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Factors affecting webpage's visual interface design and style

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Abstract

In the past, many researches of web interface were focused on usability and technical aspects. Instead, this research takes the visual communication-oriented approach to see how much the visual interface style adds to its rating. The main purpose of this study is to understand the design criteria and major factors that influenced different web visual interface styles. First of all, Researchers made use of literature review and interviews with 31 users to collect important information about key design criteria and guidelines of web interface design, from which a total of 11 major design criteria were identified. After that, a Likert-type 7-point scale was applied to rate 90 website based on 11 design criteria, and 32 subjects were invited to participate in an experiment. The result showed that 'title or logo, promotion of image, ease of information display, willingness to read, colors, structure, attraction, layout, usability, hyperlink, and readability of texts' were the important design criteria that users cared about. Subsequently, these 11 design criteria were further analyzed using principal component analysis to identify two critical factors, 'emotion factor' and 'function factor,' affecting users' evaluation. Finally, how the two factors and design criteria that influence six types of website interface style are discussed in the latter part of this paper. It is hoped that this research could provide valuable insight for web designers or developers to select a proper style based on users' evaluation.

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Keywords: Visual interface design, website, interface style

1. Introduction

Many web sites' subject matter may differ, but their visual interface styles are alike, because their purposes, production technologies, bandwidth restrictions or functional concerns are very similar. That is why search engines (e.g. Google.com, Yahoo.com) and online retailers are alike (e.g. Amazon.com, Books.com.tw). We also know that web-based design, in comparison with its paper-based counterpart, has to be adapted to the fixed-sized monitor. Therefore when a web designer uses visual elements, he or she has to think in different ways to a traditional designer. For example, hyperlinks and animations all add to the complexity of web-based design. Because web design shares some elements of traditional paper-based and interface design, some researchers have used usability and technical criteria [1-4], while some other researchers have used user emotional perception criteria to analyze web design [5-7]

There are two major schools of web design: the first is the art-oriented school whose followers usually have an art-related background; the second is the tech-oriented school whose followers usually have been trained in computer science. A typical designer of the former school tends to emphasize visual effects and the overall mood; while one of the latter school may spend more time on coding pages. If a designer fails to recognize the importance of users by over-indulging in visual effects or programming, his or her website may become much less interactive.

Therefore, we must know the main factors and design criteria affecting the interface design. In addition, how the different types of visual interface style influence the users' evaluation? From the past researches [8], we learned that there are six major types of web visual styles. We know that pages of the different styles are not always

perceived as the same, but does the style of a webpage affect a user's evaluation? By answering above questions, we plan to provide some suggestions and rules on web authoring for both designers and developers.

2. Literature review

2.1. Researches on websites' design

Nielsen and Tahir [9] investigated the websites from the usability perspective, and suggested 113 criteria for webpage design guidelines. Lin [10] believes that the earlier focus on human-computer interaction emphasizing efficiency, usability, and functionality, overlooks the interface aesthetics and formats that affect users' experiences and emotions. Her study discovered that, if an e-commerce website interface was presented to a user for the first time, the page layout with aesthetics definitely improved personal feelings about the website. If emphasis was placed on the emotional side, the impact of aesthetic feeling was inherently greater than its usability. An experimental group feeling strongly about aesthetics produced a sense of pleasure; however, another experimental group ignoring aesthetics only produced negative emotions. Hekkert & Schifferstein [11] believe that differences in aesthetic feelings produced from different information systems affect our senses to produce different emotional reactions, thus people using different information systems naturally produce different views and evaluations in their minds. Therefore, research on interface design should not only address functionality and usability, but should also consider other dimensions such as aesthetics and emotional levels.

[12] Powell, T. A., Jones, D. L., & Cutts, D. C. [12] categorized webpages into two groups: text-based and GUI (or metaphor-based); while Veen [10] used library and gallery as metaphors. A text-based (or library-like) webpage is usually functional and used to provide information. The style and aesthetics are usually less important, for example, search engines (e.g. Google.com, Yahoo!). In contrast, a metaphor-based or gallery-like design is form-based which makes use of colors, creativity and mood. Hsu, Chang & Chuang [8] using multidimensional scaling (MDS) analysis and focus group interview, found webpages fall into six categories: text-first type, frames-and-color-blocks type, rational layout type, emotional-and-curved type, image-centered type and cartoon-like type (Fig. 1). However, it can be said that the present researches on the relationship between visual interface styles and users' evaluation are still inadequate. Therefore this paper seeks to explore the main factors that influence the design of web visual interface and the characteristic of different interface styles.

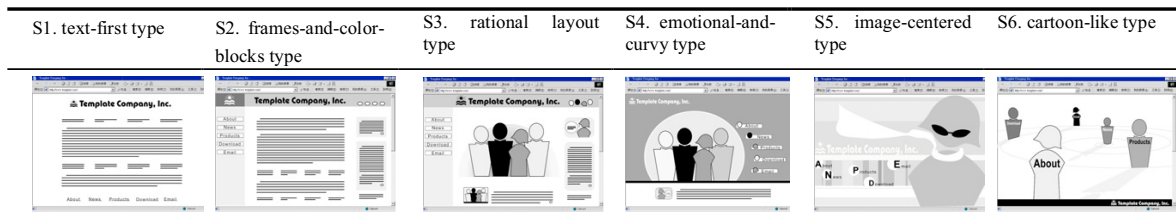


Fig. 1. Six typical webpage styles (Hsu et al. [8])

3. Research method

In this study, we used the interviews with users, Likert-type scale rating, and Principal Component Analysis to collect and analyze the data.

3.1. Experimental process

In the first stage, the study utilized literature reviews and interviews with 31 users to gather important information about website visual interface and its design principles to come up with 11 major design criteria (as listed in Table 1). In the second stage, Subjects were asked to assess 90 webpages on a 7-level Likert scale according to the 11 design criteria. 32 subjects took part in the experiment: 15 males and 17 females, between 17

and 35 years of age. They all had some Internet using experience.

3.2. Principal Component Analysis

The collected data would be used for Principal Component Analysis (PCA) by SPSS software. PCA is a method that reduces data dimensionality by performing a covariance analysis between factors. We first used Microsoft Excel software to gather the test data sets for performing preliminary statistical work. The scores given by 32 subjects for all webpages through 11 evaluation items were collected to find the mean score (M) and the standard deviation (SD). After that, we took the average score as input value and used Windows version of statistical software SPSS to conduct PCA. The main purpose of PCA was to reduce the dimensions that represented the structure of original data. After we obtained the factor loading for each conceptual factor from the data sets, we then used the scores of conceptual factors to do further analysis.

3.3. A Comparison of the Styles

Based on Hsu et al.'s research [8] of the six types of style, and ratings of 90 webpages, this paper cross-analyzed and examined these data, in the hope of learning how a webpage's style and use of visual elements affect its rating. This paper used analysis of variance and SNK test to establish a correlation between the six styles and ratings. It is hoped to show people's natural preference of styles. In the end, this paper will present some suggestions to web designers.

4. Result

4.1. Design criteria and main factors influencing web interface design

In the first stage, from assessment results of 31 subjects, the key factors influencing webpage design are itemized according to order of decreasing importance: title or logo (mean=5.81, =1.22), promotion of image, ease of information display, willingness to read, colors, structure, attraction, layout, usability, hyperlink, and readability of texts (see table 1).

Table 1. Ranking of design criteria

Design criteria	Order of importance	Mean	SD
Title or logo	1	5.81	1.22
Promotion of image	2	5.68	1.35
Ease of information display	3	5.65	.91
Willingness to read	4	5.55	1.09
Colors	5	5.48	1.03
Structure	6	5.39	1.26
Attraction	7	5.39	1.20
Layout	8	5.35	1.14
Usability	9	5.32	1.30
Hyperlink	10	5.29	1.27
Readability of texts	11	5.16	1.39

In the second stage, 32 subjects were asked to assess 90 webpages on a 7-level Likert scale according to the 11 design criteria. This research applied PCA and factor rotation to extract factors in ways that ensured better interpretation for extrapolation. Through the application of PCA, it was discovered that users usually evaluate a website with two main factors: 'Function factor' and 'Emotion factor'. Both of these factors contribute to 86.70% of the total variance (see table 2). Function factor are including six design criteria that could affect interface design:

structure, usability, hyperlink, ease of information display, readability of texts, title or logo. Emotion factor including five design criteria: attraction, colors, willingness to read, promotion of image, layout.

Table 2. Loadings of design criteria for the two main factors. (Extraction methods: principal component analysis. Rotation method: Varimax with Kaiser Normalization.)

	Design criteria	Factors 1	Factors 2
Function factor	<i>Structure</i>	.944	.127
	<i>Usability</i>	.913	.328
	<i>Hyperlink</i>	.895	.246
	<i>Ease of information display</i>	.879	
	<i>readability of texts</i>	.876	.375
	<i>Title or logo</i>	.625	.365
Emotion factor	<i>Attraction</i>		.981
	<i>Colors</i>	.168	.950
	<i>Willingness to read</i>	.272	.937
	<i>Promotion of image</i>	.338	.918
	<i>Layout,</i>	.455	.777
	Eigenvalue	7.16%	2.38%
	Variance(%)	65.05%	21.65%
	Cumulative of Variance(%)	65.05%	86.70%

4.2. A Comparison of the styles

The function factor and emotion factor can form a rating plane (see Fig. 2). From the bi-axis distribution map of the 90 webpages, we can see samples from each style tend to distribute closely. Therefore styles may very likely affect a web page’s rating.

Next, by using a style’s averaged values of both factors, we can plot their coordinate points (Fig. 3). From the distribution of the six styles’ scores on the plane’s four quadrants, we learned that S4 is good on both axis; S3 and S2 are good in the function factor, while S5 and S6 are good in the emotion factor, and S1 performs poor on both of the factors.

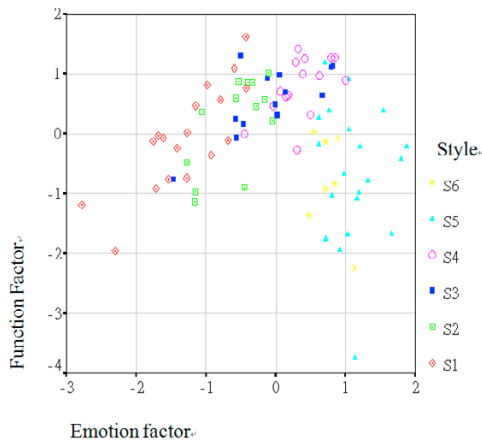


Fig. 2. The bi-axis distribution map of the 90 web pages

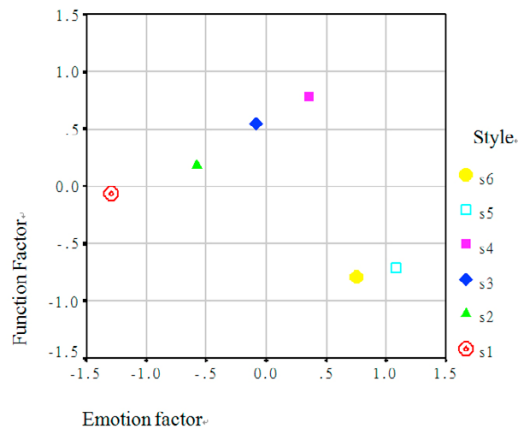














Fig. 3. Map of ratings of six styles

The table 3 below shows the ratings of six types of web style:

Table 3. Ratings of six types of web style

	Higher value <----> lower value					
Function factor						
Emotion factor						

In order to understand the relationship between performance of six styles' in each design factor and criterion, we used “+” to denote a good score and, “-” a bad score (please refer to Table 4). From Table 4 we learned S1 is the worst performer; S2 and S3 are average; S4 is quite good both functionally and emotionally; while S5 and S6 are not good functionally, they excel in the emotion factor.

In a word, participants believed the best style for a website is S4, and the worst style is S1. It could be caused by the research's focus: business websites. And it could also be many of S1's advantages, say fast download and easy to build, were not accounted. This makes S1 a poor performer. However, when too much information is displayed on a page, it will burden its reader. And its lack of features also resulted in S1's low score in the emotion factor side. What a web designer needs to do is to select a proper style based on his/her website's nature.

Table 4. A breakdown of each style's performance in each design factor and criterion.

		Each style					
Factors		S1	S2	S3	S4	S5	S6
Function factor			+	+	+	-	-
Emotion factor		-				+	+
Function factor	Structure	-		+	+	-	-
	Usability	-			+		-
	Hyperlink	-			+	-	-
	Ease of information display				+	-	-
	Readability of texts	-			+		
Emotion factor	Title or logo						
	Attraction	-				+	+
	Colors	-			+	+	+
	Willingness to read	-				+	
Emotion factor	Promotion of image	-		+	+	+	+
	Layout	-			+	+	
Averaged overall rating		-			+		
User's preference		-			+		

+ : Good (relatively high).
 - : Bad (relatively low).

5. Conclusions

This upsurge of web application will be a hot topic for discussion after the Internet shopping rage, such as Blog and Facebook. The visual interface is not only directly in contact with users, but also becomes a communication window between the users and the website. For that reason, the overall interaction or experience for users become one of the important considerations that has significant bearing on the users' preferences, as to whether they will continue to use the website. However, research on the relationship between visual interface styles and users' evaluation is still inadequate. The main purpose of this study was to understand the design criteria and styles of web visual interface design, which could serve as future references when designing new visual interfaces. In the first stage, this study identified 11 major design criteria; and then, an investigation with questionnaire survey was conducted by inviting 32 participants to rate the 90 webpages on a 7-level Likert-scale according to the 11 design criteria. Afterwards, the principal component analysis was used to obtain two major categories of design factors: function factor and emotion factor. In the latter part of this paper, we discussed about how six types of web interface style that influence two factors and design criteria. The correspondence between six styles and each design factor/criterion has been summarized in Table 4. In this table, designers can find the advice about the features and performance of each style. It is hoped this research can serve as a useful reference for web designers to know the features of each visual interface style, and the main factors that influence the evaluation of users.

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