



USING MULTIVARIATE ANALYSIS OF VARIANCE AND KANSEI ENGINEERING TO EXPLORE RESEARCH METHODS ON THE WEB PAGE LAYOUT METHOD

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ABSTRACT

Electronic commerce (E-commerce) is an entry interface of hyperlinks for presenting a website's information to visitors, which is mostly concerned with human perception in terms of users' comprehension and mental demands. The visual effect of web banner and content advertisements are especially important in electronic commerce interface design and assume a marketing strategy. With the prosperous growth of EC, cascading style sheets framework supply designers the structure of website and modeling template, website towards cross-platform and be used extensively in other web devices. This paper aims to derive website page styles from design factors of essential web framework and accord with the demands of the market, and pursue to provide a model for web image design which meets customers' needs. First, semantic differential Technique is used to investigate the influence of visual elements on website banner and content framework and then we present kansei engineering analysis of visual components properties of cognitive. Finally, multivariate analysis of variance method is used to select an optimal design strategy. The research presents a visual interface design approach for web developers to reduce cost and proposes an optimal decision making deal with a website image design. The results of website page design model is applicable to other forms of cross-platform interface design contributes the EC website design.

Keywords: *electronic commerce, Cascading Style Sheets, Kansei engineering(KE), Web image design, multivariate analysis of variance.*

1. INTRODUCTION

Electronic commerce (EC) contributes not only great business opportunities to a variety of industry but also convenience to customers. The significant merits of electronic commerce (EC) are in the domain of communicating the information with services and merchandises, conveying complicated visual components for prompt psychological feeling. Therefore, the web page layout of design plays an important role in EC design. The visual design of web page affects consumer's emotion and stimulates the desire for purchase. Interpreting images or creating an atmosphere is predominant in a well web page design. With the explosive growth of the number of EC, If the website interface design of image perception could be maintain with a standardized measurement, the results could be used to utilize the emotion web design. In communication

design, more attention has been paid to the simulation of webpage circumstances. Hsiao (2005) addressed website design is the entry point to an enterprise website and critically influences a user's decision to explore or skip other pages, as it directly provides the first impression of the enterprise. A website image design (WID) is composed of visual elements and information. Robins (2008), and Sechmen (2000) stated the visual image factors of interface design lead to web page image design and also affect user's evaluation. Therefore, using appropriate graphic design elements attract customer attention and attain to the company's image that customer expect. In addition, website design shows to create beliefs that influence users' attitudes and behavior towards the Website.

Liu and Tong (2009) pointed out the rapid competition in commercial markets and increasingly radical change of market demands, but both the profit of enterprises and marketing period for selling goods



have been reduced. The problems have been reflected on the development process, the control of production and manufacturing cost. With increasingly competitive market, many Internet industry enterprises have found that their production and manufacturing, marketing and market research reached the same level with their competitors and the only remaining competitive weapons were EC interface design innovation and the enhancement of design quality.

Consequently, a cascading style sheets (CSS) framework was created to improve website efficiency and pro-posed designer website template to shorten the re-design process. Sohrabi (2012) pointed out CSS framework design offer flexible and accessible websites that facilitate the delivery of information and services has increased dramatically. Generally, Duckett (2011) indicated website template is divided into four part, header, banner, main content and footer. Banner and content framework display the most important information and become the significant framework design influence user experience. Park(2003) proved advertisements in banner and content framework effectively increase the click-through rate and the key area impact user. Lohtia (2007) and Cebi (2013) evaluated the efficiency of banner components, the results showed that color variable affects the advertisement performance. In order to meet customer needs, web design emphasizes the User-centered design (UCD), considering and solving the user problems, enhancing the user experience and pleasure. Norman (1986) indicated user-centered interface design, effectively enhance website usability, page views increased by user's satisfactory feedback. Ngo and Byrne (2001) illustrated that when website functionality fulfill customer requirements, user turn attend to the aesthetic of interface design and website scenario. Hsu (2011) studies showed that the web page situation relate to subjective awareness, consequently, designer's top priority is to explore the critical design factors impact website image design. In Holtze (2008) and Lin (2013) paper, addressed graphics planning play an important role in improving the user-centered web page design, colors and ratio of graphic design elements contribute to the users' feelings about a web page. Bonnardel (2011) and LÁNYI (2012) realized that colors evoke distinct emotions and associated with planned website. Considerations for today's interface design are to listen the voice of consumers' and improve aesthetic of websites.

However, by increasing the degree and sophistication of automation, Lau 2006 addressed EC will become much more dynamic, efficient, and hence more widely adopted by organizations. Intelligent software agents are promising to enhance the degree of automation and sophistication of EC.

As indicated by the studies cited above, the involvement of semantic words and visual design factors for measuring the images of home page design is vital. The aim of the research is to investigate and derive the sensibility from consumers and then establish an automatic model of EC web page layout design. This research specialized in visual interface components in banner and content CSS framework, and introducing the visual factors effect to website image design. The model of a framework visual design provides designers an optimal web style development and shortens the period of exploring interface design. This paper presents an interface design suggestion so as to meet customer expectations. By means of web module, the website image model design can easily apply to cross-platform and benefit to develop website image design on dynamic devices.

2. METHODOLOGY

The study approaches to the relationship between visual factors and image sensations of web page layout design. Figure 1 outlines the research procedure.

In EC web page design, organizing the visual design on the basis of CSS framework principles can lead to an efficient model for a better perception. In order to organize a widespread extension of EC, the experiment requires electing a classical CSS framework as sample analysis. Among various category of EC, car website recommend the most standard of CSS and evident criteria in EC website page design. The research defines visual design factors of banner and content framework as independent variables, and the dependent variables in experiment design are website images. To illustrate the relevance between design factors and website image design, MANOVA analysis is used to establish a website image design optimal design solution.

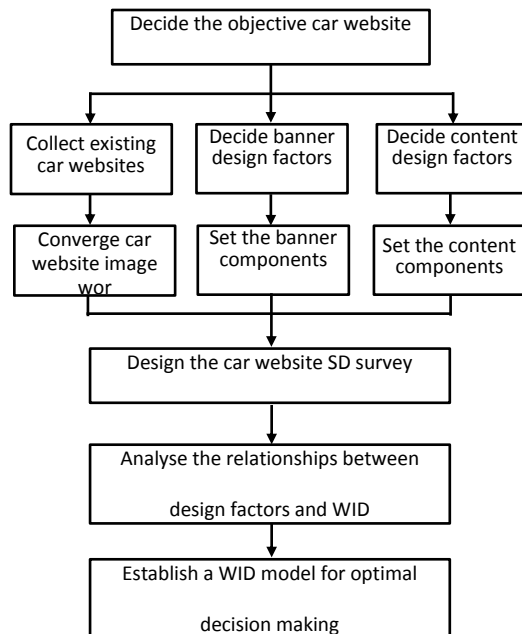


Figure 1. Flow chart of the research procedure

2.1 Decide the car website sample

Allowance must be made for website sample, the category of car website are first obtained by framework construction for the most classical CSS framework of sample analysis. Volkswagen official website was chosen from the car market's top ten websites for the most influential and proper structure framework web design for the experiment sample.

2.2 Collect car website image words

In order to select an initial set of car website sample, the concept of Kansei engineering theory (KET) was used for subsequent experiment, Nagamachi (1995), Liu and Tong (2009) advocated KET is a process of linking the users' feeling using a survey or an experiment represented by image word pairs. In this study, the open survey is used to extract variety of car website images. 30 participants were asked to describe how car website influence user emotions will.

2.3 Converge car website image words

After evaluating collected image words, based on evaluation, potency and activity policy, nine image

adjectives were selected and then made into nine representative bipolar adjectives, which are considered as suitable for describing the image of a car website.

The selected image words are active and inflexible, luxurious and simple, wild and conservative, steady and light, noble and vulgar, unique and popular, sweet and cool, male and female.

2.4 Define banner design factors

As the previously mentioned, the key design factors of influence banner design involved two independent variables, color and car size. In color system, Cochrane (2014) reported Munsell color system discovered and accurately mapped the peculiarities of human color perception which is based on rigorous measurements of human subjects' visual responses to color. Due to the basis in human visual perception, Munsell color system space specifies colors based on three color dimensions. We selected five principal hues in horizontal circle of Munsell As the previously mentioned, the key design factors of influence banner design involved two independent variables, color and car size. In color system, Cochrane (2014) reported Munsell color system discovered and accurately mapped the peculiarities of human color perception which is based on rigorous measurements of human subjects' visual responses to color. Due to the basis in human visual perception, Munsell color system space specifies colors based on three color dimensions. We selected five principal hues in horizontal circle of Munsell color system and controlled values of chroma and lightness, consisting of five major colors, refers to equation by the color set, see for Equation 1. below:

In terms of design factors of car sizes in banner, four ratio car size were defined by Fibonacci sequence, web page layout was perceived as more beautiful, the following four ratio were used: 1:1, 2:1, 3:1 and 5:1. The above content, also a golden ratio design system.

2.5 Define content design factors

Independent variables of colors and perspective of cars are determined on content design factors. The selection of five color variables of content is as above. For the content independent variables of four view angles of car were based on general car camera shooting angles, regarded as expedient perspectives



presenting completeness and feature of a car, which were as followed: 0° front, 45° two-point perspective, 90° side, 180° back. Four perspectives of car features.

2.6. Design the car website types semantic differential method survey procedure

Finally, the representative car website is rendered individually by five colors and four ratio size of object in banner framework, five colors and four car's view angles in content design as experimental samples.

In order to ensure the clarity and consistency, the experiment showed on screen with 1024×768 pixels display resolutions. In this step, each variable was designed for the car website sample questionnaire in closed survey. Subjects were asked a series of 18 website samples depended on nine bipolar adjectives criteria of website images created by Osgood's Semantic Differential survey. A seven point Likert type scale is approach to scaling responses for positively correlated or no correlation with website image design. The survey aimed to investigate user's attitude tendency and regarded as the criteria of website visual image layout.

2.7 MANOVA analyze

A total of 102 visual image designers and website engineers consisted of 79 participants, 15 male and 63 female from Taiwan web visual designers, and 23 subjects, 5 male and 18 female from western web designers, with more than five years design management experiences.

The evaluation results of the 18 representative experimental samples by the 102 subjects, 101 questionnaires were retrieved and the rate of valid questionnaire was 99%. We use multivariate analysis of variance (MANOVA) not only to examine the changes in banner and content have significant impact on web image design dependent variables, but also explore the relationship between banner and content visual design components.

3. CONCLUSIONS

In this paper, we have examined some of the properties of website image design. The experiment was performed to establish the relationship between visual factors and website image design. We have presented a new approach for transforming users' perception into interface visual elements design. The

concept of kansei engineering was used to extract the representative experimental samples of car market websites database. The study conducted MANOVA analysis to examine visual factors affect web visual image design. The result of analysis shows design factors have significant effects on website image design. It is evidently, the relation between design factors of colors in banner and content framework are more influential than car size variables. In addition, the result also indicates that nine pairs of image words can be divided into three groups. In the first group, design factors composes of 5Y5/10, 5G5/10, 5P5/10 on banner framework and 5Y5/10, 5R5/10, 5G5/10, view of 45° two-point and 90° side perspective design factors of content framework are classified into the similar website image design. The second group of website image design suggests that the ratio of car sizes 1:1 and 2:1 on banner framework design factors are close to colors of 5B5/10 and 5P5/10 on content framework design. In third group of website image design shows the consistency of 5B5/10 color design factors and car size ratio of 3:1 and 5:1 on banner design.

The study develop a website image design model to explore the optimal combination of banner and content design on car website development for a given design concept represented by a car website image word pair. The results obtained from semantic words and visual design factors for measuring the images of home page design establish a web page layout design database for an automatic model of EC. In future research, the results is applicable to automatic EC website page design and facilitates the cross-platform; shorten the period of exploring EC website design.

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The achievement of the project is practical. However, studies are insufficient for a variety of website design factors may also relates to human perception. The results provide digital interface designers with an



effective design progress to website visual image layout and utilize design factors to cross-platform.

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