level, the relevant sample also shows a considerable level of shape atypicality, regardless of age. Thus, the correlation diagram demonstrates that the relationship between participants’ shape typicality and preference levels regarding the chair samples forms an inverted-U shape.

The path of the trend curve shows that adolescents are the most accepting of atypical shapes, followed by young and middle-age adults, and then middle-age and older adults. Observing the trend curve based on gender, women are more accepting than men regarding atypically shaped products.

Our study was conducted using images of chairs, rather than actual products. Thus, participant judgments might be different from those made based on actual products. In addition, because the participants are all from Taiwan, the study results may also reflect differences in terms of cultural and social backgrounds.

The relationship between typicality cognition and preference level investigated in this study can be applied to various product types on the market. However, because of the number of product varieties, the typicality cognition and preference level relationships identified in this study may not be representative of all product types.

6. References


