How Grayscale Influences Consumers' Perception of Product Personality

Wei-Ken Hung[1, a], Yu-Shan Athena Chen [2,b], Lin-Lin Chen[3, c]

[1]Department of Industrial Design, National United University, Taiwan
[2]Department of Business Administration, National Chengchi University, Taiwan
[3]Department of Industrial and Commercial Design, National Taiwan University of Science and Technology, Taiwan

[a]hungweiken@nuu.edu.tw, [b] athena@nccu.edu.tw, [c] llchen.ntust@gmail.com

Abstract

Two studies are conducted to reveal the effect of grayscale on consumers' perception of product personality. Combining with two critical design elements — shape and surface finishing, we examined the net impact of grayscale on a particular one — business-like personality. In Study 1, eighteen cases of the mobile phone were designed as the stimuli which represented the combination of three grayscale levels (i.e., S30W70, S60W40, and S90W10), angular and curved shape, and three surface types (i.e., gloss spray, light spray texture, and heavy spray texture). The findings demonstrated that both grayscale and shapes co-influenced the perceived business-like personality. Participants considered the product with dark grayscale and angular shape to be the most business-like one. In Study 2, above mentioned effects were examined by conjoint experimental design. Sixteen photos of the product were developed as the stimuli. The results indicated that shades of black and gray (brightness) had larger impacts on perceived product personality of business-like than shape and surface type did. Furthermore, we represented the effect sizes exerted by above design elements on camera, kettle, toaster, and clock in sequence.

Key words: grayness, brightness, surface finishing, business-like, product function personality

Introduction

Previous studies have observed that color enhances the functionality and usability of a product (Stone & English, 1998) in addition to its appeal. However, in the past, because of the wide range of colors, gray was often treated as a neutral color or base for comparison with other colors (Ou et al., 2004a/2004b/2004c; Ou et al., 2012). When it was compared with common colors (e.g. red, orange, yellow, green, blue, purple, and pink), gray was generally considered to be the most boring, and along with black considered the most unexciting and unpleasant color (Tharangie, Irfan, Yamad, & Marasinghe, 2010). However, in product design, because most product coloring schemas have included achromatic colors such as white, gray, and black, these colors are clearly as crucial as other colors. Many designers favor gray and black in their work. Rau (2009) even compiled the reasons why architects all over the world favor wearing black in a book. In the book, Italian architect Massimiliano Fuksas is quoted as answering "Because they do not contain any fantasy or imagination" and Japanese architect Kengo Kuma as answering "Black can strengthen your character" to why they wore black clothes. Thus, it is worthwhile to clarify the influence of shades of gray on product functional personality.

Mugge (2011) examined the influence of shape on the functional personality of a product, and observed that an angular product shape gave a product a greater business-like personality than a curved appearance did. This appearance included conveying the traits of having greater performance quality, competence, professionalism, and trustworthiness. However, in addition to being angular, images of the stimuli that exhibited the greatest business-like personality also showed the products to be achromatic gray, as is shown in Figure 1. Hence, this study suspected that shades of gray could be the main factor that influenced the business-like personality of the products.

Surface finishing can also influence the perceived darkness of the gray color of a product. As mentioned in the study by Silva and Prieto (2011) on the effect of surface finishing on the roughness, color, and gloss of ornamental granite, different surface finishes can produce differences in color lightness, with the effect especially evident on black stone.

Fig. 1 Examples of products with the greatest (left column) and the least (right column) business-like personality as determined by Mugge (2011)

This study examined the effect of shades of gray on the business-like personality of a product, with consideration for the effect of surface finishing, and also incorporated angular and curved shape stimuli, to verify whether grayscale played a greater role than shape did in affecting the business-like appearance of a product.

Research Framework and Methods

A total of 60 students (25 male and 35 female) aged between 18 and 22 years from various departments (engineering, management, and design) of the National United University were recruited for the paid experiments (experiment fee NT$100), and were subjected to the two experiments below. The experiment time was approximately 40 min.

A. Experiment 1: Effect of different shades of gray and textures on product business-like personality

Cellphone cases were used as the stimuli in Experiment 1. In this experiment, 3 × 2 × 3 = 18 physical model stimuli (width of 67 mm × length of 138 mm × thickness of 8 mm) were employed, as are shown in Figure 2. The experiment controlled three shades of gray, two types of shapes, and three types of surface finishes. The shades of gray were based on the Natural Color System (NCS) Index 1950, and comprised C1 light gray (S30W70), C2 medium gray (S60W40), and C3 dark gray (S90W10). The two types of shapes were S1 (curved) and S2 (angular). The three types of surface finishes were R1 (gloss spray), R2 (light spray texture), and R3 (heavy spray texture). Because Tharangie et al. (2010) claimed that the pleasant sensation presented by the color white was completely different than the sensation generated by gray or black, this study did not include pure white in the experiment. For texture, common surface finishes used by the cellphone industry were considered. In addition to acrylic coating for a glossy finish, light spray and heavy spray textures were achieved by using a spray method to attain the surface roughness of commonly applied material plates TX000 and TX010.

This study referenced the research of Mugge (2011) to devise the test scale. The study used three 7-point scales to measure the business-like personality of the product, comprising not at all business-like–business-like, low quality–high quality, and not at all durable–durable. Additionally, this study used three 7-point scales to enable test subjects to verify whether the design of the stimulus was consistent with the control conditions, including curved–angular, smooth–rough, and simple–complex.

During the experiment, the researcher first randomly sorted the 18 stimuli by using a balanced Latin square. The stimuli were then shown to the test subjects individually. The test subjects were enabled to see and touch the stimuli, and were then asked to complete the questionnaires. Finally, the test subjects were asked to separate the 18 stimuli into piles (the number of stimuli in each pile was not limited) according to their shade of gray, to verify the perceived level of grayness.

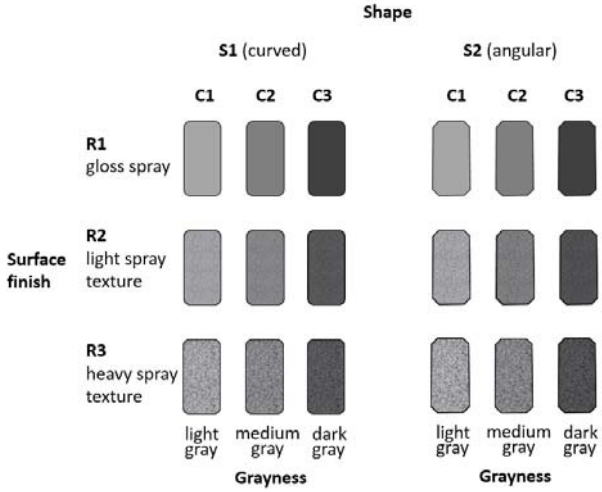

Fig. 2 Stimuli of 18 physical cell phone cases used in Exp. 1.

B. Experiment 2: Effect of hues with gray tones on business-like personality

Experiment 2 used colored images as the stimuli. The experiment collected the most business-like images compiled in Mugge's (2011) research, comprising four product categories (camera, kettle, clock, and toaster), and two types of shapes (angular and curved). The experiment then used Photoshop to alter the photos in regards to two types of material (metal and plastic), three types of hues with gray (black, blue, red), and two shades of gray (light gray with approximately 30–40% black and dark gray with approximately 70–80% black). Because of the large number of variables, totaling 96 types of combinations (4 × 2 × 2 × 3 × 2 = 96), orthogonal design was employed to reduce the number of stimuli to 16, and then a conjoint analysis was used to perform the analysis, as is shown in Figure 3. During the experiment, the photos of the stimuli and questions were already printed on the color questionnaire. The scale for measuring business-like personality was the same as that used in Experiment 1.

Fig. 3 Stimuli of 16 product images used in Exp. 2.

Test Results

A. Experiment 1 effect of surface finish on perceived grayness

The results of Experiment 1 are shown in Figure 4. The test subjects could still clearly separate the three types of grays of the experiment control, but a gloss spray (R1) surface finish made the same gray color look darker than the light spray texture (R2) did. A heavy spray texture (R3) finish made the gray look slightly darker than the light spray texture (R2) did. Therefore, surface finish could affect the perceived grayness.

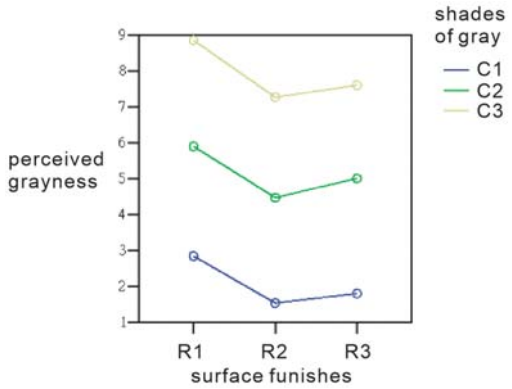

Fig. 4 Effect of the three types of surface finishes on perceived grayness

B. Experiment 1 effect of the three factors on business-like personality

Three way dependent sample analysis of variance was used to examine the effect that three shades of gray (C), two types of shapes (S), and three types of textures (R) had on product business-like personality. The results indicated that both shape and shade of gray had primary effects on product business-like personality. An angular shape had a greater level of business-like personality than did a curved shape ($F = 42.96$, $p < 0.05$), both dark gray and medium gray had a significantly greater level of business-like personality than did light gray ($F = 10.56$, $p < 0.05$), and no interaction between the three factors existed, as is shown in Figure 1. Additionally, the scale measurement results for curved–angular, smooth–rough, and simple–complex were the same as the stimuli control results during physical design; no significant difference was observed ($p < 0.05$). This result indicated that both shade of gray and shape were factors that significantly affected the perceived level of product business-like personality, but the effect of surface finish was not significant.

TABLE I
Three way dependent sample analysis of variance for business-like personality

Source of variation	Sum of square(SS)	df	Mean of square(MS)	F value *p<0.05
Main effect				
S	**548.981**	**1**	**548.981**	**42.96***
R	34.702	2	3.318	1.13
C	**6.635**	2	17.351	**13.16***
SxR	1.035	2	.518	.42
SxC	.513	2	.256	.27
RxC	8.815	4	2.204	1.83
S x R x C	2.104	4	.526	.50
Error	2468.888	1020		
Total	3251.673	1037		

C. Experiment 2 effect of gray color on business-like personality

Experiment 2 used a conjoint analysis to analyze the effect of the 16 image stimuli (including five variables) on business-like personality. The results showed that brightness had the greatest effect on business-like personality; the lower the brightness, the greater level of the business-like personality (part-worth utilities: dark gray > light gray). Second to brightness was color (black > blue > red), then shape (angular > curved), and then product category (camera > kettle > toaster > clock) and material (metal > plastic), as is shown in Table 2. This result indicated that brightness was the primary factor that affected product business-like personality (the lower the brightness is, the more business-like the product becomes), hue also had a strong influence (black and blue gave the product a greater level of business-like appearance than red did). Moreover, consistent with previous studies, the present study found that product shape (angular or curved) also affected the level of business-like appearance. Additionally, the results of conjoint analysis on dependent variables such as durability and quality indicated that the ordering of the importance percentage of all the control variables was the same as the ordering in Table 2. Hence, the effect of the five variables on business-like personality was verified.

TABLE II
Importance and part-worth utilities of the five variables on business-like appearance

Product attribute	Importance values %	Level	Utility estimate
1.Product category	9.004	Camera	.313
		Kettle	.004
		Clock	-.192
		Toaster	-.117
2. Shape	**20.090**	Angular	1.022
		Curved	-1.022
3. Material	3.597	Plastic	-.040
		Metal	.040
4. Hue	**24.892**	Black	1.130
		Red	-1.134
		Blue	.004
5. Brightness	**42.417**	Light gray	-.304
		Dark gray	.304

Conclusions

This study used two experiments to examine the effect of shades of gray on product business-like personality. Experiment 1 results verified that shades of gray and product shape (angular and curved) were crucial factors that affected business-like personality; although gloss spray surface finish could make the gray look darker, it did not have any significant effect on business-like personality. Experiment 2 further

confirmed that cool hues with tones of dark gray had a more significant effect on business-like personality than shape (angular or curved) did. Hence, surface hue had a more significant effect on business-like personality than external appearance did.

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