Design and Evaluation of the Customized Product Color Combination Interfaces Using 3D Model and 2D Illustration Display

Cheih-Ying Chen[1] and Ying-Jye Lee[2,*]

[1] Department of Cultural and Creative Industries, National Pingtung University of Education, 4-18 Minsheng Road, Pingtung City, Pingtung County 90003, Taiwan, R.O.C.
[2] Department of Cultural Business Development, National Kaohsiung University of Applied Sciences, 415 Chien Kung Road, Kaohsiung 807, Taiwan, R.O.C.
Tel.: +886-7-3814526 ext.3249
yjlee@cc.kuas.edu.tw

Abstract. The objective of this study is to investigate the interactive relationship between product color information and color combination interface on computer screen. In order to achieve the objective, this study takes the cell phone as an example. Also, two customized product color interfaces based on both three dimensional model product model and two dimensional product illustration displays via the marketing approach of experience economy are designed in the study. Furthermore, this study discusses user interface satisfaction of customized product color combination selection. It shows that both the interactive process and the resulting differ in three dimensional model display and two dimensional illustration display. It seems to be the best way for users to get a unique experience and a realistic feeling of the virtual product in 360 degrees with three dimensional model product model for displaying customized product color combination.

Keywords: customization, cell phone, image compositing, interface design, 3D model.

1 Introduction

In the new type service and experience with novel ideas involving consumers on the interaction to lead them feel, like and change service into unforgotten experience. Consumers are affected by the experience economy with either virtual or real environment more than the traditional marketing (Pine Ⅱ & Gilmore, 1999). Customization is one kind of experience economy tools. The diversified and customized products gradually substitute for the unified and standardized products, and then apply them to the e-commerce. Also, numerous products use modularity changes and mass customization to create many product variations and styles. For

* Corresponding author.

A. Marcus (Ed.): Design, User Experience, and Usability, Pt II, HCII 2011, LNCS 6770, pp. 269–275, 2011.

example, modularization of an automobile allows buyers to customize features such as exterior color, engine power, interior color and safety devices (Salvador, Forza & Rungtusanatham, 2002). More companies adopt customization for consumers undergoing an experience of design themselves to enhance purchase willingly. Wu et al. (2005) noted different color products can achieve different visual effects and create more pleasing and stylish product image. Therefore, different color combinations by applying image compositing technique to the customized design interface; it will give the consumers different color fascination and design experience (Lee et al. 2009). In the cell phone industry, there are many choices in colors and patterns for covers to change the look of cell phone completely. (e.g., Sony Ericsson, www.styleupcover.com: Design your own gadgets). There are many choices in devices and colors in automobile industry; "Smart" automobile by DaimlerChrysler Mercedes-Benz is particularly well-known for its mass customization in color choices (www.smartusa.com/smartexpressions).

2 Three Dimensional Product Model and Two Dimensional Product Illustration

As Three dimensional models reach broader acceptance, their use as communication media is attracting both commercial and industrial interests. Some companies have gradually adopted three dimensional models in place of product photographic in commercial web. Three dimensional models also in place of two dimensional illustrations for displaying image compositing in the few customized design interfaces. So far, little is known about user requirements and cognitive aspects of three dimensional model display for product customization. Also the latter's integration into the virtual product development is far from being discussed. The objective of this study is to investigate the interactive relationship between product color information and color combination interface on computer screen. In order to achieve the objective, this study takes the cell phone as an example. Also, two customized product color interfaces based on both three dimensional product model and two dimensional product illustration displays via the marketing approach of experience economy are designed in the study. Furthermore, this study will discuss the interaction of the consumer on the interface.

3 Methods

3.1 Interface Arrangement

An idealized mobile phone was divided into three product modular sections: top cover, base and camera face plate. Mobile phones are generally monochrome, bicolor or tricolor. In this study, the five common colors (white, silver, black, blue and red) were offered for top cover and camera face plate. Black was offered for the base. The study refer to the layout type of itemized color chips, which is divided into some items according to the customized color module parts of product(Wu et al. 2010), has the best grouping type for customized product color combination selection in search

time by users (Chen et al. 2007). Itemized color chip by modular section, disposed the color sample displays by product color modular sections (5 monochrome chips * 5 monochrome chips * 1 monochrome chips =25). Three types of color combination were available: monochrome (one color throughout: 1 combinations), bicolor (two colors, one repeated: 12 combinations) and tricolor (three colors, none repeated: 12 combinations) for a total of 25 combinations.

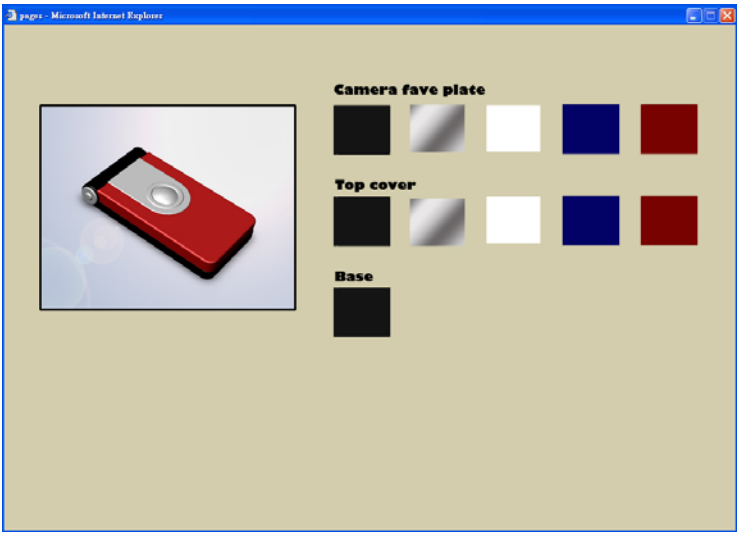

Fig. 1. The interface of two dimensional static illustration for customized product color combination selection

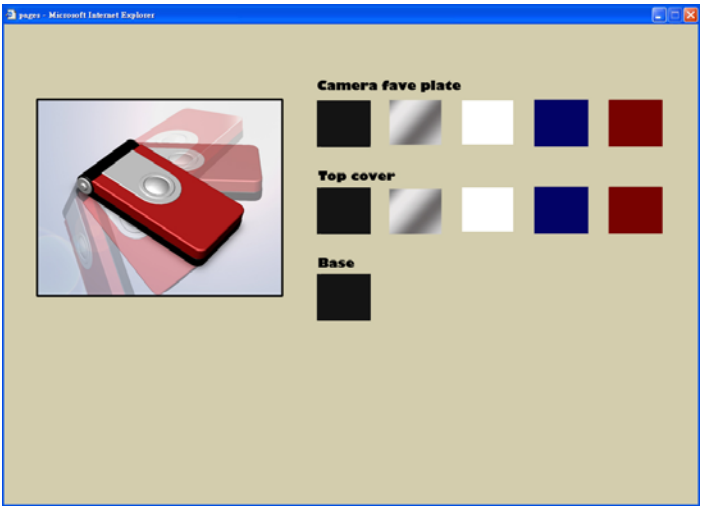

Fig. 2. The interface of three dimensional dynamic model for customized product color combination selection

In this experiment, these color chips were also nodes to link the corresponding larger compositing image of on the left side of a computer screen. The larger compositing image display of mobile phone color combination was assigned 2 types: two dimensional static illustration (Fig.1) and three dimensional dynamic model (Fig.2).

3.2 Participants

The 30 participants in the experiment (survey of layout and layout element preference) were paid from various departments of the college. All were between the ages of 19 and 26 (Mean age=21.3; SD=2.41). All participants had a color vision test found none to be color blind.

3.3 Apparatus

The experimental stimuli (screen layouts) were displayed by a multimedia computer (CPU: AMD Athlon 2.0GHz; RAM: 512MB PC3200 DDR) on a 19-inch monitor with 1280X1024 resolution and 75HZ refresh rate.

3.4 Procedure

Each subject played with each of the 2 interfaces and completed a uniform set of three color combination selection tasks:

1. Monochrome: black top cover, base and camera face plate
2. Bi-color: white top cover, black base, white camera face plate.
3. Tri-color: red top cover, black base, silver camera face plate.
4. Fine your favorite color combination.

Each subject played with each of the 2 interfaces, then filled questionnaire for User Interface Satisfaction for each interface. This study adopted a measure of overall system satisfaction along six scales of the questionnaire for User Interface Satisfaction (QUIS) on a 9-point scale (Chin, Diehl, and Norman, 1988).

4 Results and Discussion

Mean of overall user interface satisfaction for all participants in the color combination selection task is given in Table 1.

Table 1. Mean of overall user interface satisfaction of all participants

Independent variable	Two dimensional static illustration		Three dimensional dynamic model		p-value
	Mean	S.D.	Mean	S.D.	
Terrible / Wonderful	6.07	0.94	7.43	1.01	0.000000
Difficult / Easy	7.17	0.95	7.53	0.97	0.025108
Frustrating / Satisfying	6.03	1.07	7.93	0.74	0.000000
Inadequate power / Adequate power	5.27	0.94	5.90	0.71	0.000092
Dull / Stimulating	5.30	1.06	7.53	1.01	0 .000000
Rigid / Flexible	6.53	0.78	7.00	0.87	0.013638

4.1 Terrible / Wonderful

T-test analysis of the wonderful item find the results of product displays of two interfaces to be significant (p=0.000000 < 0.01), indicating that two interfaces significantly affected wonderful interaction.

Results of t- tests are given in Table 1. On the wonderful item, three dimensional dynamic model (mean score=7.43) is significantly superior to two dimensional static illustration (mean score=6.07). Therefore, product display of three dimensional dynamic model is generally preferred, because users could have a unique experience with interaction.

4.2 Difficult / Easy

There was no significant difference in two interfaces with two dimensional static illustration (mean score=7.17) and three dimensional dynamic mode (mean score=7.53). In fact, users considered the two interfaces easy to use and give both high scores.

4.3 Frustrating / Satisfying

T-test shows the results for satisfying (p=0.000000< 0.01) to be significant. Product display significantly affect mean scores on the satisfying item between two interfaces. Three dimensional dynamic model (mean score=7.93) achieves significantly higher mean scores on satisfying item than two dimensional static illustration (mean score=6.03). Therefore, product display of three dimensional dynamic model is generally satisfied, because users could see the color of every part of the product clearly.

4.4 Inadequate Power / Adequate Power

T-test shows significant differences on the adequate power item between two interfaces (p=0.000092<0.01). Results of t-tests show that mean scores for three dimensional dynamic model (mean score=5.90) is significantly higher than two dimensional static illustration (mean score=5.27). Therefore, product display of three dimensional dynamic model is generally more powerful, and could improve users' recognition of spatiality and spatial views.

4.5 Dull / Stimulating

T-test shows significant differences on the stimulating item between two interfaces (p=0.000000< 0.01). Results of t-tests show that mean scores for three dimensional dynamic model (mean score=7.53) is significantly higher than two dimensional static illustration (mean score=5.30). Therefore, product display of three dimensional dynamic model is generally stimulating, because users could view the animation and play with interface of three dimensional dynamic model display.

4.6 Rigid / Flexible

There was no significant difference on the flexible item between two interfaces with two dimensional static illustration (mean score=7.00) and three dimensional dynamic mode (mean score=6.53). In fact, users considered the two interfaces are flexible and give both high scores.

5 Conclusion

In conclusion, this study primarily uses cell phone color combination to investigate the users' operational preferences in terms of product display with two dimensional static illustration or three dimensional dynamic model for customized color selection. It shows that both the interactive process and the resulting differ in three dimensional model display and two dimensional illustration display, namely in terms of the perceived appropriateness of interface, in terms of the perceived fascination for the display, and in terms of the perceived stimulation by the medium and the aspects of visual view. Results of the experiment can be applied to similar products, and summarized into the following suggestions:

1. Three dimensional dynamic model of color combinations yields wonderful interaction for users. Product display with three dimensional dynamic model for customized color selection is more exciting than two dimensional static illustration, and it gives a strong interest in using the three dimensional model display as a medium for image compositing design and its additional dynamic externalization processes. It seems to be the best way for users to get a unique experience and a realistic feeling of the virtual product.
2. Product display with three dimensional dynamic model is stimulating and satisfied for a clear identification of different product parts and must be facilitated by 360 degree view. Users can view various color combination of product modular sections with two dimensional static illustration or three dimensional dynamic mode. Three dimensional dynamic model provides new views for the customizing process, namely animation and product viewpoint change. With a three dimensional image, a customized product can be spun and viewed in details form various angles in 360 degrees. Viewing and comparing all color combinations are best facilitated by product thumbnails by the three dimensional dynamic model.
3. Product display with three dimensional dynamic model adequates more power than two dimensional static illustration, and interact with users when viewing and comparing all options are interactive with users. The result reveals that the biggest advantage of three dimensional models lies in the process. In particular, participants emphasized the interface's ability to foster product concept and improve the recognition of spatiality and spatial views.
4. Both three dimensional model display and two dimensional illustration display for customized color selection are well interface design for interaction with users. As users progress towards three dimensional models, new experience interactive interfaces are needed, which account for the user's perceptual and cognitive abilities for the customization and experience.

References

1. Chen, C.Y., Lee, Y.J., Wu, F.G., Su, C.F.: Screen Layout on Color Search Task for Customized Product Color Combination Selection. In: Jacko, J.A. (ed.) HCI 2007. LNCS, vol. 4551, pp. 32–40. Springer, Heidelberg (2007)
2. Chin, J.P., Diehl, V.A., Norman, K.L.: Development of an Instrument Measuring User Satisfaction of the Human-Computer Interface. In: ACM CHI 1988 Conference on Human Factors in Computing Systems, pp. 213–218 (1988)
3. Wu, F.G., Chen, C.H., Lee, Y.J., Chen, R.: Effects of color sample display and color sample grouping on screen layout usability for customized product color selection. Computers in Human Behavior 26, 51–60 (2010)
4. Lee, Y.J., Chen, C.H., Wu, F.G.: Design and evaluation of the customized product color combination interface based on scenario experience, HCI 2009. LNCS, vol. 5617, pp. 263–2700. Springer, Heidelberg (2009)
5. Joseph Pine II, B., Gilmore, J.H.: The Experience Economy: Work Is Theatre & Every Business a Stage. Harvard Business School Press, Boston (1999)
6. Salvador, F., Forza, C., Rungtusanatham, M.: Modularity, product variety, production volume, and component source theorizing, beyond generic prescriptions. Journal of Operations Management 20, 549–575 (2002)
7. Wu, F.G., Chen, C.H., Lee, Y.J.: Optimum product color combination using the FAHP approach combined with the image compositing technique. In: HCI International 2005, Las Vegas, USA (2005)
8. Zaichkowsky, J.K.: Measuring the Involvement Constructure. Journal of Consumer Research 12(3), 341–352 (1985)