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ABSTRACT
At eighty-two million people, Generation Y (18-31) is the largest generation since the Baby Boomers, spending $200 billion yearly. Little past research investigates the web preferences of Generation Y, although some oblique studies have been conducted. This study extends past research by looking specifically at the web design preferences of this important age group. Data is collected through subjective measures (self-report surveys) as well as objective measures (eye tracking). The eye tracker used in this study relies on reflections from the retina to gather data, therefore eliminating the need for headgear and thus allowing eye movement to be tracked unobtrusively. Analysis shows that Generation Y prefers web pages with a main large image, pictures of celebrities, a search feature, and little text. This study has important theoretical and practical implications for businesses and future research.

KEYWORDS
Generation Y, Millennials, HCI, eye tracker, fixation, usability, web design

INTRODUCTION

Generation Y, the largest generation since the Baby Boomers (Neuborne 1999), spans in age from fourteen to thirty-one (Norum 2008). For the purposes of this study, the age range of Generation Y has been narrowed to ages eighteen to thirty-one because increased financial independence is gained at the age of 18. The investigation of web preferences of those between 14 and 18 years would not add a great deal of value to this study. This generation consists of eighty-two million people (Waters 2008). With $200 billion to spend yearly, "as much as half of all spending in the economy," Generation Y has a great deal of influence on the market (Waters 2008). Thus, to maintain relevance, corporations need to better understand this unique, technology-savvy generation and their needs (Neuborne 1999). Despite representing an important segment of the market (Waters 2008), there is little research on the web preferences of Generation Y. To address this need, we examine the web design preferences of this generation through two separate studies: an online survey and a laboratory study, in which Gen Y users are asked to view several top retail websites. In the survey study, users are asked to rate the visual appeal of each of these websites. In the laboratory study a noninvasive and unobtrusive eye tracking equipment is used to examine users' fixations when viewing these web pages.

THEORETICAL FOUNDATION & HYPOTHESES

Consistent with prior research (Eppler & Mengis 2004), we conducted a methodological search of the EBSCO research database to find prior research relevant to our study. The results revealed the paucity of research on the web preferences of Generation Y. As shown in Table 1, our search resulted in total of three articles, with one article appearing in the search results twice. The results and terms used in the search are as follows:

Table 1: The results of search using EBSCO database

	Generation Y	Millennials
Web and design	0	0
Internet and design	0	0
HCI	0	0
"human computer interaction"	0	0
Interface design	0	0
Web and preferences	3	1
Design preferences	0	0

Although these three articles mention the terms "web", "preferences", and "Generation Y", none examines Generation Y's web preferences. In one of these articles, Papini discusses the importance of understanding the preferences of Generation Y for the financial industry. She identifies Generation Y as having strong internet skills and being averse to "irrelevant marketing" (Papini 2007, 8). Papini cites a 2003 report, stating that the majority of Generation Y respondents preferred to receive financial information via the internet, yet she does not provide any suggestions or guidelines on how to present this information.

Another article discusses General Mills' plan to create customized cereals for market segments such as Generation Y using their website to gather information. Finally, the third article is geared toward the restaurant business, focusing on different market segments' dining needs, including Generation Y, and through which medium customers in general prefer to view a menu (Romeo 2000).

Although our research shows that little attention has been given to direct examination of Generation Y's web preferences, there are some oblique studies that provide valuable information for conducting such research. For example, advertising literature states that Generation Y responds well to information related by well respected messengers, such as "TV and movie stars, athletes and musicians" (Cook-Anderson 2003, p. 8). Another previous study (Chadwick-Dias, Tedesco and Tullis 2004) shows that younger participants (under forty years) who were asked to design their own web pages chose to include a search bar rather than including many links. While literature shows that websites with pictures that are aesthetically pleasing are more effective (Cober, Brown, & Levy 2004), it is suggested that pictures on a website may be particularly important to Generation Y users (Nielson 2005). This is because not only does Generation Y like "cool graphics," but this generation also does not like to read blocks of text, is impatient and easily bored (Nielson 2005). Further, picture size may also be more important to Generation Y users. A recent report states that picture size is a major factor in encouraging users to view videos on cell phones and ipods (Jarratte & Mahaffie 2007). This, combined with Generation Y's preference for little text, suggests that Generation Y may prefer web pages with a large image dominating the page. This phenomenon has also been observed in past research conducted at Fidelity Investments' usability labs, and our research will directly examine this possibility.

Based on the above discussed studies, we speculate that Generation Y prefers pages with the following characteristics:

- **a.** A main large picture
- **b.** Pictures of celebrities over pictures of people in general
- **c.** A search feature over many links
- **d.** Little text over blocks of text

We hypothesize that Generation Y will prefer web pages that have the above characteristics over ones that do not have those characteristics (e.g., prefer pages with a main large picture over pages without a main large picture). In particular, we expect Generation Y to prefer pages that have less text and more images, particularly pictures of celebrities and,/or a images that dominate the page, We also hypothesize that Generation Y will prefer web pages that have more of the above characteristics over those with little of the above characteristics. To test this latter

proposition, we calculated a preference score (based on the above characteristics) for the web pages used in our study. We expected pages with high preference score to be more appealing to Generation Y users. In the next section, we explain how these preference scores were calculated.

CALCULATING WEB PAGE PREFERENCE SCORES

As discussed in the previous section, we hypothesized that certain web characteristics (i.e., a large main image, pictures of people – particularly celebrities, little text, search bar) are expected to be appealing to Generation Y. Consistent with previous research (Tullis & Tullis 2006) we randomly selected fifty of the top one hundred retail pages according to ForeSee Results gold standard American Customer Satisfaction Index results (Freed 2006). We then ranked the randomly selected fifty retail web pages based on these characteristics. To do so we calculated a preference score based on the number of characteristics present on the web page. For example, if a web page had little text, a large main picture, and pictures of people, its preference score was set to three. This calculation generated a set of preference scores ranging from 2 to 9 with 5.62 and 5 as mean and median scores. The descriptive statistics for the calculated preference scores are displayed in Table 2.

Table 2: Descriptive Statistics for the calculated Preference Score

Min	Max	Mean	Median
2	9	4.88	5

Next we categorized these pages into two groups: high and low preference scores. The first group contained pages with scores higher than the median preference score. The second group contained pages with scores lower than the median preference score. The results of a t-test showed that the mean of preference scores in these two groups were significantly different (see Table 3).

Table 3: Results of t-test comparing the mean of web pages in high and low preference score groups

	Mean	Standard Deviation
High preference score	6.75	1.06
Low preference score	3.38	0.60
	df=35, t=12.27, p=0.000	

We expected that pages in the high preference score group will be more appealing to Generation Y. In particular, we expected that Generation Y would show greater preference for pages with those features that we hypothesized would be preferred by them (e.g., search bar, picture of celebrities, etc.). To examine this expectation, we conducted two studies. In the first study, we used a self report method to collect information about the visual appeal of the web pages. In the second study, we collected the same information through an eye-tracking device; in particular, we examined the parts of a page that captured user's attention the most.

TASK

To examine design preferences of Gen Y users, participants were asked to rate the visual appeal of approximately fifty web pages. The web pages were randomly selected from the top one hundred retail websites according to ForeSee Results' Top 40 Retail Satisfaction Index (Freed 2006). In order to remain consistent throughout the length of the study (e.g., avoid situations where company's website is updated) subjects were provided with images of the pages instead of live links. The pages were viewed in random order by all participants.

STUDY I: SURVEY

This study used a self-report method to examine users' reaction to a set of webpages. In the following sections we discuss how this study was conducted.

Methodology

Participants and Design

Ninety-eight users participated in our study. Fifty six percent of our participants were male (55 males) and forty four percent were female (43 females). The age of participants ranged from eighteen to thirty-one. All participants

reported to have high levels of internet experience. The survey was posted on online forums (e.g., facebook.com). In addition, participation from college students and Fidelity employees were solicited through e-mail. Participants were offered the chance to be entered into a raffle to win a $50 Amazon gift card after completing the survey.
As in prior research, participants were asked to rate the visual appeal (Lindgaard G., Fernandes, G., Dudek, C. & Brown, J. 2006; Tullis & Tullis 2006) of 50 top retail web pages. The pages were viewed in random order by all participants – sample images of these pages are displayed in Figures 1-3.

Procedure

Participants started the experiment by clicking on the link to the experiment's page. The first page provided a general overview of the study's purpose, with an explanation of privacy, and informed participants about the incentive. This page also made it clear that participants were expected to rate the pages based on visual appeal as opposed to content. The next page requested background information from the user, specifically gender, age, and internet experience. The users then viewed and rated the web page images in random order. Upon completion, participants were asked to enter their e-mail address in order to be eligible for the raffle.

Measurements

Using a survey used in recent web studies (Djamasbi, S., Tullis, T., Hsu, J., Mazuera, E., Osberg, K., & Bosch, J. 2007; Lindgaard et al. 2006; Tullis & Tullis 2006), participants rated web pages based on visual appeal using a five-point Likert scale, with one denoting not at all appealing and five very appealing.

Results

As mentioned in an earlier section, we calculated a preference score for each web page. Next we categorized these pages into high and low preference score groups. We expected the high preference score group (pages with more Generation Y-liked characteristics) to be more appealing to Gen Y users (receive higher visual appeal ratings). The results of t-test showed that, as predicted, the mean self reported visual appeal for the pages in the high preference score group was significantly higher than the mean self-reported visual appeal of the web pages in the low preference score group. The results also showed that the mean visual appeal rating for pages that contained images of celebrities were significantly higher than the mean rating for those pages that contained images of people who were not famous, i.e., the pages with images of celebrities were found more visually appealing than the pages with images of people in general. Similarly, the results of the t-test showed that web pages with a large main picture were considered more appealing (had significantly higher ratings) than those without a large main picture, and pages with a search feature were rated significantly higher than those with many links but no search feature. The results also showed that the pages with a large main picture (which had less text) received significantly higher ratings than those that had more text. These results, which support our predictions, are displayed in Table 4.

Table 4: Results of t-test for self report survey

Page Characteristic	Mean	Standard Deviation
Pages in the high preference score group	3.47	.60
Pages in the low preference group	3.07	.60
	df=97, t=8.57, p=.000	
Images of celebrities	3.60	.93
Images of people	3.12	.62
	df=97, t=6.85, p=0.000	
Large main image	3.31	.62
No large main image	3.04	.57
	df=97, t=5.90, p=0.000	
Search feature	3.14	.59
Many links	3.02	.62
	df=97, t=7.40, p=0.000	
Large main image	3.31	.62
More of text	2.98	.63
	df=97, t=9.46, p=0.000	

STUDY II: EYE-TRACKING

The objective of this second study was to extend the results of the above survey study. In this study we used an eye-tracker to capture users' fixations on a page. Thus, the results of these two studies together provide a more complete picture of users' reaction to a page.

Methodology

Participants

Nine participants, also ranging in age from eighteen to Thirty-one and with high internet experience, took part in the eye tracking study. Because participants were required to come into the Fidelity usability lab for the study (where this experiment was conducted), participants were solicited from within the Fidelity Investments offices and nearby colleges. Participants received a $50 American Express gift card.

Design

The same webpages that were used in the survey study were used in this study as well. As in Study I, we used images of webpages pages rather than their live links. Once again, as in Study I, the web pages were viewed in random order.

Procedure

This experiment was completed in the usability lab in nine consequent sessions (one session per each participant). Each participant was escorted to the usability lab and asked to review and sign an informed consent form. As in Study I demographic information such as gender, age, and internet experience was collected before viewing the webpages. The eye tracker was calibrated for the user at the beginning of each session. To do so, the participant was asked to follow a red dot which appeared on the four corners and center of the computer screen. The calibration process took approximately ten seconds.

After calibration, participants began viewing the pages. Participants were told to view each page for at least ten seconds. After viewing and rating the page the participants could move to the next page by clicking on a button (participants had control of the mouse, allowing them to choose when they continued to the next page and to scroll). Once all of the pages had been viewed, participants were thanked for their participation and were debriefed. The entire procedure for each participant did not exceed 30 minutes.

Measurements

The eye tracker used four infrared sensors on the monitor to extrapolate the user's fixation (how long a user looked at something on the page). Consistent with previous studies, fixation was defined as a gaze of longer than 300 milliseconds (Djamasbi et al. 2007). These fixations were then represented through heat maps or hot spots which demonstrated where on the pages the participants collectively fixated. In these maps, red indicates a high fixation, while yellow and green indicate decreasing amounts of fixation. Uncolored areas were not fixated upon. According to Pan, B., Hembrooke, H., Gay, G., Granka, L., Feusner, M., & Newman, J. (2004), fixation has been linked to intense cognitive processing.

Results

Based on previous research (Neilson 2005, Cober et al. 2004) and past observations, we expected that a main big picture as well as picture of people capture Gen Y's attention on a web page. The analysis of users' gaze provided evidence for this expectation. For example, on the Neiman Marcus page (Figure 1), the main fixation is on the central picture (large main picture) and there is additional strong fixation on the woman to the right (pictures of people). Although text does have some fixation, as the heat map shows, the participants' main focus is on images.

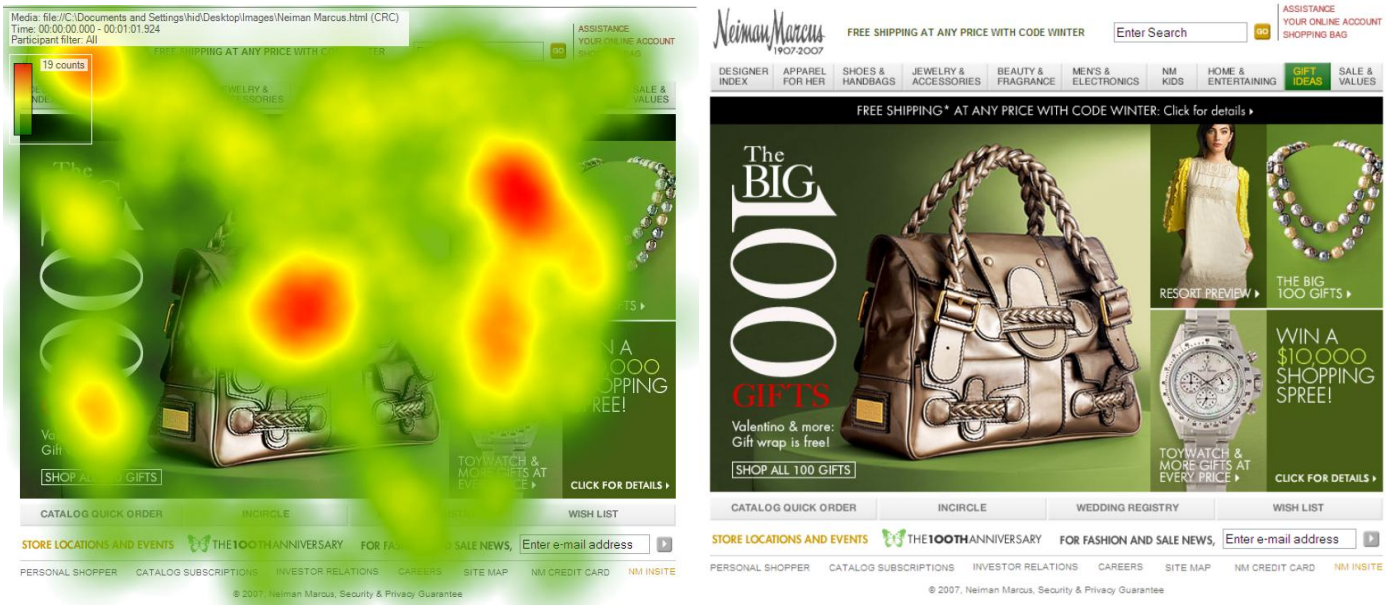


Figure 1: Heat map for Neiman Marcus web page. Users fixated a great deal on the large central picture and the person on the right. Color indicates fixation, with red meaning very high fixation and green indicating lower levels of fixation across users.

Our analysis also showed that fixation on images of celebrities, compared to images of people in general, was longer. This can be seen through a comparison of the Gap web page and the Netflix web page. The fixation on the two women in the pictures, both celebrities, on the Gap web page is depicted through very vibrant red, indicating high fixation. In contrast, the family on the Netflix web page has low fixation on the people (who are not celebrities), depicted through some green across the faces and some lighter red on the adult female's face. On the Netflix page, the most attention is paid to the pricing and free trial.



Figure 2: Heat map for Gap and Netflix web pages, comparing fixation on celebrity against fixation on people in general. Color indicates fixation, with red meaning very high fixation and green indicating lower levels of fixation across users.

Navigational links and the search feature both have some fixation. As can be seen in the Toys R Us web page below, there is some fixation on the search bar and on the navigational links on the top and left of the page (where links are conventionally placed). However, many of the links in the middle of the page, particularly those without images, were ignored.



Figure 3: Heat map for Toys R Us web page. Users fixated on links on the top and left of the page and the search bar, but had low or no fixation on links in the middle of the page. Color indicates fixation, with red meaning very high fixation and green indicating lower levels of fixation across users.

The gaze data also show that participants fixated on images much more than text. As can be seen on the heat map for American Girl (Figure 4, below), there is one large, strong hot spot (red) on the main picture, then smaller ones on the pictures across the middle. Very little to no fixation is given to the blocks of text beneath the pictures.

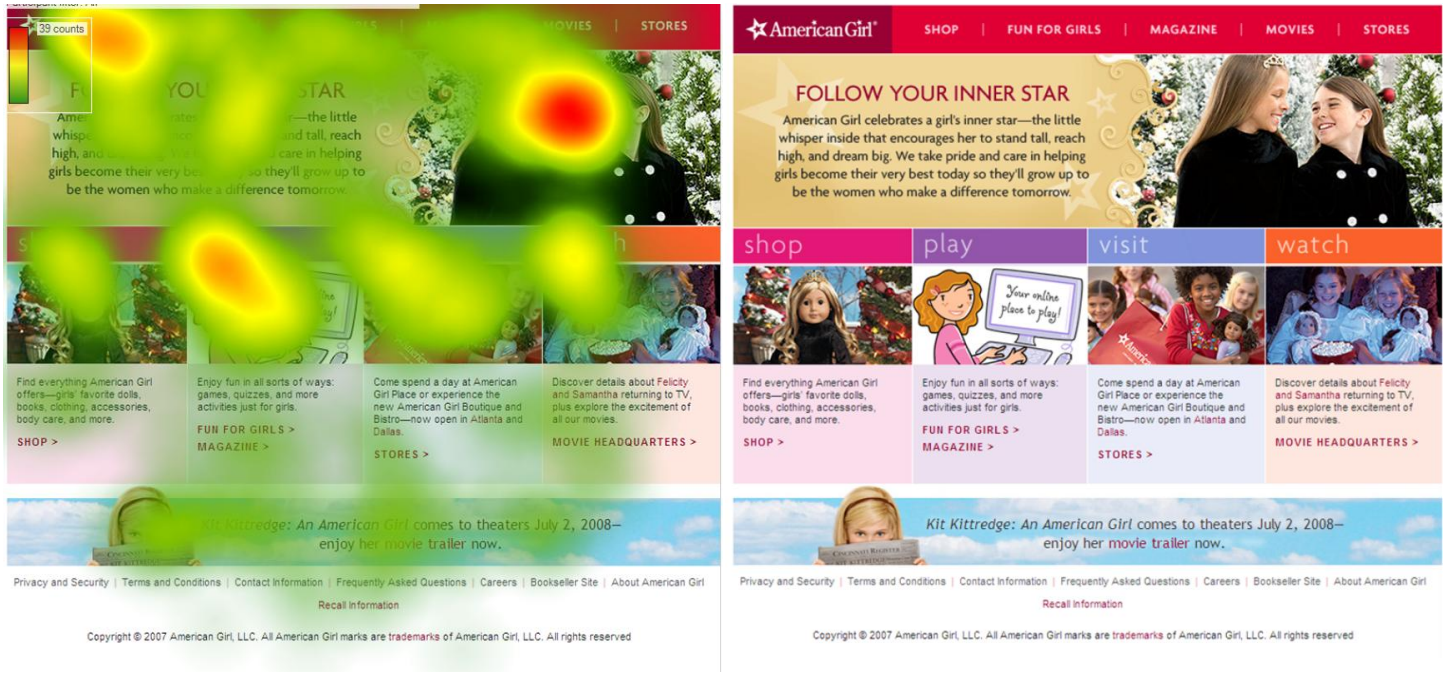


Figure 4: Heat map for American Girl web page. Users fixated images a great deal more than blocks of text. Color indicates fixation, with red meaning very high fixation and green indicating lower levels of fixation across users.

DISCUSSION

This study examined the web preferences of Generation Y through both a survey and an eye tracking study, with particular attention to several web page characteristics. Through the survey, it was discovered that Generation Y likes web pages that provide a search feature, include picture of celebrities, have little text, and contain a large main image. The eye tracking data provides further empirical evidence to support these findings. Fixation levels, interpreted as interest, were higher for large, main images and images of celebrities. Participants also fixated on the search bar more than many links and pictures more than text.

The results of this study are consistent with and support prior research that show people under forty like to include search feature in their web design (Chadwick-Dias et al. 2004), that suggest Generation Y respond favorably to messages delivered by celebrities (Nielson 2005), and that suggest younger users may prefer large images (Jarratte & Mahaffie 2006). Thus, our study provides the rational and theoretical direction for future research into the web preferences of Generation Y. The results of this research have also important practical implications, particularly for corporations targeting the Generation Y market segment. This research provides information on how to redesign web pages to be appealing to this important market.

LIMITATIONS & FUTURE RESEARCH

The eye tracking portion of this study was necessarily conducted in a laboratory environment. As with any laboratory study, the generalizeability of these results are limited to the laboratory setting and the task used. We reduced the threats to external validity by using an unobtrusive eye tracker to track fixations in a setting (Fidelity Usability Labs) which is designed to resemble realistic environments. Additionally, the survey study was completed online in a setting of the participant's choice.

Our methodological search for prior research on web preferences of Gen Y showed that our study is the first to examine this topic. Hence our study lays an important foundation for future research toward investigating Gen Y web preferences. For example, future studies using different tasks (e.g., assigning participants to complete a task rather than browsing a page) are needed to refine our results. Moreover, future studies are needed to compare web

preferences between different generations, such as Generation Y (aged 18-31) and the Baby Boomers (aged 44-62), which form formidable market segments and thus are of particular importance to companies.

CONCLUSION

In this study, grounded in previous research, we hypothesized that certain web features on a web are preferred by Generation Y. Using these hypothesized characteristics, we categorized fifty top retail pages into two categories: pages that are more preferred by Generation Y, pages that are less preferred by Generation Y. The results of our survey confirmed our categorization and showed that this generation prefers pages with a large main image, pictures of celebrities, little text, and a search feature. By tracking users' gaze, we were able to provide objective evidence (hot spots) for the self reported survey results.

The results of this study have both important theoretical and practical implications. From the theoretical point of view, this research extends previous studies that examine Generation Y preferences to include their web preferences. This research also extends usability studies to include generations in their models. From a practical point of view, this study suggests that inclusion of certain characteristics (e.g., pictures of celebrities) can lead to a higher level of visual appeal of the web page, potentially leading to the attraction of more new Generation Y users as well as higher return rates. With technological advances, it is easier and more effective to target specific audiences. This approach should be preferred since targeting different market segments as one melded population attempts to appeal to everyone and in the end appeals directly to no one. In particular, companies with Gen Y as their target market can benefit from the results of this study.

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