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Using Eye Tracking to Understand Banner Blindness and Improve Website Design

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and Improve Website Design

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Abstract

Banners, as a form of advertising on the web, are important for businesses. Conversely customers want to navigate the site without being distracted by irrelevant or annoying ads. Design and placement of banners is not well understood and "banner blindness", which occurs when users overlook the banner entirely, is what causes the ineffectiveness of the banner. This study employs eye tracking to investigate how banner background color and the banner's relevance to users' tasks influence banner blindness. Eye movements were collected for users performing several tasks and viewing banners in a task-free context. Different banners were counterbalanced with task order. Findings on viewing behavior and user preference based on both questionnaires and eye tracking analysis offered evidence that banner background color and relevance did not influence banner viewing behavior. Through the use of eye tracking, we attempt to identify the effectiveness of banners on a website and offer recommendations for redesign.

Introduction

Businesses commonly monitor the frequency with which users click on banners as a measure of their effectiveness in capturing the user's attention. Recently a major corporation observed that banner click-through rates dropped when homepage banners with a uniform, white background were replaced with banners with a more varied color background (see Figures 17 and 18). This study investigated whether this decreased user interaction was due to banner blindness (when users overlook banners) and investigated several factors that may influence banner viewing behavior. Banner variables included background color and relevance to the user's task. We gathered eye movement data for users performing four tasks and also in a free viewing (task-free) context.

What is 'Banner Blindness'?

Benway and Lane (1998, Benway, 1998) introduced the concept of banner blindness and coined the term. Wikipedia (2005) defines banner blindness as

"A usability phenomenon in which a website visitor completely overlooks a banner. Such a banner may either be an advertising banner from an external site, or a banner that the serving site intends to use to promote content or a navigation link."

Banners, as a common form of advertising, were introduced in 1994 as a way to attract users' attention and to trigger a desired reaction. The desired reaction was largely getting users to click on the banner to visit the advertised site. This is commonly known as the banner's "click-through rate" and is determined by dividing the number of page views by the number of banner clicks. A study done in 1996 by a digital advertising company, DoubleClick, found that many banner ads were not catching users' attention at all but rather were reinforcing the idea that banner ads contained information that was predominantly irrelevant to the task at hand. This reinforced condition thus led users to avoid these ad spaces. DoubleClick's study showed that the probability of a user clicking on a web banner ad declined significantly after repeat exposures. Subsequent studies have reported conflicting results (Bayles, 2000; Albert, 2002). Bayle's study concluded that animation to enhance banner awareness was not effective while Albert's study told of several banner variables that could be adjusted to help increase banner awareness. Other studies, including those conducted by Nielsen (2000), show a consistent decline in banner ad

click-through rates year over year for a website. Williamson (1996) reported a national average for click-through rates of 2.1%. Click through rates subsequently declined for five consecutive years starting in 1995. The click through rate fell from 2.0% in 1995 to 0.2% in 2000 (Williamson, 1996). Starkov (2003) reports that click-through rates have dropped from 2% in 1997 and 3% in 1998 to less than 0.3% in 2002. This trend is also reflected in the percentage of total dollars spent on online advertising as advertisers are seeking new ways to promote their goods. The national average in 1996 showed that 56% of all Internet marketing budgets were spent on banner ads. This number dropped to 48% in 2000, 36% in 2001 and approximately 32% in 2002 (Amiri & Menon, 2003).

The upside to banner blindness is that it may allow the user to create an instant visual apparition of the webpage, based on past experiences, and thus pushes users towards the useful components of the page (Clark, 2002). This is assuming the banner itself is composed of information that is irrelevant to what the user is actually trying to find within the site.

Importance

Webpage banners are an important form of advertising for businesses that want to improve product or service sales through the website or convey some message to the user. Customers want to navigate the site and find the pertinent information they are looking for without being distracted by irrelevant or annoying ads. Contradictory results have been documented regarding the effectiveness of banner advertisements on websites. A study done by the Internet Advertising Bureau (1997) on over 16,000 users found that online advertising has tremendous communication power. The study showed that eight of the twelve banners tested produced a significant increase in brand awareness. The Internet Advertising Bureau states:

> A single exposure [to banner ads] can generate increases in advertisement awareness, brand awareness, product attribute communication and purchase intent. Nearly all of the impact measured was generated without a 'click-through' to the advertiser's site, proving the power of the ubiquitous banner. (pg. 7)

A banner's content has significant implications for both businesses and visitors of the site. Businesses want to improve their website's usability to help increase visitor retention and performance by reducing user frustrations and errors. If the website does not effectively address the needs of its viewers, then the site has little to no chance of cultivating repeat visitors.

Customers want a site that is easy to understand and provides a clear navigational layout that is void of irrelevant information or distracting ads. The design and placement of banner ads within websites needs to be better understood in order to maximize their effectiveness for both businesses and visitors to the site.

Methodologies Used for the Study of Web Interfaces

Usability testing is used to help designers improve the usability of the artifacts that they design (e.g., webpages, electronic interfaces, devices, software, and documents). Rather than attempt to formulate universal principles, as in more scientific studies, usability testing focuses more specifically on improving a single object or interface. Typical usability evaluation methods include think-aloud protocols, task-based usability tests, questionnaires, and heuristic evaluations. The test administrator needs to arrange a setting where users can interact with the object or interface and provide feedback regarding specific variables that either help or hinder use. A representative sample of the user population participates in order to give designers insight into how people expect the interface to work.

The concurrent think-aloud protocol is a common usability technique to help the administrator understand the thought processes of the users. Participants are asked to verbalize what they are thinking as they navigate through the interface or interact with the object. This technique is used because it can be difficult for the test administrator to make sense of why a participant performed a certain action. One problem with having the users think aloud while performing a task is that it can disrupt delicate, ongoing cognitive processes. This distraction of having to think-aloud could skew results (Nielsen, 1994).

The way in which the usability test itself is conducted can affect participant behavior (John & Marks, 1997). Participants who are given specific tasks to perform, that accurately reflect a realistic situation, will behave differently from participants who are given atypical tasks to perform that they would not otherwise perform outside the laboratory environment. The form in which a participant seeks information (search paradigm - directed, undirected, active or passive) can also affect their interactions with the given interface (Larson, 2005).

Trying to pinpoint the area of the interface with which a user had problems, can be the most difficult part of a study. Accurately interpreting the user's behavior is essential to the reliability of the study but not always clear cut. Users actions can be driven by many different variables (Pan et al ETRA, 2004). The administrator needs to be able to decipher whether or not the user disregarded a portion of the interface because he or she did not see it or because they felt the area contained information irrelevant to the task at hand. The same can be said if a user is interacting with an object. For example a user may not press a button because he or she did not see it, did not understand what it did, or did not realize that it was required to accomplish the task.

To make the experiment as natural as possible, a usability test administrator is trained not to distract the user or ask questions that could bias the user's answer. This makes it very difficult for the administrator to determine what the true reasoning behind a participant's actions might have been. To help gain better insight into the thought and decision-making process of the participant, usability professionals are increasingly turning to eye tracking.

Modern eye tracking uses a combination of hardware and software to determine the location of the user's dwell on a given interface or scene. Eye tracking was originally introduced over 100 years ago by Dodge and Cline (1901). They used an invasive procedure that involved direct physical contact with the eye. This type of experiment, one could only imagine, would disrupt the participant's natural behavior. Eye tracking has since evolved technologically. New equipment is helping to make it a more viable option. Eye tracking technologies continue to become more portable, more accurate, less intrusive and less expensive and thus a more practical supplement to traditional usability testing techniques (Jacob & Karn, 2003).

There are many benefits of including eye tracking in a usability study. The primary advantage is that it can help the investigator uncover usability issues that conventional usability tests would otherwise miss. Eye tracking produces a large amount of data, leaving the test administrator with many options in terms of analysis. The experimenter can compute information such as fixations (i.e., eye's focus on a single point), scan paths (i.e., order in which multiple fixations occur), and the number and duration of dwells (i.e., consecutive observations in the same region) on areas of specific interest to the experimenter.

Schroeder (1998) states that eye trackers can also help determine:

- if the user is looking at the screen
- if the user is reading or scanning the words on a page
- the relative intensity of a user's attention to various parts of the interface
- whether the user is searching for a specific item
- user scan patterns

Technological limitations, such as equipment size and invasiveness, are disadvantages of eye tracking compared to traditional usability tests. Eye tracking systems require extensive calibration procedures to ensure accuracy. Use of this apparatus can prove time-consuming. Wearing a head-mounted system can make participants cautious of their actions, thus limiting how naturally the participant behaves in the testing environment. Even after calibration is complete, eye movement analysis cannot prove that a participant actually perceives something. It merely indicates the participant's point of regard. It also doesn't prove that users did not perceive something (i.e., through peripheral vision). Additional disadvantages of eye tracking compared to traditional usability tests include the cost to purchase the software and equipment needed, the additional time required to calibrate participants and some limitation of participants that can be tested based on eye shape. Due to the increased time necessary for eye tracer calibration and also for data analysis, the number of participants that can be eye tracked is usually smaller than the number that could be tested if using conventional usability testing in the same given time frame. Another disadvantage that is also listed as an advantage is the amount of data that is produced by eye tracking. This gives the investigator plenty of options with respect to what he or she choose to analyze but it also means a possible significant increase in the length of time it takes to analyze the rich data produced by eye tracking (Jacob & Karn, 2003).

Study of Xerox Web Banner Design Using Eye Tracking in Usability Testing

A collaborative usability project between Rochester Institute of Technology (RIT) and Xerox Corporation was conducted using eye tracking. The experiment in the Laboratory for Computer-Human Interaction and Performance Support at Rochester Institute of Technology was motivated by the findings of Xerox Corporation on their office website. Xerox Corporation

experienced a significant drop in the number of visitors clicking on their primary banner advertisement when switching from a banner with a white background to a banner with a color background. RIT conducted the usability test in a controlled environment using eye tracking to test the variables that could have led to the significant decrease in visitor click through performance.

Hypothesis

To test the banner's effectiveness in capturing the user's attention, controlled alterations were made to the banner. The only variable manipulated was the design of the banner.. We made the following hypotheses.

- *Hypothesis 1: The background color of the banner would influence participants viewing behavior. Banners with a color background would decrease the frequency or total duration of dwells on a visual element.*

- *Hypothesis 2: The relevance of the banner content to the task at hand would influence participants viewing behavior. Banners that contained information relevant to the task would increase the frequency or total duration of dwells on the banner.*

Eye movement data were collected from participants performing four realistic tasks and in a free viewing context to help gain more insight into understanding user behavior while navigating websites that contain banner ads. This study used traditional usability testing techniques in conjunction with eye tracking to help us gain a better perspective on user behavior.

Methods

Participants

A market research firm recruited 24 participants in the Rochester, NY area for the study. The participants included ten males and fourteen females. One female participant was unable to be eye tracked due to difficulties getting an accurate calibration, leaving thirteen female participants and a total of 23 participants. All participants were recruited from surrounding small, medium, and large Rochester area companies. We developed a screening telephone questionnaire (see Appendix I) with the following criteria which most closely targets the intended user population for the Xerox website:

- Researches, recommends, or purchases office equipment (e.g., laser printers, copiers, or multi-function office products). At least one such purchase ≥$1,000 within the last 18 months.
- Uses equipment manufacturers' websites as a primary source to gather information about office products.
- Has no experience managing or designing websites.
- Is willing to wear eye tracking headgear and be videotaped for analysis.
- Does not work for Xerox Corporation or any Xerox agent or dealer.
- Is not of Asian or Pacific Island origin[1].
- Is able to speak and read English.

If all of these criteria were met, then the participant was scheduled for an individual session of 1.5 hours. The number of employees at the companies at which our participants worked ranged from 7 to over 2500.

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[1] Individuals of Asian or Pacific Island origin generally cannot be eye tracked because the shape of their eyes is too narrow to allow the eye tracker to capture reflected light from the cornea.

Apparatus

The team conducted five pilot sessions and many issues were uncovered and addressed. Issues addressed included better wording of the questions so that they would be presented in an unbiased fashion. The setup of the lab and observatory were arranged to be more efficient and less intrusive. In order to experiment with human subjects, RIT required the filing and approval of both the Institutional Review Board (IRB) Form A (Appendix II) and IRB Form C (Appendix III). The experimental design itself was also altered slightly to accommodate for time restrictions.

The entire eye tracking study was conducted in the Laboratory for Computer-Human Interaction and Performance Support located in the Center for Advancing the Study of Cyber Infrastructure (CASCI) on the Rochester Institute of Technology campus (Appendix IV). The laboratory contained the eye tracking equipment and an observation area for others to watch in real time as participants were tested.

The laboratory environment included a 19" Dell Ultrasharp LCD monitor, the Applied Science Laboratories (ASL) head mounted eye tracking system (Figure 1), ASL software, two computers running Pentium 4 processors with 2 gigabytes of RAM and 250 Gigabyte hard drives, an over-the-shoulder video camera mounted high behind participant to record body language, and a microphone and mixer to record audio.

Figure 1: ASL 5000 head mounted eye-tracking system.

The eye tracker was an ASL model 501 head-mounted system that came equipped with ASL's *E5Win* software with serial cable connection, model 5000 control unit, and the headband with optics. Other lab equipment included additional monitors, a mini DV tape recording deck, DVD-R's, a 17" Apple Powerbook with DVD burner used for DVD creation and other miscellaneous tasks and a 42" Gateway plasma monitor used in the observatory.

After participants had completed testing, the encoding of the mini Digital Video (DV) tape was done in the Visual Perception lab located in the Carlson Center for Imaging Science at RIT. The mini DV tape was played back using a JVC BR-DV600UA mini DV editing video tape recorder, RS-422 control, and controller (to control playback speed). The software used in conjunction with the equipment that allowed us to define our areas of interest and manually encode the tapes was written by Professor Jeff Pelz using the Matlab software package. All of the encoding work was done via a serial connection to a Dell PC.

The website used in the study was a subset of the live site of Xerox Corporation that focuses on office equipment (see Figure 2). The site provides sales-related information for new products, customer support information for existing products, on-line ordering, and downloads of product-related software. Participants interacted with the website via a web browser (*Internet Explorer 6.0*) running on a PC with the Microsoft *Windows XP Professional* operating system, a two button, optical scroll mouse and English keyboard, and a 19 inch, flat panel display[1] with 1024x768 pixel resolution. In other respects, the lab simulated a typical office environment.

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[1] Dell 19" Ultrasharp, TFT, active matrix, flat panel. 75 Hz Refreshrate, 800:1 advertised contrast ratio. Participant sat approximately 20 inches from the display.
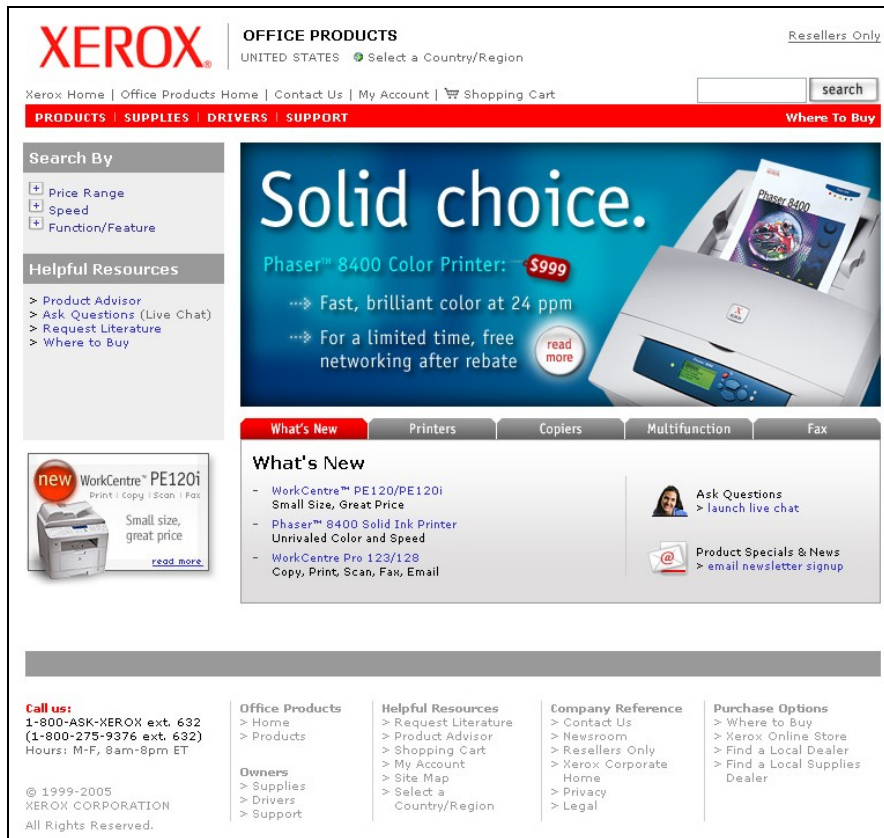
Figure 2: Home page of the tested site.

Design of Experiment

      The tasks for our experiment were broken down into two main sections, a task-driven section and a free-viewing section to better help us assess how participants view webpage banner advertisements. The tasks, pertinent to the site and appropriate for the recruited participants. Banner ads were carefully controlled on the live site throughout the course of the experiment. The website used in the experiment was the office section of the Xerox Corporation website (http://www.office.xerox.com), which provides sales-related and customer support information. The sales-related information included products currently being offered along with a detailed description and the supplies that accompanied those products. The customer support information included an extensive help section that provided additional information about driver downloads, Frequently Asked Questions (FAQ), and additional contact information such as phone numbers, business addresses, email addresses, and a form submission option. Each session had a prominent banner advertisement, for a Xerox product, with the intent to advertise new products and services to site visitors. The banner advertisement occupied 25% of the total area on the Xerox office homepage that required user scrolling to view the entire page. This entire banner

area served as a link to the detailed information page of the product that it was advertising.

The task-driven portion of our study, that always occurred first, involved participants performing a series of tasks on the Xerox office website. Participants were not given a time limit to complete each task. Participants were instructed to notify the test administrator when they had finished the task or felt that they could not finish the task.

The four tasks (for details see Appendix V) included:

- Find a printer that meets a set of four criteria (i.e., prints in color at 20 pages per minute or faster, prints 2-sided, network ready, costs less than $1,500)
- Find and purchase a multifunction product meeting a set of four criteria (i.e., Copies, prints, scans, and faxes, costs less than $1,000, prints on 8.5" x 14" paper, prints at least 20 pages per minute in black & white)
- Find a support solution (i.e., for color spots and marks on printed output)
- Find and download a specific printer driver (i.e., for a Phaser 7750 color printer)

One of four banners appeared in each of the four tasks and no banner appeared more than once for a participant. This was controlled by setting up banner viewing assignment prior to the participant arriving to ensure each banner only appeared once across the four tasks. Each of the four banners was displayed separately in one of four separate browser windows and then all were minimized to hide them from view. When it was time for the task, the window containing the appropriate banner was maximized for viewing. Each banner was unique, but all were advertisements for Xerox office products. Background color, which was varied systematically (white or color). The other controlled variable was banner relevance. Banner relevance was defined by whether the content of the banner was relevant or irrelevant to the completion of that task (i.e., an advertisement for, and link to, the product that met the criteria for a search task). Since all four banner ads were intended as promotions for specific new products, none were ever relevant to two of the tasks (finding a support solution and printer driver download). In order to have two banners that were task-relevant and two that were not, the ads appearing during the two *Find Printer* tasks were always relevant (i.e., provided information and a direct link to the product for which the participant searched). As a result, banner relevance was confounded with specific tasks. While this is an undesirable side effect of this experimental design, it reflects a realistic scenario. The four tasks were counter-balanced with respect to presentation order. Of

the four banners presented, two banners contained information that was relevant to the task and two banners contained information that was irrelevant to the task. Of the two banners that contained relevant information, one banner had a color background and the other banner had a white background. The same was true for the banners that contained information irrelevant to the task. At the end of each task, we asked the participant a series of questions (Appendix VI) before moving on to the next task.

During the free-viewing portion of our study, which always occurred last, participants were instructed by the test administrator to simply "look at" the webpage. Scrolling was permitted to allow participants to view the entire webpage, but we did not permit any clicking or other navigation off the webpage. Participants were given 15 seconds to view and scroll around the webpage without a specific task to perform. At the end of the viewing time we asked the participant a series of questions related to the webpage (Appendix VII) as a whole before moving on to the next webpage. Each participant viewed a total of six web pages that each displayed six different banners. The banners were the only difference between web pages.

Procedure

All participants were tested individually. The recruiter scheduled participants for 90-minute sessions between the dates of January 31st and February 15th, 2005. A detailed map and directions to the lobby of the Golisano College of Computer and Information Sciences (Appendix IV) along with a visitor-parking pass was mailed to each participant before the scheduled date of their session.

Upon arrival, either the test administrator or an assistant greeted the participant in the lobby. The participant was led to the lab and briefed regarding how the session would be conducted. Each participant was given a consent form (Appendix VIII) to read and sign. The test administrator explained that the participant could end the session at any time, for any reason, without penalty. The participant was given a chance to ask any questions he/she had before going into the lab. For greater detail on the introduction procedure, see Appendix IX. All participants received $150 dollars compensation.

Once in the lab, the participant was briefed on the laboratory equipment. A brief explanation on how the eye tracker worked, including the location of the cameras, monocle, and infrared light were pointed out. The PC mouse and keyboard were the only equipment the participant needed to interact with to browse the website on the monitor. Once the participant was briefed, he/she put on the head-mounted eye tracker and the calibration process began. Participants were notified that if, at anytime during the session, they felt discomfort, the eye tracker could be adjusted, removed for a few minutes, or the session terminated. The test administrator answered any further questions for the participant, then proceeded with the calibration process.

The eye tracker headgear was placed on the participant and adjusted to fit snugly enough so that it would not move during testing and not be tight enough to cause pain. Once the fit was adjusted, the test administrator adjusted the monocle and cameras used to capture the pupil and corneal reflection. Next, the administrator adjusted the *E5Win* software program to ensure capture of the best image of the eye. These adjustments were to the camera brightness, pupil diameter reading, and corneal reflection. Once a good calibration of the participant's eye was being displayed, the participant was instructed to look at nine different points on the monitor to locate the foveal gaze.

The eye tracker was calibrated to a visual accuracy of 0.78 degree (arctan 0.32/24). This degree of accuracy was determined by having the participant sit 24 inches away from the monitor and look at each of the nine different calibration targets when instructed. The targets were located in rows of three across the top, middle and bottom of the screen. Each calibration target measured 0.32 inches in radius. For greater detail on the calibration screen points and layout, see Appendix X. The point of gaze was computed in real time and presented simultaneously on the screen along with the nine calibration checking circles. The point of gaze had to be within the 0.65 inch (1.55 degree) diameter circle when the participant fixated the center, to be considered accurate enough to move on to the next point for calibration. The participant was instructed to look at each target during calibration and if the crosshair marker (displayed as real-time feedback of the eye tracker's computation of the participants gaze) was within the 0.65 inch diameter circle on the screen, the calibration was determined to be accurate. Participant was then instructed to view the next calibration target. Once the calibration of all nine targets met the criteria, the administrator started the recording process. A small microphone

was clipped to the participant's shirt to record audio during the session. Two mini DV tapes were used to record video; one tape was for the scene camera and the second tape for the over-the-shoulder camera.

The administrator then began the task-driven part of the session by reading a scenario (Appendix V). The scenario simulated a real life situation where he/she would have to accomplish a task. The participant had no time limit and was told to work at a pace and with a level of care representative of how the participant would behave in his or her own office setting. The test administrator read the instruction to the participant and the participant was asked if he/she fully understood their objective and had any questions. If the participant did not have any other questions and fully understood their objective, the administrator handed a reference card (Appendix V) with the basic information needed to complete the task to the participant. Participants typically placed the card on the desk and would read it from the desk or pick it up and read it, then set it back down on the desk. The administrator brought up the starting webpage and the participant began the task. As the participant worked through each task, the administrative assistant in the lab took detailed notes about the participant's behavior and comments. For greater detail on the note-taking template used, see Appendix XI.

The participant was instructed to close the browser window when finished with the task. The participant was handed a series of questions to follow along with while the administrator read the questions aloud (Appendix VI). After all the questions had been answered, the calibration of the eye tracker was checked again. The participant was instructed to look at a point on the monitor to ensure the calibration was still accurate to within 1.55 degree visual angle. The participant was recalibrated if necessary. This process was repeated for each of the four tasks.   At the end of the fourth task the participant was asked a series of questions related to the website as a whole. Specific questions can be found in Appendix VI.

Before we began the second part of the session, which was the free-viewing portion, the calibration was checked again and recalibrated if necessary. The administrator explained to the participant that this portion of the experiment would not involve any navigation of the website. Participants were instructed to simply "look at" the webpage. They were permitted to scroll the webpage, but were told not to click on any hyperlinks and/or navigate off the page. Once the user understood, the administrator brought the first webpage up for the participant to look at for

15 seconds. At the end of the 15 seconds, the administrator asked the participant a series of questions (Appendix VII) related to the webpage. No reference to the banners was made at this point. After completion of the questions for that page, calibration was checked again, using just a single point, and adjustments were made if needed. The administrator brought up the next webpage for the participant. This process was repeated for each of the six webpages the first pass through. After the participant had gone through each webpage once, they were instructed to go back to the first webpage again. This time, the participant was asked a series of banner specific questions (Appendix VII). This process was again repeated for each of the six webpages.

At the completion of the second pass through the six webpages, each participant was then asked a series of questions pertaining to the website as a whole. Further details of these questions can be found in Appendix VII. Time permitting, participants were then instructed to look at one last webpage that contained an animated banner. They were asked a series of questions related to this banner (Appendix VII). Screen shots of the six banners used can be found in Appendix XII.

At the end of the test, the test administrator notified the participant that the experiment was over and the eye tracker headgear was removed. The administrator stopped recording of both DV tapes and turned off the audio equipment. Participants were notified as to how they would be receiving their payment and given the contact information of the recruiter in the event of questions regarding payment. The test administrator thanked the participant for their time and showed him/her back to the lobby from which they entered. This concluded the session. Further details of Eye Tracking Recording Sheet can be found in Appendix XI.

Analysis

Eye Tracking Analysis

The eye tracking video data were encoded and analyzed after the data collection sessions. The encoding of the eye tracking data used a custom MATLAB software application. This program allowed us to capture the user's point of fixation during the task starting at the time of entrance into an area of interest (AOI) and stopping when they exited the area of interest. Figure 3 shows the areas of interest on the website.

Figure 3: Areas of Interest on the Website.

The areas of interest in our study included:

- Header (A)

- Primary navigation on top (B)

- Secondary navigation on the left (C)

- Primary banner in the center (D)

- Secondary banner on the left (E)

- Tab navigation in the center (F)

- Footer (G)

Manual encoding was done by playing back the eye tracking video that represented the participant's point of fixation with a cross-hair overlay on the screen. Figure 4 shows an image captured through the scene camera with a picture-in-picture (PIP) of the eye camera. This image demonstrates what the crosshairs looked like as they overlaid the screen with which the participant was interacting.

Figure 4: Scene Camera with Crosshairs Overlaid on the Screen and a picture-in-picture inset of the Eye Camera.

As the crosshairs moved in and out of different areas of interests the experimenter pressed one of eleven function keys to record movement into and out of the predefined areas of interest. When the function key was pressed, a timestamp associated with the video clip was recorded. Function keys represented the entering and exiting of areas of interest. The total time spent on the area of interest could then be calculated along with the number of dwells. The encoding application also allowed for customized inputs.   Figure 5 below shows a screen shot of what the encoding application interface looks like:
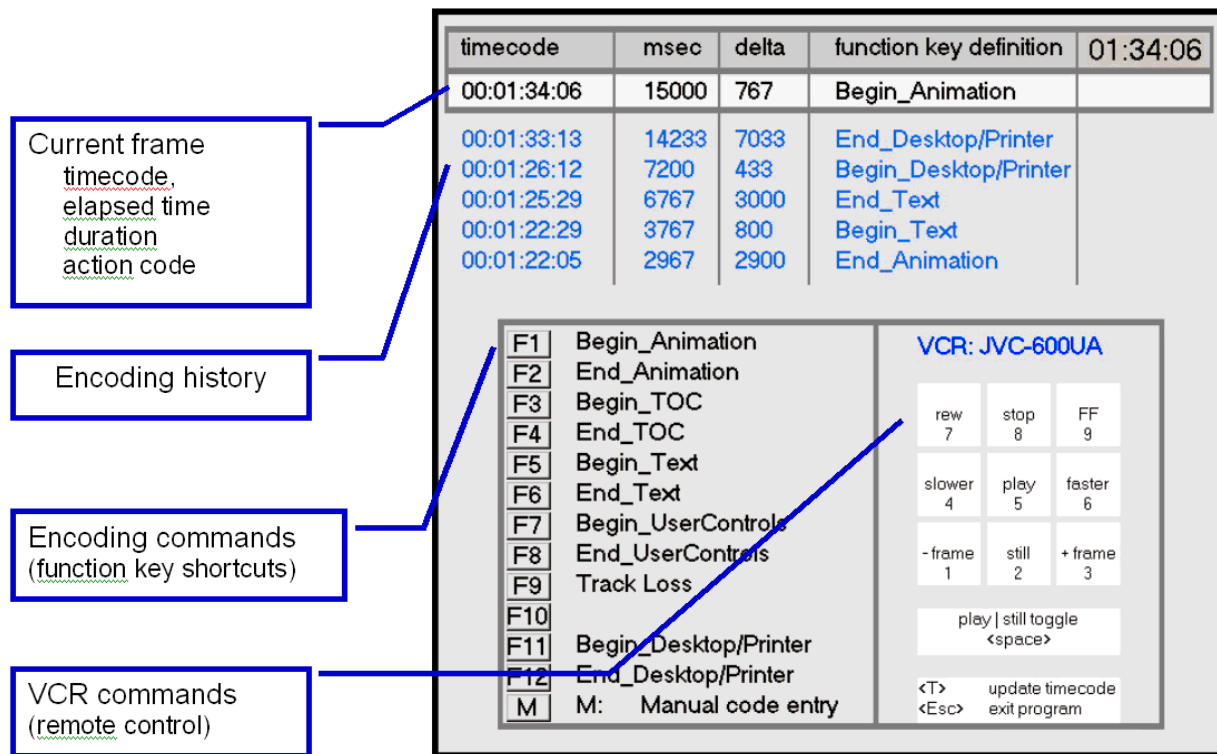
Figure 5: Screen shot of the encoding application interface with main areas labeled.

After data from each participant was encoded and saved, the results were exported to a spreadsheet where they could be further analyzed. The individual participant data spreadsheets were eventually combined so that further statistical analysis could take place. We performed ad hoc analyses to compare the visual behaviors in the Task and Task-free conditions. We wanted to see if the way in which the study itself was conducted (i.e., whether it was task free or task driven) would influence participants' viewing behavior. We looked at how task free searches and task driven searches would increase or decrease the frequency or total duration of dwells on a visual element. We also analyzed the data to determine whether users spend less time looking at the banner advertisement over the course of the four tasks performed on the same website.

Results

Task Driven Results

The task-driven portion of our experiment attempted to address our hypotheses. Hypothesis 1 stated that the background color of the banner would influence banner-viewing behavior. Hypothesis 2 stated that the relevance of the banner content to the task at hand would influence banner-viewing behavior. Tables 1 and 2 below show summary data of total and average time and dwells on white and color background banners and relevant and irrelevant banners to the task on the homepage.

	Total time spent viewing the banner across all participants (sec)	Average time spent viewing the banner per participant (sec)
Time on Color BG:	60.2	2.6
Time on White BG:	63.5	2.8

	Total number of dwells on the banner across all participants (dwells)	Average number of dwells on the banner per participant (dwells)
Dwells on Color BG:	66	2.9
Dwells on White BG:	78	3.4

Table 1: Time and Dwells on White and Color Background Banners.

	Total time spent viewing the banner across all participants (sec)	Average time spent viewing the banner per participant (sec)
Time on Relevant:	60.3	2.6
Time on Irrelevant:	63.4	2.7

	Total number of dwells on the banner across all participants (dwells)	Average number of dwells on the banner per participant (dwells)
Dwells on Relevant:	70	3.0
Dwells on Irrelevant:	74	3.2

Table 2: Time and Dwells on Relevant and Irrelevant Banners.

Each of the twenty-four participants answered a series of questions after each task (Appendix VI). Tables 3 and 4 outline the participant feedback to the task driven questionnaire. Each scale ranged from -4 (Extremely difficult, Much too Little Information, or Extremely Confusing) to +4 (Extremely Easy, Much too Much Information, or Extremely Clear) with 0 being neutral. See Appendix XI for further details of eye tracking recording sheet and Appendix XIII for a summary of the eye tracking recording data.

Average Ratings By Task

Task ID	Task Description	Ease of Use	Amt of information	Confusion
1	Phaser 8400-Find, Request more info	1.33	0.30	1.91
2	PE120-Find, purchase	1.33	0.08	1.75
3	M24-Find a support solution	2.58	N/A	N/A
4	Phaser 7750-Download Driver	2.92	-0.33	2.50

Table 3: Participant feedback and ratings to the task driven questionnaire.

Website Attributes

Attribute Count

Attribute	# of Participants who agreed
professional	22
savvy	5
vibrant	5
complicated	4
slow	2
playful	1
dull	1
none of the above	1
disorganized	0

Additional Information:

# who selected professional alone:	10
# who selected professional and savvy:	5
# who selected savvy alone:	0
# selected professional and vibrant:	4
# selected vibrant alone:	1
# selected professional and complicated:	3
# selected complicated alone	1
# selected professional, savvy, vibrant	2

Table 4: Participant feedback on Xerox website attributes.

Analysis of the eye tracking data during the task driven portion of the experiment revealed no significant difference between the white and color banner background with respect to total time participants dwelled on the banner (1-Tailed Wilcoxon Signed-Rank Test, P = 0.4801) or the number of dwells on the banner (1-Tailed Wilcoxon Signed-Rank Test, P = 0.3156). Graphs of the median total dwell time and median number of dwells on the banner with respect to banner background color across 4 tasks can be found in Figure 6 and Figure 7.
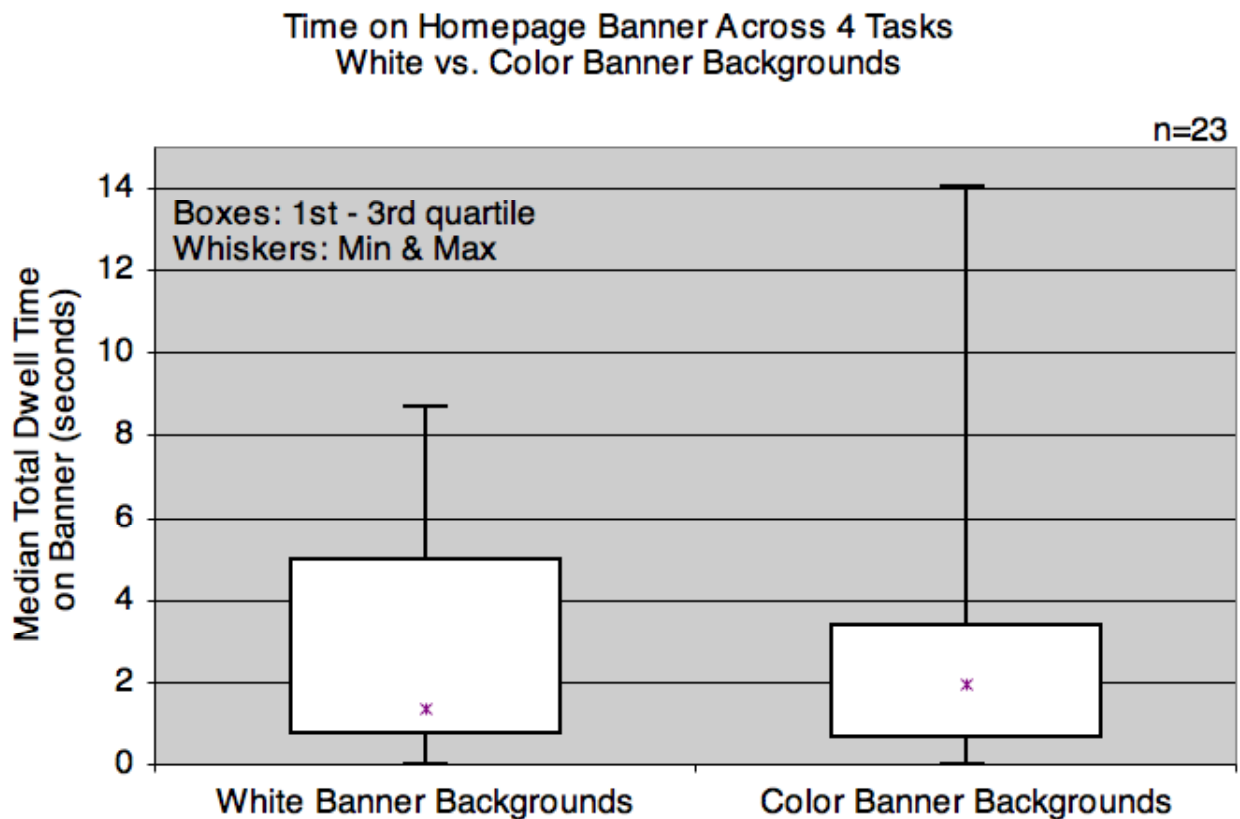
Figure 6: Median Total Dwell Time with respect to Banner Background Color Across Four Tasks. Asterisks (*) represent the median values.
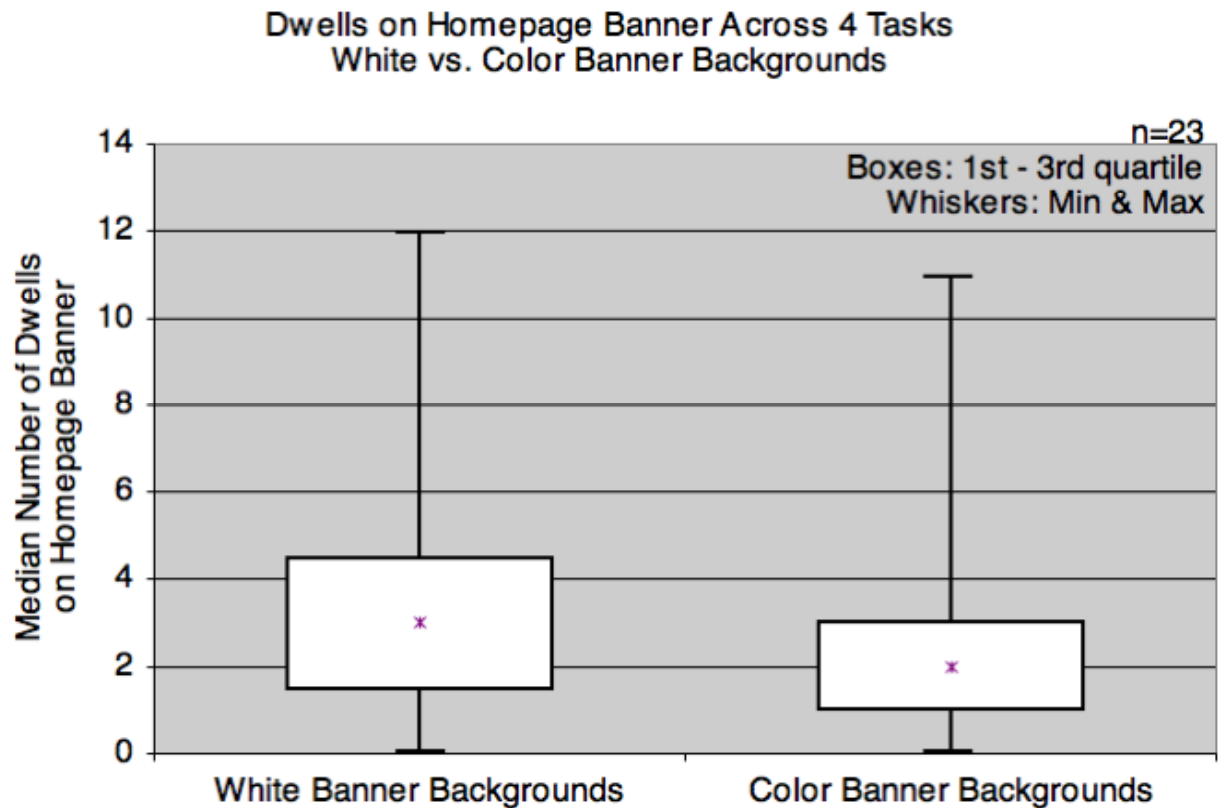
Figure 7: Median Number of Dwells on the Banner with respect to Banner Background Color Across 4 Tasks. Asterisks (*) represent the median values.

We found no significant difference between a task relevant banner and a task irrelevant banner with respect to total time participants dwelled on (1-Tailed Wilcoxon Signed-Rank Test, $P = 0.1379$) or number of dwells (1-Tailed Wilcoxon Signed-Rank Test, $P = 0.2578$) on the banner. Graphs of the median total dwell time and median number of dwells on the banner with respect to banner relevance can be found in Figures 8 and 9. The output of the statistical calculations is in Appendix XIV.

**Dwells on Homepage Banner Across 4
Tasks**
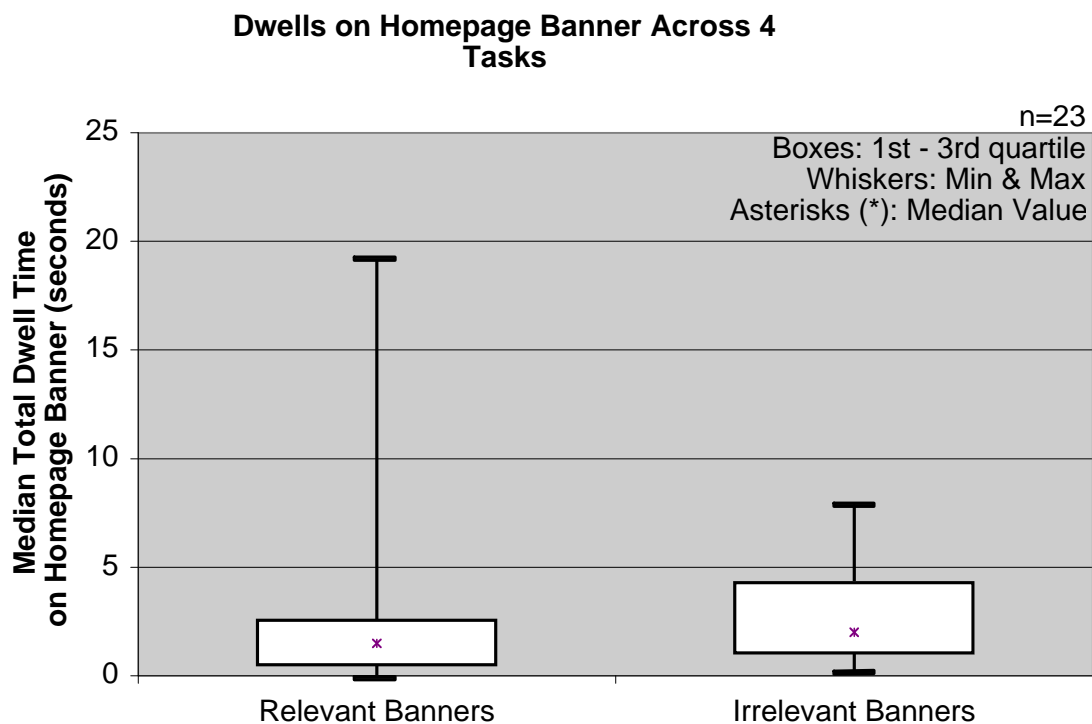
Figure 8: Median Total Dwell Time on the Banner with Respect to Banner Relevance.

**Dwells on Homepage Banner Across 4
Tasks**
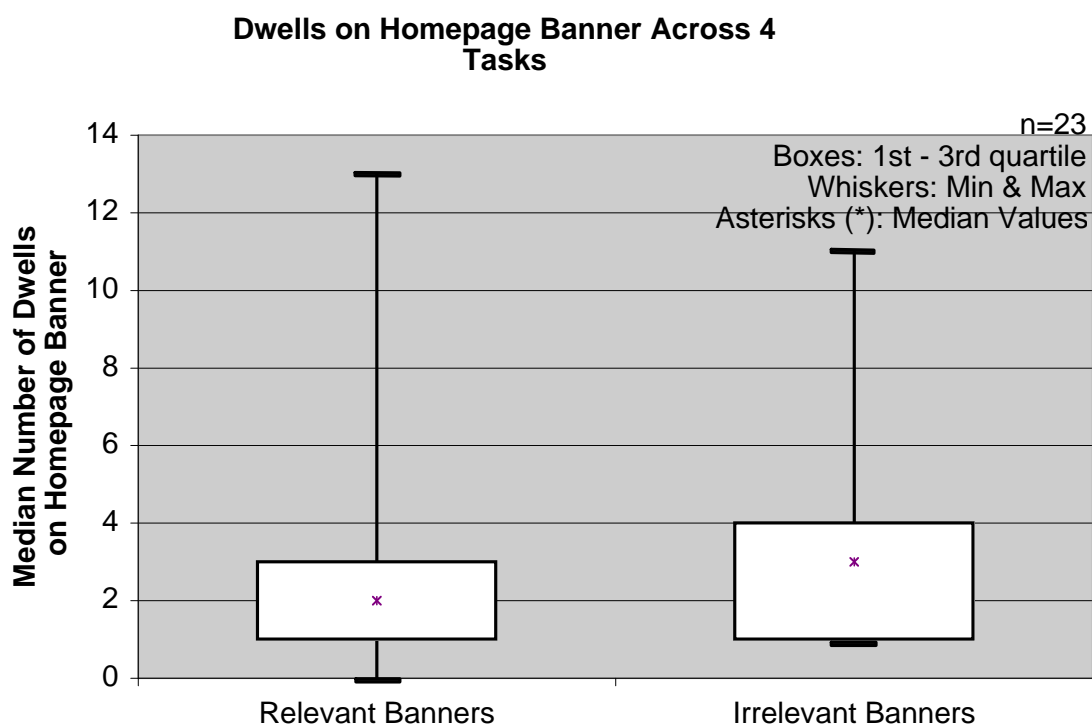
Figure 9: Median Number of Dwells on the Banner with Respect to Banner Relevance.

We plotted total dwells on homepage vs. task order because we were interested in seeing if repeated exposure to the same webpage resulted in an increase in banner blindness (i.e., decreasing frequency or duration of dwells on the banner).

Banner viewing, with respect to total dwells, decreased significantly with each successive task (Friedman test, $p<.05$) see Figure 10.

Total Dwells on Homepage Banner vs. Task Order
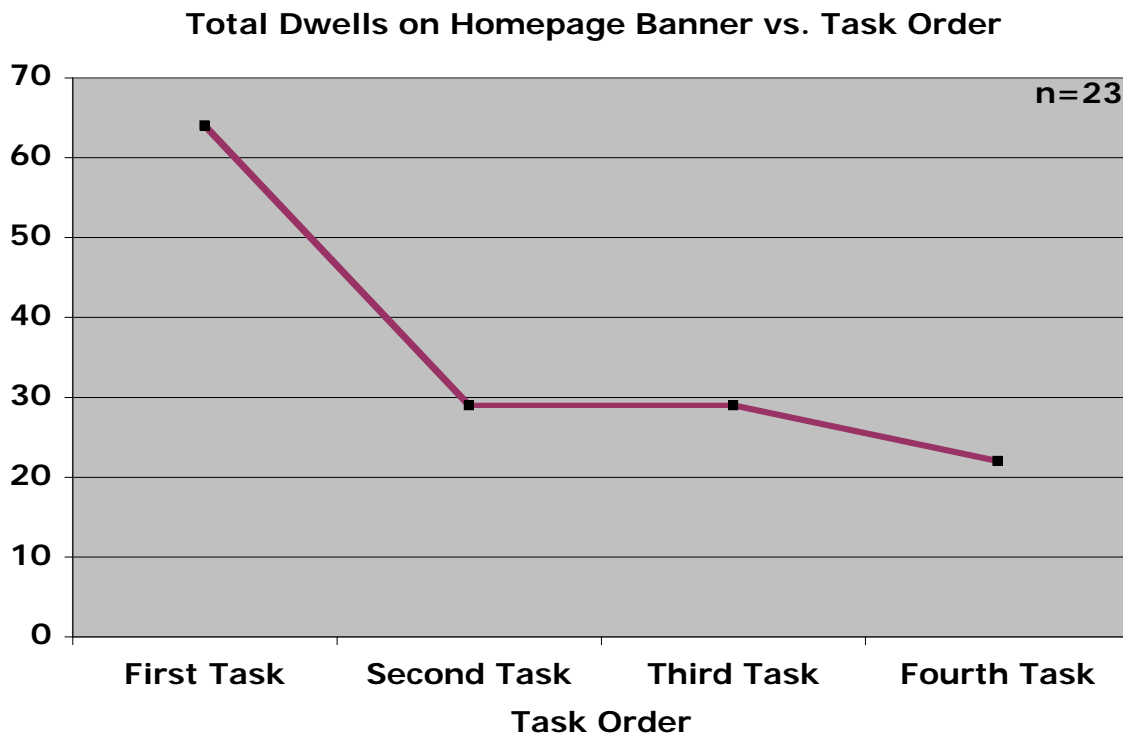
Figure 10: Total Dwells For All Participants Across Tasks on Homepage.

We hypothesized that the decreasing time spent viewing the banner with later tasks could result from either of two causes:

1. Participants learn where the banner ad is, judge that it is irrelevant to their work and avoid it.
2. Participants learn the general structure of the site and become faster at performing tasks and leave the home page more quickly on later tasks thus having less opportunity to see the banner ad.

While it is difficult to distinguish between these two possibilities, we plotted total dwells on the homepage banner vs. elapsed time spent on the homepage accumulated across tasks as a histogram. Figure 11 shows a steady downward trend of total dwells on the homepage banner as

time elapses on the homepage suggesting that participants quickly learn to avoid banners perceived to be irrelevant to the task with elapsed time spent on the homepage.
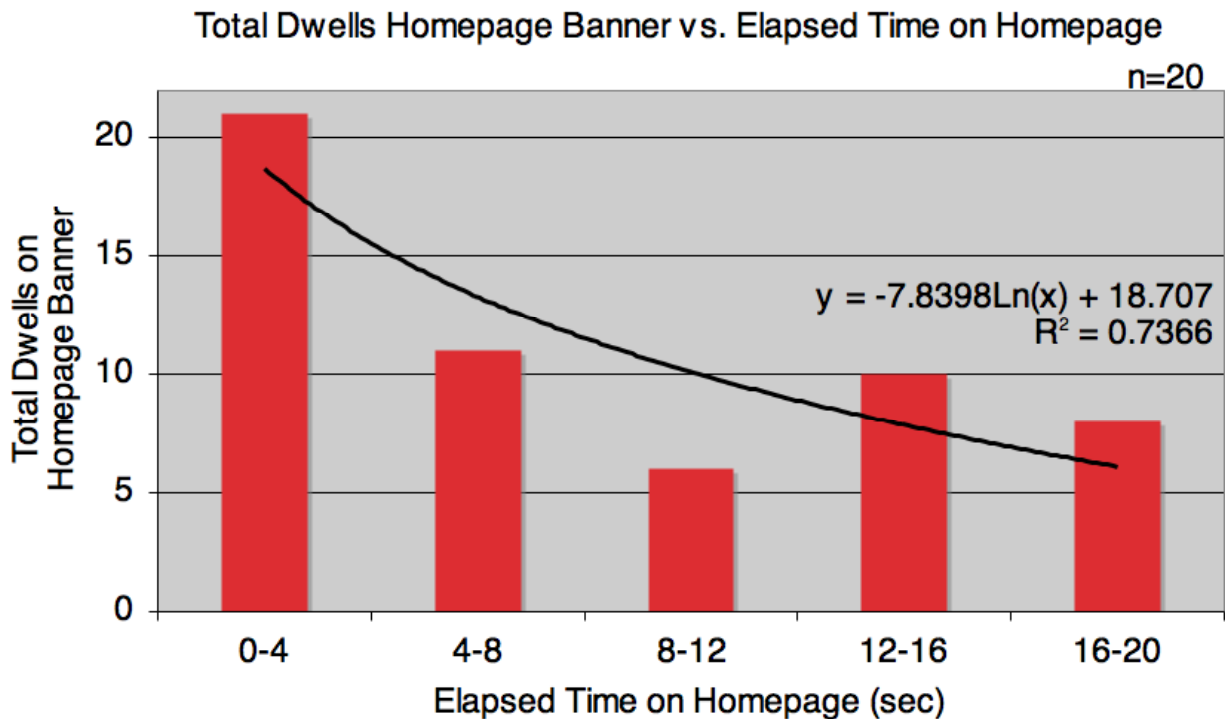
Figure 11: Total Dwells on Banner Across Elapsed Time on Homepage

We predicted that task free vs. task driven viewing would impact participant viewing behavior and be reflected in an increase or decrease in the frequency or total duration of dwells on the banner. While we tracked participants' eye movements for the first 15 seconds on each home page stimulus in the task free condition, participants spent different amounts of time viewing the home page before navigating to another page or completing the task in the task driven condition. As a result, tasks on which a participant spent more time on the home page provided a greater opportunity for dwells on the banner advertisement. To remove such a bias, we looked at only the first 10 seconds[2] of eye position data for comparison between the four tasks and the free viewing condition. Some participants completed some tasks in less than 10 seconds. In those cases we normalized the data as follows. If the participant spent at least 10 seconds on the home page before navigating off or completing the task, no adjustment was

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[2] We choose 10 seconds in order to capture only the initial perception of the page and to minimize the amount of data that would require normalization. Pan et al (2004) used a similar value (15 seconds).

performed. If a participant spent less than 10 seconds on the homepage, we looked at the ratio of dwell time on the banner to the total amount of time spent on the homepage. We multiplied this ratio times 10 seconds to reflect 10 seconds of viewing time to better compare the results against each other and ensure no data were lost. This process was repeated across each task. There were six such cases in the first task, eight such cases in the second task, thirteen such cases in the third task and fourteen such cases in the fourth task. As participants became more familiar with the site, they spent less time on the homepage. We found significantly more dwells on the banner and more total banner viewing time (Friedman test, $p<.05$) in the task-free context. A graph of banner dwells with respect to task presentation can be found in Figure 12.
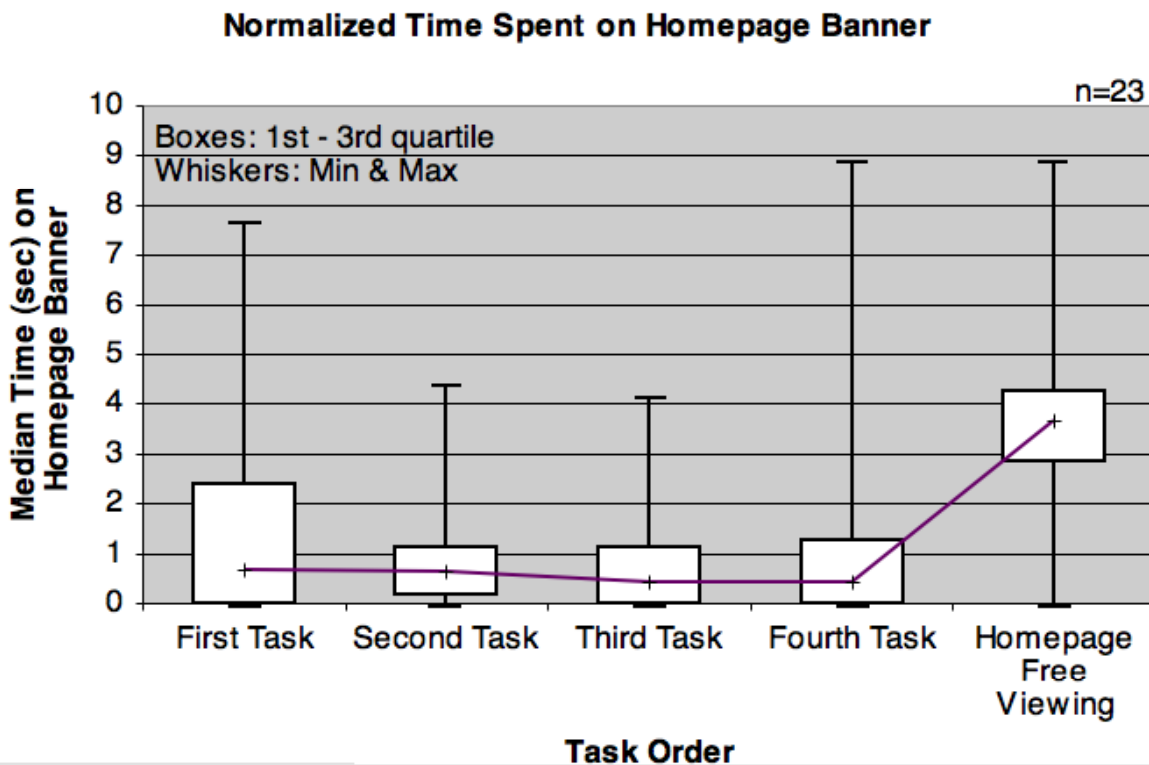
Figure 12: Normalized Time Spent on Homepage Banner

Free Viewing Results

The free viewing portion of our experiment gave participants a standard viewing time (15 seconds) of a webpage in which they were instructed to simply look over the webpage and not click on any links or navigate off the page. At the end of the time, they were asked a series of website related questions the first pass through (Appendix VII). Tables 5 and 6 below outline the participant feedback to the free viewing questionnaire. The banner rating ranged from -4 (Extremely difficult, Much too Little Information, or Extremely Confusing) to +4 (Extremely Easy, Much too Much Information, or Extremely Clear) with 0 being neutral.

Banner ID	Product advertised	Title	Background	Person	Displayed Price	Overall Appeal	Attention-getting	Background Appeal
1	WorkCentre	Streamline	Complex	In BG	No	1.17	2.13	1.58
2	Phaser	Solid Choice	White	No	Yes	-0.54	1.38	-1.13
3	Phaser	Color Payback	Complex	Yes	Yes	0.71	1.38	1.17
4	WorkCentre	Delegate	White	On printouts	No	-0.50	1.46	-0.96
5	Phaser	Solid Choice	Complex	No	Yes	2.21	2.54	2.13
6	WorkCentre	Delegate	Complex	Yes	Yes	1.08	1.13	0.50
Animated	Xerox Color	N/A	White	No	No	1.83	2.79	N/A

Table 5:   Mean Banner Ratings Comparison. Banner ID's 2, 4, 5, 6 were used in the first part of the study.

Each participant was asked three questions at the conclusion of the free viewing part of the experiment.

1. Do you prefer banners with a white or color/image background?

    Number preferring White: 6   **Number preferring Color/Image:** 18

2. Do you prefer banners with an image of a person or without an image of a person?

    Number preferring Person: 11   **Number preferring No Person:** 13

3. Do you think the price of the product should or shouldn't be displayed on a banner?

    Number preferring Price: 20   **Number preferring No Price:** 4

The result of question one suggests that a participant's preference for a color/image background does not translate into increased banner fixations during task driven or free viewing scenarios. This is important to acknowledge because had the experiment been run using only subjective questions like those in Table 6, the experiment would have only been testing the participant's opinion (Jerz, 2002). A more accurate test of the user is accomplished with the aid

of eye tracking. This allows for a more in-depth observation of how the participant interacts with the environment and measures their performance rather than simply gathering opinions. Reporting only the opinions displayed in Table 6 back to Xerox would have been greatly misleading and conflicting with the results from eye tracking.

Eye tracking data of participants looking at the webpage in the task-free condition were recorded and analyzed. The webpage was broken down into seven areas of interest: header, header navigation, left navigation, primary banner (center), secondary banner (left), tab navigation and footer.   Refer to Figure 3 for further details of the area of interest. Each banner was then broken down in several areas of interests depending on the banner's content. These areas of interest included main title, block of text, person/face, *read more* button, printer image, *editors choice* button and a price tag. Banner areas of interest were not always the same size, (i.e., the size the printer and human/face areas of interest differed between banners), and thus were adjusted for size so they could be compared. Calculating the area of interest size (pixels) divided by the total dwell time multiplied by 1000 did this. See Figures 13 and 14 for outline of how each banner area of interest was defined. Each banner area of interest fell into the category of title text, detail text, printer image, facial image, price tag or read more button. Figure 15 shows each banner element and the adjusted dwell time (mS). No further analysis was done on this data.

Figure 13: Color Background Banner Areas of Interest

Figure 14: White Background Banner Areas of Interest

Banner Walkthrough - Adjusted Dwell Time - Banner 1
Dwell Time (mS) / Pixel

Main Title
5%

Person/Face
20%

Block of text
34%

Read More Btn
25%

Printer Image
16%
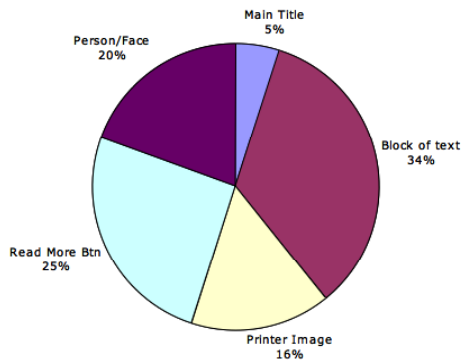
Banner Walkthrough - Adjusted Dwell Time - Banner 2
Dwell Time (mS) / Pixel

Main Title
7%

Block of text
15%

Editors Choice
40%

Printer Image
11%

Price Tag
15%

Read More Btn
12%
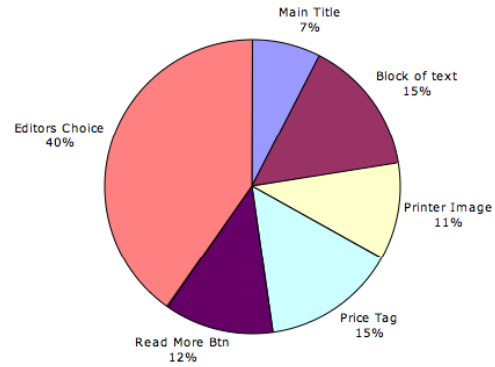
Banner Walkthrough - Adjusted Dwell Time - Banner 3
Dwell Time (mS) / Pixel

Person/Face
9%

Main Title
10%

Read More Btn
15%

Block of text
22%

Price Tag
18%

Printer Image
26%
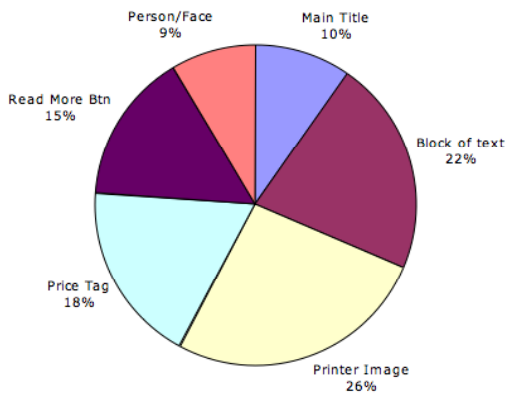
Banner Walkthrough - Adjusted Dwell Time - Banner 4
Dwell Time (mS) / Pixel

Main Title
8%

Block of text
19%

Person/Face
52%

Printer Image
10%

Read More Btn
11%
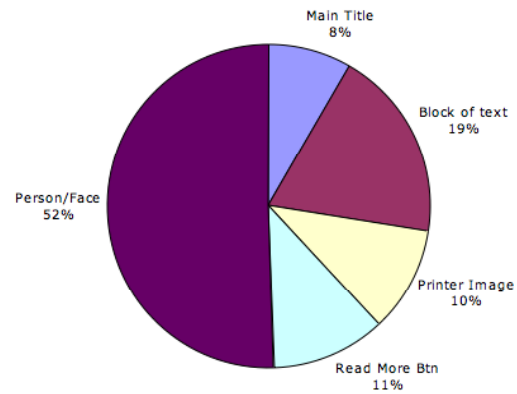
Banner Walkthrough - Adjusted Dwell Time - Banner 5
Dwell Time (mS) / Pixel

Main Title
8%

Read More Btn
22%

Block of text
21%

Printer Image
9%

Price Tag
40%
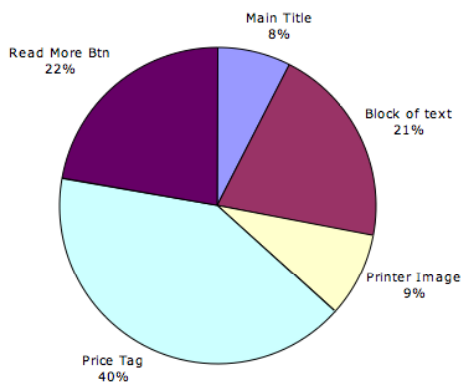
Banner Walkthrough - Adjusted Dwell Time - Banner 6
Dwell Time (mS) / Pixel

Person/Face
12%

Main Title
14%

Read More Btn
35%

Block of text
28%

Printer Image
11%
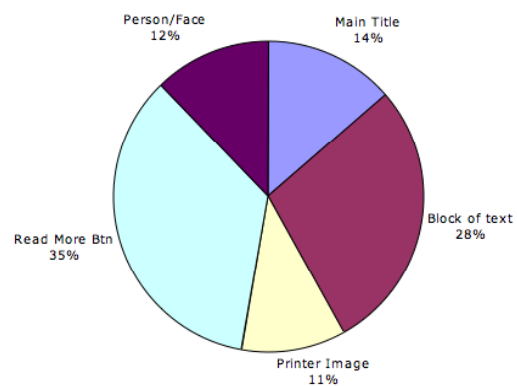
Figure 15: Adjusted Dwell Time for Banner Elements.

Discussion

We expected that changes to the background color of the banner and the banner relevance to the task at hand would have a significant effect on participant banner-viewing behavior. The statistical evidence does not support our hypotheses.

Hypothesis 1: The background color of the banner would influence banner-viewing behavior. The background color of the banner had no significant effect on banner-viewing behavior (i.e., time or number of dwells on the banner). Table 1 shows time and dwells on both white and color background banners. Despite the differences found, none proved to be significant (Appendix XIV). This could have been partially due to the relatively small sample size of 23 participants.

Hypothesis 2: The relevance of the banner content to the task at hand would influence banner-viewing behavior. The relevance of the banner content to the task did not significantly affect the viewing time or number of dwells on the banner. Table 2 shows time and dwells on banners that were relevant and irrelevant to the task. None proved to be significant (Appendix XIV).

Deploying visual attention to banners seems to be most common when a user initially visits a webpage. Users quickly learn the structure of a webpage and avoid visual fixations on banner ads. This learning sees to occur mostly during the initial exposure to a web page. Our study suggests that users generally assume that banner ads are irrelevant to the task at hand indicating that users generalize experiences from one webpage to another. Eye tracking data proved to be a valuable supplement to other quantifiable measurements such as click-through rates because it allows for a deeper look into the participant's behavioral actions than does click-through rate measurement alone. Just because a user did not click on the banner does not mean that he or she did not fixate on it and/or gain insight on the information they were seeking though the banner. Our study shows that eye tracking is a useful tool for understanding user behavior and evaluating alternative designs when developing websites.

The time that participants spent looking at banners with white backgrounds was slightly (though not significantly) higher than the time participants spent looking at banners with color

backgrounds. (see Table 1). This may suggest that some participants did not distinguish between the white banner background and the white webpage background, thus making the banner content blend better into the page itself. With a higher sample size, this difference could prove to be significant. This would confirm that a user's preference, in terms of banner aesthetics, is not always what he or she fixates on during a real task scenario. Participants might be assuming that clearly distinguishable banner ads contain irrelevant information and thus avoid it.

The contradictory results, participants preferring color background banners but fixating and clicking more on white background banners, is a testament to the value added by eye tracking and the way in which the usability experiment was conducted. Taking the results of only the traditional usability questionnaire (Appendix VII), would have suggested that participants preferred banners with a color background.

Participants in a task driven scenario, as opposed to sitting in front of a screen and being asked simply to look at a web page, yielded significantly different results. Refer to Figure 12 for a graph of banner dwells with respect to task presentation. Another study (Wong, 2001) claims participants are not "totally banner blind" but never tested the banner in a task driven scenario to see how users would react. Our study showed significantly higher dwells and total viewing time on the banner in the task-free context, suggesting that the way in which the experiment is conducted can affect results.

Recommendations for Further Study

This study has opened the door to other future research possibilities that we either did not touch upon at all during our research or touched upon modestly. Other such research possibilities could include:

- How banner animation affected participant behavior. We looked briefly at banners that had animation in them and how that affected user behavior. We did not analyze the data and did not conduct enough tests to really gain a firm understanding of banner animation. A separate experiment could be setup to look specifically at this.

- Various banner placements on a webpage. All banners tested were constantly displayed in the same position on the webpage. Consider experimenting with a design that moves banner ads on the page from visit to visit to determine if such variable placement of ads might increase their attention-getting effectiveness without disrupting the user task performance.

- Content within the banners. Although we did some analysis on banner content the experiment itself was not set up in a way that could give us concrete results that would point to specific banner content such as a person's face.

- Users' memory for the content of banner ads (Spillers, 2004). We did not test if participants could accurately recall the different contents within the banner ad.

- The size and text within the banner. We did not vary the size of any of the banners and we also did not control the text within the banners.

- Consider conducting more in-depth analysis of the eye tracking data to investigate the pattern of eye movements over extended periods of time (Pelz & Canosa & Babcock, 2000). We only analyzed a fixed amount of time during the task-drive portion of the experiment. A software tool, created by Julia West (2005), called eyePatterns could be used to help identify fixation sequences across each of the tasks.

We recommend choosing a banner background color based on factors other than their ability to attract visual attention. Google is one company that offers content specific advertising to target audiences. Their advertising success with small banner and text ads could be worth further research. Further research in any of these areas would help us gain a better understanding of customer behavior thus helping businesses, which want to improve their site's usability for sales and for customers who want to navigate the site without being distracted by irrelevant or annoying ads. Assume that users of the website will be most likely to look at a banner on their first visit to a page. Analyze the tasks of users on initial visits to the home page and target banner advertising accordingly.

Additional cost-benefit analysis of usability testing (Ellender, 2003; Nielsen, 2003) in the corporate world with respect to how best to incorporate usability testing into a project could be done. Ellender suggests that the best returns on your usability investments will be yielded if usability testing is done at the earliest stages and continues throughout the development process but only offers one example. This idea could be tested more extensively in a controlled setting. Further research on this topic could prove greatly beneficial to many corporations.

Acknowledgements

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Appendix I: Screening Questionnaire

Usability Screener for Xerox.com Eye-tracking Study

December 20, 2004

Respondent Name:	**Telephone#:**
Title:	**Interviewer:**
Company:	**Appointment Date & Time:**

INTERVIEWER: Ask to speak with a person who is involved in the process of selecting office equipment such as printers, copiers, fax machines, or multi-function machines for the organization. The potential participant might perform any of the following in addition to other job responsibilities: researching, evaluating, recommending, specifying, approving, or purchasing printers, copiers, fax machines, or multifunction office machines.

Hello, My name is _____ of Karlamar Associates. This is not a sales call. We have been commissioned by Xerox Corporation and Rochester Institute of Technology to find qualified people to participate in a study of how people seek information when considering a purchase decision. The purpose of this call is to identify people who may have the qualifications and interest to participate in the study. Participants in the study will browse websites while researchers track their eye movements. The eye tracking system is comfortable and safe to use. It simply requires the participant to wear a headband that supports two miniature cameras. Each person who participates in a one-hour session will receive a financial honorarium of $100. The sessions will be scheduled January 31, 2005 through February 13, 2005 on the Rochester Institute of Technology campus. I'm calling to find out if you are interested and if you fit the profile of the participants that we seek. If you are interested, I would like to ask you some questions about your work experience. Your responses to these questions will determine if you are qualified to participate in the study and will take about 10 minutes. Is this a convenient time?

      ☐ Yes   CONTINUE
      ☐ No   SCHEDULE CALLBACK DATE & TIME:_____
      ☐ Refused   ASK FOR A REFERRAL TO SOMEONE ELSE

Keep in mind that there are no right or wrong answers to these questions. It is important that you answer the questions as honestly as possible.

1. Have you or any member of your household ever worked for Xerox Corporation or any Xerox agent or dealer?

      ☐ Yes – THANK AND TERMINATE
      ☐ No   – CONTINUE

2. Have you ever worked at designing or managing websites?

      ☐ Yes – THANK AND TERMINATE
      ☐ No   – CONTINUE

3. The research study involves tracking your eye movements while you view and interact with various websites. This involves wearing a snug headband that supports some optical components.

Eye tracking technology is safe and the headband can be adjusted for comfort. Will you allow the use of the eye-tracking system?

- ☐ Yes – CONTINUE
- ☐ No – THANK AND TERMINATE

4. The evaluation sessions are typically recorded on videotape for analysis. Are you willing to allow video recording of the evaluation?
- ☐ Yes – CONTINUE
- ☐ No – THANK AND TERMINATE

5. The eye-tracking system may need to be adjusted based on the shape of your eyes. In order for us to enable proper adjustments we need to know your ethnic origin. Please select all ethnicities that apply. Are any of your ancestors …

- ☐ Caucasian?
- ☐ African /African American?
- ☐ American Indian / Alaska Native?
- ☐ Asian / Pacific Islander? - THANK AND TERMINATE

6. Are you comfortable reading information on websites written in English and conversing fluently in English about your experiences?

- ☐ Yes – CONTINUE
- ☐ No – THANK AND TERMINATE

7. In the past 18 months, which of the following types of office equipment have you been involved in investigating, recommending and or purchasing for work? Please include brand and model. Please exclude purchases made for personal home use:

- ☐ Inkjet printer – THIS ALONE DOES NOT QUALIFY
- ☐ Direct-connect, desktop laser printer – CONTINUE
- ☐ Network laser printer – CONTINUE
- ☐ Copier – CONTINUE
- ☐ Fax machine – CONTINUE
- ☐ Multi-function inkjet product (e.g., combination copier / printer) – THIS ALONE DOES NOT QUALIFY
- ☐ Multi-function laser product (e.g., combination copier / printer) – CONTINUE
- ☐ Other _____
- ☐ None   – THANK AND TERMINATE

Note to interviewer: Must have purchased some sort of "Xerox-class product" (i.e., laser technology – not just ink-jet and cost >$500,)   If "Other" need to qualify with usability test administrator. Home business purchases are OK, but products for personal home use do not qualify.

8. In addition to the recently procured equipment listed above, what other office equipment does your work group share? Please include brands and models.

- ☐ Inkjet printer
- ☐ Direct-connect, desktop laser printer
- ☐ Network laser printer
- ☐ Copier
- ☐ Fax machine
- ☐ Multi-function inkjet product (e.g., combination copier / printer)
- ☐ Multi-function laser product (e.g., combination copier / printer)
- ☐ Other _____

9. Which of the following sources of information did you consult when gathering information about office products for your organization?

- ☐ Professional or trade magazines
- ☐ Tradeshows
- ☐ **Equipment manufacturer or service provider websites** – **REQUIRED**
- ☐ Shopping comparison websites
- ☐ Telephone contact with vendor
- ☐ Printed literature
- ☐ Other

10. What is the name of the company that you typically buy office equipment from?

_____

_____

11. Have you ever purchased anything on the web for business or personal use? If so what was it and when did the purchase take place?

_____

_____

12. What are some of the paper output you produce?
- ☐ Office documents (Word, Excel, PowerPoint)
- ☐ Legal briefs in large quantities
- ☐ Marketing drafts
- ☐ Presentations
- ☐ Other. Please describe: _____

_____

13. When selecting office equipment which one of the following most closely describes your role in the process: **[Interviewer read list and check only one response.]**
- ☐ I investigate options for purchase and forward the information to others for assessment and evaluation – THANK AND TERMINATE
- ☐ I investigate options and make recommendations to others who make the final decisions – CONTINUE
- ☐ I investigate options and make the final purchase decision – CONTINUE
- ☐ Someone else investigates options and I make the final purchasing decision – CONTINUE
- ☐ None of the above – THANK AND TERMINATE
- ☐ Other. Please describe: _____

_____

Note to interviewer: If "Other" need to qualify with usability test administrator.

14. Which one of the following sources of information did you consult when gathering information about equipment purchases for your organization? **[Interviewer read list and check only one.]**
    - ☐ Professional or trade magazines
    - ☐ Tradeshows
    - ☐ Equipment manufacturers' or service providers' websites – REQUIRED
    - ☐ Shopping comparison websites
    - ☐ Telephone contact with vendor
    - ☐ Printed literature
    - ☐ Other

    Note to interviewer: Use of Equipment manufacturers' or service providers' websites is required.

15. Approximately how many people are typically in the organizations that are affected by these purchase decisions for office equipment?
    _____ (Enter approximate number of people).

16. For what purposes do you use the Internet either at work or at home?

    - ☐ Research topics for work or school
    - ☐ Browse or search for information on topics of interest
    - ☐ Bank online
    - ☐ Make travel plans
    - ☐ Download programs, music, documents or pictures
    - ☐ Shop online
    - ☐ Probe: For business or personal use? What was it, when was it purchased?
    - ☐ Other _____
    - ☐ Don't use Internet – THANK AND TERMINATE

Note to interviewer: This question is designed to confirm that potential participants are competent internet users. Probe for specific site names and tasks (e.g., "I check scores on ESPN," "I shop on Amazon," "I do online banking at BankAmerica," etc.) Only disqualify if they cannot describe **anything.**

17. Which browser do you typically use?

    - ☐ Internet Explorer
    - ☐ Mozilla
    - ☐ Firefox
    - ☐ Safari
    - ☐ Netscape

Note to interviewer: This question is designed to help us set up the test environment before the participant gets there so little time is wasted.

IF RESPONDENT ANSWERS SATISFY REQUIRED RESPONSES IN SCREENER THEY QUALIFY FOR PARTICIPATION IN THIS STUDY

18. The study is scheduled to run from January 15 till January 31. Are you interested in participating?
   - ☐ Yes – CONTINUE
   - ☐ No – THANK AND TERMINATE

I'd like to schedule you for the one-hour session *(INTERVIEWER CONSULT SCHEDULE).* What date and time might work for you to participate?

Specify Date and time scheduled: _____

Note to interviewer:
- No earlier then 9:00 am
- No later then 10:00 pm
- Unavailable times include
   i. Monday from 12:00 – 2:30 pm
   ii. Tuesday from 12:00 – 4:00 pm
   iii. Wednesday from 6:00 – 10:00 pm
   iv. Thursday from 6:00 – 10:00 pm

We will email (fax?) you a confirmation letter, along with directions, forms and other documentation required for the evaluation. The evaluation will be informal, and no preparation on your part will be necessary. As a token of the sponsor's appreciation, you will receive a check for $100 in the mail within 3 to 4 weeks after you have completed the session.

It is important that you are on time and ready for your appointment. If for any reason you will be late or have to cancel, please notify the contact person identified in your confirmation letter as soon as possible.

I need to collect the following contact information…

Name: _____

Title: _____

Employer: _____

Phone #: _____

Fax # (optional): _____

Email (required): _____

Address to which to send check: _____

_____

Do you have any questions for me?

End Session

Interviewer Notes:

Appendix II: IRB FORM A

<table>
<tr>
<td>R•I•T</td>
<td colspan="2">

Rochester Institute of Technology

INSTITUTIONAL REVIEW BOARD

585-475-7983 ● www.research.rit.edu/compliance/irb/ ● marshak@mail.rit.edu
</td>
</tr>
</table>

FORM A: Request for IRB Review of Research Involving Human Subjects

- ❖ To be completed by the investigator after reading the RIT Policy for the Protection of Human Subjects in Research, found in the *Institute Policies and Procedures Manual*, Section C5.0, and on the Office of Human Subjects Research website, www.research.rit.edu/compliance/irb/.
- ❖ Submit an electronic version of the completed form along with a hard copy to Marsha Konieczny, RIT IRB Administrator, 2000 Louise Slaughter Building, marshak@mail.rit.edu.

<table>
<tr>
<td colspan="3">Project Title:</td>
</tr>
<tr>
<td>Investigator's Name:</td>
<td>Investigator's Phone:</td>
<td>Investigator's Email:</td>
</tr>
<tr>
<td colspan="3">Investigator's College and Department:</td>
</tr>
<tr>
<td colspan="2">Project Start Date:</td>
<td>Date of IRB Request:</td>
</tr>
<tr>
<td>If Student, Name of Faculty Supervisor:</td>
<td>Faculty's Phone:</td>
<td>Faculty's Email:</td>
</tr>
<tr>
<td>If Not Employed or a Student at RIT, List Name, College & Dept. of RIT Collaborator:</td>
<td>RIT Collaborator's Phone:</td>
<td>RIT Collaborator's Email:</td>
</tr>
<tr>
<td colspan="3">Will this project be funded externally?   ☒Yes ☐ No</td>
</tr>
<tr>
<td colspan="3">If yes, name of funding agency:</td>
</tr>
<tr>
<td>Status of project:</td>
<td>☒ Submitted on</td>
<td>☒ Funding pending   ☐ Funding confirmed</td>
</tr>
<tr>
<td colspan="3">Do you have a personal financial relationship with the sponsor?   ☐ Yes   ☒ No
If yes, please read RIT policy C4.0 – Conflict of Interest Policy Pertaining to Externally Funded Projects. Complete the Investigator's Financial Disclosure Form and attach it to this Form A. All information will be kept confidential.</td>
</tr>
</table>

BY MY SIGNATURE BELOW, I ATTEST TO AN UNDERSTANDING OF AND AGREE TO FOLLOW ALL APPLICABLE RIT, SPONSOR, NEW YORK STATE, AND FEDERAL POLICIES AND LAWS RELATED TO CONDUCTING RESEARCH WITH HUMAN SUBJECTS. If significant changes in investigative procedures are needed during the course of this project, I agree to seek approval from the IRB prior to their implementation. I further agree to immediately report to the IRB any adverse incidents with respect to human subjects that occur in connection with this project.

Signature of Investigator   Date

Signature of Faculty Advisor (for Student) or RIT Collaborator (for External Investigator)   Date

Signature of Department Chair or Supervisor   Date
Complete the attached Research Protocol Outline* and attach to this cover form with other required attachments.

Attachments: ☒ Project Abstract*****   ☒ Informed Consent Materials
                          ☐ Questionnaire or survey   ☐ External site IRB approval if applicable*****
                          ☐ IRB Training Certificate(s) from OHRP (see http://137.187.172.152/cbttng_ohrp/) **
                          ☐ Cover letter to subjects and/or parents or guardians
                          ☐ Other
                                                   * Required   **Required after July 1, 2004

Form A (continued): **Research Protocol Outline**

❖ The RIT Institutional Review Board (IRB) categorizes <u>Human Subjects Research</u> into five <u>Risk Types</u> (<u>Exempt</u>, or <u>Type I-IV</u>, defined at the end of this form). As the investigator, you should determine which type best categorizes your project. The IRB will make the final determination of risk type, and will consider your ranking at the time of their review.

❖ Please complete this entire form (1 through 10 below). ENTER A RESPONSE FOR EVERY QUESTION. If a question does not apply to your project, please enter "N/A". Leaving questions blank may result in the form being returned to you for completion before it is reviewed by the IRB.

❖ <u>Underlined</u> terms are defined at the end of this form.

<u>FOR ALL PROJECTS, please complete 1-10 below</u>.

1)   If you believe your project qualifies for <u>Exemption</u>, which <u>exemption number(s)</u> apply?

   Which <u>Risk Type (Type I-IV)</u> do you believe applies to your project?
   (Note: The IRB makes the final determination of <u>Exemption</u> or <u>Risk Type</u>).

2)   Describe the research problem(s) your project addresses.

3)   Describe expected benefits to subjects and/or knowledge to be gained from your project.

4)   Describe the <u>population sample</u> for your project.
   a)   How many subjects will participate in this project?

   b)   How will these subjects be identified and selected for participation?

   c)   Describe the rationale for inclusion or exclusion of any subpopulation.

   d)   How will you recruit subjects?

   e)   Describe any incentives for participation you plan to use.

5)   Will you include any of the following vulnerable populations in your research? (Check any that apply)
                  ☐ <u>Children</u>   ☐ Mentally Ill
                  ☐ Prisoners   ☐ Mentally Handicapped/Retarded

☐ Pregnant Women   ☐ Fetuses

If any of these populations are to be included, please addresses the following:

a) **Rationale for selecting or excluding a specific population:**

b) **Description of the expertise of project personnel for dealing with vulnerable populations:**

c) **Description of the suitability of the facilities for the special needs of subjects:**

d) **Inclusion of sufficient numbers of subjects to generate meaningful data:**

6) **Describe the data collection process.**
   a) **Will the data collected from human subjects be <u>anonymous</u>?**   ☒ Yes   ☐ No
   b) **Will the data collected from human subjects be kept <u>confidential</u>?**   ☒ Yes   ☐ No
   c) **Describe your procedures for ensuring anonymity and/or confidentiality:**

   d) **How much time is required of each subject?**
   e) **If subjects are students, will their participation involve class time?**
   f) **What methods, instruments, techniques, and/or other <u>sources of material</u> will you use to gather data from human subjects?**

7) **Will this research be conducted at another university or site other than RIT?** ☐ Yes   ☒ No
   If yes, describe location:

   Note: If you will be conducting human subjects research at another university or college, you will also need to obtain IRB approval from that institution. **Attach a copy of that approval to this application.**

8) **Describe potential <u>risks</u> (beyond <u>minimal risk</u>) to subjects:**
   a) **Are the risks physical, psychological, social, legal or other?**

   b) **Assess their likelihood and seriousness to subjects:**

   c) **Discuss the potential benefits of the research to the population from which your subjects are drawn:**

   d) **Discuss why the risks to subjects are reasonable in relation to the anticipated benefits to subjects and others, or in relation to the importance of the knowledge to be gained as a result of the proposed research:**

   e) **Describe the planned procedures for protecting against or minimizing potential risks, including risks to confidentiality, and assess their likely effectiveness:**

   f) **Where appropriate, describe plans for ensuring necessary medical or professional intervention in the event of adverse effects to the subjects:**

9) **Will you be seeking <u>informed consent</u>?** ☒ Yes ☐ No
If yes, describe:

    a) **What information will be provided to prospective subjects?**

    b) **What (if any) information will be concealed prior to participation, and why?**

    c) **How will you ensure consent is obtained without real or implied coercion?**

    d) **How will you obtain and document consent?**

    e) **Who will be obtaining consent? Provide names of specific individuals, where available, and detail the nature of their preparation and instructions for obtaining consent.**

    f) **Attach a copy of your consent materials (forms, protocol, script, etc.) to this application.**

10) **Please attach a copy of your project description or proposal abstract**.

RIT IRB Risk Type Classification
Exempt

<u>Research activities</u> in which the only involvement of <u>human subjects</u> will be in one or more of the following six categories of **exemptions** are not covered by the regulations:

(1)   Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (a) research on regular and special education instructional strategies, or (b) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

(2)   Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (a) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (b) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation. ***If the subjects are children, this exemption applies only to research involving educational tests or observations of public behavior when the investigator(s) do not participate in the activities being observed.*** [Children are defined as persons who have not attained the legal age for consent to treatments or procedures involved in the research, under the applicable law or jurisdiction in which the research will be conducted.]

(3)   Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior that is not exempt under section (2) above, if the human subjects are elected or appointed public officials or candidates for public office; or federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

(4)   Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

(5)   Research and demonstration projects which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine: (a) public benefit or service programs; (b) procedures for obtaining benefits or services under those programs; (c) possible changes in or alternatives to those programs or procedures; or (d) possible changes in methods or levels of payment for benefits or services under those programs.

(6)   Taste and food quality evaluation and consumer acceptance studies, (a) if wholesome foods without additives are consumed or (b) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the US Department of Agriculture.

Type I: No <u>risk</u> of injury to subjects; <u>informed consent</u> is not required, but may be recommended.

Type II: Minimal <u>risk</u> to subjects; <u>informed consent</u> is needed.

Type III: Potential exists for harming the subject or violating their rights. <u>Informed consent</u> and assurance of minimization of <u>risk</u> is required.

Type IV: Significant possibility of injury to the subject exists. In this instance:
- <u>Risk</u> must be outweighed by the potential benefit to the subject and the knowledge to be gained,
- <u>Informed consent</u> and assurance of minimization of <u>risk</u> are needed,
- The IRB must meet to discuss the proposed project, and
- The provost must approve.

Human Subjects Research - Definitions

Anonymity – Anonymity offers the best insurance that disclosure of subjects' responses will not occur. Research data that is anonymous contains no information that would link the data to the individual who provided the information.

Confidentiality – Confidentiality refers to (a) identifiable data (some information about a person that would permit others to identify the specific person, such as a non-anonymous survey, notes or a videotape of the person) and (b) agreements about how those data are to be handled in keeping with respondents' interest in controlling the access of others to information about themselves. The two critical elements of this definition of confidentiality indicate the critical role of <u>informed consent,</u> which states how the researcher will control access to the data and secures the respondent's agreement to participate under these conditions.

Child (Definition of) **and Use of Children in Research -** Children are defined as persons who have not attained the legal age for consent to treatments or procedures involved in the research, under the applicable law or jurisdiction in which the research will be conducted. In New York State, a person age 18 is considered an adult and can provide consent without parental permission. However, some students at RIT are under age 18. To use children (individuals under the age of 18 years) in research, you must first obtain the permission of the parent(s) and then obtain **assent** from the child.

Human Subjects - The regulations define human subject as "a living individual about whom an investigator (whether professional or student) conducting research obtains (1) data through intervention or interaction with the individual, or (2) identifiable private information." *(1) If an activity involves obtaining information about a living person by manipulating that person or that person's environment, as might occur when a new instructional technique is tested, or by communicating or interacting with the individual, as occurs with surveys and interviews, the definition of human subject is met. (2) If an activity involves obtaining private information about a living person in such a way that the information can be linked to that individual (the identity of the subject is or may be readily*

determined by the investigator or associated with the information), the definition of human subject is met. [Private information includes information about behavior that occurs in a context in which an individual can reasonably expect that no observation or recording is taking place, and information which has been provided for specific purposes by an individual and which the individual can reasonably expect will not be made public (for example, a school health record).]

Informed Consent – Informed consent is a process by which individuals learn about a study – the substantive issue investigated, participation demands (including time expenditure, types of activities), participant rights (voluntariness, confidentiality), risks, benefits, costs/compensation, contacts if further questions arise, etc. There are multiple **ways to convey these elements of consent**: by written document, oral presentation with script, oral presentation without script. In addition, there are various **ways to document consent**: written signature of the participant, written indication of participant's study identification number, oral recording of consent, oral consent documented by the investigator. In addition, sometimes it is important to obtain separate consent for the use of photographs or videotaped images. The different ways to obtain consent include:

(1) Written consent with written documentation by participant.
    (a) formal style (for study involving mothers and children)
    (b) informal style
    (c) formal style for at-risk population
(2) Written consent with written indication of participant's study identification number.
(3) Written consent without documentation (for no/minimal risk survey studies).
(4) Oral presentation with script with oral consent documented by the investigator.
(5) Oral presentation with script without documentation (includes contact card).
(6) Oral presentation without script without documentation (provides rationale for request for waiver of written documentation and indicates what will be said).
(7) Written consent with written documentation by participant for use of photos.

Population Sample
- Describe the proposed involvement of human subjects in your project.
- Describe the characteristics of the subject population, including their anticipated number, age range, and health status.
- Identify the criteria for inclusion or exclusion of any subpopulation.
- Explain the rationale for the involvement of special classes of subjects.

Research Activity - The ED Regulations for the Projection of Human Subjects, Title 34, Code of Federal Regulations, Part 97, define research as "a systematic investigation, including research, development, testing and evaluation, designed to develop or contribute to generalizable knowledge." *If an activity follows a deliberate plan whose purpose is to develop or contribute to generalizable knowledge, such as an exploratory study of the collection of data to test a hypothesis, it is research.* Activities which meet this definition constitute research whether or not they are conducted or supported under a program which is considered research for other purposes. For example, some demonstration and service programs may include research activities.

Risks in Research – As with any activity, there is potential for harm in the social and behavioral sciences – from inconvenience or embarrassment to stigma or legal or economic consequences. Typically, however, in these sciences both the potential harms and the risks of them are minimal and not of the type routinely being assessed in biomedical research. Much of the risk relates to disclosure of the identity of human subjects or the information they provide; thus, considerable effort in these sciences is devoted to safeguarding subjects' privacy and the confidentiality of the data they provide even when the information has no or minimal potential for harm.

Minimal risk means that the probability and magnitude of *harm* or discomfort anticipated in the research are not greater in and of themselves than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests. "Risk" refers to a probability that some harm will occur. "Harm" refers to a specific outcome(s) or event(s) – and can be inconvenience, physical, psychological, social, economic, or legal in nature. If human subjects are exposed to a degree of harm roughly equivalent to what one would expect in the course of daily life or in the course of routine tests and examinations, then "minimal risk" applies.

Sources of Materials
- Identify the sources of research material to be obtained from individually identifiable living human subjects in the form of specimens, records, or data.
- Indicate whether the material or data will be obtained specifically for research purposes or whether use will be made of existing specimens, records, or data.

Appendix III: IRB FORM C

Form C
IRB Decision Form

TO: Chad Lapa

FROM: RIT Institutional Review Board

DATE: **1/4/05**

RE: **Decision of the Institutional Review Board**

Project Title: *Xerox Eye-Tracking—Banner Blindness*

The Institutional Review Board (IRB) has taken the following action on your project named above.

☒   Approved as Type II.   Informed Consent is required.

We would like to suggest one change on your informed consent form. It states that personal information will only be used for "research purposes." This phrase is rather vague. We suggest replacing it with a statement that personal information will be used only for data analysis purposes, to link data to the subject. Please feel free to contact me if you have any questions.

Now that your project is approved, you may proceed as you described in the Form A. **Note that this approval is only for a maximum of 12 months; you may conduct research on human subjects only between the date of this letter and_____.** You must promptly report to the IRB any proposed modifications, unanticipated risks, or actual injury to human subjects. The IRB will send you a Form F approximately two months before the end of your 12-month human research project. If your project will extend more than 12 months, your project must receive continuing review by the IRB – please contact me for information that must be presented to the IRB for continuing approval to conduct human subjects research at RIT.

Julie A. White
Director, Human Subjects Research
(On behalf of Richard Doolittle, IRB Chair)

cc: IRB Members

Appendix IV: Rochester Institute of Technology Campus / Directions
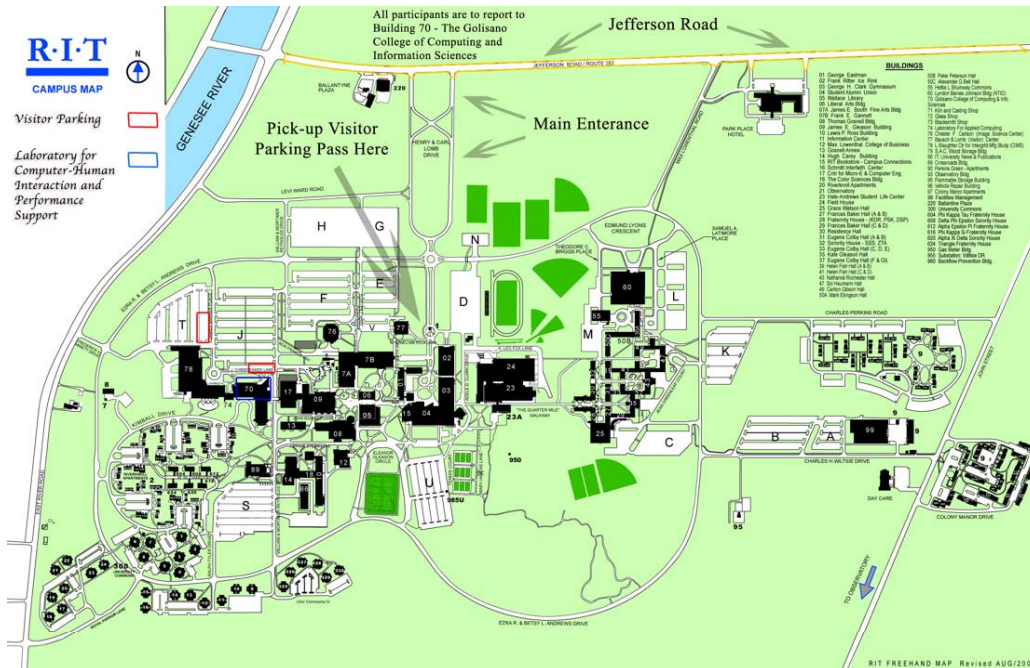
Directions to the Laboratory for Computer-Human Interaction and Performance Support located in Building 70 - The Golisano College of Computing and Information Sciences.

1.) Coming from Jefferson Road turn into the main entrance of RIT (Henry & Carl Lomb Drive)

2.) Proceed straight until you reach the circular intersection that will have the large flag poles in the middle of it. You will have to yield here to other traffic. When clear then continue to proceed straight though the intersection to the other side.

3.) Continue straight until you reach the visitors booth and request a visitors parking pass for building 70.

4.) Once you have got your visitors parking pass then turn around and head back to the circular intersection.

5.) At the intersection you are going to need to make a left onto Ezra and Betsy Andrews Drive - Otherwise known as just Andrews Drive. CAUTION - this requires you to make a right and go around the one way circular intersection.

6.) Continue straight on Andrews Drive until you hit your second stop sign and make a left. This will see parking lot F on your left.

7.) Take your first quick right and you will then see parking lot J on your right. Proceed all the way up to the front row and make a right.

8.) You will then see visitor parking on your right - find an open spot and park.

9.) Proceed to the entrance of building 70.

10.) Once you enter building 70 someone will be there to greet you and guide you the rest of the way. If someone is not there to meet you for some reason then please find a seat at one of the tables located to your right when you walk in and wait patiently until someone comes to guide you the rest of the way.

Appendix V: Detailed Outline of Four Tasks

Task 1 (Phaser 8400DP)

Script:
Imagine that you have decided to replace the printer that you currently have. After thinking about it and discussing it with your colleagues, you decide that you need a printer with the following features:

(Hand them cheat card and read them the criteria)
- Prints in color at 20 pages per minute or faster
- Prints 2-sided documents
- Network Ready
- Costs less than $1,500

(Give the participant some time to become familiar with the criteria so that he / she does not have to rely on the card too much. Involve the participant in some discussion around the criteria if you can in hope that the participant will internalize the criteria a bit.)

Ask them:
Do you have any questions about the criteria?

You have decided to see if Xerox has a printer that meets these criteria. Please look for a color printer using these criteria. Remember, the printer must print in color at 20 pages per minute or faster, be able to print 2-sided, be network ready and cost less than $1,500. Once you find a color printer that meets these requirements, request information from Xerox on the printer that you choose.

Notify me when you think you have completed the task successfully. (Tell them to open the first browser window on the left and begin the task when ready). When have completed the task, have them close the window.

Task 2 (WorkCentre PE120)

Script:
Imagine that your department is looking for a multifunction machine for your office. After talks with your colleagues it is decided that you need a machine with the following features:

(Hand them cheat card and read them the criteria)
- Copies, Prints, Scans, and Faxes
- Costs less than $1,000
- Prints on 8.5″ x 14″ paper
- Prints at least 20 pages per minute in black & white

(Give the participant some time to become familiar with the criteria so that he / she does not have to rely on the card too much. Involve the participant in some discussion around the criteria if you can in hope that the participant will internalize the criteria a bit.)

Ask them:
Do you have any questions about the criteria?

You have decided to see if Xerox has a printer that meets these criteria.   Remember, the machine needs to copy, print, scan and fax, cost less than $1000, print on 8.5″ x 14″ paper, and print at least 20 pages per minute in black & white. Once you find a printer that meets these requirements, determine how you would purchase the product based on the options provided on the site.

Notify me when you think you have completed the task successfully. (Tell them to open the first browser window on the left and begin the task when ready). When have completed the task, have them close the window.

Task 3

Script:
Imagine that one of your colleagues approaches you and says that there is a problem with the printer. The colleague shows you some sample print out from the machine that has the color spots and marks on them.

(Hand them cheat card and read them the criteria)
- Xerox WorkCentre M24 Color Multifunction machine
- Color spots & marks on printouts
- Find solution to problem on Xerox website

You decide to go online to the Xerox website to see if you can find out how to fix the problem. The machine is a Xerox WorkCentre M24 color multifunction machine. Remember, the Xerox WorkCentre M24 color multifunction printer is printing out pages with color spots and marks on them.

Notify me when you think you have completed the task successfully. (Tell them to open the first browser window on the left and begin the task when ready). When have completed the task, have them close the window.

Task 4

Script:
Imagine that your organization just upgraded all it computers from the Windows 2000 operating system to the Windows XP operating system. Since the upgrade has been completed you realize that you are going to need to download the correct printer driver so that you can print from your newly upgraded computer. The printer you use at work is a Phaser 7750 color printer from Xerox located down the hall. Download the recommended driver for the Phaser 7750 color printer for the Windows XP operating system.

(Hand them cheat card and read them the criteria)
- Xerox Phaser 7750 color printer
- Windows XP operating system
- Download recommended print driver

Notify me when you think you have completed the task successfully. (Tell them to open the first browser window on the left and begin the task when ready). When have completed the task, have them close the window.

Appendix VI: Task Relevant Questions

Participant Feedback

1. Based on the experience you just had, how easy or difficult was it to find the information you were looking for?

Extremely Difficult	Largely Difficult	Fairly Difficult	Slightly Difficult	Neutral	Slightly Easy	Fairly Easy	Largely Easy	Extremely Easy
4	3	2	1	0	1	2	3	4

2. Based on the experience you just had, how would you rate the amount of information about the product that was provided on the site?

Much too Little Information	Largely too Little Information	Somewhat too Little Information	Slightly too Little Information	Neutral Correct amount of information	Slightly too Much Information	Somewhat too Much Information	Largely too Much Information	Much too Much Information
4	**3**	**2**	**1**	**0**	**1**	**2**	**3**	**4**

3. How clear or confusing was the information that you viewed?

Extremely Confusing	Largely Confusing	Fairly Confusing	Slightly Confusing	Neutral	Slightly Clear	Fairly Clear	Largely Clear	Extremely Clear
4	3	2	1	0	1	2	3	4

4. Based on the experience you just had, please describe what you remember about the product you selected.

5. Which of the following words do you think the Xerox site embodies (check all that apply):
   - ❑ Playful
   - ❑ Complicated
   - ❑ Savvy
   - ❑ Slow
   - ❑ Vibrant
   - ❑ Disorganized
   - ❑ Professional
   - ❑ Dull
   - ❑ None of the above

   Why?

Appendix VII: Free Viewing Relevant Questions

Question 1: What is your initial impression when you look at this page? Does anything in particular stand out?

Question 2 was asked during the second pass through.

Question 2: Please describe the primary banner image in a few sentences. What is your impression of the imagery, content?

Banner attribute	(+ / -)
Overall opinion of banner	
Ability to grab attention	
Amount of info given	
Quality of info given	
Fits w/ site	
Color scheme	
Photo of person	
Photo of Printer	
Other photos	
Background	
Title	
Printer name	
Price tag	

Appendix VIII: Informed Consent
Rochester Institute of Technology
INFORMED CONSENT FORM

Project: Xerox Eye-Tracking and Banner Blindness.

Principal Investigators: Evelyn Rozanski, Chad Lapa, Keith Karn, Anne Haake

The usability test you have volunteered to participate in will help us to better understand problem solving, decision-making, and perception in individuals as they complete a variety of tasks on a website. We do not anticipate taking more than 90 minutes of your time.

RISKS

As part of this research study, you will be required to use an eye tracker. The eye tracker used in the study monitors your eye movements by monitoring one eye with a video camera while you are performing a task. A special computer uses the video image to determine the direction that your eye is pointing. Your eye will be illuminated with an infrared LED (like that used in TV remote controls). The amount of infrared illumination at your eye is less than the amount outside on a sunny day, and ten to a hundred times less than the recommended chronic (long-term) exposure levels. If the eye tracker headband is too tight, it may become uncomfortable and cause a headache. Please let us know immediately if you experience any discomfort so that we can re-adjust the headband and/or terminate the experiment. There are no other known risks associated with the eye tracker.

BENEFITS

This project is intended to contribute to new knowledge in the area of website design and usability. In addition, you will gain the experience of being involved in a "real" usability test along with receiving $150.00 to be paid to you at the completion of the test.

CONFIDENTIALITY

Data will be compiled and analyzed in an anonymous manner, and will only be reported in the aggregate and never by name. Publications related to this work will not make reference to individuals. The summary may include discussion of the demographics of the subjects. The session may be recorded on video and / or audio tape, and notes will be taken to record your opinions and actions. This document states that you agree to be video / audio taped while participating in this study. This information, including the video tape, may be used to improve products. It may also be shared with others for educational or promotional purposes. We will hold as confidential your personal information (such as name and phone number) and use it only for data analysis purposes, to link data to the subject.

CONTACT

If you have questions at any time about the study or the procedures, you may contact the researcher, Evelyn Rozanski Department of Information Technology 475-5384 or e-mail epr@it.rit.edu or Chad Lapa Graduate Assistant in the Department of Information Technology 414-1582 or email cjl1901@rit.edu.

PARTICIPATION

Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at any time without penalty and without loss of benefits to which you are otherwise entitled.

CONSENT

I have read and understand the above information. I have received a copy of this form. I agree to participate in this study.

Participant's signature _____

Date _____

Participant's name (printed) _____

Investigator's signature _____

Date _____

Parent's signature _____

Date _____

(if student is under 18)

Appendix IX: Introduction Procedure

Introductory Remarks

Usability Evaluation

Greetings / introductions
I want to thank you for agreeing to participate in our study. The work you do today will influence future RIT/Xerox products and is very important to us.

Participated in usability evaluation?.
Have you ever participated in a usability evaluation here at RIT before? *(If Yes give an abbreviated version. If No use paragraphs below).*

Why We do Usability Evaluations
We perform usability evaluations like this to determine how easy or difficult our products, or in this case a website, are to use. Then we gather the comments and suggestions from participants, like you, to improve the design and make the product or website easier to use before we sell them.

What We do in a Usability Evaluation
The way we do this is by asking participants to complete some tasks with a product or on the website while a test administrator like me records what that person did and in particular when they did and did not have problems with a task. We typically perform these usability evaluations while the product is still in development so that we can change the design before the products is released. For that reason, you will be working with a prototype of a new system today.

Un-released Product = Confidential (Non-disclosure form)
Because the product you will use today has not yet been released, please consider it confidential. It is important that you do not talk to anyone about the product. That is why had you sign the disclosure agreement. *Make sure they've signed the non-disclosure form.* You may tell others about your experience in the usability laboratory, as we are always looking for participants, just not about the products that you see here.

Prototype – not all features working properly
You should also keep in mind that because we are working with a prototype today. There may be times that it doesn't work as we intend it to. When that happens, I will try to explain how things are intended to work.

Tasks / Instructions / Questions
I will present the tasks to you, one at a time. You can following along with the instructions I read with this *(provide printed copy of task instructions – one task per page, but don't let them read ahead – make them wait until you present the first task to start reading)*. If you don't understand the task, please ask and I will explain it further. You may also have questions once you get started on a task and I encourage you to ask questions as you go along. Sometimes I may not answer them directly, because it's important for me to be able to record when people have problems and how they solve them.

Stopping
There is no time limit on any of the tasks, but if you ever get to a point where you are lost or don't think you can continue, don't want to continue, or just need a break please let me know. Likewise, when you believe you have completed the task successfully let me know that.

Think Aloud
While you are working I will be in the room with you taking notes *(tell them if you will be doing so on a keyboard so that they are not surprised by this)* and may sometimes ask you to tell me what you are doing or thinking. Please think out loud or talk out loud as you go through each task. It helps me understand how you approach the task or where you are headed.

Discussion / Rating After Each Task
After each task, we'll discuss what you did and ask you to rate how easy or difficult it was for you to complete the task.
Please keep in mind that we are looking for your open and honest feedback about the system - both the things that you like and the things you don't like. Remember, we need your ideas and suggestions to improve the product.

Videotaping (permission form)
Before we begin I want to point out the video cameras up along the ceiling. They allow us to review a portion of the evaluation that we may have missed, and also allows us to better understand peoples' interactions with the system. That is why we had you sign the audio / video taping permission form. *Make sure they've signed the videotaping permission form.*

Machine Introduction
The system you will be working with today is….. INSERT DESCRIPTION OF MACHINE AND FEATURES HERE.

Relax
Finally, if is important to keep in mind that we are evaluating this product, not you. So, you can relax and hopefully have some fun doing this.
Duration / Any Questions?
I estimate that the study will take less than two hours. Do you have any questions about the testing process before we start?

Read Scenario

<u>Before Doing the First Rating</u>
Now, I will have you rate the task you just performed on a scale of 1-9, where "1" represents the "very difficult" and "9" represents the "very easy". **If it was a longer task:** Remember the tasks included *(insert here a reminder / brief summary of the key segments of the task if it was a longer task)*. No matter what rating you give, I'll always ask you to tell me why you chose that rating so you can explain your reasons and make any comments or suggestions you have.

Appendix X: Calibration Process Details

Eye Tracking

Manual for Eye Tracking lab at RIT

Winter 2005 Before the Participant comes:

- Turn on all equipment: Control unit, VCR, 2 monitors, 2 computers, 2 computer monitors, and speakers (if needed)

- Load the batch file named "Load1_NT" located in the folder "HSFE Code" (located on desktop)

- Once batch file is done, open **e5Win** software (located on desktop)

- When the program opens, the following screen will appear. Choose **Start Upload**.
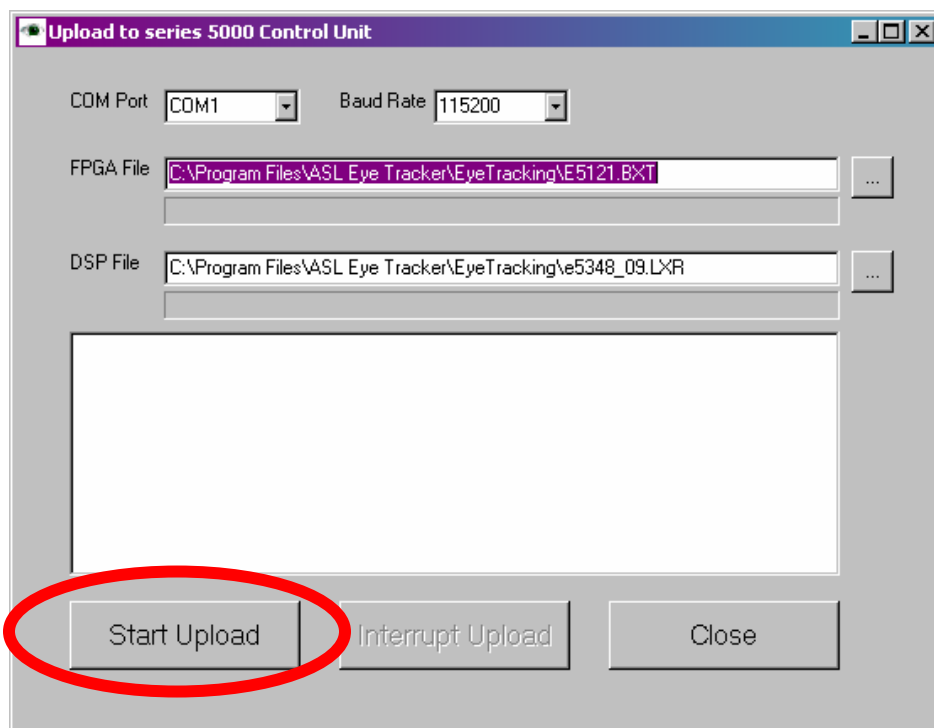
- Make sure the **Illuminator** Box is checked (in upper left-hand corner of interface)

- On the other computer (connected to the flat panel), make sure the calibration points are ready as well as your experimental interface

Headgear setup:

- Go through Informed Consent form and talk briefly about the headgear. Make sure to let the participant know that you can stop to adjust or remove headgear if they are uncomfortable

- Place headgear on participant's head. Tighten using knob on back; be sure it is not too loose or too tight.

- Look at the scene monitor to be sure the scene is level; adjust the camera if it is not

- Be sure the scene camera is not in front of their eye and that the eye camera is lined up with the pupil of their left eye

- Start with the *"default" position*; the scene camera is perpendicular with the floor and the monocle aligned with their nostril

- Moving only the monocle lens forward and backward, left and right, find the eye image in the eye monitor

- Once the eye is found in the monitor, be sure it does not ever move out of the image in monitor when the participant looks around the interface

- Be sure the corneal reflection is not lost when looking around the interface. If it is, try moving the scene camera out a bit, remembering to walk the camera and the monocle together

- Once you are assured the eye image will not be lost, move over to the computer with the software installed

E5Win Software - Pupil and Corneal Reflection Discrimination & Calibration

- Make sure the Illuminator is on and the Illumination level is to the right a couple of notches

- Looking at the eye image in the monitor, move the Pupil Discrimination level towards the right until you see the white pixels forming a circle just off the pupil image and crosshairs appear

- Adjust the levels so that the pixels form a solid circle and the crosshairs do not flicker no matter where the participant looks on the interface

- **NOTE:** It is most important that the circle of pixels is not lost. If you are very close and want to ensure they will stay formed once you start the test, click the discrimination level about 3 times to the right.

- Once the Pupil Discrimination is set, adjust the Corneal Reflection Discrimination so that the pixels form a solid circle and the crosshairs do not flicker no matter where the participant looks on the interface

- **NOTE:** Because the Corneal Reflection image is so small, you will not have trouble in forming and keeping the circle of pixels on the screen. It is extremely important that the crosshairs do not flicker (they may be a little jumpy however).

- Once you think you are set, double check your levels by having the participant look at the corners of the interface

- Have the participant hold their head as still as possible

- Check the Set Target Points button on the taskbar

- Look at the scene monitor and use the mouse to click on each of the nine points to store them into the system (make sure to keep your mouse in the right-hand side black box)

- Once you have done all nine points (make sure the counter is back to 1), click on "Save Target Points and Quit"
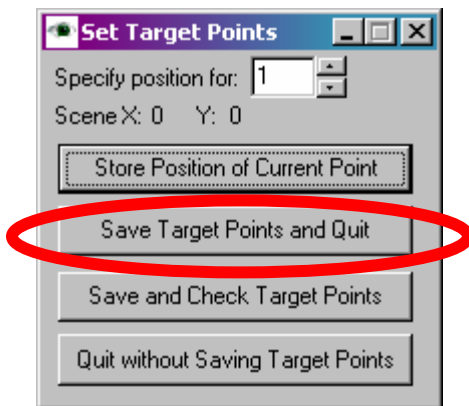
- Click on the Eye Calibration button on the taskbar (when opens, be sure that the counter is set to 1; if not Cancel and open again)
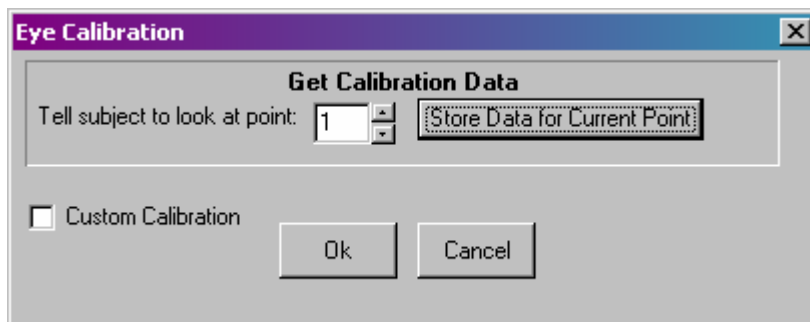
- While looking in the *eye monitor* have the participant look at each of the 9 points, ensuring the crosshairs are not flickering or the circles are not lost at each point

- After the 9 points are set, click OK

- Have the participant quickly look back through each of the points. If ANY are off, you must redo that points' calibration.

- You might be better off redoing them all if there is more than a point or two off. Have the participant relax and then start over.

- Once you are satisfied that all of the points are calibrated well, you may start recording and proceed with the experiment
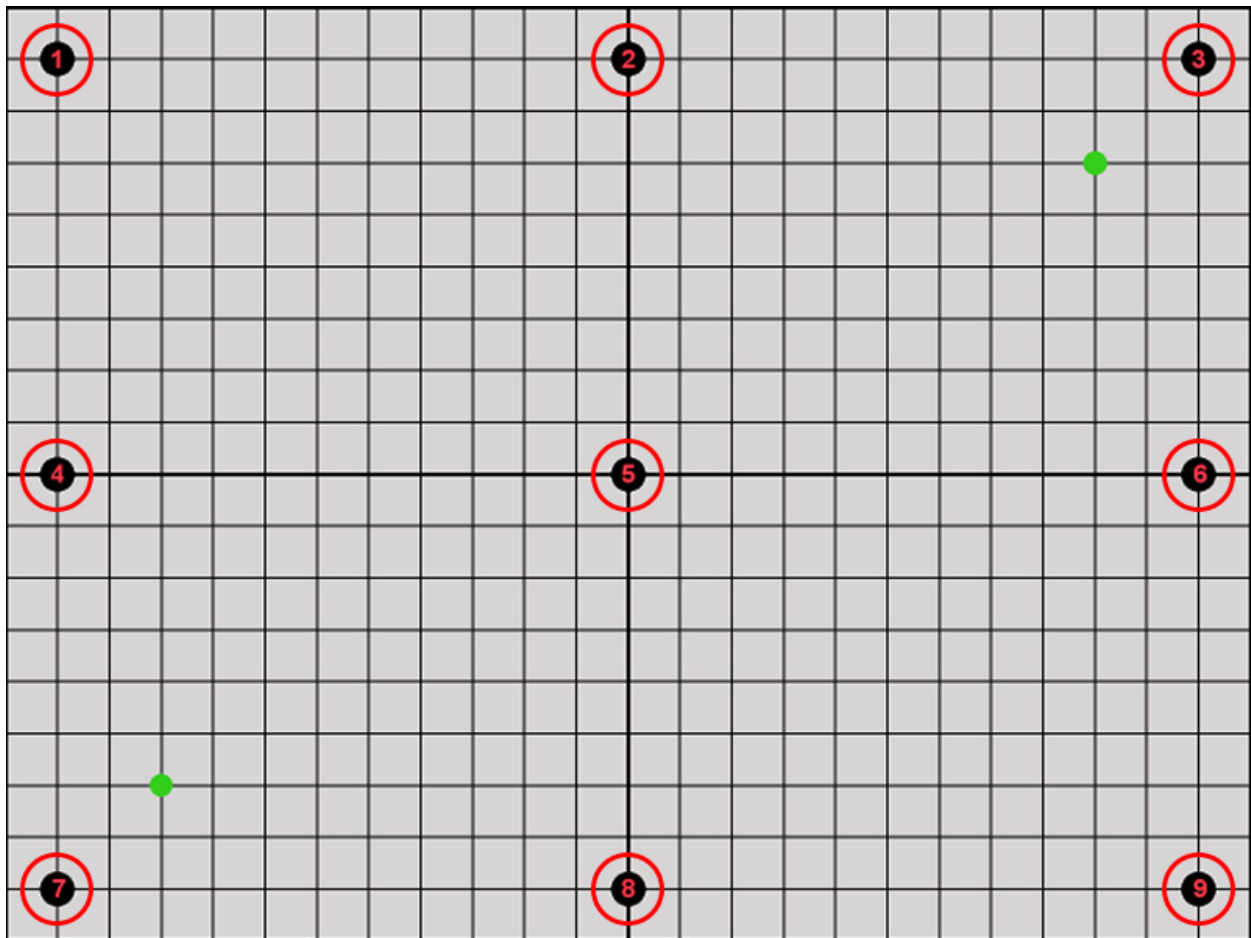
Image of calibration screen points and layout.

Data Recording To Tape or File

- If you are recording on a tape, all you have to do is hit the record button
- If you are recording to a file, make sure there is a file open and hit the record button

- **Make sure to stop recording when the test is complete**

EYEHEAD setup (one time only)

- Defining surfaces in space with respect to the transmitter
- 3-D gaze with eye and head in space

The control box for the EYEHEAD Integration must be turned on/off via a power strip. If the red light on the box is blinking, something is wrong.

Setting Up

- Check for green light in software

Go to Configure → System Settings
- System settings: headmounted; 60, 4; check direct scene, "remote" scene connector
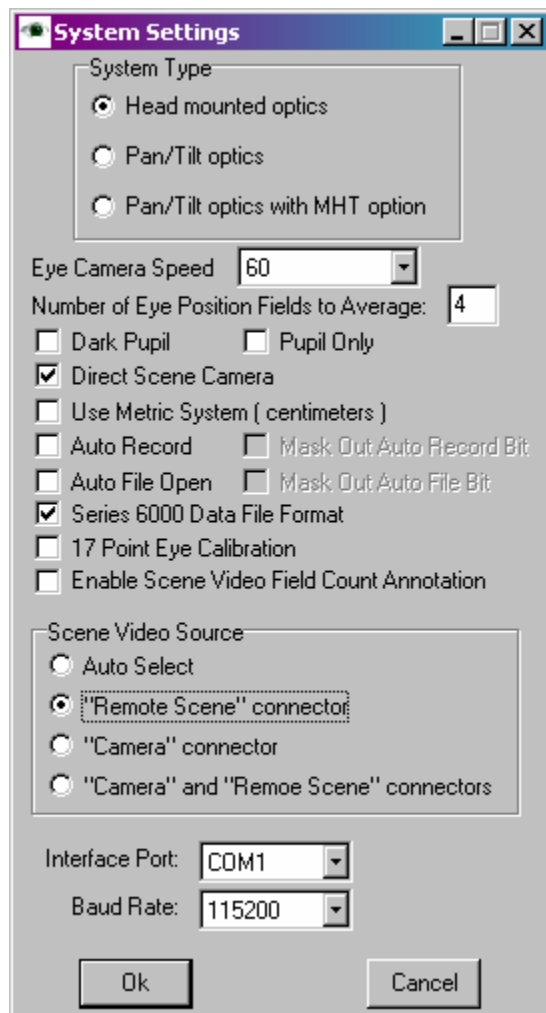
- Check Illuminator
- Enable MHT (MHT button)
- Enable Eyehead mode (EHI button)
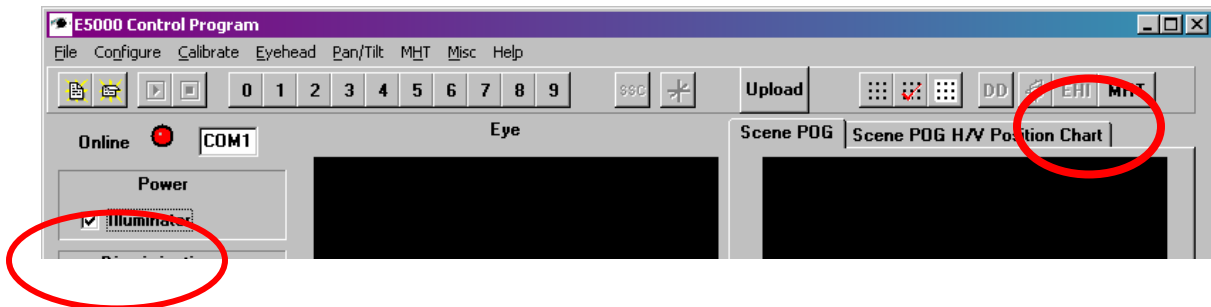
Eyehead Setup

Go to Eyehead → Setup

General Tab
- MHT Transmitter Offset – should always remain 0 unless you need to mount transmitter separate from gimble (x=0, y=0, z=0)
- MHT Scene to eye vector – from label on headband
- Final Scene Coordinate – skip this; leave default values
- Options for Specifying – point with gimbal
- MHT Transmitter to end of gimbal – 19.56 – leave this
- Misc Scene Plane Parameters – 0 for one surface, first plane = 0
- CHECK Record Integrated Eyehead Data (coordinates of gaze)!! – otherwise will only spit out raw data
- Grid Scale – equal to the size of our grid squares – In INCHES

Calibration Scene Plane Tab
- AXIS – a bit different than we know…..
- AUTOSET between 1 & 9

Individual Scene Plane Tab
- To set orientation of plane in space
- MHT Transmitter Center to end of Gimbal – use the 3 we already measured
- Points A, B, C – IN THAT ORDER
- A,B,C – Set from points 9,7,1
- When measuring, we want to be within $1/16^{th}$ of an inch…we used regular tape measure
- Grayed Boxes – set with pointer
- Try to set up with another tripod; if have to do with self, hold close to body
- Need one person to click, 1 person to hold – Tape trigger
- Point at each 3 points, hit SET, @ end hit OK
- Point A, B, C – Set from points 9, 7, 1

- Rectangle Scene Plane Boundary – use if using more than one plane, measure, <1/2" of stack outside, make sure not to hit other planes

Gimbal Test
- Access via menu or 3rd button from right; hit OK when at point 5
- Now will see crosshair
- New data box appears: scene 0 with actual distances
- If have a point of interest, get coordinates via grid and ask system when it gets in there
- Can point during gimbal test and get exact coordinates

- Now can add another surface; fill out individual scene plane tab for this surface
- Set A, B, C points ONLY
- Set boundaries again – only if more than one plane
- Gimble test – software should move between planes automatically
- In boundaries, make sure top and left are negative
- If inaccurate, make sure all negatives are in right places
- Then go to recheck measurements

Note:
- If doing table surfaces or floor then tilt transmitter 10 degrees so not parallel with z axis
- Only 1 plane with calibration

Stationary Scene camera Option
- Need longer video cable and power supply
- Make sure to set up so head not in way over their shoulder

Stationary Scene Camera Set Up Tab
- 5 points – uses to calculate and compensate for distortion
- Must be in Z pattern
- Can reuse points 1, 3, 5 from calibration points
- Once points set, click ENABLE
- OK for real world coordinates

Eyehead → Stationary Scene Camera Target Points (p. 40)
- Choose set
- Use mouse to click on point 1 in the scene camera monitor (like setting up points in regular calibration)
- After going thru, check points OK
- Initialize with SSC button or via menu
- Now can see on grid via gimble test
- Can record parallax Free!

- Gimble Test – look at grid first
- If OK, then scene camera
- *****Now put sensor on subjects head!
- Screw sensor in right-hand side of the headband
- Tie back extra cables

- READY TO GO

Appendix XI: Eye Tracking Recording Sheet

Eye Tracking Website Recording Sheet		
Participant ID:	**Date:**	**Time:**
Recorder:	**Task order:**	

Calibration information:

Was eye tracker calibration successful: ____ YES   ____ NO

If no, provide an estimate of the degree to which calibration was off:

Notes/Experiment setup issues:

------------------- Task 1 -------------------

Banner Information:
___ relevant   ___ irrelevant
___ white   ___ complex

Routes Used (check all routes used, circle route that led to completion of task)
____   Products Link > Printers (Color Link) > Phaser 8400
____   Products Link > Phaser 8400 Banner > Phaser 8400
____   Phaser 8400 Banner (large) > Phaser 8400
____   Footer Nav (Products Link) > Printers (Color Link) > Phaser 8400
____   Footer Nav (Products Link) > Phaser 8400 Banner > Phaser 8400
____   Search (color printer) > Phaser 8400 link > Phaser 8400
____   Search (Phaser 8400) > Phaser 8400
____   Search By (Price Range: $500 - $999) > Phaser 8400
____   Search By (Speed: 21 ppm – 30 ppm) > Phaser 8400
____   Search By (Function/Feature: Print, Color) > Phaser 8400
____   Printers Tab under banner > Phaser 8400
____   Printers Tab under banner > Color Link > Phaser 8400
____   Other_____
____   Other_____
____   Other_____

Participant's comments/questions:

Notes/Observations:

Task results:

Attempt #	Outcome (Success/failure)	Notes (e.g. reasons for failure)

Reliance on cheat sheet: ___ Low   ___ Moderate   ___ High
Did the user click on the banner? ___ Yes   ___ No
Ease of use Rating: ____
Amount of Information Rating: ____
Confusion Rating: ____

What user remembered about product:
___ price   ___ paper size   ___ ppm   ____ 2 sided print standard   __ color printer
___ "Editor's Choice/pick of year"   Other _____

------------------- Task 2 -------------------

Banner Information:
____ relevant   ____ irrelevant
____ white   ____ complex

Routes Used (check all routes used, circle route that led to completion of task)
_____ Products Link > multifunction (B/W up to 30 ppm) > PE120
_____ PE120i Banner (small) > PE120i
_____ Footer Nav (Products Link) > multifunction (B/W up to 30 ppm) > PE120
_____ Search (multifunction) > Any product link that qualifies
_____ Search (PE120) > PE120
_____ Search By (Price Range: $500 - $999) > PE120
_____ Search By (Speed: 21 ppm – 30 ppm) > PE120
_____ Search By (Function/Feature: Print, Copy, Scan) > PE120
_____ Multifunction Tab under banner > PE120
_____ Multifunction Tab under banner B/W up to 30 ppm link > PE120
_____ Other_____
_____ Other_____
_____ Other_____

Participant's comments/questions:

Notes/Observations:

Task results:

Attempt #	Outcome (Success/failure)	Notes (e.g. reasons for failure)

Reliance on cheat sheet: ___ Low   ___ Moderate   ___ High
Did the user click on the banner? ___ Yes   ___ No
Ease of use Rating: ____
Amount of Information Rating: ____
Confusion Rating: ____
What user remembered about product:
___ price   ___ paper size   ___ ppm   ___ multifunction   ___ network ready
___ black and white copy/print   ___ color scan/send   ___ other:

------------------- Task 3 -------------------

Banner Information:
___ relevant   ___ irrelevant
___ white   ___ complex

Routes Used (check all routes used, circle route that led to completion of task)
_____   Support Link > WorkCentre M Series > M24 > Support > Solutions For (Image Quality)
         > Image Quality > Black or Color Spots when Printing > Solutions Link
_____   Support Link > WorkCentre M Series > M24 > Support > Solutions For (Image Quality)
         > Refine Search (Any Image Quality Problem) > Solutions Link
_____   Support Link > Telephone Support
_____   Support Link > Online Technical Support via Email
_____   Footer Nav (Support Link) > WorkCentre M Series > M24 > Solutions For (Image
         Quality) > Black or Color Spots when Printing > Solutions Link
_____   Footer Nav (Support Link) > WorkCentre M Series > M24 > Solutions For (Image
         Quality) > Refine Search (Any Image Quality Problem) > Solutions Link
_____   Footer Nav (Contact Us Link) > contact commerce webmaster or phone support
_____   Header Nav (Contact Us Link) contact commerce webmaster or phone support
_____   Header Nav (Contact us) > WorkCenter M24 > Solutions for Image Quality
_____   Search (support) Links > Online support, contact Xerox - main offices, or product
         support
_____   Other_____
_____   Other_____
_____   Other_____

Participant's comments/questions:

Notes/Observations:

Task results:

Attempt #	Outcome (Success/failure)	Notes (e.g. reasons for failure)

Reliance on cheat sheet: ___ Low   ___ Moderate   ___ High
Did the user click on the banner? ___ Yes   ___ No
Ease of use Rating: ____
Amount of Information Rating: ____
Confusion Rating: ____

------------------ Task 4 ------------------

Banner Information:
___ relevant   ___ irrelevant
___ white   ___ complex

Routes Used (check all routes used, circle route that led to completion of task)
_____ Drivers > Phaser > 7750 > Drivers and Downloads >
_____ Products > Color Printers > Phaser 7750 > Specifications > Drivers
_____ Search (Phaser 7750) > Specifications > Drivers
_____ Footer Nav (Drivers) > Phaser > 7750 > Drivers and Downloads
_____ Other_____
_____ Other_____
_____ Other_____

Participant's comments/questions:

Notes/Observations:

Task results:

Attempt #	Outcome (Success/failure)	Notes (e.g. reasons for failure)

Reliance on cheat sheet: ___ Low   ___ Moderate   ___ High
Did the user click on the banner? ___ Yes   ___ No
Ease of use Rating: ____
Amount of Information Rating: ____
Confusion Rating: ____

Last Question on Participant Feedback

Question 5: Which of the following words do you think the Xerox site embodies:

___ playful   ___ savvy   ___ vibrant   ___ professional

___ complicated   ___ slow   ___ disorganized   ___ dull

___ none of the above

Why?

Banner Recording Sheet   Starting Banner #: _____

Banner ID: _____

Question 1:   What is your initial impression when you look at this page? Does anything in
                  particular stand out?

Question 2: Please describe the primary banner image in a
few sentences. What is your impression of the imagery,
content?

Banner attribute	(+ / -)
Overall opinion of banner	
Ability to grab attention	
Amount of info given	
Quality of info given	
Fits w/ site	
Color scheme	
Photo of person	
Photo of Printer	
Other photos	
Background	
Title	
Printer name	
Price tag	

Banner ID: _____

Question 1: What is your initial impression when you look at this page? Does anything in
particular stand out?

Question 2: Please describe the primary banner image in a
few sentences. What is your impression of the imagery,
content?

Banner attribute	(+ / -)
Overall opinion of banner	
Ability to grab attention	
Amount of info given	
Quality of info given	
Fits w/ site	
Color scheme	
Photo of person	
Photo of Printer	
Other photos	
Background	
Title	
Printer name	
Price tag	

Banner ID: _____

Question 2: Please describe the primary banner image in a few sentences. What is your impression of the imagery, content?

Banner attribute	(+ / -)
Overall opinion of banner	
Ability to grab attention	
Amount of info given	
Quality of info given	
Fits w/ site	
Color scheme	
Photo of person	
Photo of Printer	
Other photos	
Background	
Title	
Printer name	
Price tag	

Banner ID: _____

Question 2: Please describe the primary banner image in a few sentences. What is your impression of the imagery, content?

Banner attribute	(+ / -)
Overall opinion of banner	
Ability to grab attention	
Amount of info given	
Quality of info given	
Fits w/ site	
Color scheme	
Photo of person	
Photo of Printer	
Other photos	
Background	
Title	
Printer name	
Price tag	

Banner ID: _____

Question 2: Please describe the primary banner image in a few sentences. What is your impression of the imagery, content?

Banner attribute	(+ / -)
Overall opinion of banner	
Ability to grab attention	
Amount of info given	
Quality of info given	
Fits w/ site	
Color scheme	
Photo of person	
Photo of Printer	
Other photos	
Background	
Title	
Printer name	
Price tag	

Banner ID: _____

Question 2: Please describe the primary banner image in a few sentences. What is your impression of the imagery, content?

Banner attribute	(+ / -)
Overall opinion of banner	
Ability to grab attention	
Amount of info given	
Quality of info given	
Fits w/ site	
Color scheme	
Photo of person	
Photo of Printer	
Other photos	
Background	
Title	
Printer name	
Price tag	

Banner Ratings Questionnaire
Banner ID _____

1. Overall Banner appeal rating (-4 to +4): _____

2. Attention grabbing rating (-4 to +4): _____

3. Background appeal rating (-4 to +4): _____

Banner ID _____

1. Overall Banner appeal rating (-4 to +4): _____

2. Attention grabbing rating (-4 to +4): _____

3. Background appeal rating (-4 to +4): _____

Banner ID _____

1. Overall Banner appeal rating (-4 to +4): ____

2. Attention grabbing rating (-4 to +4): ____

3. Background appeal rating (-4 to +4): ____

Banner ID _____

1. Overall Banner appeal rating (-4 to +4): _____

2. Attention grabbing rating (-4 to +4): _____

3. Background appeal rating (-4 to +4): _____

Banner ID _____

1. Overall Banner appeal rating (-4 to +4): _____

2. Attention grabbing rating (-4 to +4): _____

3. Background appeal rating (-4 to +4): _____

Banner ID _____

1.   Overall Banner appeal rating (-4 to +4): _____

2.   Attention grabbing rating (-4 to +4): _____

3.   Background appeal rating (-4 to +4): _____

Additional Questions (after all banners have been shown):

1.   Do you prefer a white or colored/image background?

____ white   ____ colored / image

2.   Do you prefer banners with an image of a person?

____ yes   ____ no

3.   Do you think the price of the product should be displayed up front on the banner?

____ yes   ____ no

Question for Additional Banner

1.   How appealing or unappealing was the animated banner rating (-4 to +4): ____

Appendix XII: Banner Screen Shots

DELEGATE

A desktop device to take care of all your copying, printing, scanning, and faxing.

Introducing the
WorkCentre™ PE120i

read more

Solid choice.

Phaser™ 8400 Color Printer: **$999**

·····▷ Fast, brilliant color at 24 ppm

·····▷ For a limited time, free networking after rebate

read more

Delegate.

A desktop device to take care of all your copying, printing, scanning, and faxing.

Introducing the
WorkCentre™ PE120i

read more

Appendix XIII: Eye Tracking Recording Data Summary

Eye Tracking Recording Summary Sheet
---------------------- **Task Overview** ----------------------

Banner Click Results
Number of participants who clicked on a banner   1
Banner that was clicked on: Relevant, White Phaser 8400 banner

Task Ratings Comparative Results
We asked users the following three questions after each task…

1. How easy or difficult was it to complete this task?
        Scale: -4 (extremely difficult) -> +4 (extremely easy)
2. How would you rate the amount of information about the product that was provided on the site?
        Scale: -4 (much too little information) -> +4 (much too much information)
3. How clear or confusing was the information that you viewed?
        Scale: -4 (extremely confusing) -> +4 (extremely clear)

Average Ratings By Task

Task ID	Task Description	Ease of Use	Amt of information	Confusion
1	Phaser 8400-Find, Request more info	1.33	0.30	1.91
2	PE120-Find, purchase	1.33	0.08	1.75
3	M24-Find a support solution	2.58	N/A	N/A
4	Phaser 7750-Download Driver	2.92	-0.33	2.50

Website Attributes
Participants were given a list of attributes and asked to check all the ones the Xerox website reflected:

Attribute Count

Attribute	# Of Participants who agreed
professional	22
savvy	5
vibrant	5
complicated	4
slow	2
playful	1
dull	1
none of the above	1
disorganized	0

Additional Information:
# who selected professional alone:	10
# who selected professional and savvy:	5
# who selected savvy alone:	0
# selected professional and vibrant:	4
# selected vibrant alone:	1
# selected professional and complicated:	3
# selected complicated alone	1
# selected professional, savvy, vibrant	2

- Note for the "slow" rating-the computer we were using was a bit slow at times. Also, one participant clarified by saying the loading time was fine but that it was slow in the sense of being slow to learn.
- 4 participants noted that it was easy to navigate
- 5 participants commented that it was busy, or that there was too much information, especially on the home page. 2 participants said it wasn't busy or cluttered.
- 3 participants said it wasn't "flashy" or had lots of flashing icons/animations like other sites (which they felt was a positive attribute)
- 2 participants said the site was organized
- 3 participants compared it to other sites, HP and Monster.com (Note: we did not specifically ask them to compare Xerox with any other sites, these were just unsolicited comments offered by the participants when they were justifying the attributes they selected). 2 of these three participants said it wasn't as flashy as HP or Monster, 1 participant said it was "very good compared to the HP site"

--------------------Banner Overview ----------------------

General Webpage Question (participants were given a few seconds to look over the first webpage and then were asked the following question):
What are your impressions of this web page? Does anything in particular stand out?
I noted how many people mentioned the banner in their response.

 # mentioned banner: 22
 # didn't mention banner: 2

Almost everybody mentioned the banner when asked this question; however, I was watching their eye movements when they were just scanning the page before the question was asked and I noticed that for several people, they barely looked at the banner if at all. Then when Chad asked, "does anything stand out?" they would look at the banner and comment on it. This would be an interesting notion for Chad to check out when he's analyzing the eye tracking data.

Banner Ratings Comparison

Banner ID	Product advertised	Title	Background	Person	Displayed Price	Overall Appeal	Attention-getting	Background Appeal
1	WorkCentre	Streamline	Complex	In BG	No	1.17	2.13	1.58
2	Phaser	Solid Choice	White	No	Yes	-0.54	1.38	-1.13
3	Phaser	Color Payback	Complex	Yes	Yes	0.71	1.38	1.17
4	WorkCentre	Delegate	White	On printouts	No	-0.50	1.46	-0.96
5	Phaser	Solid Choice	Complex	No	Yes	2.21	2.54	2.13
6	WorkCentre	Delegate	Complex	Yes	Yes	1.08	1.13	0.50
Animated	Xerox Color	N/A	White	No	No	1.83	2.79	N/A

- Banner 5 received the highest overall and background appeal ratings, which is consistent with the findings from additional banner questions (see below). Banner 5 has a colored background, no person, and displays the price, though with a smaller price tag. It had all the qualities that more people preferred.
- Many positive comments were made about the "read more" button on all the banners.
- Most participants wanted to see a good image of the product itself, noting instances where the printer was not shown clearly enough on some banners.

Banner Additional Questions
1. Do you prefer banners with a white or colored/image background?
   White: 6   **Colored/Image:** 18

   - More people preferred a complex background which is consistent with the banner ratings given: banners 2 and 4, which both had white backgrounds, received the lowest overall and background ratings (and in fact were the only ones to receive negative average ratings).
   - 2 comments suggested that color was more likely to draw their attention, which would be something to investigate further with eye-tracking data.

2. Do you prefer banners with an image of a person or without an image of a person?
   Person: 11   **No Person:** 13

   - Slightly more people preferred no person in the banner, but the difference is so small that it's by no means conclusive.
   - Interestingly, all of the 6 participants who preferred a white background all also preferred no person. These people expressed similar comments about banners: they liked no-nonsense banners that focused on the product.
   - 4 participants said that a person is irrelevant and takes away the focus from the product.
   - 2 participants that did prefer a person in the banner said that it made the product look more user-friendly. 2 others said that the person must be connected to the technology somehow.

3. Do you think the price of the product should or shouldn't be displayed on a banner?
   Price: 20   **No price**: 4

- Most people liked having the price displayed on the banner, and pointed out its absence on the banners that didn't have the product price listed.
- Several people commented on the fact that the giant price tags in some of the banners didn't match their perceptions of Xerox and instead reminded them of "lower-end" stores like Best Buy and Staples.
- People did not seem to object to the smaller price tag displayed in banner 5 (no negative comments about price on this banner, about 8 positive comments).

----------------------Task 1 Detail ----------------------

Top 3 Routes Used

Route	# Participants who used this route
Search (by function/feature)	12
Search (by price range)	10
Products Link (in header) > Printers (color)	7

Failures:
Only two participants were unable to complete this task in one attempt. An attempt is defined as when the participant reported that he/she had successfully completed the task.
- One participant selected Phaser 6100, which didn't meet ppm requirement. This participant was able to successfully complete the task on the second attempt
- One participant was unable to complete the task and gave up after trying several different routes.

Criteria remembered

Product attribute	# Participants who remembered
2-sided print standard	14
Price (less than $1500)	13
Network Connectivity	13
Ppm	11
Color	11
"Fit criteria we were looking for"	2

Number of participants that remembered all the criteria: 2

Non-Criteria items remembered

Product attribute	# Participants who remembered
Printer line/model (Phaser 8400)	9
Solid ink technology	3
Rebate amount	2
Color of product	2
Paper size`	1
Warranty	1
Size of product	1
Number of models in Phaser line	1
Price of supplies	1
"Fast Color"	1
RAM	1

Number of participants that remembered 2 or more non-criteria items: 6
Number of participants that remembered 3 or more non-criteria items: 0

Ratings/Comments

	Ave	Std. Dev.	Mode	# pos ratings(>0)	# neg ratings(<0)	# neutral
Ease of Use	1.33	1.88	2	18	4	2
Amt of Information	0.29	0.81	0	8	3	13
Confusion	1.92	1.64	3	18	4	2

- Most people had positive comments about the ease of this task. The people who had difficulties with this task mentioned that it was a little difficult to locate some of the criteria-2-sided, network connectivity, ppm (6 people).
- Over half the participants gave this a neutral (correct amount of information) rating. 1 person who gave it a positive rating said that they'd "rather have too much information than too little" and another said "I don't believe you can have too much information." At least 3 others said that there was so much info that it was hard to find the particular criteria we were looking for.
- 4 people commented on the chart layout (for the model comparisons) but opinions were split: 2 thought it was clear and laid out nicely, 2 thought it was confusing.

----------------------Task 2 Detail ----------------------

Top 3 Routes Used

Route	# Participants who used this route
Search (by price range)	11
Search (by function/feature)	6
Products Link (in header) > Multifunction (b/w up to 30 ppm)	6

At least 3 participants suggested that the Search By feature should be expanded so that users can select multiple criteria such as Price AND function AND ppm instead of having to choose just one of the three categories.

Failures:

Only three participants were unable to complete this task in one attempt. All were able to complete this task on the second attempt.
- Two participants selected a Phaser model, which didn't meet multifunction requirement
- One participant first selected FaxCentre 510

Criteria remembered

Product attribute	# Participants
Ppm	18
Multifunction (print, scan, copy, fax)	16
Price (< $1000)	12
Paper size	5
Black/White copy and print	5
"Fit criteria we were looking for"	5

Number of participants that remembered all the criteria: 0
Number of participants that remembered 4 of the 5 criteria items: 2

Non-Criteria items remembered

Product attribute	# Participants
Name of product (WorkCentre PE120)	4
Network ready	2
Size of product	2
Color of product	2
Personal/Small workgroup use	2
Laser	1
Number of Models (PE120, PE120i)	1
10-100 Ethernet card	1
Small footprint	1
Where to buy it locally (store name)	1
Scan using Twain drivers	1

Number of participants that remembered 3 or more non-criteria items: 0

Ratings/Comments

	Ave	Std. Dev.	Mode	# pos ratings(>0)	# neg ratings (<0)	# neutral
Ease of Use	1.33	1.88	2	16	6	2
Amt of Info	0.08	0.41	0	3	1	20
Confusion	1.75	1.57	3	18	3	3

- One common comment among participants was that finding the product was easy but figuring how to buy it was a bit difficult (5 people mentioned this). One problem was that when participants went to the Xerox Online store to buy the PE120, it said "No description available for this product." If, however, participants clicked on the PE120 on the left hand side of the store page, they could buy it. 2 participants also felt that there should be some way to add the product to your shopping automatically from the PE120 product page.
- Mostly positive ratings for how clear or confusing this task was, but 4 participants remarked that figuring out how to buy product was confusing.

----------------------Task 3 Detail ----------------------

Top 3 Routes Used

Route	# Participants who used this route
Support > WorkCentre M series > M24 > Support > Refined Search	13
Broad search (used search bar in header)	5
Support > WorkCentre M series > M24 > Support > Image Quality > Black or Color Spots when Printing	4

Failures:
No failures. All participants were able to complete this task in one attempt.

Ratings/Comments

	Ave	Std. Dev.	Mode	# positive ratings(>0)	# negative ratings (<0)	# neutral
Ease of Use	1.33	1.88	2	16	6	2

- Overall, most people found this task very easy to complete.
- 5 people stated that the placement of the support link in the header of the main page made it very easy to find the support information they needed.
- 2 people also mentioned that it was easy due to prior experience with other websites that had similar layouts.

---------------------Task 4 Detail ----------------------

Top Route Used

Route	# Participants who used this route
Drivers > Phaser > 7750 > Drivers and Downloads	19

Almost everybody used this route.

Failures:

No failures. All participants were able to complete this task in one attempt.

Ratings/Comments

	Ave	Std. Dev.	Mode	# pos ratings(>0)	# neg ratings (<0)	# neutral
Ease of Use	2.92	1.91	4	21	3	0
Amt of Info	-0.33	1.05	0	2	4	18
Confusion	2.50	1.50	3	20	2	2

- Most people did not have difficulties with this task, noting that it was easy because of:
    o prior experience with similar navigation structures on other sites (3 people)
    o the prominent driver link in the header (12 people)
    o the drop-down menus to select driver (5 people)
- Most people gave the amount of information a neutral (correct amount of information) rating.
    o 5 people mentioned the fact that it clearly said which driver was recommended and so they went with that one.
    o 3 people felt that the XP platform wasn't displayed prominently enough-one person suggested listing the operating systems in order from most recent to oldest in the drop down menu (currently it's listed as Win-2000/XP instead of Win-XP/2000)

---------------------Banner 1 Detail ----------------------

Pass 1 *(Users asked to comment on their impression, likes and dislikes of this banner)*
Below I've characterized their comments and tabulated the number of positive and negative comments made in each category.

	# Positive Comments	# Negative Comments
Overall opinion of banner	2	0
Ability to grab attention	2	0
Info given	0	5
Fits w/ site	0	1
Photo of Printer	3	3
Photos being printed	3	3
People in bg image	0	1
Background/Color	11	2
color of title	1	0
Absence of Price tag	0	1
meaning of title/theme/Connection to multifunction	9	1
title's ability to grab attention	1	0
read more	4	0
layout	1	0
other text	0	2

- Most people (though not all) understood the theme of this banner-9 participants made positive comments about the connection between the title, the background, and the multifunction machine.
- This banner, however, didn't have as much information about the product as some of the other banners and 5 participants felt there wasn't enough information, and not one participant had a positive comment about the information conveyed on the banner. Participants indicated that they would like to see at least a few basic features.
- The background image received a lot of positive comments. 2 participants liked rowing and so this particular background reminded them of pleasant memories. Other participants liked the sense of movement it conveyed.
- 3 people added positive comments about the b/w rowing photos, noting that they let you know that this machine could print in b/w and copy. One participant said he/she didn't like that these photos were in b/w. The other two participants said they simply didn't like the photos' presence in this banner.
- 3 participants gave the printer image positive comments, saying that they liked that the banner contained an image of the printer. All 3 negative comments about the printer image said that not enough of the printer was shown.

Pass 2 *Ratings*

Rating	Ave	Std. Dev.	Mode	# pos ratings(>0)	# neg ratings (<0)	# neutral
Overall appeal	1.17	2.04	2	16	6	2
Ability to grab attention	2.13	1.42	2	22	2	0
Background appeal	1.58	1.91	3	18	2	4

---------------------Banner 2 Detail ----------------------

Pass 1 *(Users asked to comment on their impression, likes and dislikes of this banner)*

	# Positive Comments	# Negative Comments
Overall opinion of banner	1	5
Ability to grab attention	3	2
Info given	4	0
Fits w/ site	1	1
Color scheme	0	4
Ability of colors to grab attention	1	0
Photo of person	0	0
Quality of Printer photo	0	4
Presence of printer image	5	0
Other photos	0	1
Background	0	1
Printer name	0	0
Presence of Price tag	7	0
Look of price tag	0	5
Banner layout	2	0
meaning of title	2	0
title font	0	1
title color	1	2
size of title	0	2
how much of title showing	0	1
Editor's choice award/review	8	0
read more	4	0
other text	0	1

- Many people liked the fact that the price was listed but several participants disapproved of the appearance of the price tag, noting that it looked "cheap."
- Inclusion of the Editor's Choice Award on this banner received all positive comments. Participants noted that the award piqued their interest in the product and that they generally liked to read product reviews before making a purchase.
- Several people made positive comments about the information given, noting the ppm and free networking.
- 5 participants liked the fact that the printer was displayed but 4 participants objected to its orientation or the detail on the image (couldn't read the blue display panel well enough)

Pass 2 *Ratings*

Rating	Ave	Std. Dev.	Mode	# pos ratings(>0)	# neg ratings (<0)	# neutral
Overall appeal	-0.54	2.26	-1	7	13	4
Ability to grab attention	1.38	1.74	2	17	4	3
Background appeal	-1.13	2.40	0	5	13	6

--------------------Banner 3 Detail ---------------------

Pass 1 (Users asked to comment on their impression, likes and dislikes of this banner)

	# Positive Comments	# Negative Comments
Overall opinion of banner	4	1
Ability to grab attention	2	2
Info given	2	4
Fits w/ site	0	1
Color scheme	11	2
Photo of person	8	9
Photo of Printer	2	4
Other photos (printed out)	2	0
Background	4	2
Meaning of title	0	3
Price tag	8	2
Title	0	2
Summary	1	0
read more	5	0
font color (white/yellow text)	1	1
title color	1	0

- Many people liked the play on color in this one-the combination of the background, woman's jacket, and woman's eyes.
- Most participants commented on the woman in the picture, but had mixed feelings about her. 4 participants liked her eyes. 4 participants also described her positively, using words such as "inviting," "youthful," "cute," "confident," and "competent" to describe her. 4 people felt she took up too much space on the banner and took the focus away from the printer.
- Most people liked the price tag, which was much smaller in this banner.
- 2 participants said that they didn't like the black line in the background. Another participant, however, felt that the black line was good in that it "led you right to the printer."

Pass 2 *Ratings*

Rating	Ave	Std. Dev.	Mode	# pos ratings(>0)	# neg ratings (<0)	# neutral
Overall appeal	0.71	2.07	2	14	8	2
Ability to grab attention	1.38	1.84	3	19	4	1
Background appeal	1.17	2.06	3	15	6	3

----------------------Banner 4 Detail ---------------------

Pass 1 *(Users asked to comment on their impression, likes and dislikes of this banner)*

	# Positive Comments	# Negative Comments
Overall opinion of banner	4	2
Ability to grab attention	2	3
Info given	4	1
Fits w/ site	1	1
Color scheme	2	4
Photo of person	1	0
Photo of Printer	9	1
Photos printed by printer	5	4
Background	2	2
Printer name	0	0
absence of Price tag	0	5
words in title/meaning	3	9
size of title	0	3
color of title	0	2
color of other text	1	0
read more	4	0
placement of title	0	1

- The printer image received almost all positive comments. Participants liked the large, 3D, frontal image of the printer and felt that it made the printer the focus of this banner.
- 5 participants made positive comments about the b/w printouts, noting that they looked hi quality, sharp, and let consumers know that it's a b/w machine. 2 participants didn't like the fact that these photos were in black and white instead of color.
- Many participants had problems with the word "Delegate" and didn't understand it. One participant noted that Delegate is both a noun and a verb, adding to the confusion. Several commented that they didn't know who was delegating to who.
- Other participants did not like the size and color of the title, adding that they felt this banner was "yelling" or "screaming" at them.
- Several people noticed the absence of the price tag in this banner.
- 4 positive comments about the amount of information given with participants noting that it was concise and gave a good overview of the major features.

Pass 2 *Ratings*

Rating	Ave	Std. Dev.	Mode	# pos ratings(>0)	# neg ratings (<0)	# neutral
Overall appeal	-0.50	2.13	-1	5	13	6
Ability to grab attention	1.46	1.89	1	19	3	2
Background appeal	-0.96	2.35	-2	6	14	4

--------------------Banner 5 Detail ---------------------

Pass 1 *(Users asked to comment on their impression, likes and dislikes of this banner)*

	# Positive Comments	# Negative Comments
Overall opinion of banner	4	0
Ability to grab attention	3	0
Amount of info given	9	0
Color/Background	16	1
absence of person	1	0
Photo of Printer	9	1
Photos printed by printer	3	2
Price tag	8	0
Title/choice of words	6	0
title color	1	1
Ability of title to grab attention	0	1
Quality of printed photos	1	0
layout of banner	2	0
read more button	5	0
color of other text	0	2
free networking	3	0
size of banner	0	1

- This banner received very few negative comments and received the highest ratings overall.
- Many participants commented on the color background, using words such as "soothing," "vibrant," "striking," "commanding," and "friendly" to describe it. One participant said it also made the product stand out more.
- Mostly positive comments about printer image as well because it was detailed and prominently displayed.
- The small price tag received all positive comments as opposed to the banners with the large price tag which received mixed comments on the price tag.
- Participants liked the "Solid Choice," with 2 participants specifically comparing it to "Delegate" and noting that "Solid Choice" makes much more sense.

Pass 2 *Ratings*

Rating	Ave	Std. Dev.	Mode	# pos ratings(>0)	# neg ratings (<0)	# neutral
Overall appeal	2.21	1.41	3	22	2	0
Ability to grab attention	2.54	0.93	2	24	0	0
Background appeal	2.13	1.42	2	20	2	2

--------------------Banner 6 Detail ---------------------

Pass 1 *(Users asked to comment on their impression, likes and dislikes of this banner)*

	# Positive Comments	# Negative Comments
Overall opinion of banner	4	0
Ability to grab attention	2	3
Info given	4	4
Fits w/ site	2	0
Color scheme	2	3
Photo of person	4	7
Photo of Printer	6	0
Absence of printouts	0	1
Background	1	1
Banner layout/presentation	1	0
meaning of title	0	4
Color of title	1	2
Size of title	0	1
read more	2	0
absence of price tag	0	5
other text	1	1

- Mixed feelings about the information provided. 4 participants felt that it was informative enough as it told you it was a multifunction machine. 1 participant said the information was very "clear." 4 participants felt that more features/specifications should have been listed.
- Several people commented on the person in the banner. Some liked the presence of a person in the banner, with 1 participant adding that "she looks happy." 3 participants felt she took up too much space and attention away from the printer. 2 other participants weren't sure what she was smiling about.
- All positive comments about the printer image-both its presence and the quality of the image in terms of how much of the printer it showed.
- Again, people had problems with the word "Delegate," which didn't mean anything to several people.
- 5 people noticed the absence of the price tag and suggested that it should be on a banner.

Pass 2 *Ratings*

Rating	Ave	Std. Dev.	Mode	# pos ratings(>0)	# neg ratings (<0)	# neutral
Overall appeal	1.08	1.61	2	16	6	2
Ability to grab attention	1.13	1.94	2	17	3	4
Background appeal	0.50	1.72	-1	12	9	3

--------------------Banner 7 (Animated) Detail --------------------

What's Really Sweet? Juicy Color.   TAKE A BITE

Here's a juicy fact.
Color helps sell up to 80% more.
Have some! There's plenty for everyone.

Xerox Color. It makes business sense.

Ratings

Rating	Ave	Std. Dev.	Mode	# pos ratings(>0)	# neg ratings (<0)	# neutral
Overall appeal	1.83	2.44	4	19	5	0
Ability to grab attention	2.79	1.98	4	22	2	0

Comments
- 3 participants made positive comments about this banner while watching it (before asked).
- 4 participants laughed while watching it. 3 of those participants gave it a positive overall rating.
- 2 participants asked to view it again.
- 12 participants liked the animation. Many said it was very attention-getting. One participant said that the animation serves to "present the information in a logical fashion"
- 6 people commented positively on the vibrant colors.
- 3 people said they loved strawberries.
- 4 people said the banner animation took too long.
- Of the 5 people that gave this banner a negative overall rating, 3 of them gave it a positive rating for its ability to grab their attention, noting the animation.
- One thing Chad and I noticed for one of the participants that rated this banner negatively was that as soon as the animation began, he immediately moved to a different area of the page and looked at other things. It would be interesting to see if any of the other participants who rated it negatively had the same eye movement pattern.

--------------------Banner Recommendations --------------------

Based on participant ratings and comments, the ideal banner would have…

- A colored/image background. The blue background on banner 5 was the most popular.
- The price displayed, but not in a giant red tag. Smaller red tag, which isn't the focus of the banner, would be fine.
- No person or if it had a person, the person would have to be clearly connected to the product and not detract from the primary focus of the banner, which should be the printer.
- A full 3-dimensional image of the product.
- Read more button
- Link to product reviews
- Basic information about the product-what it is (e.g. multifunction machine), and 1 or 2 features (ppm, free networking, etc).

---------------------HP Site ----------------------

We had the opportunity to get some feedback about the HP site from 2 participants.

We first asked them about their general impressions of the web page:
Participant 6: "I see the orange. I'm not sure why the page isn't full size, there's lots of white space on the right. The page is broken down-home, small business, etc. It's clear that you can to online shopping, support, drivers, etc."

Participant 13: "Overall it's pretty good. Good sort criteria. All pertinent info, specifications, price were available"

Next, we asked them to browse the HP site for a printer (any printer):
Participant 6:
route 1: online shopping (then went back to home page)
route 2: search > 4200 tri > HP shopping > HP LaserJet 4200tri

Participant 13:
route 1: printing and multifunction > photo printers for business
route 2: back to printers and multifunction machines > photo printers for home > see all photo printers.
route 3: printers (in header) > color laser jet printer > under 600 > HP color laserjet 2550L (went through overview, specs).
route 4: back, changed price criteria to 600-2000 > hp color laser 3500 printer (went through overview, specs).
route 5: printer (header) > all in ones > laser jet > compare (first 3 products) using "check to compare" feature.
route 6: back to all in ones page > laser 3380 (went through overview, specs)

Participant 13 spent a long time browsing the HP site, trying different routes and looking at several different printers. After the task, he told us that he was looking for a high-quality, all-around printer.

---------------------cdw.com Site ---------------------

After one participant mentioned this site, we asked her and one other participant to perform task 2 (find a multifunction machine) on this site. Following that task, we asked them for their comments on this site.

Routes taken to complete task
Participant 20:
route 1: search > multifunction (didn't finish typing in search)
route 2: products > Xerox > WorkCentre PE120

Participant 24:
route 1: hardware > printers > printer multifunction-fax > Laser printers
route 2: back to multifunction > HP 3015
route 3: then back, then chose Xerox WorkCentre PE120i

For participant 20, we asked her about her likes and dislikes of this page:
- like how you can shop by brands, hardware
- I know this site so that helps
- good layout, flows easily
- not busy, nothing to distract me. All info I need to know is laid out clearly.
- I liked how this [PE120 info] looks all lined up. It's easy to find what you're looking for

For participant 24, we asked him to rate how easy/difficult it was to complete task, the amount of information, and how clear or confusing the information provided was. We used the same scales from task 2 (-4 to +4)

	Rating	Comments
Ease of use	-1	Xerox site [was better]. I was able to find things more quickly [on Xerox site]. This site grouped by manufacturer, which slowed down process. Not as much info as Xerox
Amt info	-2	None
Confusion	-2	none

We also asked participant 24 to check which attributes the cdw.com site reflects (from the same list of attributes participants used to describe the Xerox site):
He selected: complicated, slow, disorganized, dull

Appendix XIV: Statistical Output

Performed on Vassar Stats page, http://faculty.vassar.edu/lowry/VassarStats.html

Data Entry:

Pairs	X_a	X_b	S/R of $\|X_a - X_b\|$
1	1	2	-4
2	12	1	+21
3	6	3	+13
4	7	3	+17
5	2	0	+9.5
6	2	2	---
7	0	2	-9.5
8	2	0	+9.5
9	3	6	-13
10	3	3	---
11	4	3	+4
12	1	0	+4
13	5	9	-17
14	0	1	-4
15	1	5	-17
16	2	3	-4
17	6	11	-20
18	2	1	+4
19	4	0	+17
20	1	4	-13
21	4	2	+9.5
22	7	3	+17
23	3	2	+4

Import/Export Box — X_a and X_b

```
0  1  -4
1  5  -17
2  3  -4
6  11  -20
2  1  +4
4  0  +17
1  4  -13
4  2  +9.5
7  3  +17
3  2  +4
```

Clear this box

S/R ="signed rank"

Import data to data cells

Wilcoxon Signed-Rank Test (n=23.)

Xa = Simple BG Dwells
Xb = Complex BG Dwells

Reload Reset Calculate

$W = 28$

$n_{s/r} = 21$

$z = 0.48$

	P(1-tail)	P(2-tail)
	0.3156	0.6312

Data Entry:

Pairs	Data Cells X_a	X_b	S/R of $\lvert X_a - X_b \rvert$
1	2	1	+4
2	2	11	-15.5
3	3	6	-11.5
4	2	8	-14
5	1	1	---
6	3	1	+9
7	1	1	---
8	1	1	---
9	5	4	+4
10	3	3	---
11	3	4	-4
12	0	1	-4
13	13	1	+17
14	0	1	-4
15	4	2	+9
16	2	3	-4
17	13	4	+15.5
18	0	3	-11.5
19	1	3	-9
20	0	5	-13
21	3	3	---
22	5	5	---
23	3	2	+4

Import/Export Box
X_a and X_b

```
0  1  -4
4  2  +9
2  3  -4
13 4  +15.5
0  3  -11.5
1  3  -9
0  5  -13
3  3  ---
5  5  ---
3  2  +4
```

Clear this box

S/R ="signed rank"

Import data to data cells

Wilcoxon Signed-Rank Test (n=23.)

X_a = Relevant Dwells
X_b = Irrelevant Dwells

Reload   Reset   Calculate

$W = -28$

$n_{s/r} = 17$

$z = -0.65$

P(1-tail)   P(2-tail)

0.2578   0.5157

Data Entry:

Pairs	Data Cells X_a	X_b	S/R of $\lvert X_a - X_b \rvert$	Import/Export Box X_a and X_b	S/R ="signed rank"
1	0.9	3.066	−14		
2	1.5	7.833	−20		
3	0.7	7.601	−22		
4	1.833	5.934	−17		
5	0.367	0.333	+1		
6	1.701	1.066	+6		
7	0.933	2.066	−8		
8	0.633	0.766	−2		
9	3.366	1.834	+12		
10	5.033	1.999	+16		
11	2	4.5	−15		
12	0	.2	−3		
13	19.101	.5	+23		
14	0	.967	−7		
15	3.134	1.033	+13		
16	1.166	1.7	−4		
17	10.935	4.2	+21		
18	0	1.133	−9		
19	0.267	4.799	−19		
20	0	4.366	−18		
21	1.666	2.967	−11		
22	2.835	3.466	−5		
23	2.266	1.033	+10		

Import/Export Box content:
```
0.9      3.066
-14
1.5      7.833
-20
0.7      7.601
-22
1.833    5.934
-17
0.367    0.333    +1
1.701    1.066    +6
0.933    2.066    -8
```
Import data to data cells

Clear this box

Wilcoxon Signed-Rank Test (n=23.)

X_a = Relevant Time
X_b = Irrelevant Time

Reload
Reset
Calculate

$W = -72$

$n_{s/r} = 23$

$z = -1.09$

	P(1-tail)	P(2-tail)
	0.1379	0.2757

Data Entry:

Pairs	Data Cells X$_a$	Data Cells X$_b$	S/R of $\lvert X_a - X_b \rvert$	Import/Export Box X$_a$ and X$_b$
1	0.267	3.699	−17	
2	8.7	0.633	+22	
3	7.601	0.7	+21	
4	4.933	2.834	+14	
5	0.7	0	+9	
6	1.301	1.466	−3	
7	0	2.999	−16	
8	1.399	0	+11	
9	1.168	4.032	−15	
10	5.366	1.666	+19	
11	2.533	3.967	−12	
12	0.2	0	+4	
13	5.533	14.068	−23	
14	0	0.967	−10	
15	0.366	3.801	−18	
16	1.367	1.499	−2	
17	7.702	7.433	+5	
18	0.8	0.333	+6	
19	5.066	0	+20	
20	1.267	3.099	−13	
21	2.666	1.967	+8	
22	3.201	3.1	+1	
23	1.333	1.966	−7	

Import/Export Box contents:
```
0.267    3.699
-17
8.7      0.633
+22
7.601    0.7
+21
4.933    2.834
+14
0.7      0          +9
1.301    1.466      -3
0        2.999
```

Import data to data cells

Clear this box

S/R ="signed rank"

Wilcoxon Signed-Rank Test (n=23.)

Xa = Simple BG Time
Xb = Complex BG Time

Reload   Reset   Calculate

$W = 4$

$n_{s/r} = 23$

$z = 0.05$

	P(1-tail)	P(2-tail)
	0.4801	0.9601