

EDS*f*



Color Preferences in Web Design

UNIVERSITY OF NORTHERN IOWA
Department of Industrial Technology
Graphic Communications Program

Professor
Carl Nelson Blue

Students
Christopher McGee
Ty Welu

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Pete England
Toby Cobrin

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Introduction

This research was conducted in two phases: Phase One quantitatively identified color preferences for computer screen colorimetric space for web design from a diverse sample population; in Phase Two, “Phase One” results were presented to a second sample of industry and academic professionals. They were asked to comment on the value of the Phase One results and whether these results would help them make better design decisions in web site development. These research objectives and findings are presented in this article.

Objective

The overall objective of this EDSF research project was to investigate color preferences in web design within a diverse sample population. Through the use of an online survey, the primary goal (Phase One) was to collect and identify color preferences from the sample’s responses to computer-screen’s colorimetric space by characteristics based on age and gender. In the Phase One investigation, over two hundred observations are documented on a sample population’s descriptive and quantifiable information, and includes specifics on age, gender, academic level, areas of study or profession, along with each participant’s color preferences for webpage backgrounds, text, and links. The goal in Phase One was to compare color preferences for the within-group and between subgroup responses. *(Within-group comparisons looked at variance within all members of the sample, whereas subgroup comparisons looked at the variance in responses about the sample’s color preferences and how they related to variables like gender and age.)*

The next step (Phase Two), was to present these color preference findings and data on an accessible website to a sample population of industry and academic professionals in order to document their responses to the Phase One findings. In Phase Two, the research was based on the Phase One observations. The results were provided to a secondary group of nearly fifty participants from both industry and academic professionals in order to gather their responses and perceptions on the Phase One research. This group provided additional analysis on the overall color preferences in web design research.

Prior to this EDSF research (Phase One and Phase Two of the current study), a pilot study was conducted on a sample population of undergraduate students. This preliminary research found that the greater proportion (33% of the sample) preferred WHITE backgrounds with BLACK text (Figure 1). Though these observations for MOST favorite color combinations were identical for both genders, additional observations of choices in color preferences for background and text by subgroups were distinctly different from gender-to-gender and prompted further investigation (Figure 2 and Figure 3). The pilot study provided the direction for this EDSF investigation that asked whether there were any identifiable color preferences by gender and age from a larger and more diverse population.

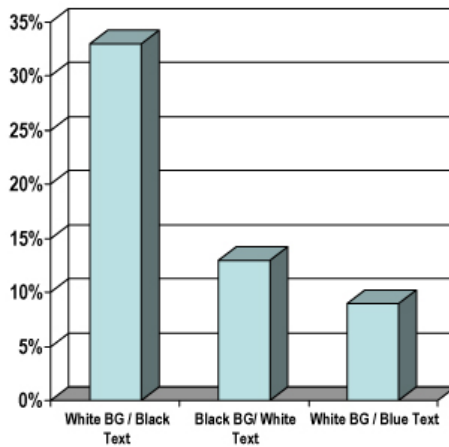


Figure 1: Pilot study results on color preferences for background (BG) and text

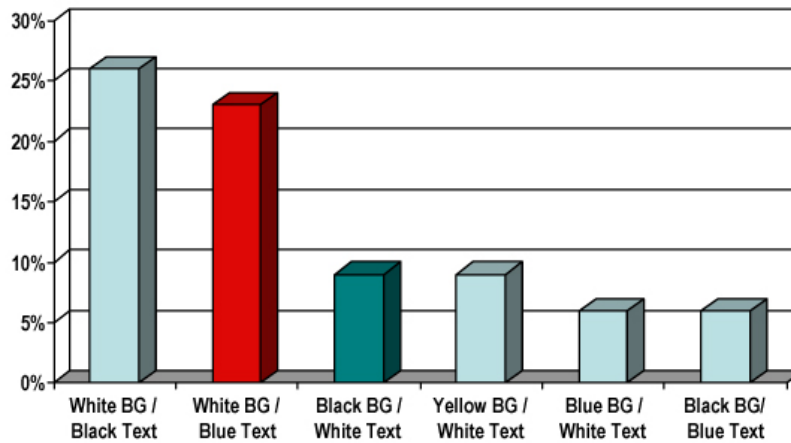


Figure 2: Pilot study results for female choices on color preferences for background (BG) and text

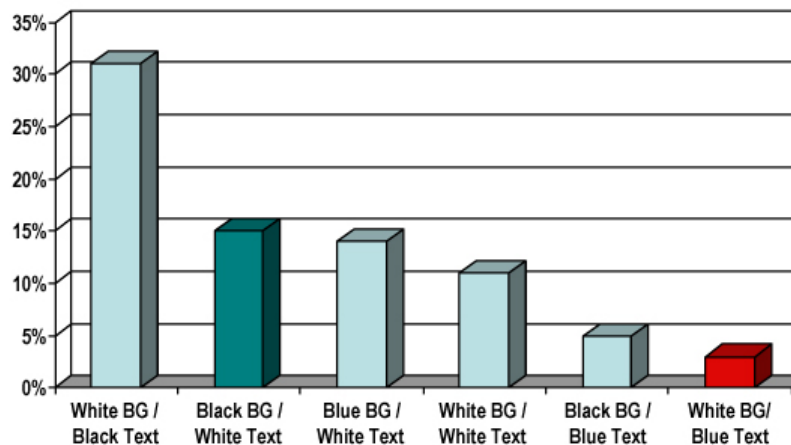


Figure 3: Pilot study results for male choices on color preferences for background (BG) and text

Approach

Phase One

A website was developed to collect participants' color preferences in web design. An online survey served as the instrument for the collection of descriptive, numerical, and nominal data. The data collected for this research included age, gender, present academic level, and area of study or profession. The colors preferences selection portion of the survey included the color choices for the categories: Background Color, Text Color, Link Color, Visited Link, and Active Link. Participants were given (16) color choices for each of these categories that included: Black, Silver, Gray, White, Maroon, Red, Purple, Fuchsia, Green, Lime, Olive, Yellow, Navy, Blue, Teal, and Aqua. These colors were chosen as the standard for this portion of the survey in accordance to the HTML 4.01 specifications of the sixteen "Named Colors" are specified as sRGB and were included in the HTML 3.0 specifications that has noted that these colors as being the standard 16 colors supported with the Windows VGA palette.

Color Name	Background Color	Text Color	Link Color	Visited Link	Active Link
black	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
silver	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
gray	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
white	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
maroon	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
red	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
purple	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
fuchsia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
green	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
lime	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
olive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
yellow	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
navy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
blue	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
teal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
aqua	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 4: Available named color choices

Two hundred and eleven participants contributed their choices in color preference for background color, text color and link color preferences by selecting one of the sixteen "Named Colors".

The data was collected over a period from late 2006 to early 2008 via submissions to a secure server and focused on quantitatively identifying observable color preferences for computer screen colorimetric space by groups for age and gender. It is important to note that these color preferences were derived from the participant's subjective choices without being coerced or persuaded with color samples through an assortment of prearranged background colors with text color and link color compositions. Due to the difficulty of standardization of color across the World Wide Web and human-user interface technologies, this research studied cerebral and analytical observations of color preferences for computer screen colorimetric space and web design.

Phase Two

Once the data from Phase One was compiled and developed into a format for online access, individuals from academia and industry were sent an email inviting them to participate in Phase Two of the research. Phase Two consisted of interviews [n=48] with experts from industry, academia, and other technology leaders who are qualified to comment on this particular research topic. Participants were instructed to review the quantitative research findings found on the Phase One Research website, and then asked to provide their analysis and reflections on those findings. Participants were told the information collected from the survey would be compiled into quantitative responses for an academic article for Electronic Document Systems Foundation.

Target Audience

Phase One

The color preferences research was open to all participants that had access to the Internet. Observations were gathered from voluntary and convenient populations in order to ensure a large diverse sample of participants. Participants contributed their preference for background color, text color and link color preferences by selecting one of the sixteen "Named Colors".

The sample's size was 211 participants with an overall average age of 30 years. There were 109 females that participated with an average age 28, with an age range between 12 to 91 years old. Females were 52% of the total sample's overall population. There were 102 males that participated with an average age of 32, with an age range of 11 to 75 years old. Males were 48% of the total sample's overall population. The Phase One research participants' characteristics for their highest level of academic studies included: Middle School 6%, High School 13%, College Undergrads 63%, Graduate Studies 12%, and Doctorates 6%.

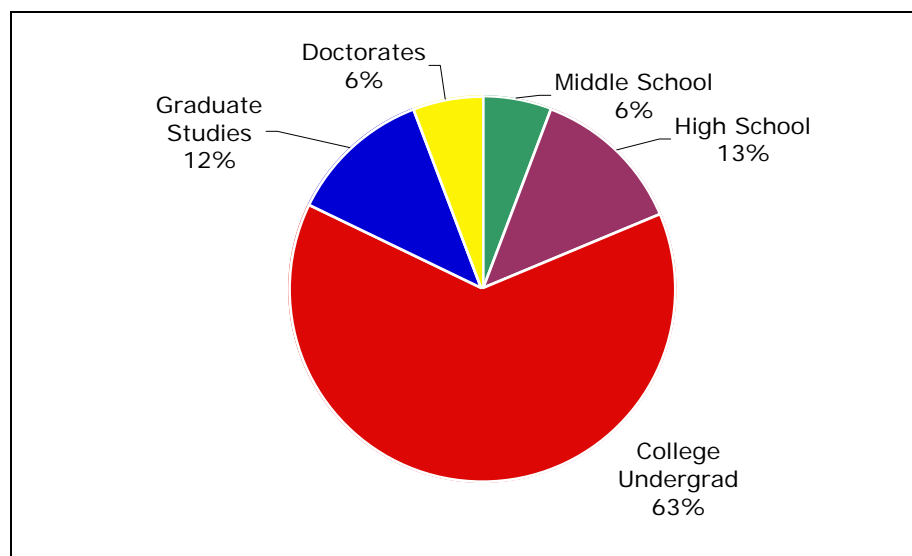


Figure 5: Academic level for Phase One participants

Phase Two

These participants provided qualitative responses to the perceived benefits of the quantitative results from the Phase One Research. They accounted for 18 [40%] from industry, 22 [49%] from academia, and 5 [11%] from other areas (Figure 6). Those participants had varying years of experience in Industry or their academic areas with [24%] having 1 to 5 years, [16%] having 6 to 10 years, [13%] having 11 to 15 years, [11%] 16 to 20 years, and [36%] with 20 plus years of professional experience.

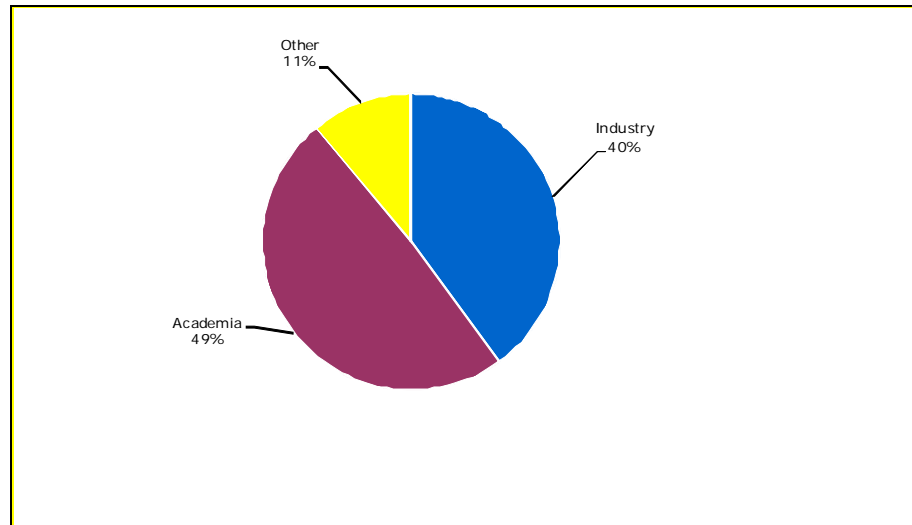


Figure 6: Phase Two participant's areas of profession

These participants' gender ratio was 58% males, 42% females. The age range for the sample was for participant under 20 years [0%], 21-30 years old [24%], 31-40 years old [11%], 41-50 years old [29%], 51-60 years old [27%], 61-70 years old [9%], and over 71 years old [0%].

Key Findings – Phase One

First Key Finding: Color Preferences for the Overall Group

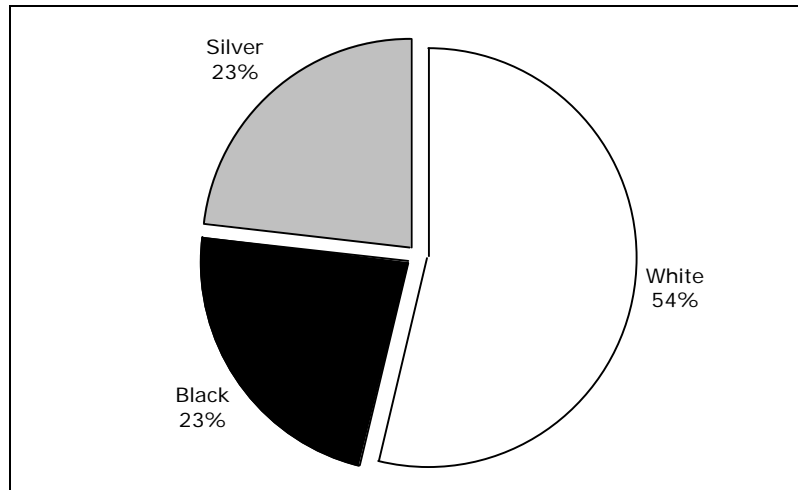


Figure 7: Top three background color preferences for overall group

When comparing the Phase Two findings and those observed in Phase 1, both research samples' favorite choice in color combinations for background and text color preferences was a WHITE background with BLACK text. In looking at 100% of the Phase Two observations, the sample's favorite choices in Background, Text colors preferences found that 33% preferred White Background, Black Text, and when looking at Link color preferences, 18% of the total group preferred White Background, Black Text, with Blue Links.

1. White Background with Black Text				
Average age	# of males	# of females	Sample size	% of sample
32	45	37	82	39%
1.a White Background with Black Text and Blue Link (sub-sample of 1)				
Average age	# of males	# of females	Sample size	% of sub-sample
33	26	13	39	48%
2. Black Background				
Average age	# of males	# of females	Sample size	% of sample
24	16	19	35	17%
2.a Black Background with White Text (sub-sample of 2)				
Average age	# of males	# of females	Sample size	% of sub-sample
24	N/A	N/A	17	48%
3. Silver Background				
Average age	# of males	# of females	Sample size	% of sample
33	16	15	31	15%
3.a Silver Background with Black Text (sub-sample of 3)				
Average age	# of males	# of females	Sample size	% of sub sample
33	N/A	N/A	20	65%

Table 1: Favorite choice in color combinations for background and text color preferences

Second Key Finding: Gender Observations

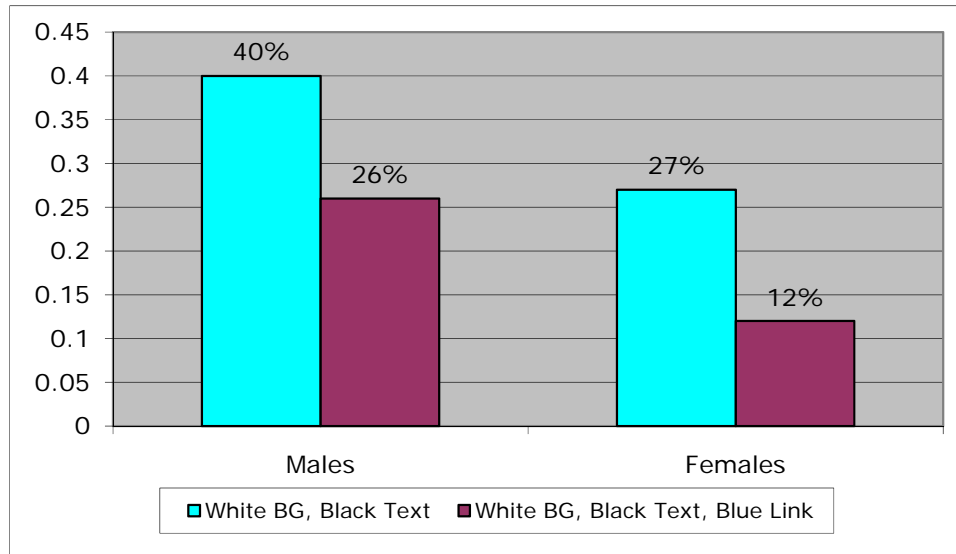


Figure 8: Popular Color preferences for backgrounds, text, and links by gender

In looking at gender color preferences, females' favorite combinations of colors for Background and Text; and Background, Text, and Link: 27% preferred a White Background with Black Text, and 12% preferred White Background, Black Text, and Blue Links. In looking at males' preferences, the similar favorite combinations of colors for Background and Text; and Background, Text, and Link: 40% preferred White Background with Black Text, and 26% White Background, Black Text with Blue Links.

Females' Top Preferences (> 5%)

Background and Text	Percentage
white-black	27%
black-white	7%
silver-black	5%
Background, Text and Link	
white-black-blue	12%
white-black-navy	6%

Table 2: Females' top preferences (> 5%)

Males' Top Preferences (> 5%)

Background and Text	Percentage
white-black	40%
silver-black	10%
black-white	9%
Background, Text and Link	
white-black-blue	26%
silver-black-blue	6%
black-white-blue	6%
white-black-navy	5%
white-black-red	5%

Table 3: Males' top preferences (> 5%)

Third Key Finding: Gender Significance Testing on Color Choices

Two Sample Variance Statistic for Text, Links, Background Color Preferences for Gender to Group by Testing the Null Hypothesis: (*Between subgroup comparisons looked at the variance in responses about the sample's color preferences and how they related to variables like gender.*)

Is there any statistical significance by gender in their popular choices of colors for Text, Links, and Background?

- Statistical testing found that specified popular chosen text colors are significant to the Male gender whereas specified popular text colors are not significant to Females within the sample.
- Statistical testing found that specified popular background colors are significant to the Female gender whereas specified popular background colors are not significant to Males within this sample.
- Statistical testing found that specified popular link colors are significant to the Male gender whereas specified popular link colors are not significant to Females within this sample.

When comparing specific popular color choices and their significance to each gender within this sample...

- Female popular choices for color preferences for background colors are more significant, than their popular choices for text and links.
- Male popular choices for color preferences for text and link colors are more significant, than their choices for backgrounds.

Is there a gender difference in response to color? These investigations have indicated that there are differences between genders in preferences for colors. Do those differences make a difference? Investigation shows that in some cases they do, in cases of color choices in text/links and backgrounds. It is OK to acknowledge that men and women are going to design, find attractive, or utilize web color space differently.

Fourth Key Finding: Age and Color Preferences

Both Phase One and Phase Two samples had similar choices in color preferences, however, the Phase Two participants had a larger age variance. When comparing choices in color between age groups, there was a considerable difference. For this study, the research focused on two sub-samples from the overall group of participants, those under (<30) and over 30 (>30) years of age.

In looking at the favorite color combinations for (> 30) sample with an average age of 32, it was observed that 39% preferred White Background, and that 33% preferred White Background with Black Text and 18% preferred White Background with Black Text and Blue Links. In looking at the favorite color combinations for (< 30) sample with an average age of 24, it was observed that 17% preferred a Black Background, and that 8% preferred a Black Background with White Text, and 3% preferred Black Background and White Text with Blue Links.

This research found that the two favorite preferences in color combinations were dominated by two distinct age groups, with the older sample preferring white or light backgrounds with dark text and the younger sample preferring black (dark) backgrounds with white or other colored text.

Black Backgrounds with White or (Colored) Text [< 30 years]				
Average age (total group)	# of males	# of females	Sample size	% of sample
24	16	19	35	17%
White Backgrounds with Black Text [> 30 years]				
Average age (total group)	# of males	# of females	Sample size	% of sample
32	45	37	82	39%

Table 4: Two favorite preferences in color combinations

Key Findings – Phase Two

First Key Finding: Majority of Respondents Find Color Research Beneficial

Roughly the same percentage of males (65%) and females (68%) found research on color preferences beneficial to their profession. After reading and reviewing the responses to the research findings from Phase One of this project, seventeen out of twenty-six male participants (65%) said that they found it beneficial to them in their field of work. Thirteen out of nineteen females (68%) said that this was beneficial to them in their profession. Some positive comments regarding this research's benefit include:

“This could be beneficial in terms of designing our marketing communications to be best perceived by the widest range of viewers.”

“Wonderful information to bolster the ongoing argument that there is a certain expectation of the user experience on a web site - there really are significant reasons to use certain common elements like "conventional " colors on a "business " or academic site rather than "decorating " a site like your living room with school colors.”

“Yes. I market numerous programs to the general public for continuous education and lifelong learning. It is helpful to be able to use color to more accurately capture the attention of my primary audience, many of whom are defined by age.”

“Since I advise my clients on their entire marketing presence (in addition to having my own web presence) it is good to know what the general population views as "good" and "positive" colors. In addition and breakdown by age and industry demographic would be even more useful for focused marketing activities to key demographic profiles.”

“I market numerous programs to the general public for continuous education and lifelong learning. It is helpful to be able to use color to more accurately capture the attention of my primary audience, many of whom are defined by age.”

What is significant about these findings are that both genders value this information and feel it is beneficial to their profession. Even though the participants work in different industries, academic or otherwise, they believe that better understanding the color preferences of their target audience will help them be more effective in reaching them. The findings also point out “universal favorite colors” which appear to stay the same whether the person is a male or female.

As more and more industries convert to digital processes, an increased emphasis will be put on using computers for all aspects of business, from distance learning to marketing. An understanding of usable colors will be a vital part of creating software and websites for these purposes. The direction of future research may need to expand from simple website colors, and expand color useage in various types of software, such as word processing, direct digital control, and any other software that is largely dependent on user interaction.

Second Key Finding: Varying Industries Agree That Color Research Applies to Them

Throughout the different subgroups, including industry, academics, and other professionals, the majority of people feel that this information would be applicable to their position.

Participants in Phase Two of this survey are very diverse. They include print facility managers, researchers, marketers, graphic artists, web designers, educational administrators, web content developers, consultants, webmasters, IT specialists, and professors. Although many of these subgroups seem to differ greatly, as a whole, 66% believe that this information is applicable to their job and could be used to better reach target audiences. Some positive comments regarding the research's applicability are:

"As a web designer and trainer utilizing multimedia, creating informative pieces that are easy to comprehend is imperative."

"People are people, and although each culture/country will identify with color in different ways, there are still implications for making color choices based on the audience and message, regardless of the area of work or study."

"This is applicable as I often use web pages as supplements to teaching face-to-face classes and I never like the "canned" templates that come with the programs. I soon will be starting an assistant professor position at a university that uses a lot of distance learning, so this survey about web colors will help me a lot then as well."

"Color and design are very important when developing a marketing presence of any kind and the web even more so these days."

"The results are applicable. They reinforce my opinion that most Internet users prefer clean, clear visuals vs. unusual color combinations and lower contrast."

These findings show the subgroups find this kind of information applicable to helping them target certain audiences more effectively. No matter if the people work in direct marketing of goods or services or not, they all wish to be able to gain the largest audience possible. By using color combinations that are appealing to certain demographics they are better able to get their message out to that specific demographic.

Once again, we see that all industries are concerned with people's color perceptions. As this research moves forward and expands, larger color areas will need to be addressed, such as color in print media and video production. We have learned through this research that the future of color preferences will always be a key component in most industries.

Third Key Finding: Continuation of Research

Of all responses collected, 66% would like a continuation of this research, and would like additional information collected in the future.

When asked if a continuation of this research would be useful in the future, we received a favorable 66% response in the affirmative. Those that responded positively were also asked if they would like anything included in future research. One of the most requested additions was to add different age groups, particularly those over 50 years of age. Some suggestions were:

"I think the more information gathered on this topic the better it would be. So yes, a broader study in this area should be conducted. Other variables that would be interesting to investigate besides color preferences are sound, motion, and embedded video."

"We're charged with creating a useful site that is easily navigated by students age 13 through 70. Any research into what works for the broadest audience, the lowest common denominator would be welcome. Is there a difference between what colors people prefer and what colors allow them to complete tasks on a site more easily /quickly? Any tie in to usability or accessibility?"

"Yes definitely. As more and more material is being accessed on screen it is important to understand how the end user perceives it. I would also be interested in font choice or size of the text color in relation to the background color."

"Yes, another study would be useful. I would be interested in knowing the average time spent on the web in a single session, as that may have some bearing on visual receptors and therefore color choices. I would also like to know whether subjects work or do school work online- and for what length of time in a single session; for example, I work on a computer almost all day (8 hours) and then use my home computer for an hour or more in the evening."

"Another characteristic may have significant value, is to also find out preferences based on length of time using the internet. This could show what the Digital Immigrants and Digital Natives each prefer, if it differs. This would allow application to older members of society who would like to use the technology but need additional help, as well as pointing towards the current and future users who are comfortable with the technology."

The significance of these findings show a continual learning process is required when color preferences are concerned. Although we were concentrating on web design colors, we have learned through the data collected in this research that color preferences span across all industries. What began as research into better web design has now become a look at color usage throughout all communication mediums.

Conclusion - Major Implications of the Findings

Results from this research found that in the sample of over 200 participants, in excess of one third of the group preferred a white background with black text. In addition to the preferences for the white background, black text, 18% of the total group preferred that combination with blue hyper-links. These findings show that a greater proportion of those surveyed preferred high contrasting page layout with blue hyperlinks. These preferences may reflect or symbolize conventionality in conservative web design, but it may also offer the designer or web content manager with more predictability of interface with website contents and greater usability.

In looking at gender color preferences, females were nearly half of the entire sample yet only 27% preferred white background, black text, with 12% blue hyper-links, whereas 40% of the males preferred white background, black text, with 26% blue hyper-links. There were nearly twice as many males with this preference over females. Statistical testing reflected these preferences in text and link colors to be significant to what the males were choosing in this group whereas the opposite was found significant for the females in their choices for background colors. Popular color preferences for females background colors are more significant than their choices for text and links. Male popular choices for color preferences for text and link colors are more significant, than their choices for backgrounds. In other words, the overall color of the webpage background colors and choices for women was more important than their preferences for text and link colors; whereas for men, the colors used for content associated with the text and hyperlinks was more important. For women it may be more about the aesthetics and look of a website, and with males its might have more to do with the details or particulars of the content. One can acknowledge that men and women are going to design, be attracted by or utilize web color space differently.

In looking at age as a variable, this research found that there are preferences in color combinations based on age groups. These results could reflect the difference in “digital immigrants”, those born prior to the computer/internet era and “digital natives”, those born within the era of digital technologies. People more accustomed to conventional print might prefer the conventional interface that mimics white paper pages with contrasting dark printed text, whereas a younger viewer is more comfortable with a differing electronic interface. Additionally, it may also reflect a difference in age as it relates to the eyes and the ability to see clearly and how that might influence color/contrast preferences. All these issues with age and color preferences should be taken into account for web designers and intended audiences.

In reviewing the comments and observations provided by the academic and industry experts, an overwhelming majority of respondents found this color research beneficial in terms of designing their marketing communications and bolster the ongoing argument that there are certain expectations of the user’s experience on a web site. There really are significant reasons to use certain common elements like conventional colors on a website. It is helpful to be able to use color to more accurately capture the attention of the primary audience, many of whom are defined by age. The results reinforce the opinion that most Internet users prefer clean, clear visuals vs. unusual color combinations and lower contrast.

Research into color preferences and how those choices affect usability are as important as the content that goes into a website. Addressing these issues should be an important aspect to web design and web design interface research about the human user and the colorimetric color space.

About EDSF (The Electronic Document Systems Foundation)

EDSF is a charitable foundation dedicated to preparing the next generation of professionals for the document management and communications industries. EDSF supports the marketplace's future by granting scholarships to students in support of their academic careers, by providing research grants to colleges and universities, by building an awareness about industry careers, and by recognizing innovative educators and educational programs. EDSF serves vendors and users who design and implement document solutions for business applications.

For more information about EDS, email info@edsf.org or visit the EDSF website at www.edsf.org.

About University of Northern Iowa

University of Northern Iowa (UNI) is a quality, state-supported university of approximately 14,000 students, located on the west side of the Cedar Falls/Waterloo metro area in northeast Iowa. UNI has been named one of the "Best in the Midwest" in the 2006 Princeton Review Best 351 College Rankings guide. UNI has ranked second in Midwest top public comprehensive universities by U.S. News and World Report for eleven consecutive years.

About the Research Team

Team Leader

Dr. Carl Blue is the Assistant Professor and Program Coordinator of the Graphic Communications Program in the Department of Industrial Technology, University of Northern Iowa. Academic research interests are the study of curriculum and instructional materials in communication technology, primarily how people use communication technologies, the design of human interface, natural mappings and communication technologies for usability and accessibility.

Student Team Members

Chris McGee is a U.S. Air Force veteran currently working towards a Bachelor of Arts in Graphic Communications. Born in Newmarket, England, he currently calls Cedar Falls, Iowa home. He enjoys computers and motorcycles, and splits much of his spare time between the two. Current interests include anything to do with the print industry, and learning as much as possible about all phases of design work. His future goals are to become a freelance graphic designer, and also to travel to countries other than the 13 he has already seen.

Ty Welu is a working toward a Bachelor of Arts in Graphic Communications and a Minor in Marketing with an expected graduation in December 2008. He is originally from Dubuque, Iowa and attends the University of Northern Iowa in Cedar Falls. He has worked at John Deere, Inc in the Information Technology department most recently. His goal is to be able to attain a job when he graduates next December 2008. He is interested in the advertising and marketing side of graphic communications.

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