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EFFECTS OF COLOR TEMPERATURE AND GENDER ON WEBSITE AESTHETICS

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Abstract

Limited research exists on the hedonic dimensions of HCI and their relevance to usability and an even smaller set of this research is empirical in nature (Hoffman & Krauss, 2004; Schenkman & Jonsson, 2000; Zhang and Li, 2005). Furthermore, it appears that there are gender differences regarding perceptions of attractiveness, usability, and the consequent affective state of satisfaction, in website design. This empirical research aims to address the above gap by studying the effects of color and gender on perceptions of website aesthetics. A 2 x 2 between-subject research design is employed, where color is manipulated in two ways representing the two factors: temperature and scheme. Regarding temperature levels, two pairs of colors are selected from the color wheel, each pair consisting of adjacent hues and categorized as either "warm" or "cool." Color scheme levels indicate whether a warm color, for instance, is selected as either the primary or secondary color choice for the particular website design. Findings include significant user perceptions of aesthetic website designs when they utilize cool color combinations (here, blue-light blue) as opposed to warm ones (here, red-orange), direct effects of classical aesthetic dimensions (e.g. cleanliness) on expressive aesthetics items (e.g. creativity), and no effects of gender on either set of aesthetics.

Keywords: Aesthetics, Attractiveness, Usability, Human Computer Interaction, Website, Design, Color, Color Temperature, Gender, Hedonic.

Introduction

As the World Wide Web continues to grow in popularity, currently estimated to exceed 1.2 billion users (Nielsen 2005), websites have become core extensions of a business practice rather than a consideration of a new channel (Seethamraju, 2005). Companies seek new insights on how to create more effective websites and entice online customers. Extensive literature exists on the acceptance of a new technology, but the former has centered on utility-related dimensions that drive this acceptance. Limited research exists on the hedonic dimensions of HCI and their relevance to usability and an even smaller set of this research is empirical in nature (Hoffman & Krauss, 2004; Schenkman & Jonsson, 2000; Zhang and Li, 2005). Furthermore, it appears that there are gender differences regarding perceptions of attractiveness, usability, and the consequent affective state of satisfaction, in website design. However, more research is needed to understand the nature of such differences as in most past studies there were many confounded design variables. Thus, this research aims to address the above gap by studying the effects of color and gender on the perceptions of websites aesthetics.

Literature Review

Aesthetics

People throughout the centuries have been highly interested in aesthetics. The appreciation of beauty is a classical quality that is applied to many aspects of life, such as senses, imagination and understanding (Lavie and Tractinsky 2004). Aesthetics have been a topic of study and research over the ages by many schools of thought. They have been approached from many different angles and points of view. Aesthetics possess multiple meanings (Lavie and Tractinsky 2004). There are two major approaches of studying aesthetics: the philosophical approach and the empirical approach, both being based on studies of works of art. A commonality among aesthetics across the centuries is its dynamic nature. Beauty has been reformulated to address and reflect the propensities and tendencies of the era to which it belongs. It has been observed and studied that aesthetic preferences of the present come to replace those of the past and so forth (Lavie and Tractinsky 2004). Tarasewich (2004), cites Eysenck (1983) who addresses two conflicting points on aesthetics. The first considers aesthetics as an objective quality, which can be understood and shown to people. The second point of view sees aesthetics as something completely subjective and that beauty is a quality unable to be shown. Eysenck concludes by suggesting that there is some sort of objectivity in aesthetic judgments. Similarly, the aforementioned dyadic relationship parallels those described in the respective works of DeAngeli et al. (2006) and Lavie and Tractinsky (2004). Lavie and Tractinsky (2004) describe this dyad as two distinct approaches of understanding aesthetics found in classical aesthetics and expressive aesthetics. *Classical aesthetics* is defined as aesthetic notions that "presided from antiquity until the 18th century" and "emphasize orderly and clear design," while *expressive aesthetics* is defined as aesthetic notions that reflect a designer's creativity and originality (Lavie and Tractinsky 2004). Nasar (1988) offers support for these two dimensions, but labels them *visual clarity* and *visual richness* respectively.

The relationship between classical and expressive aesthetics has received extremely limited attention. Lavie and Tractinsky (2004) point out that such a relationship is not predefined and that good design "should strive to balance their degrees given the design context." On the other hand, the Bayesian model presented by Papachristos' et al. (2005) offers support for the following relationships between website design attributes: a "pleasant" design affects perceptions of a "fresh", "modern" and "dynamic" (or similarly, creative) design, while an "attractive" (or similarly, aesthetic) design has a mediated effect on how "sophisticated" it is perceived to be. These attributes are found in the operationalization of the two *aesthetics* constructs by Lavie and Tractinsky (2004), suggesting that *classical aesthetics* impact *expressive aesthetics*. Therefore, and with the caveat of extremely limited support, the following hypothesis is proposed:

H1. Higher levels of Classical Aesthetics will have a more positive effect on Expressive Aesthetics.

Hedonic Effects of Color

Hedonic, derived from Greek where "hedonism" means pleasure, dimensions include factors such as color, graphics, animation and other design elements that either implicitly or explicitly cause an affective state of pleasure. Zhang and Li (2005) argue that the more pleasing or attractive a website is, the easier it will be for the individual to learn how to use it and

the more likely that this individual will continue to use it. Past studies have primarily looked at website design as the aggregate product of these hedonic dimensions and the users' consequent affect. However, a closer look at the impact of each hedonic dimension on affect is warranted.

Empirical studies on the impact of color on the perceived attractiveness and usability of websites are extremely limited. Most studies focus on the role that aesthetics play in usability and treat color in an overly subjective and qualitative manner. However, based on the limited number of empirical studies on the subject, it appears that color (and more specifically color combinations and schemes) have a significant effect on the perceived attractiveness and aesthetic appeal of a website. Brady and Philips (2003) suggested that users found a site with a Triadic color scheme more usable and more aesthetically pleasing than a site with a non-standard color scheme. Their study was limited by its design in that it did not differentiate the users' perceptions of usability and attractiveness between the variables of color and balance, both of which make up *visual balance*. Papachristos et al. (2005) suggested that color combinations and schemes resonate with users in a particularly emotional manner. Their research shows that users tend to predictably attach specific emotional descriptors, such as fresh, modern, friendly, and aggressive, to specific color schemes and color combinations. Results of their research further suggested that the design attribute with the strongest effect on the website's perceived attractiveness is the *brightness* of the dominant color, followed by the *brightness* of the secondary color and its temperature (warm or cool), the *number of colors*, and the *contrast* between hues. As a rough point of reference to color theory, warm colors include those that fall in the spectrum between red and yellow (with orange as their secondary by-product), whereas cool colors encompass those that center around blue (with green and purple as their secondary by-products) (Ohta and Robertson 2006).

Based on the limited past empirical research, it is plausible to suggest that color, color schemes, and color combinations are variables dependant on other areas of design such as balance and contrast. It is also possible to suggest, based on the work by Papachristos et al. (2005), where cooler colors were found to be preferred over warmer colors, that the perceived "temperature" of a color impacts a website's aesthetics. Thus, the following hypotheses are proposed for this study:

H2. Increasing the color temperature of a website design will negatively impact users' perceptions of its classical aesthetics.
H3. Increasing the color temperature of a website design will negatively impact users' perceptions of its expressive aesthetics.

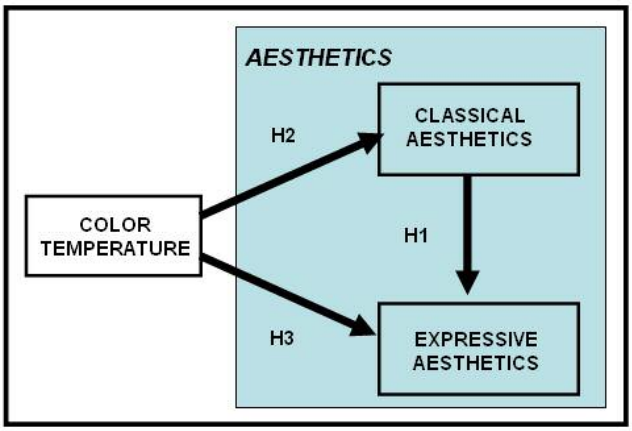


Figure 1. Proposed research model

Gender Differences in Hedonic Effects

Effects of web design on affect have also been studied in the context of the users' gender. While most studies explored gender differences for credibility, trust, and satisfaction with websites, a few studies focused on the relationship between gender and perceived attractiveness of websites. In the realm of visual design, men had more favorable impressions of how product information was presented. Women were more attracted by the colors on the site, and men by animations and the interactive, 'flashy' aspects of the site (Cyr & Bonanni, 2005). Simon (2001) found that women preferred sites that were less cluttered, having few graphics, as well as sites that avoid multiple levels of sub-pages to drill through. Men liked sites that used extensive graphics and animation. Additionally, in a study of gender and Web usage among college students, significant gender differences emerged with respect to evaluative criteria and use patterns, with men liking some of the "bells and whistles" and women using academic Web sites more (Mitra et. al, 2005).

It appears that there are gender differences regarding perceptions of aesthetics, usability, and the consequent affective state of satisfaction, in website design, but more research is needed to understand the nature of such differences. As with past studies on hedonic dimensions and usability/acceptance, gender differences were explored in terms of website designs as an aggregate of multiple design elements instead of a more controlled design regarding these aesthetic factors. There is limited research that investigates the effects of gender on color preferences. Studies in various contexts have found that both men and women prefer the same color temperature (i.e. "cool" blue) (Silver and Ferrante 1995; Guegen 2003; Dittmar 2001), but significant differences arose regarding their least preferred colors, where men "stated more often yellow and less often red as least preferred than women did" (Dittmar 2001). Thus, the following hypothesis is proposed for this study:

H4. Increasing the color temperature of a website design will have a more negative impact on women's perceptions of its aesthetics than those of men.

Methodology

Experiment Design and Procedure

This study employs a 2 x 2 between-subject research design, where color is manipulated in two ways representing the two factors: temperature and scheme. Regarding temperature levels, two sets of colors are selected from the color wheel, each being categorized as either "warm" or "cool." Color scheme levels indicate whether a warm color, for instance, is selected as either the primary or secondary color choice for the particular website design. Implementation of this design resulted in the following four treatments or color combinations for the test website: i) Warm Primary – Warm Secondary (i.e. Red – Orange); ii) Warm Primary – Cool Secondary (i.e. Red – Light Blue); iii) Cool Primary – Warm Secondary (i.e. Blue – Orange); and iv) Cool Primary – Cool Secondary (i.e. Blue – Light Blue). All other design elements (e.g. text, images, background) were held constant across the four designs. This research design allowed for any differences found among the four groups of subjects to be attributed to the decreased levels of color warmth as a result of color choices for the primary and secondary colors of the website. A website was developed by the authors for the purpose of this study and represented the digital storefront of a fictional hotel. Thus, four versions of the identical website design were produced with color (temperature) combination being the only varying design element (see Appendix for corresponding screenshots).

Tasks invoked participants to browse through a website developed for the purpose of this study in search of specific information. Participants were informed that the tasks were only meant to offer them an opportunity to explore the website and its design, instead of measuring their performance with it. Having evaluated the website design randomly assigned to them, participants were then asked to rank four different website designs in terms of their respectively perceived aesthetics.

A Structural Equations Modeling (SEM) technique, Partial Least Squares (PLS), is used in testing the validity of both the structural and measurement model. Data analysis will speak to the four aforementioned hypotheses.

Subjects

A total of 356 subjects were recruited for this web-based voluntary study via email announcements on various databases and listservs. Of the 356 participants recruited, 328 usable data sets were collected, with a minimum of 72 subjects per group. All participants used the same website, but each treatment involved the use of a discriminant color design described above. The minimum sample size for the selected method, PLS, is 10 times the number of the most complex construct (Chin 1998). In this study endogenous constructs consist of five items each, thus our sample size far exceeded the needed 50 cases. Each subject participated in only one treatment group, and assignment of subjects to groups was fully randomized to control for confounding effects due to differences in subject characteristics. The sample exhibited a relatively even split between males and females (170 males to 158 females). The average age was 34 (ranging from 18 to 70), and 83% described themselves as Caucasian/White (while another 7% as Asian/Pacific Islander). The participants were almost entirely college-educated, and had an average experience of 17 years with computers and 10 years with the World Wide Web, respectively. ANOVA tests found no significant differences for subjects in the various treatment groups in terms of these control variables, thereby ensuring the successful randomization of assignment across groups.

Instrument Scales and Validity

The questionnaire used for data collection contains scales that measure the various constructs shown in the research model and are provided in Table 1. All scales were adapted from a prior study (Lavie and Tractinsky 2004), which had established their reliability and validity, thereby satisfying content validity. These scales were used to measure the users' perceived attractiveness of websites through assessments of "classical aesthetics" and "expressive aesthetics." These 7-point Likert scales (anchored "Strongly Disagree/Agree") measured responses to the shared question "My perception of this website is that it is…" for each of the following items: Clean, Clear, Symmetric, Aesthetic, and Pleasant for "Classical Aesthetics," and Original, Creative, Fascinating, Sophisticated, and Uses Special Effects for "Expressive Aesthetics."

When the questionnaire was conducted items within the same construct group were randomized to prevent systemic response bias. Upon further testing it was shown that non-response, temporal, and common method biases were not present in our data set.

The factor loadings for the total set of items used in this study are summarized in Table 1. Shimp and Sharma (1987), Carmines and Zeller (1979), and Hulland (1999) suggest that an item is significant if its factor loading is greater than 0.7 to ensure construct validity. Adherence to this criterion required the modification of only one scale (Classical Aesthetics) through the removal of two items: ClasAes1 (or "Clean") and ClasAes2 (or "Symmetrical"). After the removal of the non-valid items, each item was re-validated by testing its item-to-total correlation measure, where all items had higher measures than the 0.35 threshold suggested by Saxe and Weitz (1982).

Table 1. Construct items and their factor loadings

Item	Question	Loading	Item-Total Correlations
ClasAes1*	Thinking about my impression with the website, it is clean.	0.661	0.593
ClasAes2	Thinking about my impression with the website, it is clear.	0.746	0.607
ClasAes3	Thinking about my impression with the website, it is aesthetic.	0.863	0.701
ClasAes4	Thinking about my impression with the website, it is pleasant.	0.895	0.547
ClasAes5*	Thinking about my impression with the website, it is symmetrical.	0.605	0.442
ExprAes1	Thinking about my impression with the website, it is original.	0.848	0.763
ExprAes2	Thinking about my impression with the website, it is sophisticated.	0.851	0.728
ExprAes3	Thinking about my impression with the website, it is fascinating.	0.895	0.825
ExprAes4	Thinking about my impression with the website, it is creative.	0.883	0.816
ExprAes5	Thinking about my impression with the website, it uses special effects.	0.777	0.688

*Note: * denotes items removed from the subsequent analysis; ClasAes – Classical Aesthetics; ExprAes – Expressive Aesthetics*

Results of tests for convergent validity (Bagozzi, 1981), discriminant validity (Bagozzi, 1981; Fornell and Larcker, 1981), construct means and Cronbach's alpha can be found in Table 2. All constructs had adequate reliability (Carmines and Zeller, 1979) and internal consistency well above the 0.7 threshold (Nunnally 1978). Cronbach α-values were satisfactory for our constructs (0.771 - 0.906) and constructs' AVE exceeded the 0.5 benchmark for convergent validity (Fornell and Larcker 1981). The square root of the variance shared between a construct and its items was greater than the correlations between the construct and any other construct in the model (see Table 3) suggesting discriminant validity (Fornell and Larker 1981). Discriminant validity was confirmed by verifying that all items load highly on their corresponding factors and load less on other factors (see Table 4). Although the correlation between the two aesthetics constructs was quite high (i.e. 0.622), a phenomenon also observed in the work by Lavie and Tractinsky (2004), it is not exceedingly high according to Kline's (1998) suggestion that correlations between factors should not be greater than 0.85, thus further supporting the discriminant validity of the two aesthetic factors.

Table 2. Construct statistics

	ClasAes	ExprAes
Arithmetic Means (all items)	5.457	3.294
Arithmetic Means (used items)	5.342	3.294
Cronbach's α Reliability	0.771	0.906
Internal Consistency	0.875	0.930
Convergent Validity (AVE)	0.701	0.726
Discriminant Validity [sqr(AVE)]	0.837	0.852

Table 3. Correlation matrix and discriminant validity assessment

	ClasAes	ExprAes
ClasAes	**0.985**[1]	
ExprAes	0.622	**0.832**[1]

[1] *Fornell and Larcker (1981) measure of discriminant validity which is the square root of the average variance extracted compared to the construct correlations. Bold values are supposed to be greater than those in corresponding rows and columns.*

Table 4. Matrix of loadings and cross-loadings

ITEM	ClasAes	ExprAes
ClasAes2	**0.746**	0.455
ClasAes3	**0.863**	0.547
ClasAes4	**0.895**	0.554
ExprAes1	0.474	**0.847**
ExprAes2	0.638	**0.849**
ExprAes3	0.571	**0.896**
ExprAes4	0.524	**0.885**
ExprAes5	0.391	**0.779**

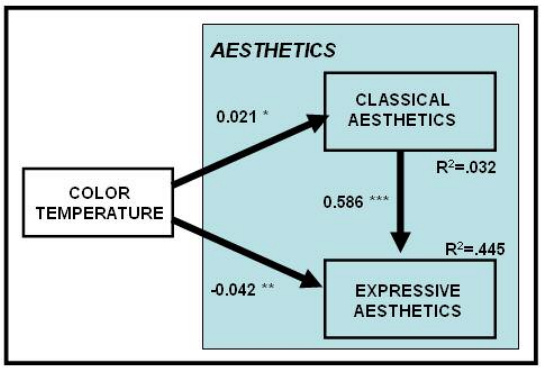
Results

Following from the earlier discussion on the instrument's validity, statistics regarding significant items and construct are reported in Table 5.

Table 5. Item and construct statistics

	Mean	Std. Dev	Loading	Error	Item-Total Correlation	Alpha	Alpha if Item deleted
Classical Aesthetics	5.342	1.632				0.771	0.783
Clear	5.317	1.433	0.746	0.018	0.495		0.835
Aesthetic	5.230	1.230	0.863	0.024	0.638		0.656
Pleasant	5.479	1.155	0.895	0.025	0.712		0.587
Expressive Aesthetics						0.906	0.906
Original	3.412	1.558	0.847	0.319	0.763		0.885
Sophisticated	4.079	1.564	0.849	0.320	0.728		0.893
Fascinating	3.079	1.538	0.896	0.357	0.825		0.871
Creative	3.439	1.555	0.885	0.348	0.816		0.873
Uses special effects	2.460	1.381	0.779	0.270	0.688		0.900

The proposed structural model shown in Figure 1 was tested by Jackknifing in PLS. This resampling procedure assesses the significance of PLS parameter estimates (Chin 1998). Jackknifing is just one of several PLS techniques that may be used in evaluation a research model. For example, Bootstrapping is another common PLS approach, but in general, estimations by either one approach should converge (Chin 1998). All three of the original hypotheses were supported. Table 6 presents the validation of these hypotheses in more detail. Furthermore, the structural model tested using PLS demonstrated mixed explanatory power for perceived website aesthetics. With an R-square of 0.45, 45% of the variance in Expressive Aesthetics was explained by the color manipulation in this study. Only 3.2% of the variance for Classical Aesthetics was explained by this manipulation, suggesting that there are other dimensions not captured by the scale (in part explained after the removal of two items) and/or by the exogenous construct's effects.



* significant at 0.05 level; ** significant at 0.01 level; *** significant at 0.001 level

Figure 2. PLS Model

Table 6. Validity test results

Hypotheses	From	To	Beta	t-Value	p-Value	Sig	Status
H1	Design	ClassAes	0.021	2.110	< 0.05	*	supported
H2	Design	ExprAes	-0.042	4.666	< 0.01	**	supported
H3	ClassAes	ExprAes	0.586	13.317	< 0.001	***	supported

The next measurement pertains to the ranking of the different website designs. Rankings were significantly different (one-sample T-test) suggesting a preference for "blues" or the cool-cool color design (see Table 7).

Table 7. Site rankings and one-sample comparison of means

Website Design Primary-Secondary	N	Mean	Std. Deviation	Std. Error Mean	t	Df	Sig. (2-tailed)
Warm-Warm	328	2.97	1.171	0.065	45.956	327	0.000
Warm-Cool	328	2.62	0.914	0.050	51.959	327	0.000
Cool-Warm	328	2.34	0.980	0.054	43.326	327	0.000
Cool-Cool	328	2.00	1.135	0.063	31.971	327	0.000

The fourth hypothesis stated that "*increasing the color temperature of a website design will have a more negative impact on women's perceptions of its aesthetics than those of men."* ANOVA showed that there were no significant differences in the reporting of both classical and expressive aesthetics scale items (see Table 8), as well as the ranking of the four website designs (see Table 9). Thus, gender does not appear to be related to users' perceptions of aesthetics as a result of color temperature combinations in the context of hotel websites. However, the hypothesized directionality becomes apparent when contrasting the p-values for the two "cool" website designs (i.e. third and fourth design with p-values above 0.88) with the two "warm" website designs (i.e. first and second design with p-values below 0.30). Thus, gender differences regarding color preferences at the warmer end of the spectrum may occur, although the findings of this study do not offer such support.

Table 8. ANOVA for potential relationships between gender and aesthetics (classical and expressive)

Item		Sum of Squares	df	Mean Square	F	Sig.
ClassAes2	Between Groups	1.451	1	1.451	.707	.401
	Within Groups	669.573	326	2.054		
	Total	671.024	327			
ClassAes3	Between Groups	3.280	1	3.280	2.178	.141
	Within Groups	491.110	326	1.506		
	Total	494.390	327			
ClassAes4	Between Groups	.233	1	.233	.175	.676
	Within Groups	435.617	326	1.336		
	Total	435.851	327			
ExprAes1	Between Groups	.435	1	.435	.179	.673
	Within Groups	793.001	326	2.433		
	Total	793.436	327			
ExprAes2	Between Groups	4.632	1	4.632	1.899	.169
	Within Groups	795.307	326	2.440		
	Total	799.939	327			
ExprAes3	Between Groups	.027	1	.027	.011	.916
	Within Groups	773.912	326	2.374		
	Total	773.939	327			
ExprAes4	Between Groups	.085	1	.085	.035	.852
	Within Groups	790.696	326	2.425		
	Total	790.780	327			
ExprAes5	Between Groups	1.286	1	1.286	.674	.412
	Within Groups	622.199	326	1.909		
	Total	623.485	327			

Table 9. ANOVA for relationships between gender and aesthetics rankings of four website designs

Item		Sum of Squares	df	Mean Square	F	Sig.
Rank of Site 1	Between Groups	2.280	1	2.280	1.665	.198
	Within Groups	446.473	326	1.370		
	Total	448.753	327			
Rank of Site 2	Between Groups	.931	1	.931	1.115	.292
	Within Groups	272.191	326	.835		
	Total	273.122	327			
Rank of Site 3	Between Groups	.004	1	.004	.004	.949
	Within Groups	314.066	326	.963		
	Total	314.070	327			
Rank of Site 4	Between Groups	.027	1	.027	.021	.886
	Within Groups	420.970	326	1.291		
	Total	420.997	327			

Discussion

The findings of the present study support and extend prior research regarding the effect of color combinations on aesthetics (Brady and Philips, 2003; Papachristos et al., 2005). First, color temperature variations on website designs appeared to impact both sets of aesthetic dimensions (i.e. classical and expressive). Second, the triadic color schemes that utilized a cool primary color (blue) for the top or global part of the page and then used either another cool color (medium blue) or a warm color (orange) for the secondary page components provided the balance that users found most aesthetically pleasing. In contrast, the site that combined both a warm primary color (red) and a warm secondary color (orange) was the least aesthetic site, likely because the color pairing did not balance out the rest of the page. Additionally, research has shown that the cool blue color schemes are associated with higher perceived credibility and trust levels, which would be important for a travel booking website (Fogg et. al, 2001; Lee & See, 2004; Zhang & Li, 2005). The current results suggest that designers need to carefully consider color choice as the combinations will convey information about the quality of the site that may not be intended.

Furthermore, while there was limited literature regarding the hypothesis that *classical aesthetics* directly impacts *expressive aesthetics*, this study offers strong support for this relationship. A significant implication to management arises: by ensuring website designs adhere to fundamental design principles and guidelines, thus satisfying more "objective" aesthetic dimensions, such favorable impressions will also influence perceptions of more "affective" aesthetic dimensions (e.g. originality, creativity). Consequently, this is a research area that warrants further investigation. Therefore, we can extend Norman's suggestion that "what is beautiful is usable" to argue that "what is orderly is beautiful and in turn usable" bearing in mind that *context of use* is the overriding factor that influences perceptions of order and beauty.

While other research has found gender effects in several computer-related contexts (Cyr & Bonanni, 2005; Simon, 2001), the current study did not indicate that gender impacted perceptions of website aesthetics. One plausible explanation for this observation is that women tend to employ more exhaustive information processing strategies than men do, which means that gender differences may have been masked by the lack of detailed content in the prototype website; the content was not as extensive as users expected from a travel website (Simon, 2001; Meyers-Levy & Maheswaran, 1991). We plan to expand and hone the website content to create a more realistic level of detail on each page, as well as having more content pages, which would enable users to better assess perceived usability within the context of the multiple color schemes. Additionally, future research efforts will seek to broaden the focus to assess the influence of culture on perceptions of website aesthetics through a global multi-country study.

In closing, this study aimed at extending the limited body of research (Lavie and Tractinsky 2004; Tarasewich 2004; DeAngeli et. al 2006) in the area of website aesthetics and our understanding of how the manipulation of design elements (here, color temperature and color scheme) may impact users' perceptions of a website's aesthetics.

References

Bagozzi, R. "Evaluating structural equation models with unobservable variables and measurement error," Journal of Marketing Research, 18, 1981.

Brady, L. and Phillips, C. "Aesthetics and usability: A look at color and balance," Usability News, 5.1, 2003, Retrieved on October 15, 2006, from http://psychology.wichita.edu/surl/usabilitynews/51/aesthetics.htm.

Carmines, E. and R. Zeller. Reliability and Validity Assessment, Sage Paper Series on Quantitative Applications No. 07-017, 1979, Beverly Hills, CA: Sage Publications Inc.

Chin, W.W. The Partial Least Squares Approach for Structural Equation Modeling. Lawrence Erlbaum Associates, 1998, pp. 295-336.

Cyr, D., and Bonanni, C. "Gender and website design in e-business," International Journal of Electronic Business, (3:6), 2005, pp. 565–582.

De Angeli, A., Sutcliffe, A., and Hartmann, J. "Interaction, Usability and Aesthetics: What Influences Users' Preferences?" DIS, 2006.

Dittmar, M. (2001). "Changing Colour Preferences with Ageing: A Comparative Study on Younger and Older Native Germans Aged 19-90 Years." Gerontology, 47(4), pp. 219-226.

Eysenck, H. J. Visual Aesthetic Sensitivity and its Measurement. In M. Russ (Ed.), The Arts: A Way of Knowing, Oxford: Pergamon Press, 1983, pp. 105-125.

Fogg, B. J., Marshall, J., Laraki, O., Osipovich, A., Varma, C., Fang, N., Paul, J., Rangnenkar, A., Shon, J., Swani, P., and Treinen, M. "What makes web sties credible? A report on a large quantitative study," SIGCHI'01, (3:1), 2001, pp. 61-68.

Fornell, C. and D. Larcker. "Evaluating Structural Equation Models with Unobservable Variable and Measurement Error," Journal of Marketing Research, 18, 1981, pp. 39-50.

Guéguen, N. (2006). "The Effect of Glass Colour on the Evaluation of a Beverage's Thirst-Quenching Quality." Current Psychology Letters, published on line on: March 30, 2006, retrieved on April 30, 2007, from http://cpl.revues.org/document398.html.

Heijden, H.V.D. "Factors influencing the usage of websites: The case of a generic portal in the Netherlands," Information and Management, (40:6), 2003, pp. 541-549.

Hoffman, R., and Krauss, K. "A critical evaluation of literature on visual aesthetics for the Web," Proceedings of SAICSIT, 2004, pp. 205-209.

Hulland, J. "Use of Partial Least Squares (PLS) in Strategic Management Research: A review of four recent studies," Strategic Management Journal, 20, 1999, pp. 195-204.

Kline, R.B. (1998). Principles and Practice of Structural Equation Modeling. New York: Guilford Press.

Lavie, T. and Tractinsky, N. "Assessing Dimensions of Perceived Visual Aesthetics of Web Sites," International Journal of Human-Computer Studies, (60:3), 2004, pp. 269-298.

Lee, J. D., and See, K. A. "Trust in automation: Designing for appropriate reliance," Human Factors, (46:1), 2004.

Meyers-Levy, J., and Maheswaran, D. "Exploring gender differences in males' and females' processing strategy," Journal of Consumer Research, 18, 1991, pp. 63-70.

Mitra, A., Willyard, J., Platt, C., and Parsons, M. "Exploring web usage and selection criteria among male and female students," Journal of Computer-Mediated Communication, (10:3), article 10, 2005. Retrieved on October 15, 2006, from http://jcmc.indiana.edu/vol10/issue3/mitra.html.

Nasar, J.L. (1988) Perception and evaluation of Residential Street Scenes. In Nasar, J.L. (ed.), *Environmental Aesthetics: Theory, Research, and Applications*. Cambridge University Press.

Nielsen, J. "One billion Internet users," Jakob Nielsen's Alertbox, December 19, 2005. Retrieved on October 15, 2006, from http://www.useit.com/alertbox/internet_growth.html.

Nunnally, J.C. Psychometric Theory, 2nd edition, 1978, New York: McGraw-Hill.

Ohta, N. and Robertson, A. Colorimetry: Fundamentals and Applications. January, 2006, Wiley – Halsted Pr.

Papachristos, E., Tselios, N., and Avouris, N. "Inferring relations between color and emotional dimensions of a Web site using Bayesian Networks," Proceedings of Interact 2005.

Saxe, R. and B. Weitz. "The SOCO Scale: A measure of the customer orientation of salespeople," Journal of Marketing Research, 19, 1982.

Schenkman, R. N., and Jonsson, U. "Aesthetics and preferences of web pages," Behaviour & Information Technology, (19:5), 2000, pp. 367-377.

Seethamraju, R. "Relative importance of Web quality dimensions," Proceedings of AMCIS, 2005.

Shimp, T. and Sharma, S., "Consumer ethnocentrism construction and validation of the CETSCALE," Journal of Marketing Research, 24, 1987.

Silver C. & Ferrante R. (1995). Sex differences in color preferences among an elderly sample. *Perceptual and Motor Skills, 80*, 920-922.

Simon, S. "The impact of culture and gender on Web sites: An empirical study," The DATA BASE for Advances in Information Systems, (32:1), 2001, Winter, pp. 18-37.

Tarasewich, P. (2004). An Investigation into Web Site Design Complexity and Usability Metrics. To appear in Quarterly Journal of Electronic Commerce.

Zhang, P. and Li, N. "The importance of affective quality," Communications of the ACM, (48:9), September 2005, pp. 105-108.

Appendix

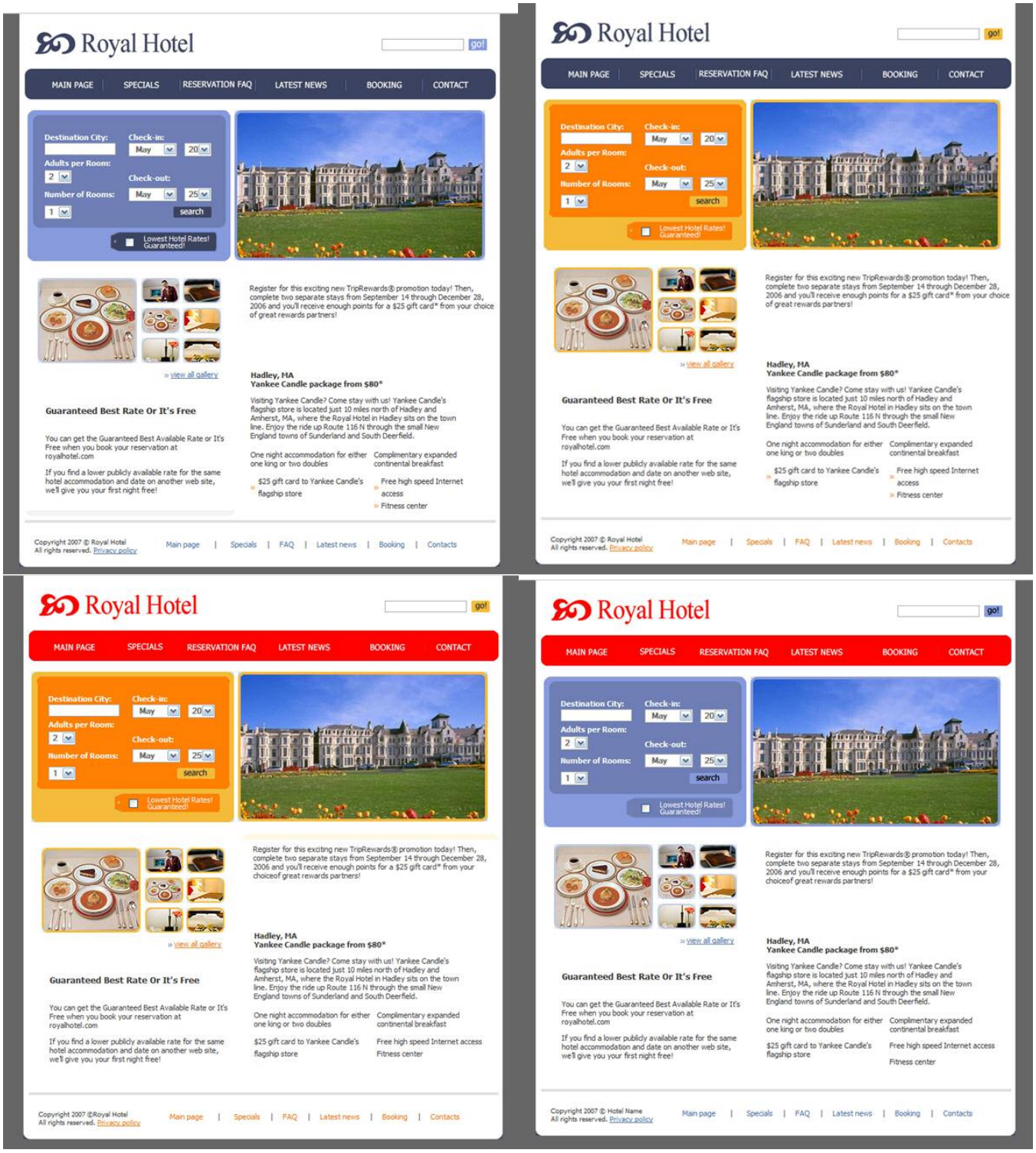


Figure 3. Screenshots of the test website, shown from most to least aesthetic (clockwise from top-left)