

Color As A Factor Of Product Choice In E-Commerce

Karen Biers, (E-mail: karenb@ext.usu.edu), Utah State University
Lynne Richards, (E-mail: apr48ml@okstate.edu), Oklahoma State University

ABSTRACT

An exploratory study was conducted to evaluate the effects of Web site background color on consumers' attitudes toward selected product attributes and consumers' likelihood of purchase using a mixed design factorial experiment. Simulated Web pages were created using fully saturated colors from a Web page software program. Seven levels of color, including neutral white, and three levels of product were used in the experiment. Results indicated a trend for two of the three products to receive more positive attribute scores when featured on a blue or purple background.

INTRODUCTION

Color affects consumers at three different levels including physiological, aesthetic, and psychological. Physically, the choice of Web background color can place a strain on consumers' eyes thus preventing consumers from browsing a site. Color can be used to create an aesthetically pleasing site that provides a pleasant shopping experience. Psychologically, color is used as non-verbal communication. Nonverbal communication methods are used to convey meaning about products to consumers. Nonverbal communication is perceived through the visual, aural, olfactory, and tactile senses. Color, scent, sound, and touch are used to stimulate these senses. According to Lee (2002) “. . . because colour exerts its effects on a subconscious level (not in all cases but in many cases), people do not realise that they transfer its effects onto the contents of a package (or a product) . . .” (p. 9).

Nonverbal forms of communication are used to create an atmosphere in a shopping environment, which Kotler (1973/74) suggested should be the conscious designing of space to create certain effects in buyers. If used effectively in the shopping environment, nonverbal communication can have a positive effect upon consumers' attitudes toward products and on purchase decisions. The store's atmosphere is also a factor in a store's image. Store image is how the store is defined in the consumer's mind (Katerattabakul & Siau, 2003). According to Katerattabakul & Siau, the store design and atmosphere have to be acceptable and appealing to consumers or else other factors such as price are meaningless. Characteristics of a Web site, including the background color, create the shopping environment for an Internet commercial exchange site. Lightner (2004) suggests that a well designed Web site impacts the exchange between a business and the consumer, as the site acts as the primary contact with the consumer.

The development of the World Wide Web has led to the creation of an electronic shopping environment. Mathwick, Malhotra, and Rigdon (2001) warn that the electronic shopping environment can be dull and lifeless and result in an aesthetically unpleasant shopping experience. Color, a visual stimulus, can be used to create an atmosphere in an electronic shopping environment that may result in positive or negative experiences for consumers. In addition, color can influence consumers' attitudes toward product attributes (Mandel & Johnson, 1999; White, 1990).

LITERATURE REVIEW

Color

Color is a sensation produced in the human brain through a combination of light and the human visual system (Levkowitz, 1997). From the observer's aspect, color is composed of three dimensions including hue, value, and saturation. Hue is the actual color that is seen (i.e., red, blue, yellow, etc). The perception of a hue depends on the surrounding hues and the amount of each of the hues (Levkowitz; White, 1990). Value specifies the lightness or darkness of a color. Value depends upon the amount of light that is reflected or absorbed. A shade is a hue that has been darkened and a tint is a hue that has been lightened. Value strongly affects the perception of a color. Saturation specifies the intensity of the color. The corresponding dimensions of light terminology are dominate wavelength (hue), luminance (lightness or darkness), and purity (saturation) (Levkowitz).

Electronic Color

The additive system is used in electronic coloring. Red, blue, and green are the additive primary hues (Pile, 1988). Additive colors mix together the wavelengths that represent the three hues considered primary, as these hues cannot be made by mixing other hues. A problem with color displays on computer monitors is that the monitors vary in the way they produce colors (Levkowitz, 1997). Saturation on the computer is achieved from the phosphors that form the color image and red, green, and blue display the highest saturation (Norman, 1990). Some computer systems use the RGB (i.e., red, green, and blue) model to create colors. When the RGB model is at 255 or the maximum amount of each color, white is created (the presence of all color) and when the RGB model is at 0, black is created (the absence of all color). Other systems use the LHS model in which the user specifies the hue, the lamination, and the saturation.

Color and Consumers

Color is one of the visual dimensions of the physical environment and is a nonverbal communication tool used to convey meaning about products (Bellizzi, Crowley, & Hasty, 1983). It is through this system of nonverbal communication that consumers receive cues about products and the shopping environment (Markin, Lillis, & Narayana, 1976). Color has been found to play a significant role in consumers' attitudes toward products in retail settings. Web background hue and design were found to influence attributes that consumers valued when making purchase decisions about selected products (Mandel & Johnson, 1999).

It has been posited that background color impacts the length of time consumers browse on a site ("Colour Speak", 2004). Retail studies indicate that the longer consumers stay in a shopping environment, the more likely they are to make a purchase. Previous studies, simulating retail settings and using fully saturated colors, indicated that products featured on a blue background elicit more positive evaluative responses than those same products featured on a red background (Bellizzi & Hite, 1992; Crowley, 1993; Middlestadt, 1990). Products featured on blue backgrounds were deemed to be of a higher quality than when they were featured on other colors. Because of the potential for subsequent sales, business owners using a Web site business format need to consider the atmosphere of the site when they are planning their Web marketing strategy, including the impact of the Web site background color. Sharpe (1974) found that North Americans preferred saturated colors to unsaturated colors. However, Arnheim (1969) suggested using saturated colors in limited quantities.

Research findings related to gender's impact on response to color has been ambiguous, although many results indicate that there are differences in color preferences between genders. Men tend to prefer blue over red and women tend to prefer red over blue (Khouw, 2004). Men have been found to prefer bright colors while women prefer more subdued colors. In addition to gender, age, income, cultural background, and social background impact consumers' response to color (Khouw, 2003; Lee, 2002).

PURPOSE

The primary purpose of this study was to examine how Web page background color influences consumers' attitudes toward selected product attributes and consumers' likelihood of purchase. Web designers frequently suggest that Web background color should be white or light gray (Karp, 1997; Zhang, Keeling, & Pavur, 2000). However, some designers support the notion that the choice of background color should be selected with the primary targeted consumer in mind (Lee, 2002). Research supports that the atmospherics of a retail setting, including color, has an effect on consumers' attitudes and behavior and that by selecting background color to fit the dominate target market, a seller can manipulate consumers' attitude toward the site ("Colour Speak", 2004).

METHOD AND PROCEDURE

Research Design

In order to test the effect of background color on product attributes, a mixed design factorial experiment was conducted using two independent variables. Color, with seven levels (i.e., blue, green, orange, purple, red, yellow, and neutral white), and product, with three levels (i.e., fleece vest, chest of drawers, and bicycle bag) served as the independent variables. Simulated Web pages were created with each of the products featured individually on each of the selected colors. The background colors were created using Web page development software. The colors were at full saturation for the software, and saturation value and lamination value were held constant. The generic name of the product, in black print, was included on the page.

Participants' attitudes toward selected product attributes were the dependent variables. The product attributes, for which attitudes were assessed, included uniqueness, usefulness, quality, durability, expensiveness, workmanship, and attractiveness. Although each of the products had other attributes, the selected attributes applied to each of the products. Participant's attitude scores were obtained for all these attributes for each product in relation to randomly assigned background colors. Likelihood of purchase scores also were obtained for each product in relation to assigned colors.

Research Instrument

A questionnaire to collect participants' attitudes toward each product's attributes was developed. A seven-point semantic differential scale was used to collect attitudinal scores concerning the product attributes and to assess the likelihood of purchase. Data related to personal color preferences were collected using a ranking system. Open-ended questions and checklists were used to collect demographic information. Using a test-retest methodology, a pilot test was conducted to assess the reliability of the instrument. Cronbach alpha coefficients were .94 for the fleece vest, .85 for the chest of drawers, and .72 for the bicycle bag.

Sample

The participants consisted of a convenience sample of undergraduate students at a western land-grant university. Students were asked to volunteer to participate in the study. Participants were informed that the purpose of the study was to collect information on how individuals evaluate products on the Web.

Experimental Procedure

Participants were randomly assigned to one background color and viewed each product on the assigned background color. Each participant viewed all three products on the same background color. To control for sequencing, the viewing order of products was rotated within each color. Participants were randomly assigned to one viewing order. Each background color and viewing order was viewed by at least 30 participants. After viewing each product, participants completed the portion of the questionnaire pertaining to that product's attributes before viewing the next product. To control for color variation on the monitor, the same computer was used throughout this research.

Participants were asked to rank the colors used in the study (of which they viewed only one as a background hue) in order of their personal preference. Participants also provided selected demographic information and Web usage information.

Products

Prior to selecting which products to feature in the study, criteria were established: (a) the products would be useful to college age students, (b) the products would be utilitarian, and (c) the products would currently be sold via a web site. The final product selections consisted of a fleece vest, a chest of drawers, and a bicycle bag.

Data Analysis

A mean attribute score was obtained for each product on each background color. A one-way analysis of variance (ANOVA) between-groups design was conducted on all attributes across each product to determine if there were any significant mean differences between the attitudes toward the products' attributes when the products were featured on different background colors. Fisher's least significant difference (LSD) post hoc test was conducted on those attributes that were found to be significantly different.

An independent-samples t-test was conducted to determine if there were significant differences between participants' attitudes toward attributes when the products were featured on a colored background and when they were featured on a white background.

FINDINGS

Demographics

Descriptive statistics were used to analyze demographic characteristics of the sample. The sample was predominately white and included 91 males and 122 females for a total of 213 participants. The majority of participants (47.4 %) were 21-23 years of age. Overall the participants had online experience with 85.9 percent spending at least one hour or more per week online and 68.9 percent shopping online at least once a year or more. Nearly three-fourths of the participants had access to a credit card.

Products and Background Color

The fleece vest received the highest mean scores for five of the seven attributes (Usefulness, Quality, Expensiveness, Workmanship, and Attractiveness) when it was featured on the blue background. When the vest was featured on the orange background, it received the highest mean scores on uniqueness and durability and the second highest scores for the remaining attributes. The mean attribute scores and standard deviation for the fleece vest are displayed in Table 1.

Chest of Drawers

The chest of drawers received the highest mean attribute scores for all seven attributes when viewed on the purple background and the lowest mean attribute scores for five of the seven attributes (Usefulness, Quality, Durability, Expensiveness, and Attractiveness) when viewed on the red background (See Table 2). Analysis of responses concerning the chest of drawers revealed a significant mean difference for the Workmanship attribute, $F(6, 206) = 2,219$, $p = .043$ and the Quality attribute, $F(6, 206) = 2.162$, $p = .048$. Fisher's LSD post hoc test indicated that there was a significant mean difference for Workmanship between the purple and the white backgrounds when each was compared to the red background and the green background.

Table 1: Mean Attribute Scores for Fleece Vest by Background Color

Color	n	Attributes						
		Unique	Useful	Quality	Durable	Expensive	Workmanship	Attractive
Blue	30							
M		3.133	5.667	5.367	5.367	4.667	5.233	5.933
SD		1.279	1.213	0.809	0.809	0.994	1.006	0.944
Green	31							
M		2.677	5.258	5.194	5.290	4.419	4.742	5.452
SD		1.166	1.237	1.223	1.071	0.992	1.182	1.338
Orange	31							
M		3.323	5.323	5.355	5.516	4.484	5.129	5.710
SD		1.492	1.166	1.050	0.996	0.996	1.204	1.071
Purple	31							
M		3.161	4.968	5.161	5.290	4.258	4.774	4.936
SD		1.530	1.560	1.214	1.039	1.437	1.203	1.548
Red	30							
M		2.900	5.000	5.167	5.133	4.467	4.633	5.133
SD		1.398	1.083	0.874	0.860	0.900	1.189	1.525
White	30							
M		2.867	5.100	4.867	4.967	4.367	4.833	5.333
SD		1.480	0.923	0.860	1.033	1.273	0.986	1.269
Yellow	30							
M		2.500	5.300	4.700	4.800	3.900	4.567	5.233
SD		1.253	0.915	1.055	0.997	1.062	1.073	1.165

Note: The scores in bold and larger print indicate the highest mean score for the attribute across hues and the scores in italics indicate the lowest mean score for the attribute across the hues.

Concerning the fleece vest, ANOVA revealed a significant mean difference for the attractiveness attribute, $F(6, 206) = 2.161, p = .048$, in relation to the background hue. Results of Fisher’s least significant difference (LSD) post hoc test indicated that when the vest was featured on the blue background it received a significantly higher score for attractiveness than when featured on the purple, red, or yellow backgrounds.

Table 2: Mean Attribute Scores for Chest of Drawers by Background Color

Color	n	Attributes						
		Unique	Useful	Quality	Durable	Expensive	Workmanship	Attractive
Blue	30							
M		3.100	6.033	5.100	5.333	4.700	4.833	4.933
SD		1.689	1.129	1.029	1.093	1.208	1.147	1.363
Green	31							
M		2.484	6.161	4.839	5.194	4.452	4.258	4.548
SD		1.435	0.820	1.068	1.078	1.234	1.341	1.524
Orange	31							
M		3.258	6.129	4.807	5.129	4.710	4.710	4.936
SD		1.549	0.763	1.195	1.088	1.071	1.296	1.436
Purple	31							
M		3.452	6.258	5.226	5.548	4.936	5.129	5.333
SD		1.690	0.930	1.023	0.961	1.031	0.991	1.295
Red	30							
M		2.933	5.800	4.300	4.900	4.367	4.300	4.300
SD		1.461	1.243	1.535	1.494	1.712	1.317	1.897
White	30							
M		3.067	6.200	5.000	5.400	4.667	4.967	5.000
SD		1.574	0.925	1.232	1.133	0.922	1.245	1.531
Yellow	30							
M		3.167	5.933	4.600	5.067	4.500	4.567	4.733
SD		1.341	0.980	1.070	1.143	1.167	1.135	1.437

Note: The scores in bold and larger print indicate the highest mean score for the attribute across hues and the scores in italics indicate the lowest mean score for the attribute across the hues.

Bicycle Bag

Analysis of responses to the bicycle bag failed to reveal a significant mean difference at the .05 level for any of the product attributes in relation to the background hue. However, when viewed on the orange background, the bag did receive the highest mean score for the three attributes of Quality, Durability, and Workmanship. Table 3 displays the mean attribute scores and standard deviation for the bicycle bag.

Table 3: Mean Attribute Scores for Bicycle Bag by Background Color

Color	n	Attributes						
		Unique	Useful	Quality	Durable	Expensive	Workmanship	Attractive
Blue	30							
M		5.767	4.600	4.733	4.967	4.800	4.867	3.967
SD		1.305	1.694	1.112	1.299	1.297	1.008	1.377
Green	31							
M		5.548	4.645	5.032	5.097	5.097	4.710	4.065
SD		1.567	1.942	1.169	1.274	0.978	0.938	1.590
Orange	31							
M		5.645	4.936	5.290	5.226	5.097	5.032	4.290
SD		1.496	1.181	1.039	1.087	1.076	0.983	1.442
Purple	31							
M		5.548	4.710	4.710	4.548	5.065	4.677	4.677
SD		1.480	1.532	1.039	1.261	1.340	1.137	1.514
Red	30							
M		5.433	4.667	4.933	4.867	5.167	4.633	4.400
SD		1.569	1.749	1.258	1.306	1.511	1.426	1.476
White	30							
M		5.600	5.133	5.233	5.167	5.167	4.933	4.500
SD		1.163	1.008	0.935	1.020	1.177	0.868	1.526
Yellow	30							
M		5.167	4.700	4.567	4.633	4.633	4.667	4.233
SD		1.744	1.622	1.135	0.850	1.098	0.959	1.547

Note: The scores in bold and large print indicate the highest mean score for the attribute across hues and the scores in italics indicate the lowest mean score for the attribute across the hues.

Demographics, Background Color, and Attributes

Product attributes in relation to demographic characteristics were analyzed using a two-way, between groups ANOVA. To increase cell size, colors were collapsed into cool colors (i.e., blue, green, and purple) and warm colors (i.e., orange, red, and yellow). The results indicated that gender played a significant role in how participants perceived the product attributes in relation to the background color. Males tended to mark higher attribute scores when the products were featured on cool color backgrounds and females tend to mark higher attribute scores when the products were featured on warm color backgrounds. Results indicated significant interaction between background color and gender for the fleece vest attributes of Workmanship, $F(1, 179) = 8.430, p = .004$, Durability, $F(1, 179) = 6.628, p = .011$, Attractiveness, $F(1, 179) = 7.148, p = .008$, and Quality, $F(1, 179) = 3.750, p = .054$.

Comparison of Color Background and White Background

White is frequently used as a background color for Web sites therefore; it was included in this study. An independent-samples *t*-test was conducted to determine if there were significant differences between the product attribute mean scores when the products were featured on a colored background and when they were featured on a white background. No significant differences emerged from this analysis, but there was a trend for the fleece vest to

receive more positive attribute scores when it was featured on one of the six hues. The chest of drawers and the bicycle bag received more positive attribute scores when they were featured on the white background.

Other Findings

Because this was an exploratory study, additional findings were investigated. A one-way ANOVA was conducted to determine if there were significant mean differences in attribute scores and likelihood of purchase scores in relation to the viewing order for the study.

Regardless of the background color, likelihood of purchase scores were lower when the products were the first item viewed. Fischer's LSD post hoc test indicated a significant difference between viewing order one and viewing order two for both the fleece vest and the chest of drawers and a significant difference between viewing order one and viewing order three for both the fleece vest and the chest of drawers.

A two-way ANOVA was conducted to determine if there was interaction between the three viewing orders, gender, and likelihood of purchase. Significant interaction was found for the fleece vest, $F(2, 210) = 2.924, p = .056$, the chest of drawers, $F(2, 210) = 9.652, p = .000$, and the bicycle bag, $F(2, 210) = 7.681, p = .001$. Males indicated that they were more likely to purchase the fleece vest and the bicycle bag when the products were viewed second and females were more likely to purchase the fleece vest and the bicycle bag when the products were viewed last. Males indicated that they were more likely to purchase the chest of drawers when it was viewed last and females were more likely to purchase the chest of drawers when it was viewed second.

Mean attribute scores were obtained for each product by viewing order and gender. The fleece vest was rated more positively by both genders when it was viewed last. Males rated the chest of drawers more positively when it was viewed second. Males rated the bicycle bag more positively on five of the seven attributes when it was viewed second and females rated the bicycle bag highest on all seven attributes when it was viewed last.

CONCLUSIONS AND RECOMMENDATIONS

The findings from this study reaffirm that business owners need to identify their target market regardless of the marketing strategy that they use. The gender of the participants in this study was associated with significant differences in the effect of Web background color upon attitudes toward products. Findings also indicated there was interaction among the factors of gender, viewing order, and likelihood of purchase.

This study found a significant correlation between consumers' attitudes toward the products and the likelihood of purchasing those products. Correlation was especially high for the perception of Attractiveness in relation to likelihood of purchase, across all products and all colors, except for the fleece vest when viewed on a yellow background. Findings from a study by Katerattanakul and Siau indicate that the appearance of a virtual store can be used to provide a pleasant shopping experience. Color is one of the factors that can be used to enhance the attractiveness of the store's product offerings.

Previous research has revealed that customers tend to postpone purchases when higher priced products are featured on warm colors (i.e., red, yellow, orange). In this study, participants indicated a higher likelihood of purchase when the furniture item, which may have been perceived as the most expensive of the three products, was featured on the cool background colors of blue and purple. In other words, business owners who are selling high end products on the Web may be able to enhance sales through the use of a cool color background.

Participants' perceptions of product quality and durability were highly correlated with the likelihood of purchase across all products. The inclusion of facts relevant to quality and durability, within the product description, may translate into improved e-sales. Additionally, there was a modest correlation between participants' attitudes toward product uniqueness and likelihood of purchase. Business owners who sell products that fill niche market needs tend to have products that are unique. Sellers of unique products may have an advantage in the e-commerce marketplace.

The findings related to viewing order indicate that business owners with an online store should rotate the order in which products are viewed. This rotation could be incorporated into the updating of the Web site.

A perusal of fashion magazines and catalogs, published at the time of the study, revealed that the color orange was a fashionable apparel color. The seemingly positive impact of the orange background upon participants' attitudes toward the products' attributes and likelihood of purchasing the products may reflect an affinity for a current fashion trend. If this is indeed the case, then as fashion color trends change, the impact of a virtual store's background color upon consumers may change.

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