

# Generation Y, web design, and eye tracking

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Received 2 October 2008; received in revised form 1 October 2009; accepted 29 December 2009

Available online 4 January 2010

## Abstract

Generation Y (age 18–31) is a very large and economically powerful generation, containing eighty-two million people and spending \$200 billion annually. It is not surprising that companies are interested in gaining the patronage of this group, particularly via the web. Surprisingly, very little research into making web pages appealing to this important demographic has been done. This paper addresses this need through two separate studies. The first, an online survey, provides evidence that our proposed score for predicting the visual appeal of web pages reflects the self report measure of what pages Generation Y likes. To refine these findings, an eye tracking study is conducted using the pages that were most and least liked in Study I. Participants' eye movement is tracked while browsing these pages, providing evidence of what attracts their attention. The results of these two studies suggest that Generation Y may prefer pages that include a main large image, images of celebrities, little text, and a search feature. This research has important implications.

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**Keywords:** Generation Y; Millennials; HCI; Human computer interaction; Eye tracker; Fixation; Gaze; Usability; Web design

## 1. Introduction

Many companies use the World Wide Web as a major channel to broaden their reach and market share (see Loiacono and McCoy, 2004). This is evident by the total sales of goods and services over the Internet, which increased from \$172.4 billion in 2005 to \$201.7 billion in 2006. This number is projected to further increase to \$328.6 billion in 2010 (US Census Bureau, 2007). Given this, it is not surprising that improving users' web experiences has become a major theme in industry research labs (e.g., Tedesco and Tullis, 2006; Tullis and Stetson, 2004). Research indicates that whether a user finds a website visually appealing (Lavie and Tractinsky, 2004; Lindgaard et al., 2006) often has a powerful impact on forming his or her perception of website usability (Schenkman and Jönsson, 2000; Tractinsky et al., 2000). Thus, making

websites visually appealing has become of great importance to organizations (Djasasbi et al., 2007, 2008).

In particular, companies are interested in capturing the patronage of Generation Y (age 18–31). At eighty-two million people, this generation could account for as much as “half the spending in the economy,” or \$200 billion in annual spending (Waters, 2006). This demographic has the added distinction of having been exposed to technology since childhood, making it a unique target market. As an extremely technologically savvy demographic, Generation Y demands that corporations understand them and their needs and adapt accordingly in order to maintain relevance in a competitive marketplace (Neuborne and Kerwin, 1999). Despite the compelling relevance of Generation Y to both business (Waters, 2006) and academics, very little research has been done on their web preferences. Because Generation Y is such an important segment of the market, making websites visually appealing to this group of users has become an important challenge for many companies (Djasasbi et al., 2008).

The following section provides background on the subject of this paper. Next, the two studies conducted are

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presented: Study I, an online survey, and Study II, an eye tracking study. Finally, the implications of the findings are discussed, as well as the ways this research can be extended by future studies.

## 2. Background

Information on a web page is typically communicated through its perceptual elements, such as text and image. Creating a ‘visual hierarchy’ through the proper arrangement of these perceptual elements can naturally guide users in viewing the page (Faraday, 2000). For example, the size of an object is an important factor in its perceived visual importance—the larger the item, the greater its importance and, consequently, the higher its level in the visual hierarchy (Faraday, 2000). Similarly, images and graphics affect visual hierarchy because viewers tend to process these first. As an example, a number of studies show that people tend to gather information on a newspaper page by scanning images on the page first, then reading the text (Brandt, 1954). The location of perceptual elements on a web page also influences the visual hierarchy—components that are placed at the top of a page tend to be perceived as more important (Faraday, 2000). It is not surprising, then, that people tend to expect the title to be located at the top of a page (Bernard, 2001). Creating a visual hierarchy on a web page can make it easier to understand (Faraday, 2000), consequently making it more usable. Table 1 displays the summary of factors that affect visual hierarchy by influencing a user’s entry point to a page (Faraday, 2000).

Making web pages more usable is important to companies because a good web design can keep users from moving away from the website. While users may move away from a website for technical reasons (slow download) or content reasons (the information on the page), studies suggest that form (the impression of a page) can also be a reason for moving away from a website (Schenkman and Jönsson, 2000). A good web design can also attract new users such as those surfing the web without any particular intention (e.g., to look up a certain piece of information). Such new users may be attracted to a page through various methods, but the visual appeal of the page may be particularly important (Schenkman and Jönsson, 2000).

Table 1  
Factors affecting visual hierarchy by influencing point of entry to a page.

1. Motion (animated elements draw user attention before any other elements)
2. Size (larger objects attract more attention )
3. Images (images attract more attention than text)
4. Color (elements with brighter colors attract more attention than those with darker colors)
5. Text style (typographical variations serve as effective non verbal cueing systems for attracting attention)
6. Position (top elements attract more attention than those located on the bottom)

In addition to keeping users from moving away from the website or attracting new users, the visual appeal of a web page can have a strong effect on the evaluation and enjoyment of a website (Lindgaard et al., 2006). In social psychology literature, this is often called the halo effect or confirmation bias (Lindgaard et al., 2006; Nisbett and Ross, 1980). No matter its name, this effect holds true even when a site is little more than marginally usable; one study found that although they could, on average, complete less than half the assigned tasks successfully, participants still valued websites that they had previously found highly visually appealing (Lindgaard and Dudek, 2002). Even major usability flaws on a website can be overlooked based on an extremely positive first impression. The lasting effect of a first impression is not limited to *positive* first impressions (Everard and Galletta, 2003). In fact, if users’ first impression of a website is negative, confirmation bias will keep them from changing their opinion in spite of positive evidence to the contrary (Lindgaard et al., 2006). Consequently, visual appeal has been recognized as an important factor in determining a website’s quality and a good predictor of a user’s intention to purchase an item or revisit the website (Loiacono et al., 2002). Furthermore, an appealing website may be important in developing the trust of users (Karvonen, 2000). Users’ statements, such as “if it looks pleasant, I just trust it,” in studies provide evidence that visual appeal has a significant effect on important issues such as “trusting a service to be reliable and secure” (Karvonen, 2000; Karvonen et al., 2000).

### 2.1. Investigating visual appeal

There are two main general approaches to investigating aesthetic responses: one that investigates reactions to the whole object and one that examines reactions to isolated parts of an object (Lavie and Tractinsky, 2004). The former approach is grounded in the Gestalt theory, which suggests that one’s perception of an object cannot be decomposed into its elementary parts (Arnheim, 1988, 1992). Because the “wholeness” of a perception is not necessarily the sum of its parts, to understand visual appeal, one must “evaluate complete and natural stimuli” (Lavie and Tractinsky, 2004, p. 274). Because this type of research is concerned with the ecological validity of a stimulus, it promotes the use of complete real world stimuli rather than artificially created ones that may capture only aspects of the stimuli, such as prototypes. For example, according to this approach, the aesthetic preferences for various architectural styles and environmental designs are best understood when people consider the actual stimuli (e.g. buildings, art works, environmental scenes) (Arnheim, 2004, p. 78; Nassar, 1984, 1992, p. 276; Oostendorp and Berlyne, 1978) rather than their isolated attributes (e.g., shape, color, etc.). Because of its emphasis on the “wholeness” of stimuli, this category of research often takes an exploratory approach to understanding factors that represent subjective evaluations of stimuli (Lavie and

Tractinsky, 2004). In the case of websites, this angle of research suggests that the aesthetic evaluation of a web page should consist of a subjective appraisal of the web page as a whole, not the assessment of its discrete elements.

The second approach to studying visual appeal complements the first by studying reactions to individual elements. According to this second approach, aesthetic responses are best understood by examining reactions to the atomic parts of an object (Martindale et al., 1990; Swede, 1994). The roots of this approach are grounded in the field of experimental aesthetics, which argues that aesthetic preferences are governed by mathematical rules such as the golden ratio (Arnheim, 1988; Livio, 2002). According to this view, one's aesthetic preferences can be predicted through functions that depend on the inherent qualities of a stimulus. For example, the aesthetic theory proposed by Berlyne (1974) predicts that one's preference for a stimulus and the stimulus's potential for arousal can be demonstrated by an inverted *U* function. Aesthetic responses, according to this line of research, are best uncovered by a scientific method of experimentation (Swede, 1994) which examines the effect of isolated parts of a work of art (e.g., polygons) on the observer (Martindale et al., 1990; Swede, 1994). For studying web pages, this approach tries to understand what web components have significant impact on a user's perception (Lavie and Tractinsky, 2004).

Each of the above discussed approaches to studying visual appeal is valuable in advancing our understanding of web aesthetics because each reveals different aspects of user behavior (Lavie and Tractinsky, 2004). In order to benefit from both approaches, data was collected in two ways. First, we gathered participants' subjective, self reported ratings of web pages through a survey on visual appeal. This allowed us to collect information on the participants' perceptions of the actual holistic stimuli. In addition, we collected data on eye movement and gaze. This allowed us to collect reactions to the parts without affecting the ecological validity and/or "wholeness" of the stimuli. Eye movement and gaze data can reveal, which web components attracted attention and thus played a role in forming the users' perceptions.

In this study, we focused on examining visual appeal for Generation Y because studies suggest that web aesthetics may be particularly relevant to this generation (Tractinsky, 2004, 2006) because, unlike prior generations, Generation Y has grown up with technology. Despite being an important segment of the market, there is little research on the web preferences of Generation Y. In the following section, we provide a brief review of Generation Y research that is applicable to our study.

## 2.2. *Generation Y*

Spanning in age from eighteen to thirty-two (Fox and Jones, 2009), Generation Y consists of eighty-two million people with \$200 billion in annual spending (Waters, 2006). Generation Y is one of the first generations to have

technology and the internet from a very early age—they are significantly more likely than older internet users to create blogs, download music, instant message, and play online games. Additionally, Generation Y searches for health information, conducts job research, banks online, and makes travel reservations (Fox, 2008). Their wide and prevalent use of the internet, combined with their distinct position of growing up exposed to advanced technology, makes Generation Y a unique target for companies as well as a unique demographic to study (Djamasbi et al., 2008).

Some studies suggest that web aesthetics may be particularly important to Generation Y users (Tractinsky, 2004, 2006). For this generation, who has grown with technology, usability is a given and aesthetics are not a bonus but an expectation. As explained in Maslow's hierarchy of needs (Maslow, 1970), the satisfaction of our basic desires—in this case, the functional requirements of a webpage—leaves us free to pursue our higher order desires—in this case, aesthetics (Tractinsky 2004, 2006). Because members of Generation Y have grown with high level technology, they expect a certain level of functionality to be a norm. When this need is met, they are then free to pursue higher desires, such as visual appeal. Generation Y is searching for a more complete experience that allows them to complete goals through basic functionality and provides an experience.

Supporting this view, there is evidence that the visual appeal of the homepage of a retail site may be particularly important to Generation Y. The store atmosphere and storefront (or homepage, in the case of retail websites) design affects Generation Y's impression of a store's image, as well as their expectation of merchandise quality (Oh et al., 2008).

Despite the economic power and unique circumstances of Generation Y, however, little has been done to examine what web characteristics are appealing to this group of people. As a first step, in this paper, we examine the reaction of Generation Y users to several factors that may influence their perception of the visual appeal of a retail web page. These characteristics are discussed in detail below.

## 3. **Methodological search for prior theoretical studies**

To provide evidence for the need for exploration into this area of research, we conducted a methodological search for relevant articles on web preferences of Generation Y. As in prior research (Djamasbi et al., 2008; Eppler and Mengis, 2004), we used the EBSCO research database, which provides access to approximately 2000 peer reviewed journals. Additionally, the HCI Bibliography and the Association for Computing Machinery (ACM) Digital Library were searched. We searched the title, keyword, and abstract for the following terms: web and design, internet and design, HCI, human–computer interaction, interface design, web and preferences, and design preferences in combination with Millennials or Generation Y.

The EBSCO search resulted in a total number of four articles, with one appearing twice. Three of these articles were irrelevant to the topic of this research. Although these articles mention web preferences and Generation Y, none of them actually address the web design preferences of Generation Y. The first article discusses General Mills' plan to do market segment research on Generation Y via their website in order to create products specifically geared to them (Romeo, 2000). Another article discusses the importance of understanding Generation Y to the financial industry, specifying that Generation Y prefers to get information via the internet and is averse to "irrelevant marketing." It does not, however, provide guidelines for providing this information. The third article focuses on the food service industry, focusing on different market segments dining needs and examining through which medium customers prefer to view menus. The fourth and final article is about how to market to Generation Y, specifically suggesting including interactive features on a website. It does not provide any guidelines on how to utilize interactive features, nor does it provide any other suggestions on design features that would appeal to Generation Y. The HCI Bibliography returned no search results.

The ACM Digital Library returned eighteen search results, none of which were relevant to this research. Half of the articles had to do with education. Specifically, three articles discussed altering communication methods to include technology such as instant messaging, blogs, and wikis. Three articles discussed improvements to software engineering and programming classes through interactivity and social collaboration, while another article debated the merits of adding soft skills to MIS and accounting curricula. A fourth article provided tips and best practices to use Flash player to deliver curricula. The fifth article discussed a university's decision to unblock certain websites and media in order to allow students to use on-campus computers to learn in the manner they are accustomed, through multitasking. The articles that were not on education varied in topic. Two articles were about the "Spicy system," which helps select the best mappings among two data sources. The third article was on methods for improving imbedded system design, while another discussed information overload. The fourth article talked about a nutrition monitoring system for young adults. The fifth article discussed the current and future challenges of women in IT. A sixth article discussed authentication interfaces to be accessed via mobile devices. The seventh article was a panel discussion on the truth of the statement that gaming is the dominant medium of the future. The final article was on the attitude of Generation Y towards sustainability through the material effects of information technologies.

The small number of articles relevant to this research topic resulting from our methodological search in academic, peer reviewed journals and conferences provides evidence that little empirical work has been done to

investigate the web design preferences of Generation Y. This calls for scientific examination of Generation Y's reaction to websites.

#### 4. Web characteristics and characteristics score

While there has been little direct research on the web preferences of Generation Y, there are some studies that provide clues to guide our research. Based on the research described below, four characteristics were identified that may be particularly appealing to Generation Y: main large picture, pictures of celebrities, search feature, and little text. Using these characteristics, a score was calculated. Next, the possibility that this score could predict the visual appeal ratings of the web pages used in this study was examined. In the following sections, these characteristics are defined for the purposes of this research, and theories for why they may be appealing to Generation Y are explained.

##### 4.1. Main large picture

While websites with pictures are said to be more aesthetically pleasing in general (Cober et al., 2004), the inclusion of pictures on a website may be particularly important to Generation Y, as this group likes "cool graphics," balks at reading large blocks of text, and is impatient and easily bored (Nielson, 2005). Because Generation Y likes fast service (Fields, 2009), has a "short attention span," and does not like to read "long boring text" (Perez, 2008), it is likely that this generation particularly enjoys the presence of images on web pages. According to the theory of visual rhetoric, images can communicate complex messages easily (Scott, 1994), reducing the necessity of reading. Further, previous research (Oh et al., 2008) has shown that Generation Y's impression of a store's image and expectation of merchandise quality is influenced by the method of displaying information—specifically, Generation Y prefers a picture-based method of communicating information rather than a text-based method.

Interestingly, picture size is a key factor in persuading users to view videos on cell phones and iPods (Jarratt and Mahaffie, 2007). This suggests that picture size may be important to Generation Y, and, when combined with this group's predilection for little text, may mean that they prefer a large image dominating the page. Prior research has found that there is a positive correlation between the size of the largest image on a web page and visual appeal (Tullis and Tullis, 2007). Although the participants in that study ranged in age from 16 to 57, the majority (72%) were under thirty years old, possibly skewing the results towards younger users.

For the purposes of this study, we define a large picture as an image occupying a minimum of 40% of the page. In some cases, there is no main image, large or otherwise. Images contained within one another were counted as one

image—for example, the image of Steve Jobs within the large main picture on the Mac page (Fig. 1) was counted as part of that main large picture. Separate images were counted individually—for example, the images at the top of the PC Mall page (Fig. 2) were clearly not integrated and

therefore counted as individual images. The images used in this study were not manipulated in any way; because the pages studied were all highly rated retail homepages, the images are of high quality and are appropriate for marketing and public consumption.



Fig. 1. Heat map for the most liked web pages.

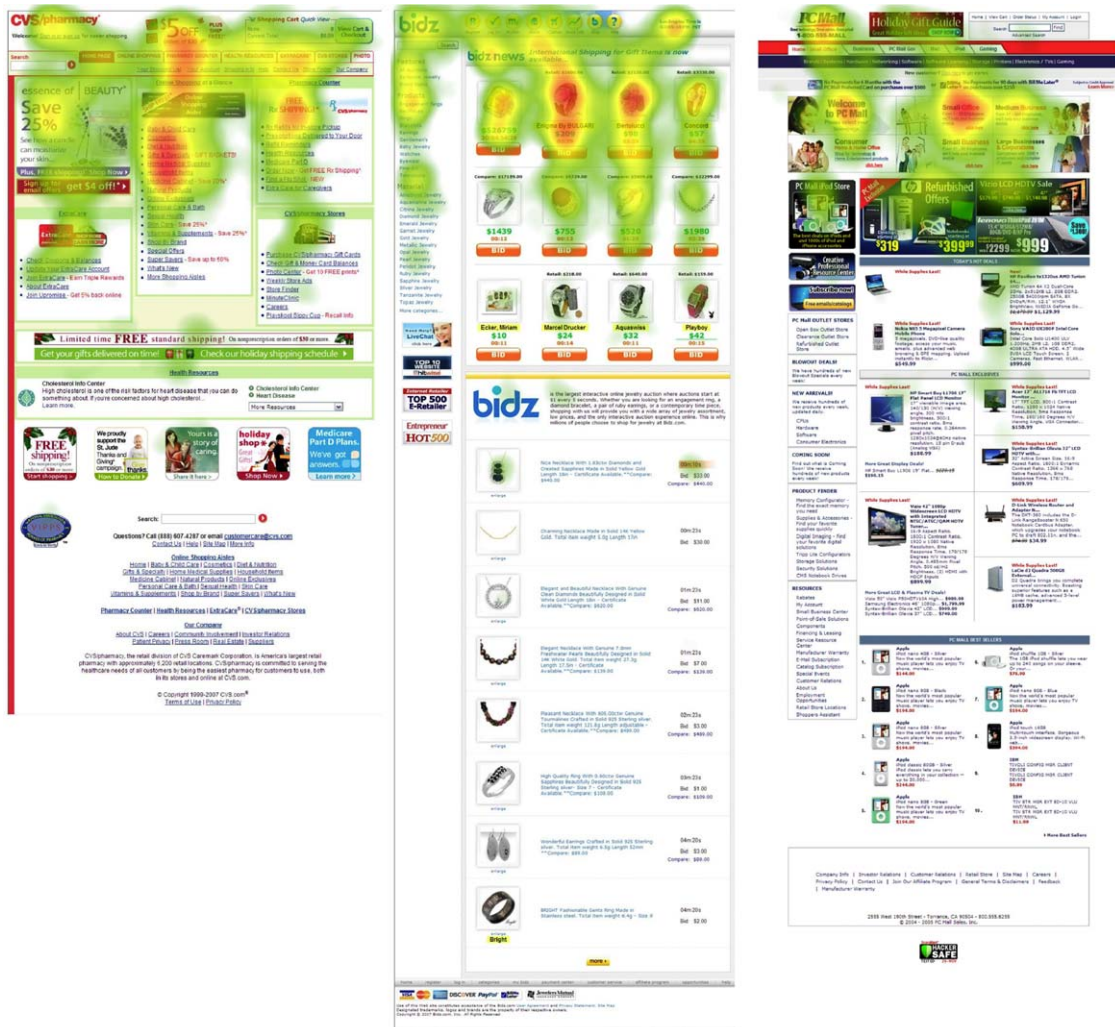


Fig. 2. Heat map for the least liked web pages.

#### 4.2. Pictures of celebrities

The social presence in communication theory refers to “the extent to which a medium allows users to experience others as being psychologically present” (Gefen and Straub, 2003, p. 11). According to this theory, by creating a feeling of warmth and human contact, websites can create a psychological connection with their users (Yoo and Alavi, 2001). One way to create a sense of warmth or human contact for the user is by including images of people (Hassanein and Head, 2007).

Including images of celebrities may be particularly important in creating emotional bonds with Generation Y users (Tsui and Hughes, 2001). In advertising literature, we find that well-respected messengers, such as “TV and movie stars, athletes and musicians” appeal to Generation Y (Cook-Anderson, 2003) and can make advertising more convincing (Bush et al., 2004; Knott and James, 2004). Celebrities are viewed as “attractive” and “real” by young people (Atkin and Block, 1983) and have a significant influence on their purchasing behavior (Bush et al., 2004; Morton, 2002; Shuart, 2007). It is likely that this influence would translate to the web pages of retail companies.

For the purposes of this study, celebrities are defined as people who are generally recognized by the public. As support for this, we provide a comparison of the Google search hits between the authors and the celebrities on the pages used in Study II. Of course, Google results are not specific to Generation Y, though they may provide some insight into celebrity status—as can be seen in Table 1, below, a Google search of the authors’ names returns far few hits than any of the celebrity names. Because Facebook was originally targeted to Generation Y and, as of 1/4/09, has a membership of which 67.5% is between the ages of 18 and 34 (Corbett, 2009), we have also included the number of “fans” the celebrities have on their Facebook Fan pages. The results of these searches are shown in Table 2.

#### 4.3. Search feature

In a study (Chadwick-Dias et al., 2004) that asked participants to design their ideal web page, it was found that younger participants, defined as participants less than forty years of age, were more likely to include a search bar

as opposed to many links. Because Generation Y has a short attention span (Perez, 2008) and likes fast service (Fields, 2009), the inclusion of a search feature on a web page may be particularly appealing to Generation Y. For Generation Y, who has grown up with technology, a utilitarian feature like search is more likely to be considered a basic need on Maslow’s hierarchy. A generation that has grown with the ability to access information with a few keyboard strokes may be strongly jarred by the absence of such a practical item as a search feature.

#### 4.4. Little text

Research indicates that Generation Y does not have a long attention span and, further, does not like reading “long boring text” (Perez, 2008). A recent study (Tullis and Tullis, 2007) shows a negative correlation between the number of characters on a page and visual appeal. While the participants in that study ranged in age from 16 to 57, the majority (72%) were under thirty years old. Thus, it is possible that these results favored younger users. Additionally, as mentioned previously, past research (Oh et al., 2008) has found that Generation Y prefers a picture-based method of communication over a text-based method.

For the purposes of this study, we define little text in terms of the number of words on a web page. The pages used in this study were sorted based on their word counts and then were split into thirds to form three groups: high, medium, and low. The results of a *t*-test showed that the means of the high word count group (615) and the low word count group (155) were significantly different ( $p = .02$ ). Further, our analysis showed that the maximum number of words on a page in the “low word count” group was 218. In this study, we considered the pages in the low word count group as pages with “little text” and expected them to be appealing to Generation Y.

#### 4.5. Characteristics score

In the above sections, several characteristics were presented, which may be appealing to Generation Y and, therefore, may favorably influence the first impressions of Generation Y users:

- a. Main large picture
- b. Pictures of celebrities
- c. Search feature
- d. Little text

These characteristics were used to calculate an index or a score for a web page in the following manner. If a page has only one of the above characteristics it is assigned a characteristics score of one, if it has two of the characteristics it is set to two, and so on. Note that a characteristic score can range from zero (having none of the characteristics) to four (having all of the characteristics).

Table 2  
Google hits and Facebook fans of celebrities and authors.

	Google hits	Facebook fans
Will Arnett	758,000	1914
Steve jobs	46,800,000	44,544
Adriana Lima	6,730,000	n/a <sup>a</sup>
Amy Poehler	1,480,000	11,052
Authors (average)	3085	0

<sup>a</sup>Adriana Lima does not have a Facebook fan page, though she does have 35 groups dedicated to her. The authors have no groups dedicated to them.

## 5. Experimental material

As in prior research, we used retail homepages to examine visual appeal (Tullis and Tullis, 2007). The web pages used in our study were randomly selected from the top one hundred retail pages from the ForeSee Results gold standard American Customer Satisfaction Index (Freed, 2006). Four expert judges categorized each page based on the presence or absence of the characteristics described above. Based on this, a characteristic score was calculated for each page. As previously mentioned, the characteristic scores of the pages ranged from zero to four, with zero indicating that the page did not have any of the above mentioned characteristics and four indicating that all characteristics were present on the page. The mean of the characteristics score for pages used in this study was 1.94, with a median of 2.

Based on their characteristic scores, we then categorized the web pages into three groups: those with a characteristic score higher than the median (score of 3 and 4), equal to the median (score of 2), and lower than the median (score of 0 and 1). From these, we took the first group of thirteen pages and the last group of eighteen pages to represent the high and low characteristic score groups, respectively. The results of the *t*-test showed that the mean of the characteristic scores in the high characteristic score group (3.23) was significantly higher ( $df = 30$ ,  $t = -22.34$ ,  $p = 0.000$ ) than the mean of the characteristic scores in low characteristic score group (1).

Because the above mentioned characteristics are likely to be appealing to Generation Y, it is likely that the pages in the high characteristic score group, with more of these characteristics, would be rated more favorably by Generation Y. To investigate this possibility, two studies were conducted. The first study consisted of a self report method that was used to collect information about the visual appeal of the web pages. We collected the same information in the second study; in addition, we utilized an eye tracker in order to determine, which parts of the page captured participants' attention most.

## 6. Study I: survey

The objective of this study was to examine whether participants' visual appeal rating corresponded to the characteristic score of the page. To do so, an online study was conducted during which participants browsed the fifty randomly selected web pages. The following sections describe the methodology and results of this study.

### 6.1. Participants and design

Ninety-eight participants (55 males, 43 females) completed this survey. Participants ranged in age from eighteen to thirty-one and reported that they had high levels of internet experience. The survey was posted on online forums (e.g., facebook.com) and e-mail solicitation was

sent to college students and the employees of a Fortune 100 company. After completing the survey, participants were offered the chance to be entered into a raffle to win a \$50 Amazon gift card.

As in prior research, participants were asked to rate the visual appeal (Lindgaard et al., 2006; Tullis and Tullis, 2007) of fifty top retail web pages. The pages were viewed in random order by all participants—sample images of these pages are displayed in Figs. 1–6.

### 6.2. Procedure

Participants received a link to the experiment's page. The landing page explained the participant's privacy rights, gave a brief overview of the study's purpose, and notified the participants of the incentive. Participants were also informed that they were to rate the pages based on visual appeal as opposed to content. The next page collected demographic information from the participants, including gender, age, and internet experience. The web pages were then displayed in random order. To maintain consistency throughout the length of the study, particularly in the case that a company updated its web page, subjects viewed images of the pages instead of the live versions. The participants rated each page's visual appeal individually. The last page thanked the participants for their participation and required them to enter their e-mail address in order to be eligible for a raffle.

### 6.3. Measurements

The survey used in this study was validated in several prior web studies (Djamasbi et al., 2007; Lindgaard et al., 2006; Loiacono et al., 2002; Tullis and Tullis, 2007). Participants rated each web page on a five-point Likert scale of visual appeal, with one indicating 'not at all appealing' and five indicating 'very appealing'.

### 6.4. Results

As mentioned previously, a characteristic score was calculated for each web page. Based on these scores, the web pages were placed into either a high characteristic score group or a low characteristic score group. Pages in the high characteristic score group had a greater number of the characteristics that were likely to be appealing to Generation Y. Hence, this group of pages were likely to be more visually appealing to Generation Y than those in the low characteristic score group. To test this possibility, a paired *t*-test was conducted on the mean visual appeal ratings given by participants for the pages in the high characteristic score group and the low characteristic score group. The results of the *t*-test, shown in Table 3 below, showed that the pages in the high characteristic score group received significantly higher visual appeal ratings from the participants than the pages in the low preference score group.

To better understand users' reactions, several additional analyses were conducted. For example, we tested whether the participants rated pages that contained images of celebrities more favorably than those that included images of people who were not celebrities. The results of the *t*-test showed that the mean of users' visual appeal rating was significantly higher for the former group of pages (see Table 4).

Next, we examined whether web pages with a large main picture were more appealing to Generation Y. The results of the *t*-test showed that the mean of users' visual appeal rating was significantly higher for pages that had a main large image. These results are displayed in Table 5.

The next comparison was between web pages that included little text and those that contained a great deal of text. Once again, a *t*-test was used to compare the mean of visual appeal for pages with little text with the mean of visual appeal for pages that included more text. The results of the *t*-test (see Table 6) showed that pages with little text received significantly higher ratings than pages that contained more text.

Finally, a *t*-test was used to compare the mean of visual appeal between pages that contained a search feature and those that did not include a search feature. This analysis, as displayed in Table 7, showed that the mean of visual appeal ratings was significantly higher for pages with the search feature.

The results showing that users rated pages with high characteristic scores as significantly more appealing than those with low characteristic scores (Table 3) warrant further examination. While the exploratory results comparing pages with certain characteristics to those that lacked those particular characteristics (displayed in Tables 3–7) are aligned with the finding that pages with high characteristics scores were rated more favorably (reported in Table 3), they do not directly test whether users noticed those characteristics on a page. This is because visual appeal is a holistic assessment of overall reaction to a page, not individual characteristics. If those characteristics were not noticed by users, they were less likely to play a part in users' ratings. To test whether these characteristics attracted users' attention, a second study was conducted. In Study II, users not only rated the visual appeal of web pages (a self report and overall measure), but also had their eye movement tracked (an objective measure revealing users' focused attention). This facilitated a better understanding of users' reaction to a web page because it

ascertained which characteristics on the page captured users' attention. The details and results of this second study are reported in the next section.

Table 4

Results of paired *t*-test for visual appeal of web pages that had the image of a celebrity compared to those that had an image of people who were not celebrities.

	Mean	Standard deviation	Standard error
Pages with images of celebrities	3.60	0.93	0.094
Pages with images of people	3.12	0.62	0.063
$df = 97, t = 6.85, p = 0.000$			

Table 5

Results of *t*-test for visual appeal of web pages that had large main image compared to those that did not have a large main image

	Mean	Standard deviation	Standard error
Large main image	3.31	0.62	0.063
No large main image	3.04	0.57	0.058
$df = 97, t = 5.90, p = 0.000$			

Table 6

Results of *t*-test for visual appeal of web pages with little text compared to those with more text.

	Mean	Standard deviation	Standard error
Pages with little text	3.31	0.62	0.063
Pages with more of text	2.98	0.63	0.064
$df = 97, t = 9.46, p = 0.000$			

Table 7

Results of *t*-test for visual appeal of web pages with and without a search feature.

	Mean	Standard deviation	Standard error
Search feature	3.14	0.59	0.060
No search feature	3.02	0.62	0.063
$df = 97, t = 7.40, p = 0.000$			

Table 3

Results of paired *t*-test for visual appeal ratings of web pages in high and low characteristic score groups.

	Mean	Standard deviation	Standard error
Pages in the high characteristics score group	3.56	0.60	0.061
Pages in the low characteristics score group	2.95	0.61	0.061
$df = 100, t = 11.50, p = .000$			

## 7. Study II: eye-tracking

The objective of the second study was to refine the findings of Study I. Study II used only the three most liked and the three least liked pages from Study I. Participants answered the same visual appeal survey used in Study I. In addition, participants' eye movements were tracked and empirical data, including fixation and gaze pattern, were collected. Both fixation and gaze data can show whether users looked at the four characteristics on the page. Using the fixation data, a heat map was generated for each web page to demonstrate which components attracted the most attention (identified as bright red spots). Because the first impression of a webpage is formed almost instantaneously (Lindgaard et al., 2006), examining where users focus their attention in the first few seconds of exposure to a page may be particularly helpful in identifying components that are likely to play a role in the formation of users' opinions about the attractiveness of a page. This was achieved by identifying areas that were fixated upon within the first five seconds of viewing. Additionally, the order of fixations in the first five seconds was determined by measuring the time it took participants to first fixate on these areas on the page, then plotting the average order in which participants viewed areas.

### 7.1. Participants

Nineteen employees from a Fortune 100 company participated in Study II. Though all participants were drawn from the same parent company, the company owns many other businesses of varied purpose. The pool from which these participants came included employees in catering, hospitality, construction, investment, design, and development.

As in the first study, participants were recruited via e-mail solicitation. Participants ranged in age from eighteen to thirty-one and had high internet experience. Because the study was designed to track users' eye movement, it was conducted in the usability labs of the company where the participants were recruited. Participants received a pair of movie tickets as an incentive.

### 7.2. Design

Due to the nature of the experiment (i.e., using an eye-tracking device), the lab was reserved for one user at the time. Rather than being asked to rate fifty web pages, users were asked to rate six pages: three that were identified as the most liked and three that were identified as the least liked web pages from the visual appeal ratings in Study I. This approach was taken to avoid possible user fatigue. As in Study I, these pages were shown in random order.

### 7.3. Procedure

Upon entering the usability lab, participants reviewed and signed an informed consent document. Basic demo-

graphic information was collected, including age, gender, and internet experience, and the experimenter explained the purpose of the study. The eye tracker was calibrated to the participant, a brief procedure in which the participant watched a dot move to approximately the four corners and the center of the screen. The calibration process for each user took approximately fifteen seconds.

The participants were given instructions to view each web page for a minimum of ten seconds, and then provide a visual appealing rating on a five-point scale. Participants were told the visual appeal rating was not to be based on the content of the page. Throughout the study, the participants had control of the mouse, allowing them to scroll and to choose when to continue to the next page. Once the study was completed, the participants were thanked for their participation and debriefed.

### 7.4. Eye-tracking device

An unobtrusive eye tracking device, the Tobii 1750, was used in this study. The eye tracker functions remotely from the user and does not require the removal of glasses or contacts, allowing for a natural environment. The eye tracker looks much like a regular monitor. Infrared light is bounced off the user's eyes and picked up by several infrared sensors on the monitor. Based on this, the software is able to interpolate the position of the participant's eyes. Participants can move freely and, as was observed in this study, often forget that their eyes are being tracked. Throughout the experiment, the experimenter was able to watch the tracking of the participants' eyes via an attached screen to ensure that data was collected throughout (i.e., the user does not move out of eye tracking range).

### 7.5. Measurements

In addition to the visual appeal question used in Study I, post-study interviews were conducted and eye tracking data was collected. One type of eye tracking data that was collected was fixation, or how long the participant looked at something on the page. Fixation has been linked to intense cognitive processing (Pan et al., 2004) and is viewed as a reliable indicator of an individual's attention (Vertegaal and Ding, 2002).

As in prior studies, fixation was defined as a gaze longer than 300 milliseconds (Djamasbi et al. 2007, 2008). Similar to prior research, the cumulative fixation data for all participants was translated into heat maps, which indicate where on a page the participants fixated the most. In a fixation heat map, red indicates a high level of fixation, while yellow and green indicate decreasing levels of fixation. Areas without color were not fixated upon. Examples of heat maps and fixation order plots are displayed in Figs. 1 and 2.

In addition to fixation, data was gathered on the amount of time, after the page was presented, before participants

fixated on specific areas of interest on the page. For example, if the logo were defined as an area of interest, data was collected on the number of seconds, on average, it took participants to fixate on the logo after the page was presented. Based on this data, one can determine the order in which the average participant looked at areas on a page.

## 7.6. Results

The results of Study II are split into three sections. First, the analysis of the visual appeal ratings, which were collected via a self report survey, is reported. Next, the results of the fixation analysis and heat maps are explained. Finally, an analysis of the order in which participants viewed areas on the pages is provided. While the visual appeal self report survey was a reliable way to measure a users' reaction to a web page, it provided only a snapshot of users' behavior. Eye tracking provided a continuous measure of the users' reactions because it recorded users' eye movement throughout the experiment.

### 7.6.1. Visual appeal ratings

The results of previous study showed that the characteristic score was a good predictor of the visual appeal ratings of Generation Y users (users rated the visual appeal of pages with high characteristics score more favorably). In the second study, as mentioned earlier, only six web pages were used—three of the most visually appealing and three of the least visually appealing pages as found in Study I. Before analyzing the eye-tracking data, it was first confirmed that, consistent with Study I, participants found these six web pages significantly different in terms of visual appeal. The results of the paired *t*-test showed that users found the visual appeal of these two groups of pages to be significantly different (Table 8). A second *t*-test showed no significant difference ( $p = .697$ ) between the visual appeal ratings for these six pages between Study I and II. Together, these results supported the applicability of the characteristic score. Moreover, the significant difference in their visual appeal ratings made these six web pages suitable for the eye-tracking study, allowing a comparison of users' eye movements and fixation for the pages that they found most and least visually appealing.

Table 8  
Results of *t*-test for visual appeal of web pages in high and low characteristic score groups, study II.

	Mean	Standard deviation	Standard error
High characteristic score	3.68	0.69	0.071
Low characteristic score	2.73	0.91	0.092
df = 20, $t = 4.05$ , $p = 0.000$			

### 7.6.2. Heat maps

Fixation, defined as a gaze longer than three hundred milliseconds, was useful in determining which aspects of a web page attracted the attention of participants. Fixation was visualized as heat maps; the heat maps were created based on the entire time participants viewed each page. As mentioned previously, red spots indicate high levels of fixation, with yellow and green indicating decreasing amounts of fixation. Areas without red, green, or yellow spots were not fixated upon. Images of the heat maps are shown in Figs. 1 and 2.

First, each page was examined as a complete unit, comparing overall fixation levels across the pages with the highest and lowest visual appeal ratings. Next, there was an examination of specific areas of the page that drew the most attention relative to other areas, both on the same web page and across web pages. This method of analysis showed that, in general, the highest rated pages had focused, bright red hot spots, located at the center of the page. On the lowest rated pages, fixation was much more scattered, suggesting that nothing immediately drew the attention of the participants. Everything on these pages seemed equally important, with no particular feature standing out.

More specifically, fixation on the highest rated pages appeared on the main large picture and images of celebrities. It makes sense that a focal point like a large picture would garner attention. On the lower rated pages, there were also images that drew attention. This did not apply to all images on the lower rated pages, however; the images that attracted attention are at the top, while other images did not get as much attention. It appeared that when there were many images, only the first few were fixated upon, while the rest were ignored.

The images of celebrities on the highest rated pages were highly fixated upon. It was not surprising that these large images of people received attention, particularly as they were part of a main large image, but it seemed that even a small picture of a celebrity still drew the eye. For example, consider the homepages of PC Mall and Mac. On the PC Mall page, there are images of people at the top of the page, but there was little or no fixation on them. On the Mac page, however, where celebrity Steve Jobs is quite small, the celebrity received a great deal of attention.

### 7.6.3. Fixation order

The heat maps showed what parts of the page attracted user attention during the entire time that they viewed a page. Because impressions are formed within the first few seconds of viewing (Lindgaard et al., 2006), examining what was viewed in first few seconds and the order in which these components were viewed can help to better understand what impacted the formation of the participants' first impressions. To gather this information, the heat maps were used to delineate "areas of interest" (AOI), which are often used to examine the average reactions to specific areas of a page (Djamasbi et al., 2007). The parts marked

by color (red, green or yellow) on the heat maps were delineated by rectangles identifying a collection of AOIs on each page. For example, because the heat maps showed that images of faces received fixation on the Gap page, these images were included in the set of AOIs for the Gap page (see rectangles marked as 1a–1d on the Gap page in Fig. 3).

Next, the gaze data for the first five seconds of viewing was aggregated. Those AOIs that received fixations in the first five seconds of viewing were then considered for calculating their average time to first fixation, i.e., the time elapsed before participants viewed them. This information revealed the order in which the AOIs were viewed by users. For example, on the main image of the Mac homepage, the large text, the image of Steve Jobs, and the top navigation were marked as three AOIs; the time to first fixation was the time from when the page was first shown to the participant until the AOI received fixation. This was measured in seconds for each AOI for each participant. The times were then averaged across participants for each AOI. Based on this, the average order in which users viewed AOIs on the pages was determined. The plots of the fixation order for each page are shown in Figs. 3 and 4. Each rectangle represents an AOI. The numbers inside the rectangles indicate the average order in which the AOIs were viewed. For example, the order plot of the Mac page indicates that the large text “Mac OS X Leopard” was viewed first, followed by the image of Steve Jobs, then the top navigation, and finally the rectangular area below the main image.

As shown in Figs. 3 and 4, participants fixated on faces, when a face was present on the page, within the first two fixations. This is consistent with the heat maps on Figs. 1 and 2, showing intense fixation on faces. The fixation order of the first five seconds together with the heat maps showed that faces not only received intense fixations but also were attended to quite early in the viewing process. On the PC Mall web page, the only page that included images of faces that were not celebrities, only one image of a person was fixated on in the first five seconds; other faces on the page did not receive fixation within the first five seconds.

The first fixations on the AOIs were mostly located on the center and top of the area above the fold, typically on focal points when they were present. For example, the first three fixations on all pages were mostly located on the top portion of the page. On the Mac homepage, the first three fixations were on the large central text, followed by fixations on the image of Steve Jobs below the text (also located in the center), then the navigation at the top. On the Gap homepage, the first three fixations were on the faces of the celebrities in the center, followed by fixations at the top on the logo, then the large text above the faces. On the Victoria’s Secret homepage, the first three fixations were on the logo (top), then in the center on Adriana Lima’s face and the large text next to image of the face. On the CVS page, participants fixated first on the center, then on the logo and the large text on the top. Similarly, on Bidz’ page, fixations started at the center, then moved to the top navigation and side navigation. On PC Mall, participants fixated first on the logo (top), then on the face on the top left of the page, and then on the navigation bar above the face (top). This data shows that participants looked at logos and top navigation within the first four fixations.

The plots show that, when a large main image was available (as in the most liked pages), it was fixated upon within the first few fixations (AOIs 1 and 2 for Mac, AOI 1a–d for Gap, and AOI 2 for Victoria’s Secret). The plots show that blocks of text were not covered in the first few fixations on most pages. The navigation bar containing relatively long lists of links (textual information) on the CVS page and on the Bidz page, located on the left and center respectively, did receive early fixations. These two pages, however, lacked a large main image. The plots show that the search feature was fixated upon, however, this feature was only attended to on the least appealing pages within the first five seconds.

## 8. Discussion

This research sought to take a step towards understanding the web preferences of Generation Y. An index

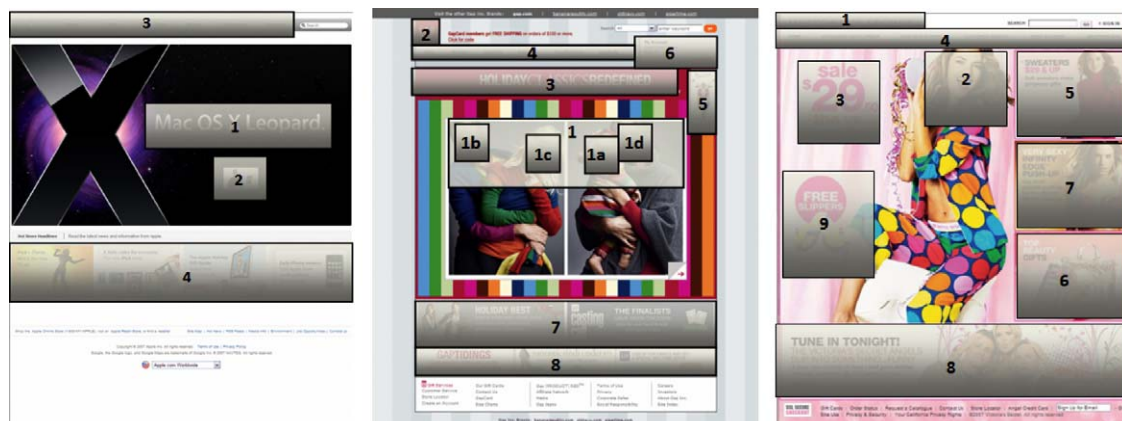


Fig. 3. Fixation order for the most liked web pages.

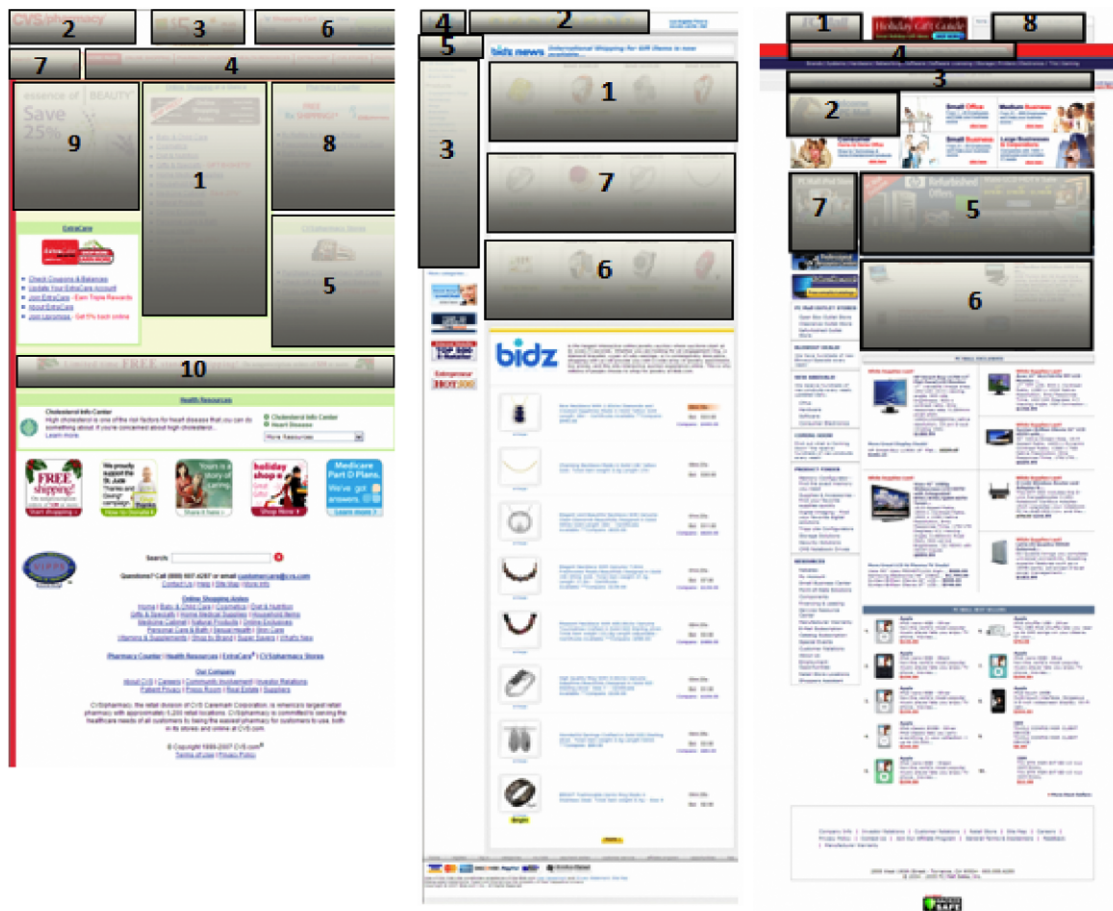


Fig. 4. Fixation order for the least liked web pages.

was defined based on several characteristics that, according to prior research, were likely to be appealing to Generation Y. This index can help to estimate how visually appealing a page is to Generation Y users. To test this index, an online study was conducted, the results of which showed that the characteristic score index used in this research was closely related to visual appeal. These results suggested that the four characteristics used in the index (large main picture, little text, search bar, and images of celebrities), may have contributed to Generation Y finding the homepage of a retail website visually appealing. As a first step towards understanding whether these characteristics played a role in the formation of users' impressions of the page, eye tracking was conducted in Study II to determine whether the characteristics under investigation attracted users' attention. Users' fixations were recorded as they viewed the web pages, providing objective evidence to determine which aspects of web pages attracted their attention. The eye tracking data showed that users fixated on main large pictures, faces of celebrities, and the search feature. Because fixation is a reliable measure of attention (Chapman, 2005), this data indicated that these characteristics attracted users' attention. It also showed relatively few fixations on the text which, along with exploratory analysis showing lower ratings for pages with more textual

information, suggested that text amount may play a role in the impression formation of Generation Y.

Research showing that first impressions are formed in the first few seconds suggests that what captures users' attention on a page is likely to have a great impact on informing users' opinion about the visual appeal of the page (Lindgaard et al., 2006). To this point, the areas of the page that were viewed within the first five seconds of viewing, as well as the order in which these areas were viewed, were examined in this research. To do so, an ordered plot of average fixation information was created for the first five seconds of viewing.

The fixation order plots showed that a main large image was likely to be attended to within the first two fixations. When a main image was absent from a page, the first three fixations included navigation presented as list of links with a relatively large amount of textual information (see CVS and Bidz). The pages that included a main large image were rated as the most appealing, and those that did not were rated as least appealing. The self report measure of appeal, along with the fixation order plots for the most and least appealing pages, suggests that the presence of a large main image and/or the absence of textual information may also play an important role in the formation of an impression of a page.

Similarly, the data showed that faces of celebrities received early attention, e.g., within the first two fixations (Figs. 3 and 4) and received a high amount of fixation (Figs. 1 and 2). This is consistent with previous research showing that users tend to fixate on faces when they are present and prefer images of people that include faces (Cyr et al., 2009; Tullis et al., 2009). The self report data showing more favorable ratings for pages with faces of celebrities combined with the objective measure of early and intense fixations suggest that the images of celebrities may play a role in the formation of favorable ratings.

The top right corner of the page, where search is typically located (Shaikh and Lenz, 2006) received fixation during the viewing process, as shown in the heat maps. This is particularly interesting because participants were asked to browse the pages; they were not oriented to complete specific tasks. In the first five seconds of viewing, however, the search feature was fixated upon on the least appealing pages only. It may be that, because of the higher number of components on the least appealing pages, users were compelled to look at the search feature. This is a topic that bears further research.

These plots showed that the first few fixations rested on the center and top of the pages, suggesting that these areas may play an important role in forming the first impression of a page. The data also showed that logos were viewed on almost all pages within the first few fixations. It is possible that the users anticipated seeing logos in top left corner of web pages and their expectation was met when this was the case. It is also possible that individuals look to the top left because they expect to find important general information—for example, two common locations for the navigation bar on a page is across the top or along the left side. By looking at the top left, in addition to orienting themselves by locating the logo, participants may have been orienting themselves relative to the navigation and layout of the web page. In fact, participants fixated on the navigation within the first four fixations on average for all pages, indicating that this may be an important feature on a web page for users. These possibilities can be clarified by future research in this area. No matter the reason, these results suggest that top left corner may be ideal for providing company information such as logos.

These findings are consistent with and support the prior literature that was used to select the characteristics identified in this study. There was a positive reaction to the pages containing a large main image and pages with lower word counts, along with relatively high fixations on large main images and low fixation on textual information. These findings are aligned with research that has shown that Generation Y prefers picture-based communication (Oh et al., 2008), as well as literature that states that Generation Y dislikes reading “long boring text” (Perez, 2008). It also strengthens the argument that the age of the participants in Tullis & Tullis may have skewed the results; because the majority of participants were under thirty years of age, the finding of a correlation between the size of the

largest image on the page and visual appeal may be applicable only to younger users. The high fixation levels on celebrities, as well as the high visual appeal ratings given to web pages that included celebrities, corroborate literature that states that images of celebrities may be particularly important to creating an emotional relationship with Generation Y (Tsui and Hughes, 2001). This is further supported by the advertising literature that suggests that Generation Y finds well-respected messengers, including “TV and movie stars, athletes, and musicians,” appealing. Finally, these findings support literature that states that, when people are asked to build their ideal web page, people under forty are more likely to include a search feature (Chadwick-Dias et al., 2004).

The eye tracking results of Study II show that certain locations consistently received fixation. The top left corner of the page, where the logo is typically located (Shaikh and Lenz, 2006), consistently received fixation, even within the first few seconds of viewing (see Figs. 3 and 4). The navigation (or “internal links”) was another area that received early fixations (within four fixations on average), suggesting that it also may contribute to visual appeal. Users may look to navigation for basic orientation on what products or information the website offers.

In contrast to the areas that received consistent fixation, other areas consistently did not receive fixation (see Figs. 2 and 4). For example, the top part of the page received high levels of fixation while the area below the fold received no fixation within the first five seconds of viewing, and very little fixation over the entire viewing time. This is consistent with the theory of visual hierarchy (Faraday, 2000) that asserts that location is an important factor in attracting users’ attention (Table 1). Similarly, large text and images consistently received high levels of fixation, again supporting literature on visual hierarchy suggesting that, by manipulating the size of objects on a page and including images on a page, one can cue users to focus on elements in a particular order. Because a hierarchy defines a viewing order, the features at the top of the hierarchy are more likely to draw attention in the first few seconds of viewing, and thus contribute to the formation of the first impression (Lavie and Tractinsky, 2004). These findings suggest that the principles of visual hierarchy may be particularly helpful in guiding future visual aesthetic research.

The results of this study have important theoretical implications for human–computer interaction studies, particularly those that investigate visual appeal. As mentioned previously, visual appeal studies generally fall into two categories, each focusing on a different aspect of user behavior. One focuses on the users’ reaction to a holistic stimulus or web page, while the other studies the effect of individual components. Because of concern about ecological validity and wholeness, the former method calls for the inspection of the actual whole stimuli by people. Because of its reliance on scientific methods of inquiry, the latter approach examines reactions to isolated parts of the stimuli. In case of web pages, the former method advocates

an examination of reactions by exposing subjects to the actual unmanipulated webpage, while the latter recommends examining reactions to isolated web components on a page. While these approaches are complementary in nature, they are difficult, though particularly useful, to employ simultaneously. The research described in this paper, particularly Study II, shows that the use of eye tracking may be a valuable method through which studies can benefit from both approaches simultaneously. For example, eye tracking can reveal the components that attract participants' attention without affecting the wholeness of a page (e.g., examining reactions to one component such as isolated images) or manipulating the webpage (e.g., creating different prototypes for each component). This, in turn, can help to identify components that are likely to affect user impressions.

In addition to the combination of the above mentioned complementary methods of visual appeal investigation, the results have also other implications for human–computer interaction studies. Self report measures, while valuable in capturing a user's subjective reaction, measure only a snapshot of user behavior at a specific point in time (e.g., after viewing a web page). To supplement this, eye tracking measures can provide an objective and continuous measure of the user's reactions through eye movement and gaze. Using this, a more complete picture of users' reaction to a web page can be formed. Thus, this work provides further support for including eye tracking methods in human–computer interaction studies.

This research not only shows that eye tracking can be particularly useful method for investigating visual appeal, but also provides a basic step towards understanding Generation Y's web preferences. Our results suggest that certain web components can affect how visually appealing a web page is perceived to be by Generation Y. The characteristics and methodology used in this study can be utilized to investigate the visual appeal preferences of other generation and demographics. Using the four characteristics identified in this study, future works can refine our understanding of the preferences of Generation Y. For example, our results show that the characteristics score used in this study was a reliable predictor of the visual appeal preferences of Generation Y in regard to retail homepages. This suggests that refining this binary (presence/absence) score may lead to a productive research avenue in visual appeal.

These results also have practical implications for companies targeting Generation Y. These findings indicate that including images of celebrities, a search feature, a large image, and little text may increase the visual appeal of a retail homepage for this demographic. Because images of celebrities can set the tone for a web page, it is likely that choosing the proper representative for the product will have a more positive impact on the first impression of Generation Y. Future research is needed to test this possibility. The inclusion of search feature may seem obvious, but many sites do not have one. The fact that

participants fixated on the search bar on the most cluttered pages suggests that this is an important feature to include, particularly since the task was merely browsing. Eye tracking indicates that a large image is likely to draw the focus of Generation Y and may be particularly attractive to them. For example, the Mac pages contained a single large main image; the fixations on this page were focused primarily on this element. In contrast, the Bidz web page contained many smaller pictures; attention was more fractured, and only the first few images received fixation. Finally, since Generation Y does not like to read large blocks of text, the inclusion of little text is likely to increase visual appeal. Through eye tracking, it was found that Generation Y did not scroll, suggesting that important information should be placed above the fold of a web page or that scrolling should be avoided when possible. The top left corner of the page appears to be an ideal place for placing company information, such as a logo, as it attracted participants' eyes. In general, and particularly when there is no main focal point, the gaze plots showed that the left side of a page tended to get more attention. This suggests that companies may benefit from placing important information on the left side of the page.

Of course, these observations are specific to Generation Y, and practitioners should be cautioned that they may not apply to all audiences. For example, Generation Y does not like to read large blocks of text (Nielsen, 2005), but Baby Boomers, another large demographic, might (Neuborne and Kerwin, 1999). Additionally, prior research provides evidence that education influences aesthetic preferences (Csikszentmihalyi and Robinson, 1990; Devlin and Nasar, 1989; Getzels and Csikszentmihalyi, 1969). Because Generation Y has been educated and grown with technology, it is likely that their visual appeal preferences may vary from those of other generations. Such evidence for possible differences suggest that future studies should look into finding similarities and differences between users of different generations and investigate how companies could use personalization to avoid possible conflicts between the visual appeal preferences of their target market.

## 9. Limitations & future research

As with any study, there were certain limitations. The online portion of this study was completed in a setting of the participant's choice; however, the setting and the potential for interruptions could not be controlled. The eye tracking portion was, necessarily, held in a laboratory environment. A remote, unobtrusive eye tracker was used in a room designed to mimic a realistic office environment, decreasing threats to external validity. Of course, the laboratory is not the participant's natural setting and so the findings are limited to the setting and the task. While recruiting participants from a single company may limit their diversity in some cases, the participants in Study II were from a company, which owns several businesses of

varied purpose, increasing their diversity. Additionally, because Study I was online and participants were not limited to a particular location or company, we believe the potential for population bias is mediated by the lack of a significant difference between user behavior in Study I and Study II. Specifically, analyses of completion time and visual appeal ratings for the pages used in eye tracking across both studies revealed no significant difference. However, we recommend that future studies investigate the effects of a more geographically diverse participant pool, extending even into the investigation of different cultures.

Furthermore, future studies are needed to determine whether the partiality to these characteristics is due of the current age of Generation Y (18–32 years) or if they are unique to the generation regardless of age. Naturally, we expect that some preferences may change as Generation Y matures; however, because they are in the unique position of growing up with technology, we suspect that these findings are more applicable to this particular generation than to their current age.

In this study, actual web pages, specifically retail homepages, were used to study users' behavior. While this method provides a suitable realistic context for studying user reactions, it does not have the virtue of prototyped web pages in which one factor at a time can be added or removed (i.e., having some participants view a web page including a picture of a celebrity and some participants view the same web page without a picture of a celebrity). Consequently, the relative importance of characteristics was not studied in this paper, though it is certainly an important topic for future research to address.

Similarly, this method does not allow for the manipulation of factors. As is discussed in the literature on visual hierarchy, manipulating the size of characteristics, such as text and images, may lead to different results. The principles of visual hierarchy suggest that some web characteristics are perceived in a certain order and, thus, with respect to each other, form a relationship of relative importance. For example, size is an important component in creating a visual hierarchy, followed by the inclusion of images, then the location of elements (Faraday, 2000). Based on this, the characteristics under examination in this study may have different levels of importance in shaping the visual appeal of a page. While an investigation of the visual hierarchy and/or relative importance of these characteristics on visual appeal was outside the scope of this study, we recommend that future studies look into this more closely.

Additionally, the quality of an image could affect the results. To that point, we also recommend that future research investigate whether screen or device size can influence the effect of these characteristics, particularly a large main image, on visual appeal. In addition, future studies should look into the effect of multiple images of varying size in comparison to a single large main image. In this paper, we examine the effect of an image of a celebrity in comparison to the effect of a non-celebrity image; future

studies should investigate the effect of different levels and types of celebrities on Generation Y's preferences. Finally, as the pages were not manipulated, all images are, by default, appropriate to a retail homepage. There are many other genres and types of images (e.g., non-photographic), which bear further examination.

While Google and Facebook searches, as well as post interviews, provide support for the celebrity status of the people on the pages for Study II, future studies may benefit from refining our results by developing a scale for rating the popularity of celebrities. We also recommend that future studies examine the effects of different types of celebrities (athletes, movie stars, musicians, etc.). Similarly, we recommend that future studies look into further refining "little text." Our results showed that retail web pages with a maximum of 218 words were appealing to Generation Y. This is consistent with the research (Tullis and Tullis, 2007) that finds a negative correlation between visual appeal ratings and number of characters on a page. Future research is needed to determine a threshold maximum for "little text" and extend the generalizability of these results to other genres and types of web pages.

The findings of prior studies suggest that Generation Y may have different visual appeal preferences than other generations. For example, as mentioned previously, prior research (Tullis and Tullis, 2007) shows a positive correlation between the size of the largest image on the page and visual appeal as well as a negative correlation between the number of characters on a page and visual appeal. Although the participants in that study ranged in age from 16 to 57, the majority (72%) were under thirty years old, possibly skewing the results towards younger users. Another study (Chadwick-Dias et al., 2004) shows that, unlike their younger counterparts, older adults may prefer to have a large amount of text on the screen. They "often read all the text on a screen" (Chadwick-Dias et al., 2004, p. 34), particularly before committing to clicking a link. Together, these studies suggest that there may be differences across generations. Future research is needed to shed light on this issue.

This research provided a basic step towards understanding what appeals to Generation Y users. Future studies should extend this study to identify other characteristics that might appeal to Generation Y based on their unique predilections, such as interactive features, and social characteristics, such as the need for immediacy and individualism. Additionally, as a browsing task was used in this study, having participants complete an active task may change the results. Future studies should extend these results by providing tasks other than browsing, such as retrieving specific information from a web page, as well as studying Generation Y's behavior on other site genres (i.e., healthcare) and page types (i.e., non-homepages). Finally, as mentioned previously, it is important to examine whether the same characteristics that appeal to Generation Y also appeal to other generations (e.g., Baby Boomers). This is particularly important for companies targeting multiple demographics.

## 10. Conclusion

Grounded in prior research, it was argued that particular web page characteristics (a large main picture, search feature, images of celebrities, and little text) were likely to be visually appealing to Generation Y on retail homepages. Four expert judges categorized the web pages based on the absence or presence of these characteristics and, based on the number of present characteristics, a score was assigned to each. Based on the score, the web pages were grouped into high and low characteristic score groups. Analysis showed that the pages in the high characteristic score group were most visually appealing to Generation Y, and the pages in the low characteristic score group were less visually appealing. The results suggested the characteristics used in calculating the score may have contributed to formation of users' visual appeal ratings. To investigate this possibility more closely, participants' eyes were tracked in Study II. This data enabled an examination of the areas of the page that attracted participants' attention and, therefore, their potential to contribute to the first impression and visual appeal. The results of Study II showed that the identified characteristics did indeed attract the attention of Generation Y.

This work has important implications both in research and practically. This research contributes to human–computer interaction literature, particularly visual appeal research. It also provides a methodology and characteristics to support future research. Moreover, the findings of this study suggest that capturing users' gaze may be a productive way of evaluating a stimulus as whole while simultaneously examining the contributing parts. Practically, we provide retail companies targeting Generation Y with specific characteristics that improve the visual appeal of their homepages, potentially leading to a higher rate of return and the attraction of more Generation Y users. With the advance of technology, targeting specific audiences is becoming more practical and, as it is easier to understand and appeal to a specific market segment, should be a preferred method.

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