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Demographic Preferences in Web Design: Usability Testing through Eye Tracking at Fidelity Investments Inc.

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**Demographic Preferences in Web Design:
Usability Testing through Eye Tracking at Fidelity Investments Inc.**

A Major Qualifying Project Report

submitted to the Faculty

of the

WORCESTER POLYTECHNIC INSTITUTE

in partial fulfillment of the requirements for the

Degree of Bachelor of Science

by

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Date: April 16, 2007

Sponsored by

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Professor Soussan Djamashi
Project Advisor

Abstract

This project examined the effectiveness of bricklets on Fidelity Investments NetBenefits web platform. Grounded in previous research, five hypotheses were developed to investigate demographic differences in web design preferences between male and female users in various age groups. Through a laboratory experiment using an eye tracker, the results of this study provided evidence for demographic differences (age and gender) in web design preferences. Based on these results, the study provided future recommendations for the use of bricklets on Fidelity's NetBenefits Site.

Executive Summary

Working with the Human Interface Design (HID) department at Fidelity Investments Inc. in Boston, MA, the goal of this project was to research the effectiveness of the bricklets on the company's NetBenefits website. A bricklet is a small window with important information that makes browsing a website easier for a user. The main purpose of bricklets is to bring important information to the attention of customers. The variables chosen to examine in this study were the background color of the bricklets and the presence of pictures within them. This study was designed to examine whether there were significant differences in bricklet usage and preference between male and female users of different age groups.

Thirty-six (17 male, 19 female; ages ranging from 20-70 years old) employees at Fidelity participated in this study. We collected information regarding the eye movement and gaze with the use of eye-tracker. While our results did not show significant differences in most cases, they revealed that such differences did exist and the directions of our hypotheses were correct. Therefore, an increase in sample size is likely to produce significant results in future experiments.

The results of this study provide Fidelity Investments Inc. with several recommendations for implementing bricklets on the NetBenefits website. While this study has analyzed the gender and age preferences of users with regard to the visual characteristics of bricklets, there are many other characteristics that can be examined in the future (page location, content, layout). The implications of this study, its limitations, and future experiments that can continue this line of research are discussed.



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April 10, 2006

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Dear Dr. Djamassbi:

The purpose of this letter is to summarize my evaluation of the Major Qualifying Project (MQP) conducted by John Bosch, Joseph Hsu, Erin Mazuera, and Kelly Osberg during their work with my group at Fidelity Investments. The basic goal of the project was to learn more about the factors that influence how people visually scan webpages, as well as their subjective reactions to those pages. Further, we wanted to see if there are demographic differences in these factors, and especially if there are differences by age group. As the primary vehicle to do this research, we selected a prototype version of Fidelity's NetBenefits website (<http://netbenefits.fidelity.com/>). Specifically, we are introducing a new "messaging" area at the top-center of the home page after login, and we wanted to determine the effect of different visual treatments for that area (i.e., background color, presence or absence of an image).

I was very pleased with this team and the work they did. They worked together as a team very well and they worked well with members of my usability team. They were regularly here at Fidelity every Wednesday working on this project and sometimes additional days, particularly when they were conducting usability tests in our lab.

The first part of their project, after defining the topic, was to design the details of the usability study. I was very impressed with how quickly they grasped many of the concepts like between- vs. within-subjects design, task order effects, prototype order effects, etc. They worked out detailed plans for handling these issues in the design of the study. I was also impressed with how quickly they picked up on actually conducting the usability test sessions in the lab—briefing the participants, running the sessions, collecting the data, etc.

One of the most challenging parts of this project was that we were using brand-new eye-tracking equipment, from Tobii Technologies, that no one on my team had used before. This was the first



project here at Fidelity to use this equipment. So the students had to learn the equipment on their own, troubleshoot it, and use it for all of the test sessions. We ran into numerous technical issues but the team overcame them all. They became the experts on using the eye-tracking equipment and the rest of my team often turned to them for help in setting up other studies using the eye-tracker. Their efforts definitely helped to jump-start our use of the eye-tracking equipment.

In summary, I was very pleased with this team and the work they accomplished. I got to know all of the members of the team and I was very impressed with their level of commitment to the project and their professionalism. It was apparent to me that every member of the team made significant contributions to success of the overall project.

I believe that what we learned from this project will help Fidelity to design and build better websites in the future. If you have any questions, please feel free to contact me. I look forward to working with you on future MQP projects.

Sincerely,

Thomas S. Tullis, Ph.D.
Senior Vice President, Usability
Fidelity Investments

Authorship Page

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Acknowledgements

Sponsor: Fidelity Investments Incorporated

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Dr. Tom Tullis

Michelle McNulty

Marguerite Bergel

Ann Chadwick-Dias

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Fidelity Investments Inc. – Marlborough

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1 Introduction

The Internet has become a ubiquitous tool that has had a powerful impact in every business sector. During recent years, companies have put a significant amount of resources into creating and improving websites that benefit both internal and external users. Websites designed to be highly functional and visually appealing for the user provide a better overall experience with the company. Improvement of the website will enable the company to better target and inform users of beneficial opportunities. Therefore, by accommodating their users, companies benefit financially by having a successful website. In addition to saving costs, websites also provide convenient online access to the company's services and its pertinent information. This in turn increases the value of the company.

In order to enhance customers' online experience, several companies currently offer bricklets on their websites. A bricklet is a window with important information to make browsing the website and attaining desired information easier for a user. The main purpose of the bricklets is to bring important, relative information to the attention of customers. Fidelity Investments Inc., one of the leaders in web based financial services which includes e-trading and retirement services, has begun using personalized bricklets on their NetBenefits website.

The objective of this project was to investigate the effectiveness of the personalized bricklets on the NetBenefits website. The project also examined whether there were significant differences in bricklet usage and preference between users of different ages and genders. The NetBenefits team at Fidelity Investments Inc. was interested primarily in the visual appearance and format of the bricklets. Hence, the

project focused on two variables that pertained to visual preferences: background color and pictures. A state-of-the-art eye tracker, produced by Tobii Technology, was the primary device and method from which data was gathered about the movement of a user's eyes while they performed a set of four tasks on the NetBenefits website.

Grounded in previous research (Hartzel 2003, Moss et al. 2006, Pan et al. 2004, Hess et al. 2006, Banks 2005, Hlotyak 2001, Tedesco et al. 2004, Meyer et al. 1997) five hypotheses were developed concerning the specific tendencies of users based on their gender and age while navigating websites. The tasks were designed and the participants were selected in such a way to provide the most accurate and equal test population for analysis of our theories.

The participants were recruited based on their age, gender, financial literacy, and knowledge of the NetBenefits website. This was to ensure the equal distribution of subjects for the tests. A total of thirty-six participants, twenty females and eighteen males, were tested during the study. The participants were also distributed evenly by age into the categories of 20's to 30's, 40's, and 50 years and older. They were asked to complete four tasks during which they were exposed to four different bricklets throughout the test. Three of the tasks were filler tasks which were not relevant to the bricklets. However, those tasks did bring the users' attention to the upper left, lower left, and directly below the bricklet so that the user would traverse the areas of the webpage surrounding the bricklet while completing the tasks. The fourth task was directly related to the bricklet and was also used to determine if the participant utilized the bricklet.

Throughout the experiment, the eye tracker collected data from the participant. This information was then filtered to attain specific data such as the amount of time each

user spent looking at each bricklet, how many users noticed each bricklet, the variance of the users' pupil sizes while looking at each bricklet, and how many users utilized the bricklet for the purpose of completing the specified task. In addition to the extensive data collection of the eye tracker, the tests were recorded both digitally through eye tracker as well as on a digital video disc.

The data gathered were then used to examine the gender and age preferences of users between bricklets with and without pictures and bricklets with light and dark colored backgrounds. Future research could benefit from eye tracker technology because of the abundant and objective data it produces. The conclusions reached in this study provide Fidelity Investments Inc. with several recommendations for the implementation of bricklets within its NetBenefits website. Due to the steps taken to recruit participants for this experiment, a comprehensive database of potential test subjects for future studies was also created for the HID group.

While this project had analyzed the gender and age preferences of users with regard to the visual characteristics of bricklets, there were many other characteristics that could be examined in the future such as its location, content, and layout. Although this study was one of many to utilize eye tracking technology in demographic research, it is the first one to examine bricklet usage and design preference.

The project focused on two variables which were chosen to be implemented in the development of the bricklets. The background colors of the bricklets were varied as well as the utilization of pictures. A state-of-the-art eye tracker, produced by Tobii Technology, was the primary device and method from which data was gathered about the

movement of a user's eyes while they performed a set of four tasks on the NetBenefits website.

Research was conducted in order to establish a framework for the project's hypotheses based on prior theories. Five hypotheses were developed concerning the specific tendencies of users based on their gender and age while navigating websites. The tasks were designed and the participants were selected in such a way to provide the most accurate and equal test population for analysis of our theories.

The participants were recruited based on their age, gender, financial literacy, and knowledge of the NetBenefits website. This was to ensure the equal distribution of subjects for the tests. A total of thirty-six participants, twenty females and eighteen males, were tested during the study. The participants were also distributed as evenly possible by age into the categories of 20's to 30's, 40's, and 50 years and older. They were asked to complete four tasks during which they were exposed to four different bricklets throughout the test. Three of the tasks were filler tasks which were not relevant to the bricklets. However, those tasks did bring the users' attention to the upper left, lower left, and directly below the bricklet so that the user would traverse the areas of the webpage surrounding the bricklet while completing the tasks. The fourth task was directly related to the bricklet and was also used to determine if the participant utilized the bricklet.

Throughout the experiment, the eye tracker collected data from the participant. This information was then filtered to attain specific data such as the amount of time each user spent looking at each bricklet, how many users noticed each bricklet, the variance of the users' pupil sizes while looking at each bricklet, and how many users utilized the

bricklet for the purpose of completing the specified task. In addition to the extensive data collection of the eye tracker, the tests were recorded both digitally through eye tracker as well as on a digital video disc.

The data gathered were then used to examine the gender and age preferences of users between bricklets with and without pictures and bricklets with light and dark colored backgrounds. Future research could benefit from eye tracker technology because of the abundant and objective data it produces which allows more controlled studies. The conclusions reached in this study provide Fidelity Investments Inc. with several recommendations for the implementation of personalized bricklets within its NetBenefits website. Due to the steps taken to recruit participants for this experiment, it has also gained a comprehensive database of potential test subjects for future studies.

While this project had analyzed the gender and age preferences of users with regard to the visual characteristics of bricklets, there were many other characteristics that could be examined in the future such as its location, content, and layout. Although this study was one of many to utilize eye tacking technology in demographic research, it provided information for the application of eye-tracking in usability studies as well as further research into web based design preferences.

2 Literature Review

This document is comprised of details to serve as a supplementary literature review. The following sections review the background research necessary for the completion of the project. Sections include information on the history of the company, Fidelity Investments Inc., and NetBenefits. Background information on website layout, contributions to the company, and the technology that will be used are also covered. Additionally, several theories that contributed to the design of the study and the final analysis of the resulting data are discussed. The document will also mention potential benefits of this project and how it aids in the company's goals.

2.1 Fidelity Investments

Headquartered in South Boston, Fidelity Investments Inc. is the largest provider of retirement plans to the world. An industry leader in innovation, Fidelity prides itself on developing products that improve the capabilities of their customers and employees. One such example is the effort put forth by the Human Interactive Design (HID) department in aiding designers to develop the most user friendly, web-based applications possible. An example of such an application is Fidelity's NetBenefits web service, which allows retirement plan holders to access and modify their 401k accounts and other such benefits.

2.1.1 History

Fidelity Investments was founded in 1946 by Edward C. Johnson as the Fidelity Management and Research Company (Fidelity Investments Inc. 2006). The company was set up as an advisor to the Fidelity Fund, a Boston, MA based mutual fund. In 1974 Fidelity became the first company to sell funds to individuals over the phone and created

the first money market account to offer check writing. In 1975 Fidelity first offered Individual Retirement Accounts (IRA's). The corporation continued its innovations with the first voice activated automated response system which provided 24-hour price quotes. The first computer trading was offered by Fidelity in 1984. Fidelity became the first mutual fund company to have a home page on the internet. Today, it is the largest mutual fund company in the United States, and is one of the foremost providers of financial services worldwide. Fidelity now offers a selection of additional financial services to compliment its mutual funds including retirement planning, brokerage services, estate planning and many others. Fidelity is a ground-breaking company with many innovations that became industry standards. The corporation's commitment to innovation is evident by the fact that Fidelity re-invests large portions of its revenue back into technology development (Fidelity Investments Inc. 2006).

2.1.2 Human Interactive Design Department

The Human Interactive Design (HID) department at Fidelity started in 1992 to expand the documentation department, which was formed to create literature explaining how and why applications were developed for the company. Though records existed defining these reasons, there were none that explained the reasons for the interface design of the application. As technological advances created a necessity for applications that were catered to the needs of the user, the documentation department found a reason for defining such requests. The documentation department realigned its focus towards the ease-of-use and preferences in interface design and thus became the Human Interface Design Department.

Under the direction of the Senior Vice President, Tom Tullis, the HID department's mission is to "constantly improve the usability of Fidelity's interactive systems," (Fidelity Investments Inc. 2006) such as their websites, telephone systems, etc. The HID department is part of the Fidelity Center for Applied Technology (FCAT), whose purpose is to research and explore new opportunities in interactive media for Fidelity Investments' growing clients.

The HID department is constantly involved in development projects throughout the company in order to improve the quality of Fidelity's applications. The HID department at Fidelity Investments provides several services including designing prototype sites and applications, performing expert reviews and documentation, and conducting usability tests, focus groups, and user surveys. Background and historical information behind these services are described in the following sections.

2.1.2.1 Human Computer Interaction Studies

Human Computer Interaction (HCI) studies are crucial to a company's continuing success. HCI studies further improve the experiences of clients and employees using the company's technological tools. The tools are put in place to allow them to perform tasks at the highest level of efficiency. Fidelity delegates this task to the Human Interface Design Department. The department specializes in HCI tests and research to further increase the ease of use for the client and employee experiences.

Also known as MMI (man-machine interaction) or CHI (computer-human interaction), Human Computer Interaction (HCI) studies involve an interdisciplinary approach to an individual's interaction with a computer through its software and hardware interfaces. The concept of HCI brings together Computer Science and

Information Technology with several other fields which include but are not limited to aesthetics, artificial intelligence (AI), cognition, design, philosophy, and psychology. Overall HCI initiatives aim to make computers easy to use and to develop universal standards for the creation of computer based interfaces with humans (Carey & Harrigan 2002).

2.1.2.2 Usability Testing

Through usability testing, it can be “determined whether a system meets a quantifiable level of usability for specific types of users carrying out specific tasks” (Stone 2005). The HID department at Fidelity Investments in Boston, Massachusetts is equipped with a state of the art usability lab facility that includes two testing rooms. They each contain video and audio recording devices, an eye tracker, a participant room, a control room, and an observation gallery. The facility is used primarily to test users’ reactions to programs and websites developed by Fidelity software engineers and programmers. Conceptually, usability testing generally focuses on a small set of objects. This differs from Human Computer Interaction studies, which attempt to develop universal design principles (Stone 2005).

2.1.3 NetBenefits

NetBenefits is a website platform provided by Fidelity Investments to manage an employee’s benefits provided by their company, such as a 401(k), pension plan, health and insurance services, payroll services, other provided benefits and human relations services. It was first launched in 1996 simply as the company’s 401(k) self service website. It has currently evolved to become the industry’s leading platform for managing benefits, services, information, and resources in one location under one account.

Presently, NetBenefits services over 19 million United States employees and retirees, and an average of more than 700,000 employees access NetBenefits during each business day (Albert 2006).

To make the NetBenefits website user friendly, the layout and location of information on the pages are determined by the NetBenefits design team. The team consists of a few key players who lead the group ahead in development. With positions in the team such as design lead, architect, and usability specialist, the NetBenefits webpage focuses on providing services to users in a convenient manner.

2.2 Websites

The HID department within Fidelity Investments Inc. is currently working to better implement and research universal design standards across all of its web-based products including the NetBenefits web service. In the following section, a brief overview and history of the technology and standards involved in website design are provided.

The World Wide Web (WWW) was created by Tim Berners-Lee in 1989 to provide more information faster and easier for governmental agencies and academic researchers. Today, it is accessible to people around the world. The WWW is made up of various websites with several web pages as a place to hold different types of information. The WWW is critical to the success of companies today, creating easy access to information and services. Hypertext Markup Language (HTML), the primary standard for webpage format, and the World Wide Web Consortium (W3C), the list of web layout standards in existence for websites, contribute to the importance of

background research for the NetBenefits website layout. In the following two sections, the significance and information on HTML and the W3C is explained and discussed.

2.2.1 HTML

Hyper Text Markup Language (HTML) is a formatting language which defines how information on a webpage is displayed. It was first written by Tim Berners-Lee when the World Wide Web was created in 1989 and was the primary way of constructing and publishing websites. The standard text document can have HTML tags placed throughout it which denote style and other layout options. There are also tags which denote font type, size, and location on the page. HTML is a versatile markup system interpreted by web browsers. A static, or unchanging, page created from the markup language HTML dictates the format and layout of fields and buttons which submit information. It also dictates navigation through the site, the presentation of requested information, and the overall depiction of the page. HTML is the backbone of the page, providing the look and feel needed for the user to successfully navigate, use, and understand the site.

2.2.2 World Wide Web Consortium

The World Wide Web Consortium (W3C) is responsible for the development of the HTML and XHTML standards. It was founded in 1994 by the current director, Tim Berners-Lee. Since then, the W3C has published more than ninety standards known as the W3C Recommendations. The mission of the W3C is “to lead the World Wide Web to its full potential by developing protocols and guidelines that ensure long-term growth for the Web” (W3C,) and is done so through various groups of staff, organizations, and public works internationally. For the web to function properly, all websites must follow a

standard so that web technologies are compatible with each other and all global users will have access regardless of what hardware or software they are using. Therefore, the W3C strives to create these standards to provide uniformity to the WWW.

2.3 Eye Tracking

Tracking the human eye was a novel idea that started as a method for studying human behavior. Eye tracking's early history consisted of concepts that brought about new ideas that could benefit scientific studies and experiments. While these ideas yielded great potential, the technologies that existed at those times could not support it. Eye tracking today is not only feasible, but practical with current technology platforms. This gives researchers the ability to further study human behavior through eye movements in many different applications. In particular, these studies help to improve the usability and accessibility of technologies used today.

2.3.1 Human Eye Movements

The human eye is arguably the most dynamic part of human anatomy. Evolution has led animals to develop the ability to control their visual focus through the movement of their head and eyes. While that may direct the focus of their gaze it does not steady the movement of the eye, especially in human beings (Richardson & Spivey 2004). The eye is said to move in a series of scanning movements and jerks called saccades (Richardson & Spivey 2004). These sudden jumps are known to occur 3-4 times each second (Richardson & Spivey 2004). Saccades correspond to the nature of human vision. The human eye can scan and search an area of approximately 200 degrees, but only realizes stimuli in detail from 2 degrees. This small area is called the fovea and incases

photoreceptors. For the short period of time the fovea is at rest, these photoreceptors provide incredible high color vision (Richardson & Spivey 2004).

The saccades of the eye have a close relationship to an individual's focus or attention, which in turn provides information into cognitive processes (Richardson & Spivey 2004). During the 30-50 milliseconds in which the eye saccades to a new stimuli, a period of low resolution occurs. The ability to detect the movement of the eye in a single millisecond interval allows for the path of the eye to be detected while moving from one stimulus to another. This not only allows for the detection of the focus of the eye but represents what a subject is seeing peripherally. Combined with the dilation of the pupil in relation to the movement of the eye, one can define exactly where a subject is looking, how long they are looking at it, and the path the eye took to move from one stimulus to another.

With rapidly advancing technology and improved methods of eye tracking, research into the movement of the human eye will have a significant impact in the fields of marketing, design, human computer interaction, and many others.

2.3.2 Evolution of Eye Tracking

The late nineteenth century and early twentieth century provided the first crude data in the tracking of human eye movements. This information was collected through observatory methods, often involving one individual watching another person's eyes performing certain tasks such as reading (Richardson & Spivey 2004). The data was considered to be insignificant since any research into the movement of the eye done by another eye provided skewed results with significant inaccuracies. Thus, the most

promising advancements in eye tracking were the use of mechanical devices to record non-bias accounts of the movements of the human eye.

The earliest devices involved mirrors positioned around the eye. The researcher would observe and attempt to count the jerks of the subject's eyes. This was said to be when the concept of saccades was first developed. Later, similar research would be done into these jerks through the use of a microphone taped under a person's shut eyelid. It would record the "jumps of the eye" as a tap and maintain an account of each tap while the subject would attempt to read with one eye. Similar tests were performed using a combination of microphones, contact lenses, and mirrors. All were found to restrict the movement of the eye and provide inaccurate results (Richardson & Spivey 2004).

In the 1920's research began to involve non-contact, non-invasive, methods of recording eye movement such as photography. The photography method, though reducing the impairment of the subject, did not provide data at a high enough speed to produce a detailed recollection of the position of the human eye. Some parts of the eye, mostly the iris, were obscured by the eyelid. However, the information provided by these tests did lead to usable data regarding the horizontal position of the eye. This method became known as Dodge's method (Richardson & Spivey 2004).

Dodge's technique grew and, with advances in video technology, certain aspects of recorded human eye movements could be electronically recognized and analyzed. Up to this point in history, all of the data regarding eye movements was said to be recorded in relationship to the position of the head. This means that all the results were in respect to a correlation of head and eye movement, not simply the movement of the eye alone. Similar tests with ocular photography were performed involving the immobilization of a

subject's head in order to provide results on only the movement of an eye (Richardson & Spivey 2004). This technique often restricted and created discomfort for the subject, thus resulting in irregular ocular scanning patterns.

Though primitive in nature, the immobilization of the head lead researches to concentrate specifically on the eye and how to best track its movements in order to find out where the subject was actually looking. In the 1970's a technique was developed to track two characteristics of the moving eye. These characteristics involved different behaviors in the eye movement and head movement and thus could be tracked and recorded in a manner that allowed "their differential to be used to calculate the 'point of regard' or exact place in the world where a subject was actually looking" (Richardson & Spivey 2004).

Therefore, the previously mentioned method compensated for the movement of the head and allowed two scientists, Merchant and Morrisette, to use an eye tracking method that calculated what position on a screen a person was focusing on. The method was unobtrusive to the point that "the user may not even recognize its existence in the room" (Richardson & Spivey 2004).

With this non-evasive method of tracking the eye, further advancements were made and improved upon, leading to the technology that is used today. This includes stand-alone, internally located eye trackers within computer monitors and other devices. These devices not only recognize the direct location and dilation of the pupil, but are also able to pick up the peripheral vision of the user as well as providing a complete representation of what is in a subject's range of view and what within that range they are focusing their attention on.

2.3.3 Eye Tracking Equipment Supplier

The equipment that Fidelity currently uses for its eye tracking research was developed by Tobii Technology. Tobii Technology was founded in 2001 and has continuously shown rapid year-to-year growth. The eye tracking company has its headquarters based in Stockholm, Sweden, with offices in McLean, VA near Washington DC in the United States. Tobii Technology is a leader in hardware and software solutions for eye tracking. With pioneering breakthroughs in the eye tracking industry utilizing state of the art technology and equipment, Tobii eye trackers bring innovation and practicality to a higher level. The company's mission is to bring eye tracking into broader use in applications such as eye control interfaces within computers, design testing, and medical diagnostics.

Tobii's eye tracking technology procures the images of a person's face, eyes, and reflections in the eyes of near-infrared reference lights to accurately estimate the position of each eye and where each eye gaze is directed. In order to correctly acquire all the data, the device must be calibrated to each individual user (Tobii Technology 2006).

Fidelity's decision to use the Tobii eye tracker was due to the equipment's practicality. The device itself is completely non-intrusive and does not require any physical contact with the user. Its highly reliable eye tracking also enables it to accommodate a wide variety of users.

2.3.4 Eye Tracker Features

The following section gives a brief overview of the data analysis capabilities of the Tobii eye tracker used at Fidelity Investments. These features include output of hotspots, gaze plots, gaze replays, and text data.

2.3.4.1 Hotspots

The simplest, though inconclusive, methods of receiving eye tracker output are through hotspots. The illustrations provide fast results, although the data is not as accurate as with other measures because it can only be analyzed visually. Hotspots display the cumulative areas of where participants spent the greatest amount of time gazing. The hotspots are illustrated through a series of colors: blue being the least viewed and red being the most viewed. Hotspot data is used to give a visual representation of the raw data.

2.3.4.2 Gaze Plot

A gaze plot identifies the areas on each web page that a user looks at most often. This is shown with a blue dot on the location with the duration of time the user's eyes were looking there. As the user looks at a location for a long period of time, the blue dot increases proportionately in size. These plots also display event data, such as the user clicking on a link.

2.3.4.3 Gaze Replay

A gaze replay video recording produced by the eye tracker shows how a user navigates through the web pages. It essentially plays back the user's session showing where the user's eyes were looking at each moment and the specific path their eyes took to complete a task.

2.3.4.4 Text Analysis

The text analysis is the raw data produced by the eye tracker. This extensive amount of data includes the length of gaze for each eye, pupil dilation size, and gaze positions. The eye tracker also produces results that show the time and duration in which

a user looks at a predefined area of interest (AOI). The fixation data gathered through this method can then be used as a reference point for pupil and event data recordings.

2.3.5 Competitive Advantage of the Eye Tracker Used in this Study

Compared to older technologies, a number of innovations have been made to overcome traditional problems associated with eye tracking such as cumbersome equipment, poor tracking precision, and limited tolerance to head motion. Some of the key aspects of Tobii's technology include patents on techniques to use fixed wide-view, high-resolution cameras and the accurate estimation of the 3D position in space for both eyes, sophisticated image processing, patented control logic, advanced algorithms to compensate for head motion without loss in accuracy, and unique techniques to enable long-lasting calibrations.

2.4 User Demographics

An important aspect of this experiment is the impact of gender, age, and financial literacy on the usability of the NetBenefits website. In order to understand the impact that these characteristics have on users' perceptions, it is necessary to note theories that have been presented by other researchers. The following sections provide information on studies that have been conducted to test the effects of gender, age, and financial literacy on website navigation and how they may affect our study.

2.4.1 Gender

As web site design standards have evolved, a conscious effort to make the site increasingly appealing to the user has come to be. Programmers are looking for the most appealing design standards and principles that can be applied to a specific targeted group of users. Research has shown that there are significant demographic differences in

regards to a user's preference in web site design. Some of the most substantial theories revolve around the specific preference differences between genders.

A study shows that males and females make up an equal percentage of the online population (Moss et al. 2006). But that is where the similarities in internet usage between the genders end. Gender has been reported to be one of the most significant determinants of web page viewing behavior. A 2004 study done at Cornell University used an eye tracker to show that gender influenced the behavior of the subjects in terms of viewing a website. Males were found to have a longer duration of fixation than females and were found to react differently to images, which affected memory performance (Pan et al. 2004).

In terms of processing information from the internet a 2006 study showed that females tend to be more detailed information processors. This means that females are noticing more of the entire web page than males. Females focus on all information available while males focus on fewer areas (Hess et al. 2006).

One of the most significant differences in gender preferences on the internet is web page design. A study at the University of Glamorgan tested 60 websites on 23 aesthetic factors of web page design and found significant differences between genders in 13 of them. The 23 factors were grouped into three main categories: navigation, language, and visual issues. Most of the differences found were in the language and visual categories. There are statistically significant tendencies for each gender to depict images of their own gender and that females are more likely to use informal language, abbreviations, specific colors (such as white yellow and pink when males prefer blue and black), and round lines to avoid a horizontal layout (Moss et al. 2006).

Another important difference between males and females is their behavior on computers when given a task. Males are reported to have a higher level of self confidence in focusing on a new challenge and are more likely to apply general knowledge and past experiences to task-specific demands (Hartzel 2003). A study on the adoption and use of new software measured the subjects' confidence levels before being given a tutorial on the new software package and then measured it after, showing that males had a significantly higher confidence level before the tutorial than females (Hartzel 2003).

As web page designs begin to focus on specific target groups and apply marketing segmentation techniques to the development of web based service and applications, it is important to take into consideration the differences between genders. This prior research shows that gender differences do affect the preferences and performances on the Internet.

2.4.2 Age

Few studies have been conducted to determine age group differences that exist among users browsing web pages. Such studies primarily focus on the major differences between young, computer savvy users and aging seniors who did not grow up with constant access to a computer. Interest in examining the differences that exist has increased in recent years because of the expanding diversity of web users. In the past, web designers targeted mainly young users who were likely to spend a great deal of time online. However, as more people have become interested in using these technological tools and younger generations begin to age, a new perspective is necessary. For example, between 2000 and 2004, the number of senior internet users increased 47% (Banks 2005). This creates a larger target audience for most industries, including financial services.

A survey conducted by Yankelovich Partners for American Express reveals the current trend in financial planning. The results of this survey suggest that age affects the use of internet resources to gather financial planning advice. They concluded that 48% of those ages 18-34, 41% of those ages 35-49, and 20% of those 50 and over used these resources (Hlotyak 2001). Seniors in the category over 50 years old desired information that was provided to meet their specific needs and were turned away by information displayed through complex multimedia or advertisements that they considered untrustworthy. Although nearly half of the youngest age group used the internet to obtain financial information, their overall low level of financial literacy indicated that this number could potentially be much larger. Moreover, this young group of users frequently used search engines and sites familiar to them rather than the sites written by financial experts. The reasons for this have not been determined, but it is possible that many young users feel that financial institutions do not provide facts, but rather aim to convince the user to become a customer.

Another study that provides contributions to theories of age differences was conducted by Fidelity Investments to examine the demographic differences that exist among web page preferences (Tedesco et al. 2004). This study involved subjects of various genders and ages and allowed them to construct their ideal web pages. Through this experiment, several different trends were uncovered. First, users under 40 years old chose to add a search feature to the web page 50% of the time, while users over 40 only added it a combined 10% of the time (Tedesco et al. 2004). Next was the option of adding a help feature. In this instance, the opposite result was obtained. Subjects over 65 years old added the help feature 30% of the time, while all users in the categories under

65 years old only added it 5% of the time (Tedesco et al. 2004). These results indicated that younger users desired more control over where they were taken on the web page, and older users desired more assistance when navigating. This study also showed that older users were significantly more likely to choose navigation that included a feature resembling a button next to a link. The subjects over 65 years old chose this button type of navigation 30% of the time, while none of the other subjects did (Tedesco et al. 2004). The results of this study suggest that age affects the preferences a user has on the appearance of a web page and the way a user navigates the page.

A further study conducted by Georgia Institute of Technology found navigational differences between young and old participants (Meyer et al. 1997). In this study, the subjects were asked to complete a set of tasks given a website consisting of 19 pages total. They tracked the number of steps taken by each subject to achieve the goal. There were two significant results of this study. The researchers discovered that the older participants generally took longer, requiring more steps, to complete each task. The older subjects completed the tasks in 9.7 steps while the younger participants finished in 6.4 steps (Meyer et al. 1997). The older participants were also more likely to return to the home page after completing a task before moving on to the next one. This was a different result than the one seen observing the younger participants, who would initiate each subsequent task immediately upon completion of the prior (Meyer et al. 1997). This may be one reason they required less steps to complete each task and it also contributes to thinking about the design of a website. Older users rely heavily on the main page to direct them to where they want to go, while younger users want to navigate further within the website, without constantly returning to the home page.

The studies conducted on the effects of age on website navigation using human subjects offer many interesting insights into the optimal design and layout of a site. The knowledge of their preferences can attract more traffic by customers, which is the goal of Fidelity Investments.

2.4.3 Financial Literacy

Financial literacy is a measure of the level of experience someone has in regards to financial knowledge. In order to measure financial literacy in the study at Fidelity, an individual was given a quiz created by the Federal Reserve System and adopted by the HID department at Fidelity. The results allow researchers to categorize the participants' knowledge of aspects of the financial industry such as stocks, bonds, retirement plans, and investment strategies. A grade of 70% suggests a high level of financial literacy and a lower score categorizes an average to low level of financial knowledge. The survey and answer key are provided in Appendix D.

2.5 Usability Concerns

As the internet has become a large source of information for people around the world, an increasing number of studies have been conducted in order to test its effectiveness in reaching out to customers. The following sections discuss some concerns that these studies have brought to light and how their concerns may have an impact on usability studies. First we discuss the concept of banner blindness, a recent discovery that has been recognized by many developers. Then we discuss the creation of "bricklets", designed by Fidelity employees to attract customers who meet certain requirements or can obtain a larger benefit from their services with Fidelity.

2.5.1 Banner Blindness

Banner blindness refers to the theory that people will ignore items on a page that they suspect to be advertisements when they don't blend with the content on the rest of the page (Benway & Lane 1998). The term results from a study that was done by Jan Panero Benway and David M. Lane on website design (Benway & Lane 1998). Design guidelines proposed by Ameritech state that "the larger an item is, the greater its perceived visual importance and likelihood of attracting attention" (Benway & Lane 1998). However, until Benway and Lane, no usability tests had been performed on human subjects to confirm this theory. Though challenged by other members of the community, their results have had a substantial influence on modern web design.

To verify the existence of banner blindness, an equal number of males and females in their 20's and 30's were assigned to perform a series of tasks (Benway & Lane 1998). They were asked to locate specific information on a website such as the one shown below in Figure 1. The control tasks occurred when the subjects were given a task that had to be performed by clicking on one of the blue links as is common in all websites. The banner tasks required the subjects to click on the banner, as shown in red.



Figure 1: Sample Webpage (Benway & Lane 1998)

The results of this experiment showed that there was a substantial amount of banner blindness. The results, shown in Figure 2, reveal the success rates of users performing various tasks. Furthermore, when the subjects did locate the banners, they said that performing these tasks were more difficult than the control tasks. Upon glancing at the page, many didn't initially notice the banner. It was only after scanning the entire page and not finding what they were looking for that they went back to the top and saw the banner.

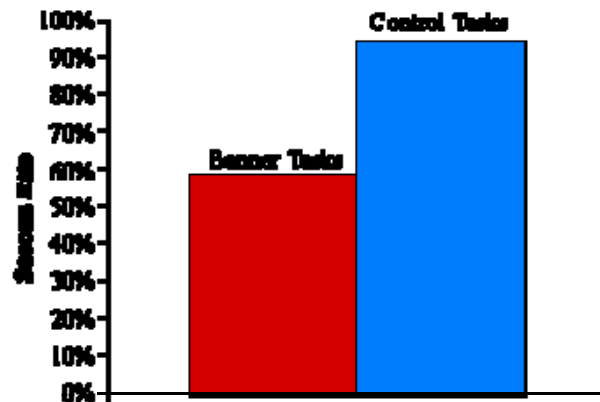


Figure 2: User Success Rates in Performing Banner Tasks

Other experiments performed by Benway and Lane revealed that the data they collected did not significantly change when the banners were animated (Benway & Lane 1998). The subjects were just as likely to overlook them. They suggested that the current trend of adding colors, motion, and sound to banners place an unwanted burden on the internet user and costs them extra time and effort (Burke et al. 2004). The goal should be to make these banners simple, yet noticeable.

Other studies have produced similar findings in support of this idea. Nielson's usability study concluded that "users were more comfortable with pages that had fewer colors, greater means of communicating with the web master, more pictures of real people and appropriate metaphors" (Nielsen & Mack 1994). Many authors also acknowledge the fact that many internet users have a set purpose when they go to a website. They want to accomplish a specific task and leave that site. Therefore, most users don't browse pages looking for extra information or at banners on the top of the page. They are only interested in items pertaining to their task. This is important to keep in mind when designing informational banners because they should be positioned in such a way to attract the users' attention visually and conceptually.

Overall, various studies have resulted in conclusions that support the existence of banner blindness. They have shown that click rates on banners have been steadily declining since they first became in use (Pagendam & Schaumburg 2001). They also show that animated banners have no effect on whether a user notices it (Benway & Lane 1998). In fact, more users recall a static banner. They also show that people are more likely to notice banners if they are aimlessly browsing (the ALB group) than if they have

a specific task in mind (goal directed approach called the GSI group) as shown in Figure 3 (Pagendarm & Schaumburg 2001).

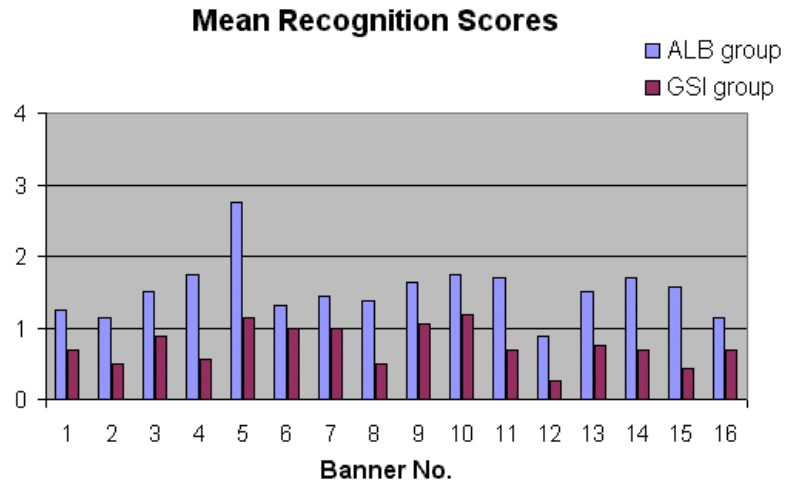


Figure 3: Results of Browsers vs. Task Oriented Users (Pagendarm & Schaumburg 2001)

2.5.2 Bricklets

A bricklet is an area on a web page that provides information and recommendations to a user. It may take many forms, but its main purpose is to make completing complex tasks easier for the user. In order to better understand the concept of bricklets, some examples are provided below. Figure 4 shows a bricklet that is displayed to a user once they log in on a specific website.

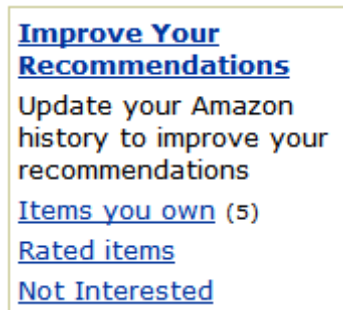


Figure 4: Bricklet on the "Recommended for You" Page of www.amazon.com

Examples of personalized bricklets are shown below in Figure 5. These bricklets appear on the main page of eBay’s website after a user has logged in. They provide immediate access to some of the user’s most important account features. The lower bricklet also provides users with items they may be interested in based on past searches or purchases.

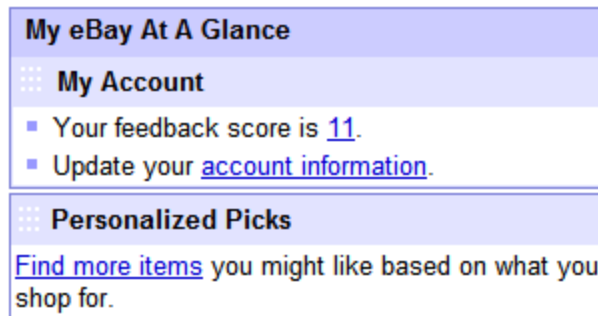


Figure 5: Personalized Bricklets on the Home Page of www.ebay.com (eBay 2007)

NetBenefits, through the help of the design team, is developing bricklets of personalized advice according to an individual’s private account information. These bricklets are designed to bring attention to the customers who may not know of or may not be using all the services available to them that Fidelity provides. This prevents the lack of awareness that some customers have about their financial benefits such as a 401(k) and point out additional help specifically targeted to them.



Figure 6: Sample Preliminary Bricklet (FMR Corp. 2006)

In Figure 6, a sample bricklet from the preliminary stages of the NetBenefits design team’s prototype is shown. In this bricklet, currently used on the NetBenefits website,

they provide information to the customer based on their personal profile. The NetBenefits design team is constantly thinking of different ways these bricklets can be displayed to produce more noticeability, with some ideas including using the person's name, using images, or by simply changing the color or location of the bricklet on the page (Albert 2006).

2.6 Major Impacts

By constructing a well-functioning website, several financial benefits occur. A proper website design contributes to the overall satisfaction of the customer, which in turn leads to the financial success of the company. A suitable website is a necessity to a company wishing to excel in the market and therefore discussing the obtained benefits is vital. The following sections describe these benefits and why they are important to any successful company.

2.6.1 Website Design

Data gathered from usability studies and testing helps fulfill Fidelity's website design goals. In this particular study, recommended changes are towards the NetBenefits website, which is the company's platform for allowing users' access to retirement and savings benefits. Improvements of the website enable the company to better target and inform users of beneficial opportunities and advice that they can use towards their advantage.

The overall website design and ease of use will also become more intuitive based on a user's demographic. With a website that is highly functional and visually pleasing for the user, the overall experience with the company is elevated.

2.6.2 Financial

Companies benefit financially by having a successful website since a website that is useful and easy to use will attract more customers. Thus, having a successful website is likely to increase a company's return on IT investment. In addition to saving cost, having easy online access to all of the company's services and information about those services makes utilizing the capabilities of the company more convenient, which in turn increases the value of the company.

2.7 Summary of Literature Review

Currently, the HID department of Fidelity Investments is seeking to improve the NetBenefits website. To do so, three factors will be taken into account: age, gender, and financial literacy. Through studying possible correlations in those three aspects, the objective of this study is to further improve users' experiences on the company's website. The metrics employed will be analyzed through Tobii Technology's eye tracking device. The conclusive data will aim to circumvent banner blindness in the company's use of bricklets. Final results of the study will help to achieve financial benefits as well as an improved web design for a distinct level of competitive advantage.

3 Hypotheses

Previous research shows that males and females have different design preferences (Moss et al. 2006). For example, females are more attracted to images of people (Tedesco et al. 2004). Thus, it is reasonable to expect that males and females will respond to bricklets with pictures of people differently.

H1) Female participants will notice bricklets with pictures of people more than males.

Previous research also shows that males tend to be attracted to darker colors (specifically blue) while females are more attracted to lighter colors (Moss et al. 2006). Thus, it is reasonable to argue that males and females will respond to the bricklets that have light or dark backgrounds differently.

H2a) Female participants will notice bricklets with a light background color more than males.

H2b) Males will notice bricklets with a dark background color more than females.

A study conducted by Fidelity Investments indicates that older users prefer help features when using a website (Tedesco et al. 2004). Therefore, we argue that these users will notice the help provided by the bricklets more than younger users who prefer to complete tasks independently.

H3) Participants 50 years and older will notice bricklets more than participants 20-49 years old.

A survey conducted by Yankelovich Partners reveals that users over 50 years old are turned away by complex multimedia and advertisements (Hlotyak 2001). They desire information that is pertinent to their task. From this information, we can assume that

older users will notice the bricklets without pictures because they are simple and do not appear as advertisements.

H4) Participants 50 years and older will notice bricklets without pictures more than with pictures.

4 Methods

This section explains the methods used to create and execute a usability study for the NetBenefits site. The focus was to determine the effectiveness of Fidelity’s personalization bricklets and the impacts that gender and age have on their design. The following sections describe the recruiting process for the testing, the pre-test procedure, the test itself, the post-test procedure, the measurements used to analyze the data, and the reasoning behind the methods we chose.

4.1 Recruitment Process

The criteria for participation in this study was included in a larger Recruitment Questionnaire that was sent out for the purpose of creating a “Potential Study-Participant Database”, which encompassed all the criterion taken into consideration for usability testing at Fidelity. This section describes the questionnaire and the rationale behind it.

4.1.1 Questionnaire

To begin the recruitment process for the usability study on NetBenefits, an online survey was developed and sent to Fidelity employees. The survey was sent to Fidelity employees because they were in the local vicinity (the Boston location), there were several thousand employees to choose from, and many of them fit the criteria of our study. The response rate to voluntary questionnaires is often low. Therefore, having this large pool of respondents was important. For example, we sent out the survey to thousands of people. However, only 900 people completed the survey.

The objective of this survey was to elicit respondents based on the following criteria: age, gender, frequency of use of the NetBenefits web platform, and a self evaluation of their financial literacy. This allowed us to filter out subjects that were not

suitable for our study (ex. certain age or financial literacy range). The survey collected demographic information such as gender and age. It also required the respondents to use a drop down menu to complete a self-report of their NetBenefits usage (Options: Less than once a month, About 1-3 times a month, About once a week, A few times a week, About once a day, Multiple times per day) and investing knowledge (Options: 1 = Novice; 2; 3; 4 = Intermediate; 5; 6; 7 = Expert). The benefit of using Fidelity employees for this study was that many males and females were employed, they were all of various age groups, were somewhat familiar with the NetBenefits website, and they were all professionals in the financial industry and had similar levels of financial knowledge.

The online survey created for our study will also be used in future usability tests conducted at Fidelity Investments. Dr. Tom Tullis and his team were able to include additional questions they felt necessary for future tests in order to accumulate a convenient database of acceptable participants. Dr. Tullis had the survey document approved by the Human Resources department before it was sent out to ensure all questions were appropriate. This final process allowed the survey to be broadcasted to all Fidelity employees at all local branches [See Appendix B].

4.1.2 Participants

The results of the online survey were saved in a database. Initial SQL queries were written to filter the data to be extracted in the following populations:

- a. Age groups:
 - i. 20s – 30s
 - ii. 40s
 - iii. 50s – 60s

- b. Gender: male and female
- c. People who rarely used the NetBenefits website (NetBenefits usage rating of 0-2 where 0 = less than once a month, 1 = 1-3 times a month, and 2 = once per week)
- d. People with average knowledge of financial literacy (self rating of 3, 4, or 5 on an scale from 0-7 where 0 = novice, 4 = intermediate, and 7 = expert)

The financial literacy self rating of 3, 4, or 5 was chosen because those people were considered to be in an average range. Those who had average financial knowledge and especially those with low NetBenefits usage (a usage rating of 0-2) were valuable subjects for this study since they could view the website with no prior expectations due to their unfamiliarity to it.

Participants who satisfied the requirements were ranked based on how closely they met our ideal attributes. Out of all the potential participants who met the requirements, we selected the top 36 candidates for the study. An email was sent to all candidates requesting them to reply with their choice of available testing dates. The testing dates began at the end of December 2006 and ran through the end of February 2007. Scheduling was processed with the help of a Fidelity intern [See Appendix C].

When candidates responded with their availability, they were organized and scheduled based on their first choice of possible dates and times. Tests were scheduled every Wednesday for a half hour, and took 15 to 20 minutes, leaving about ten minutes of preparation time between participants. With two eye trackers, ideally two participants could be scheduled for a particular time on a testing day. While the estimated maximum amount of participants per day was 28 (two eye trackers for seven hours a day with a test

time of 30 minutes per participant), due to difficulties with one of the eye trackers and conflicts in scheduling time of participants, on average about seven participants completed the study per day.

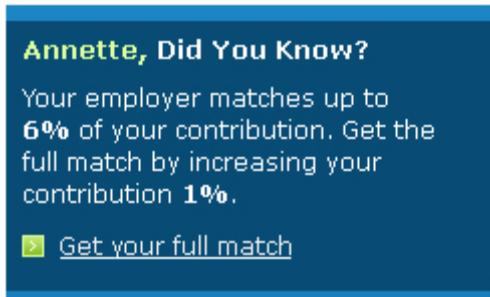
A total of 18 males and 20 females participated in this study. They all had similar levels of financial literacy as described above. A breakdown of the participant matrix is shown below in Table 1. Testing concluded at the end of February 2007.

Table 1: Distribution of Participants by Gender and Age

	20s-30s	40s	50s-60s
Male	7	6	4
Female	6	6	7

4.2 Bricklets

To examine possible gender and age influences on user preferences four bricklets with four different visual formats were used in this experiment: Bricklet Design 1- dark, no image; Bricklet Design 2- light, 2-pixel border; Bricklet Design 3- light, side people image; Bricklet Design 4- dark, side people image. The blue background color was chosen for Designs 1 and 4 because previous researched indicated that male users preferred blue or black colors significantly more than females (Moss et al. 2006). The bricklets with pictures, chosen as the second variable, were formatted in a consistent way, with the same images placed in the same location on each bricklet. The images with people were chosen because previous research indicated that females were more attracted to images of people than males (Tedesco et al. 2004). Figure 7 displays the four bricklet designs used in the study.



Bricklet Design 1- dark, no image



Bricklet Design 2- light, 2-pixel border



Bricklet Design 3- light, side people image



Bricklet Design 4- dark, side people image

Figure 7: Bricklet Designs 1-4

4.3 Design

In this study we used four different formats for the bricklets. Subjects were required to complete four different tasks using the four bricklets. To avoid an effect due to the order of tasks, we used four groups of subjects, each receiving a different task order. Additionally, within each group the bricklets were ordered differently per task: A, B, C, and D. Each of the bricklets were randomized so that each group had a different task per bricklet. This design reduced the order effect, i.e., that the bricklet was noticed due to affects other than format such as the difficulty or assignment of the task.

The design shown in Figure 8 represents our study as a Latin square within another Latin square. A Latin square is “an arrangement of symbols in a square array so that each symbol appears once and only once in every row and in every column”

(Hausner 2007). One Latin square was based on the group that each subject was in and within that Latin square was another reflecting the tasks they must complete. Figure 8 shows the first Latin square among the various groups. The second Latin square shows the various task sequences within each group.

<i>Bricklet Design Number</i>					<i>Task Number</i>				
<i>Group A</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>Group i</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
<i>Group B</i>	<i>2</i>	<i>1</i>	<i>4</i>	<i>3</i>	<i>Group i</i>	<i>2</i>	<i>1</i>	<i>4</i>	<i>3</i>
<i>Group C</i>	<i>3</i>	<i>4</i>	<i>1</i>	<i>2</i>	<i>Group i</i>	<i>3</i>	<i>4</i>	<i>1</i>	<i>2</i>
<i>Group D</i>	<i>4</i>	<i>3</i>	<i>2</i>	<i>1</i>	<i>Group i</i>	<i>4</i>	<i>3</i>	<i>2</i>	<i>1</i>

Where i = {A, B, C, D}

Figure 8: Experimental Design – Latin Square within a Latin Square

In order to verify that this grouping did not have an effect on the resulting data, tests were conducted and are discussed in the results section. There were no significant results that led to the conclusion that this design negatively impacted the study. These results can be found in Appendix E.

4.3.1 NetBenefits Website

The NetBenefits design team, located in Marlboro, MA developed the prototype for this project’s usability test. The prototype included the major functionality of the NetBenefits website. Data entered by the participant was not saved and did not affect the test. Some minor functions did not work, or worked differently within the prototype. The tasks and testing procedure were designed to accommodate only functional aspects of the website.

4.4 Tasks

Participants completed the tasks individually using the Eye Tracker. All tasks involved starting on the NetBenefits homepage. The page contents remained the same for each user and did not reflect any personal information specific to a subject, such as their name or financial information. This was because the NetBenefits page used was a prototype and did not have the functionality to access the database containing this information. The only aspect of the page that changed within the groups and tasks were the different bricklet designs.

Four tasks were written to test the noticeability of the bricklets and whether or not they were used effectively. The tasks were similar to everyday tasks employees with a NetBenefits account would complete in a normal situation. For example, general tasks included: finding the balance of all investments, locating the amount invested in a particular account, determining life insurance coverage, and increasing employee contribution to their 401k.

Tasks were read aloud to the participant and they were asked to think out loud. All four bricklet formats were presented to each participant through the tasks. Each group (A, B, C, D) was given the tasks in a different order so that all bricklets were seen during different tasks (see section 3.3 for specific details). For example, a participant in group A may have been asked to do tasks in the following order:

1. What is the total amount of your investments in all of your plans and accounts?
2. How much do you have invested in Fidelity Canada within your Theta non-qualified plan?
3. How much life insurance coverage do you have for this company?

4. Maximize the company match for your contribution in your 401(k) within your Theta Savings Plan.

Only one of the four tasks related directly to the content of the bricklet (task “d” in the above example). The other three were filler tasks. None of the tasks required the participant to click the bricklet in order to complete it, but for task “d” shown above, utilization of the bricklet made the task easier to complete. The tasks were not designed to test the participants’ knowledge or skills, but rather how the website design helped them complete the tasks. The three tasks unrelated to the bricklet were filler tasks, used to examine if participants noticed the bricklet on the page even though they didn’t need to use it. The task directly related to the bricklet was used to see if the participants used the bricklet to complete the task. The filler tasks were strategically placed in locations surrounding the bricklet (upper left, lower left, and underneath) to direct the user’s attention around the bricklet and evaluate whether or not they noticed it.

There were several ways to complete each task and each test subject was encouraged to complete it in their own way. Therefore, before testing began, we documented each way to solve the particular tasks, which made it easy for us to note the differences in solving the tasks between the participants. Although we never told the participant how to solve the task, the path they took was recorded to analyze how different people responded [See Appendix G]. These observations were noted in recommendations for the future use of personalization bricklets.

4.5 Briefing

The participants in this study underwent a briefing period before they began the experiment. The briefing period was used to explain to the subjects how the usability test

would be run and what they should expect, preparing them before the test. The process of briefing was for the participants to be comfortable with the usability test and provided information on how to act and what to do. This was an important and necessary step for the usability test.

During the briefing period, functionality of the eye tracker was explained. In order to use the eye tracker to record the participant's eye movement data on the screen, the machine had to first be calibrated. Facilitators explained the calibration process and completed it during the briefing period to properly prepare for the test [See Appendix F].

4.6 Procedure

The experiment took place at the Fidelity Investments branch in Boston. Upon arrival, the participants completed a financial test. The financial test consisted of 18 questions that tested their financial literacy [See Appendix D]. The results of this test were then compared to their financial literacy self evaluation that was completed prior to their arrival on their initial survey. This was done to verify their self evaluation scores through a controlled test. A participant may rate themselves an expert on a scale, but when asked 18 financial questions, a score of 10 would not support this evaluation. Any participants whose test scores did not match their self evaluation score, a situation that never occurred, were omitted from the study. Following the test, facilitators (our group members) briefed the test subjects on the test and technology that was used according to the script. Subjects were tested on a series of tasks related to the NetBenefits web platform. In order to be properly tested to record data, they were familiarized with the Tobii Eye Tracker Technology. Users followed the Tobii Eye Tracker Procedure (including calibrating of the eyes, testing, etc.). Upon completion of the tasks, the test

subjects went through a debriefing session about the usability test. The users were thanked for their time and given a gift of two free movie passes for their useful help.

As the user was taking the usability test, the eye tracker was simultaneously recording data onto the computer as they navigated through the website in the form of text, video, and picture files. These files included hotspots, gaze plot, etc. [See Section 3.2.5]. Information not picked up by the computer, such as the users' comments or frustrations, were documented by a group member in spreadsheet form. [See Appendix I]. Additionally, all participants' actions in the testing lab, including their navigation through the website as they solved the tasks were recorded on DVD. As all the tests were being completed, the data was analyzed for patterns or trends using the output of the data collected through the Tobii Eye Tracker.

Upon completion of the tasks, participants were debriefed. The debriefing period consisted of a survey based on the tasks and the noticeability of bricklets on the NetBenefits page. The survey included questions regarding the visual appeal, effectiveness, and noticeability of each individual bricklet. Additionally, the participants were asked to choose which bricklet(s) they recalled during the study and whether or not they felt bricklets were effective in general [See Appendix H].

4.6.1 Testing Concerns and Considerations

This section describes all concerns that could potentially create insufficient or inadequate data. These concerns are analyzed and a resolution is provided and explained so as to maintain the integrity of the data.

4.6.1.1 User Orientation

Concern: Although the eye-tracker had a high capability to monitor and analyze eye movement, its detection range could be limited. If a participant was not oriented at the proper distance from the eye-tracker at the proper sitting height, their eyes could not be tracked. This would result in inaccurate and incomplete data.

Resolution: The lab has been setup to allow remote monitoring and control of the testing computer. This allowed the test administrator to see the eye movements of the participant in real-time. When the participant was not oriented correctly or the eye-tracker was unable to monitor eye activity, it was known immediately and the problem could be addressed.

4.6.1.2 Participants with Eye Impairment

Concern: Some participants had vision handicaps due to impairments of the eye. They may not have vision through one of the eyes or have difficulty controlling it. In order for the eye-tracker to function properly, it had to be uniquely calibrated to every participant. Although eye impairments did not impact the effectiveness of the study, it did not complicate calibration with the eye-tracker.

Resolution: Detailed data is collected on both eyes during a test. Therefore it was important to note a participant's eye impairment in detail. With this information, data was filtered or adjusted to collect information relevant to the healthy eye or distortion.

4.7 Measurements

To examine the noticeability of the bricklets, we analyzed user's fixation and gaze. We also examined whether the users used a bricklet by investigating whether they clicked the links in the bricklets. This information was gathered using the Tobii eye tracker. In order to assemble only the data related to the bricklets and not the entire web page, we

defined the bricklets as Areas of Interest (AOI's) within the eye tracking software. We then gathered specific data, discussed in the following sections, using the filtered results. In addition to the objective data collected by the eye-tracker, we used a self-report survey to solicit the perceived noticeability of the bricklets.

4.7.1 Fixation

Fixations refer to users' eye movement. The eye tracker registers a fixation when the user's eye movements rest upon any area on the eye tracking screen for at least 300 milliseconds. Since we were interested in examining the noticeability of the bricklets and not the whole web page, in this experiment, the location of the screen where the bricklets were placed was defined and manually set as the area of interest (AOI). This allows the eye tracker to record a fixation and its duration. The recording starts when a fixation is established (when the eye rests for 300 milliseconds) and ends when the user looks somewhere on the website outside of the defined AOI.

4.7.2 Gaze Data

Gaze refers to the variation in size of one's pupils in millimeters while focusing on an AOI. Pupil size and pupil position in the eye was sampled by the eye tracker in this study 50 times every second. Research suggests that the average variation between the pupil sizes of a user related to how much the user was involved in the AOI and how well they understood the contents of the AOI (Pan et al. 2004). The higher the average variation in pupil diameter, the more involved they were in the defined area, and of the more they liked the contents of the AOI (Halpern 1967, Pan et al. 2004).

4.7.3 Frequency

Frequency refers to the number of times the participants' fixation or gaze was recorded by the eye tracker. More specifically, when measuring the frequency of fixations, frequency refers to the number of times people did fixate on a bricklet. As mentioned previously, a fixation was established if the participant looked at the bricklet for more than 300 milliseconds. Similar results were obtained in regards to the gaze data. The frequency of gaze refers to the number of times the participants' pupil size varied when looking at a bricklet. Therefore, the frequencies measured were a count of the number of fixations or gazes received by a bricklet.

4.7.4 Event Data

Event data refers to users' mouse clicks. Significant event data consisted of a participant clicking on a bricklet to solve the task of maximizing their company match for their 401(k) within their Theta Savings Plan. For each participant who clicked a bricklet, we also recorded the number of attempts they made at solving the task before utilizing the bricklet. An attempt was recorded when the user was unsuccessful completing the task and returned to the NetBenefits main page to start over. The total count of attempts ended upon the user's completion of the task.

4.7.5 Observation Data

Using a stopwatch, we recorded the total amount of time, in seconds, that it took a subject to complete each of the four tasks. Timing started when the NetBenefits home page appeared and ended when the subject read aloud the correct answer. The task times showed the ease of solving each task when using a bricklet. For example, the results confirmed that for task four (Maximize the company match for you 410(k) within your

Theta savings plan) it took significantly less time to complete the task using the bricklet than not using it.

4.7.6 Self Report Survey

In addition to the data collected by the eye tracker we also used a self report survey completed by each participant at the end of the session. This self report survey examined the recall of the bricklets used in our study. It also included questions regarding the visual appeal, effectiveness, and noticeability of each individual bricklet. Additionally, the participants were whether or not they felt bricklets were effective in general [See Appendix H].

5 Results

In this section, we report our data analysis. We used one way ANOVA, paired t-testing, and frequency tests to analyze our data (e.g. fixation, gaze, event data, observation, and self report results). In addition to testing our hypotheses, we conducted several ad hoc analytical tests to examine the overall preference and noticeability of the bricklets for all of the participants.

To analyze the effects of picture and color, the bricklets were separated into groups. The two bricklets with the dark blue background color (Bricklets A&D) were combined together and the two bricklets with the light background color (Bricklets B&C) were combined together. Similarly, the two bricklets with a picture of a person in them (Bricklets C&D) and the two bricklets with no picture at all (Bricklets A&B) were also grouped together when computing the statistical tests. For more information on the bricklet designs and images, see Figure 7.

5.1 Generalized Bricklet Results

Overall, there were many differences between males and females and the different age groups regarding all of the bricklets. These overall results provide evidence for several conclusions about the bricklets that could be helpful for improving a website. The opinions and preferences of all the participants on the bricklets are shown followed by the preferences by gender and age of the bricklets.

Table 2 below shows the frequency of gaze (whether the participant's pupil size changed) in all the bricklets between males and females. It shows the variance of gaze between male and female participants as well as the percentage of that variance.

According to Table 2, although not significant, the females reacted more to the bricklets than the males with a gaze percentage of 56.6% opposed to the males with 52.9%.

Table 2: The number of times that participants' pupil size changed when looking at all the bricklets broken down by gender along with its corresponding percentage (frequency of gaze)

	Gender			
	Male		Female	
	Frequency	Percent	Frequency	Percent
Notice	36	52.9%	43	56.6%
P=0.787				

The results for frequency of fixations are similar between males and females of all the bricklets as well. In Table 2, the females have higher fixation percentages than the males in all the bricklets, which suggests that females, more than males, noticed the bricklets. While again not significant, this shows that the females fixate on the bricklets more often than the males.

Table 3: The number of times that participants looked at each individual bricklet broken down by gender along with its corresponding percentage (frequency of fixation)

	Gender				
	Male		Female		
	Frequency	Percent	Frequency	Percent	
Bricklet A	14	38.9%	22	61.1%	Dark color, no picture
P=0.099					
Bricklet B	17	47.2%	19	52.8%	Light color, no picture
P=0.813					
Bricklet C	16	44.4%	20	55.6%	Light color, picture
P=0.479					
Bricklet D	18	50%	18	50%	Dark color, picture
P= -0.814					

The results of a one way ANOVA of each individual bricklet gaze variance between the genders supports the above observation. As shown in Table 4, while not significantly so, all of the females have higher gaze values than the males for all of the bricklets.

Table 4: The results of One Way ANOVA for the mean of gaze values for each individual bricklet broken down by gender

Treatment	Gender				
	Male		Female		
	Mean	St. Dev	Mean	St. Dev	
Bricklet A	0.004	0.01	0.175	0.463	Dark color, no picture
df = 34, F = 2.298, p = 0.139					
Bricklet B	0.085	0.294	0.102	0.282	Light color, no picture
df = 34, F = 0.029, p = 0.867					
Bricklet C	0.12	0.453	0.662	1.66	Light color, picture
df = 34, F = 1.701, p = 0.201					
Bricklet D	0.016	0.033	0.152	0.369	Dark color, picture
df = 34, F = 2.290, p = 0.139					

These observations can be visually supported in the hotspots recorded by the eye tracker. In the following figures (Figures 9&10), it is clear that the females looked at each individual bricklet significantly more than males. By capturing the percentage of people that looked within the range of the bricklets, the hotspots show red where there was the highest amount of activity, yellow where there was some activity, and green where there was less activity.

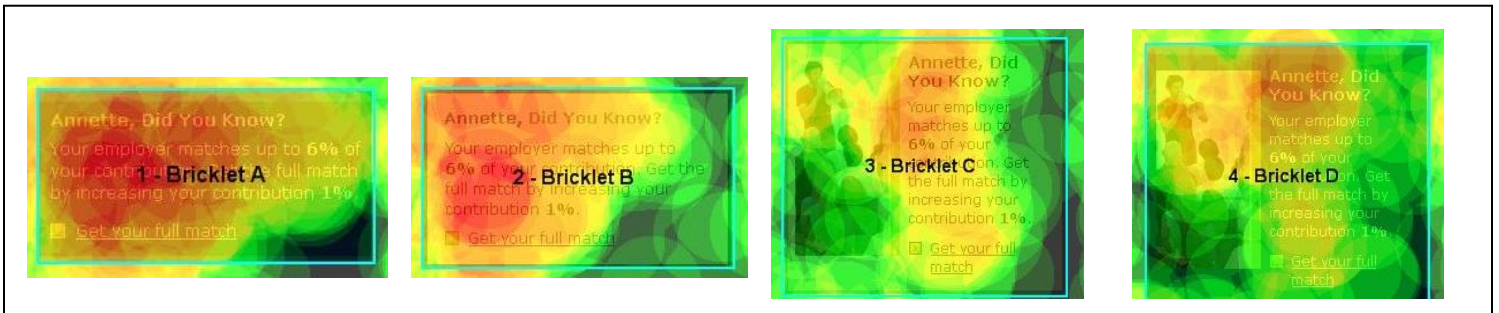


Figure 9: Visual representation of the percentage of females who looked within Bricklets A-D (hotspots)

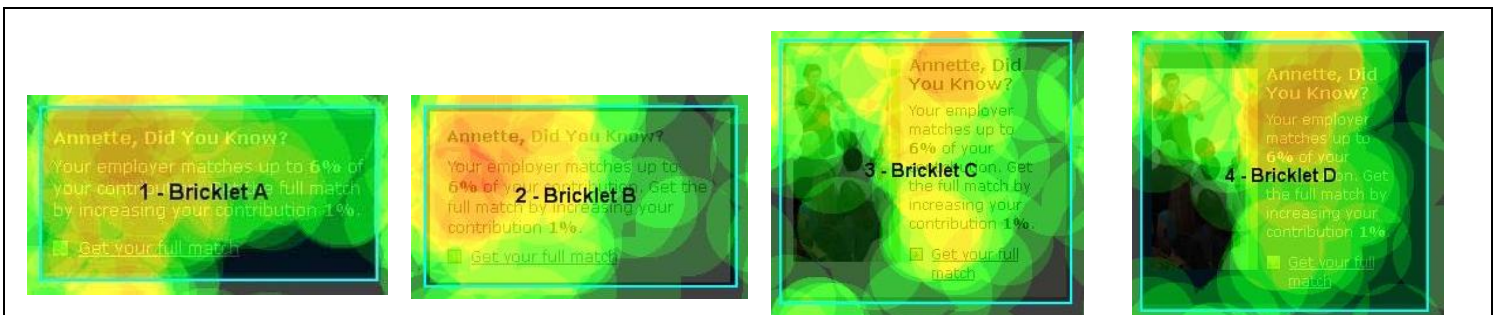


Figure 10: Visual representation of the percentage of males who looked within Bricklets A-D (hotspots)

5.2 Hypothesis 1

The first hypothesis predicts that female participants will notice bricklets with pictures of people more than males (H1). This means that we were expecting to find support that females looked more at Bricklet C and D, the bricklets with images of people, than males. To test this hypothesis we examined the frequency of fixations (number of times participants looked at the bricklets), length of fixations, and gaze of our participants.

Upon looking at the frequency results of fixations between the picture and no picture bricklets, it appears that females prefer the bricklets with pictures over males. According to Table 5, 52.8% of the total female bricklet fixations focused on the bricklets with pictures as opposed to males, with 47.2% of the total male bricklet fixations. These results, while not significant, acknowledge the direction of our hypothesis that females notice the bricklets with pictures more than the males since there are more fixations from females on the bricklets.

Table 5: The number of times participants looked at the bricklets with picture (Bricklets C&D) broken down by gender along with its corresponding percentage (frequency of fixations)

Treatment	Gender			
	Male		Female	
	Frequency	Percent	Frequency	Percent
Picture (C&D)	34	47.2%	38	52.8%
P=0.617				

Further, we examined the gaze of the males and females between the bricklets with pictures and no pictures. The gaze refers to the average change in size of the participant's pupils when looking at a bricklet. We used a one way ANOVA to determine the difference in gaze values for the different genders according to the bricklets with pictures or no pictures. In Table 6 below, females have a higher gaze mean of 0.407mm on the bricklets with pictures as opposed to the males, with a gaze mean of 0.068mm.

This data shows that females are focusing more on the bricklets with pictures than the males, supporting the direction of our hypothesis.

Table 6: The results of One Way ANOVA for the mean of gaze values for the bricklets with picture (Bricklets C&D) broken down by gender

Treatment	Gender			
	Male		Female	
	Mean	St Dev	Mean	St Dev
Picture (C&D)	0.068	0.321	0.407	1.213
df = 70, F = 2.501, p = 0.118				

In additional attempts to find support for H1 we gathered, in the event data, the number of times each individual bricklet was used. Knowing each bricklet design, shown in Figure 7, Bricklets C&D (bricklets with pictures) were used (clicked on) more often by the females than the males.

Table 7: Number of times each individual bricklet was used broken down by gender

Treatment	Gender				
	Male		Female		
	Number	Percent	Number	Percent	
Bricklet A	0	0%	4	19.05%	Dark color, no picture
Bricklet B	4	19.05%	4	19.05%	Light color, no picture
Bricklet C	2	9.52%	4	19.05%	Light color, picture
Bricklet D	2	9.52%	1	4.76%	Dark color, picture

Finally, hotspot results for the percentage of times a participant looked within the area of the bricklets with pictures can continue to visually support the direction of H1. In the figures below, the hotspots visually show a larger percentage of females look at the bricklet more than the percentage of males. The dark red areas represent the higher

percentage, and according to the images, there is more on the image for females than males.

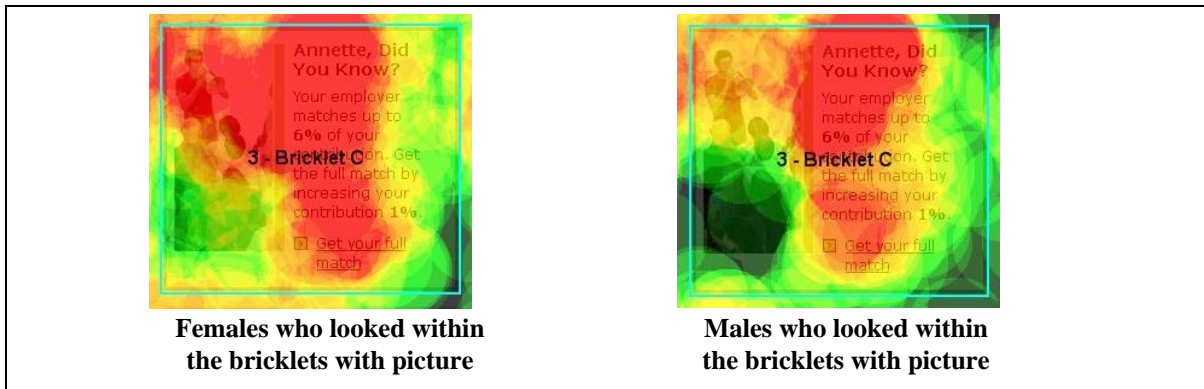


Figure 11: Visual representation of the percentage of females and males who looked within the bricklets with picture (hotspots)

The above results, while not significant, suggest that female participants will notice bricklets with pictures of people more than males, therefore demonstrating that there is a directional trend to our hypothesis.

5.3 Hypothesis 2

Our second hypothesis states that female participants will notice bricklets with a light background color more than males (H2a), while males will notice bricklets with a dark background color more than females (H2b). To test these hypotheses we first grouped the bricklets into light color (Bricklets B&C) and dark color (Bricklets A&D). As with the first hypothesis, several statistical tests were run in attempt to find evidence of support. Our results show that H2a, though not statistically significant, show a trend that females notice the bricklets with light colored backgrounds. The results for H2b did not support a trend that males notice the bricklets with dark colored backgrounds.

The frequency of fixations shows that the fixations for females (54.2%) on the bricklets with light color were larger than the fixations for males (45.8 %) as shown in Table 8 below. Though not significant, the results support the direction of our hypotheses.

Table 8: The number of times participants looked at the bricklets with light color (Bricklets B&C) broken down by gender along with its corresponding percentage (frequency of fixations)

Treatment	Gender			
	Male		Female	
	Frequency	Percent	Frequency	Percent
Light Color (B&C)	33	45.8%	39	54.2%
P=0.404				

Moreover, Table 9 shows the mean gaze in females is higher (0.382mm) than the mean gaze in males (0.103mm). While not significant, this data also supports the direction of H2a.

Table 9: The results of One Way ANOVA for the mean of gaze values for the bricklets with light color background (Bricklets B&C) broken down by gender

Treatment	Gender			
	Male		Female	
	Mean	St Dev	Mean	St Dev
Light Color (B&C)	0.103	0.376	0.382	1.208
df = 70, F = 1.673, p = 0.200				

To visualize these results further, the hotspot data below visually shows the differences between where females and males looked within the bricklet. According to the figures below, females looked more within the bricklets with light color than the males.

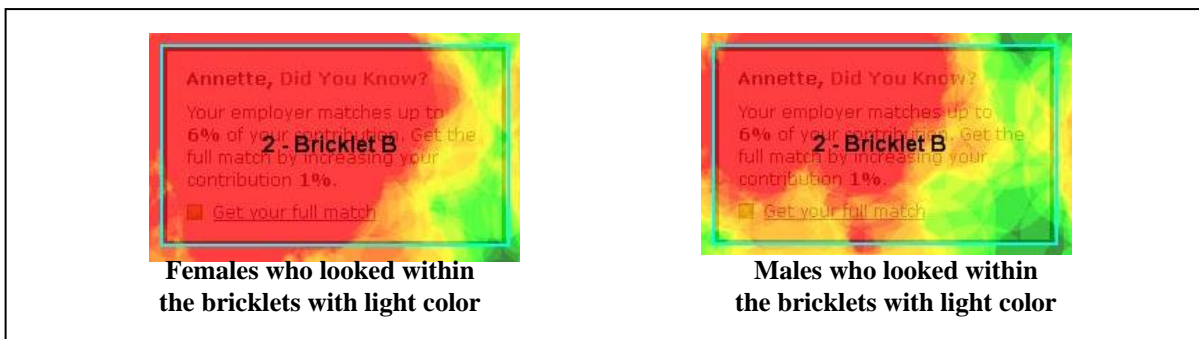


Figure 12: Visual representation of the percentage of females and males who looked within the bricklets with light color (hotspots)

Contrary to our expectations of H2b, the fixations of the males (44.4%) on the bricklets with dark color were less than the females (55.6%), as shown in Table 10. This suggests that the males responded to, and therefore noticed the bricklets with dark colors less than the females. This does not support H2b that males prefer bricklets with dark color background over females.

Table 10: The number of times participants looked at the bricklets with dark color (Bricklets A&D) broken down by gender along with its corresponding percentage (frequency of fixations)

Treatment	Gender			
	Male		Female	
	Frequency	Percent	Frequency	Percent
Dark Color (A&D)	32	44.4%	40	55.6%
P=0.243				

Similarly, the results in Table 11 also show a trend rejecting H2b. According to Table 10, the mean gaze of the males (0.01mm) is less than the mean gaze of the females (0.163mm) on the bricklets with dark color. This shows that females focus on the bricklets with dark color more than the males, in contrast to H2b.

Table 11: The results of One Way ANOVA for the mean of gaze values for the bricklets with dark color (Bricklets A&D) broken down by gender

Treatment	Gender			
	Male		Female	
	Mean	St Dev	Mean	St Dev
Dark Color (A&D)	0.01	0.025	0.163	0.413
df = 70, F = 2.705, p = 0.034				

To continue to support the results for H2b, the hotspot results below show the percentage of males vs. females who looked at the dark color bricklets. The figures below show that the percentage of males is less than the percentage of females (based on the amount of red color) continuing to reject H2b.



Figure 13: Visual representation of the percentage of females and males who looked within the bricklets with dark color (Bricklets A&D) (hotspots)

Additionally, the results previously discussed in Table 4 coincide with the data from the Tables 8 through 11. Table 4 shows the results of the one way ANOVA for the mean of gaze for each individual bricklet broken down by gender. These results show that the means of the female gaze for the each bricklet with a light colored background (Bricklets B&C) at 0.102 and 0.662 are greater than the means of the males at 0.085 and 0.120. This supports the direction of H2a. Table 4 also shows a trend that H2b is not supported through the means of gaze in the bricklets with dark color (Bricklets A&D). According to Table 4, the means are lower in the males than the females, rejecting H2b.

5.4 Hypothesis 3

The third hypothesis stated that participants 50 years and older will notice bricklets more than participants 20-49 years old (H3). Statistical tests such as a one way ANOVA and frequency of the fixations and gaze variance of the participants in the different age groups were used. In addition to the eye tracking data, the self survey data was tested to produce further conclusions [See Section 4.7.6]. The data we evaluated did not support our hypothesis.

In the overall frequencies of fixation and gaze of the bricklets between younger and older participants, H3 was not supported. In Table 12, the frequency of fixations on

the all the bricklets is at a lower percentage for the participants 50 years and older than the participants from 20-49 years old.

Table 12: The number of times participants looked at each individual bricklet (Bricklets A–D) broken down by age along with its corresponding percentage (frequency of fixations)

	Age				
	20-49		50+		
	Frequency	Percent	Frequency	Percent	
Bricklet A	11	44%	3	27.30%	Color, no picture
P=0.564					
Bricklet B	13	52%	4	36.40%	No color, no picture
P=0.615					
Bricklet C	12	48%	4	36.40%	No color, picture
P=0.777					
Bricklet D	15	60%	3	27.30%	Color, picture
P=0.148					

Additionally Table 13 shows that the participants ages 50 or older have a smaller percentage for frequency of gaze in all of the bricklets than the participants ages 20 to 49. The data in Table 12 and 13 both suggests that younger participants notice the bricklet more often through the number fixations and gaze than the older participants, therefore rejecting our hypothesis.

Table 13: The number of times participants’ pupil size changed when looking at each individual bricklet broken down by age along with its corresponding percentage (frequency of gaze)

	Age				
	20-49		50+		
	Frequency	Percent	Frequency	Percent	
Bricklet A	9	36%	3	27.3%	Color, no picture P=0.898
Bricklet B	12	48%	3	27.3%	No color, no picture P=0.426
Bricklet C	11	44%	4	36.4%	No color, picture P=0.951
Bricklet D	16	64%	3	27.3%	Color, picture P=0.095

Table 14 below shows the mean gaze of the older participants, 50+, is smaller than the mean gaze of the younger participants, 20-49. The only exception is Bricklet B, where the mean gaze is slightly larger at 0.115mm older participants, than the mean gaze for the younger participants at 0.085mm. However, this one exception is not enough to significantly support that people over 50 notice bricklets in general over younger participants, especially since the p values are all greater than 0.05.

Table 14: The results of One Way ANOVA for the mean of gaze values for each individual bricklet (Bricklets A-D) broken down by age

Treatment	Age				
	20-49		50+		
	Mean	St. Dev	Mean	St. Dev	
Bricklet A	0.119398	0.404909	0.036508	0.115642	Dark color, no picture
df = 34, F = 0.439, p = 0.512					
Bricklet B	0.084525	0.246708	0.115444	0.366426	Light color, no picture
df = 34, F = 0.089, p = 0.768					
Bricklet C	0.499703	1.466226	0.193295	0.561785	Light color, picture
df = 34, F = 1.701, p = 0.201					
Bricklet D	0.092087	0.304591	0.077965	0.202204	Dark color, picture
df = 34, F = 0.445, p = 0.509					

An additional example to find support in H3 is through the participants' self surveys [See Section 5.6.3]. In the surveys, Question 1 and Question 2 pertained to the noticeability of each bricklet and its helpfulness. Again, both tables do not support H3.

In Table 15, the participants 50+ mostly have lower noticeability frequencies than the younger participants for all of the bricklets. The only exception is for Bricklet A (dark color, no picture).

Table 15: The percentage of participants who noticed each individual bricklet according to the self surveys (Question 1) broken down by age

	Age				
	20-49		50+		
	Frequency	Percent	Frequency	Percent	
Bricklet A	9	34.6%	6	50%	Dark color, no picture P=0.752
Bricklet B	13	50%	3	25%	Light color, no picture P=0.272
Bricklet C	13	50%	4	33.3%	Light color, picture P=0.542
Bricklet D	23	88.5%	7	58.3%	Dark color, picture P=0.091

Also, Table 16, results of self survey Question 2, shows the percentage of participants that found the bricklets helpful. As shown in Table 16, the percentage frequency of the participants 50 years and older who found the bricklet useful is lower than the percentage frequency of the participants 20-49. Hence, these results do not support H3.

Table 16: The percentage of participants who found all the bricklets helpful according to the self surveys (Question 2- yes or no) broken down by age

	Age			
	20-49		50+	
	Frequency	Percent	Frequency	Percent
All Bricklets	23	88.5%	10	83.3%
P=0.360				

The hotspots data reiterate these results. According to Figure 14 and 15, all the bricklets were looked at less for participants 50+ years old (Figure 14) than the participants 20-49 years old (Figure 15), with the exception of Bricklet B. This is shown through the lower amount of red color on the bricklets within the participants 50+ (other than Bricklet B) opposed to the bricklets with participants 20-49.

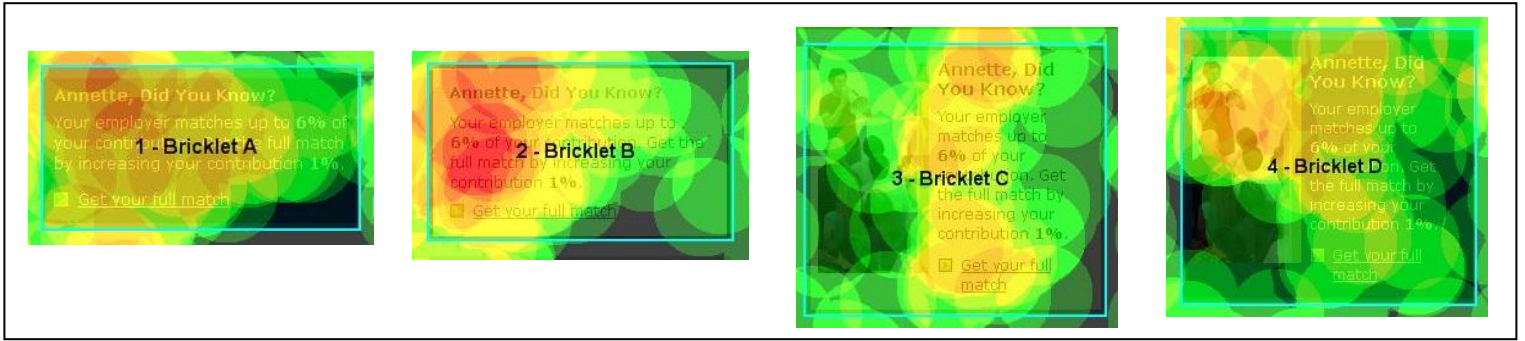


Figure 14: Visual representation of the percentage of 50+ years old who looked within Bricklets A-D (hotspots)

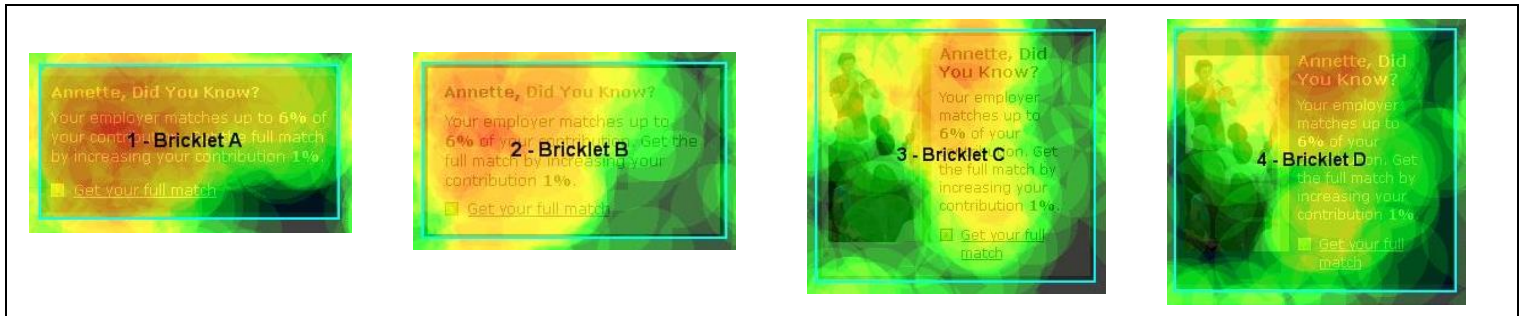


Figure 15: Visual representation of the percentage of 20-49 year old who looked within Bricklets A-D (hotspots)

5.5 Hypothesis 4

Our final hypothesis stated that participants 50 years and older will notice bricklets without pictures more than with pictures (H4). The results were found again using a one way ANOVA between bricklets with pictures vs. no pictures taking in fixation time and gaze into consideration. According to Table 17, the 50+ participants have a higher average of fixations, 75.9ms, on the bricklets with no pictures than the bricklets with pictures, 64.9ms. This acknowledges the direction of our hypothesis to be supported; although the p values (being greater than 0.05) report that the data is insignificant.

Table 17: The results of One Way ANOVA for the participants who looked at the bricklets with picture and no picture broken down by age

Treatment	Age			
	20-49		50+	
	Mean	St Dev	Mean	St Dev
Picture (C&D)	168.2295	266.3555	64.90329	105.8571
df = 70, F = 3.076, p = 0.084				
No Picture (A&B)	113.4735	129.7237	75.87226	118.2433
df = 70, F = 1.352, p = 0.249				

Contrary to Table 17 which shows the mean fixations of the bricklets with picture vs. no picture, Table 18 below shows the mean gaze for the older subjects. The mean gaze for bricklets containing pictures was higher than bricklets without pictures. This higher mean suggests that those users more readily acknowledged the information contained in bricklets with pictures, which demonstrates a trend to reject H4 unlike Table 17.

Table 18: The results of One Way ANOVA for the mean of gaze values for the bricklets with picture and no picture broken down by age

Treatment	Age			
	20-49		50+	
	Mean	St Dev	Mean	St Dev
Picture (C&D)	0.295895	1.068082	0.13563	0.416221
df = 70, F = 0.461, p = 0.499				
No Picture (A&B)	0.101962	0.332301	0.075976	0.268211
df = 70, F = 0.104, p = 0.748				

The visual data of the hotspots shown in Figure 16 below display that participants 50+ looked within the area of the bricklets with pictures more than the area of the bricklets without pictures. This suggests that within participants 50 years and older, the bricklets with no picture are more popular, additionally supporting the direction of H4.

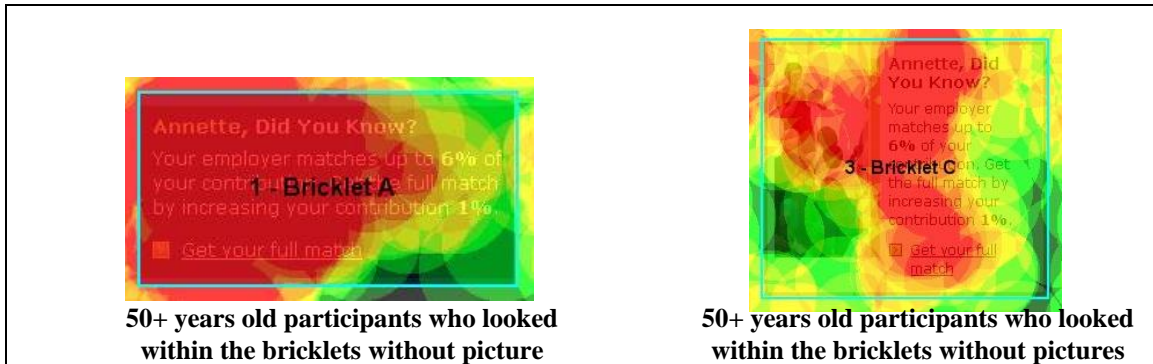


Figure 16: Visual representation of the percentage of 20-49 year old who looked within Bricklets A-D (hotspots)

5.6 Post Hoc Additional Testing

In addition to the hypotheses testing, we gathered other data that we found to be useful in the analysis of the bricklets. During the study we recorded the event data (when a user clicked on the bricklet), observation results such as the time it took a user to complete a task, and the self report, to provide additional information on the effectiveness of the bricklets.

5.6.1 Event Data

As part of our data collection, we recorded every time a subject used (clicked on) a bricklet to solve task four. Task four is to maximize the company match for your contribution to your 401(k) within your Theta Savings Plan. There are several ways to complete task four which are listed in Appendix G; however clicking on the bricklet is the easiest way.

Our data shows that approximately 58% of the participants (21 out of 36) used a bricklet to complete task four. The following table (Table 19) shows the frequency and percentage of those subjects. This table shows that the bricklet must have been noticeable enough on the website prototype since more than half of the participants did use the bricklet.

Table 19: Total Number of Participants = 36

	Count	Percent
Used Bricklet for Task 4	21	58.33%

Table 20 shows the count of males and females that used a bricklet to complete Task four. The total adds up to 21 because only 21 participants used a bricklet to complete Task 4 out of the 36 participants. Our results show that females used the bricklet more often than males. This corresponds to our results from Section 5.1, the generalized bricklets results, that females used the bricklets more often than males.

Table 20: Number of males and females who used a bricklet to complete Task 4

	Gender			
	Male		Female	
	Count	Percent	Count	Percent
Used Bricklet	7	33.33%	14	66.67%

Similar to Table 20, Table 21 shows the number of participants broken down by age that used a bricklet to complete Task 4. The ages of the participants were broken into three groups, 20-39, 40-49, and 50+. Participants in the age range of 40-49 and 50+ used the bricklet equally (eight times each) while participants in the 20-39 age groups only used the bricklet five times. Again the total adds up to 21 because only 21 used the bricklet.

Table 21: Number of participants who used the bricklet to complete Task 4 by Age

	Age					
	20-39		40-49		50+	
	Count	Percent	Count	Percent	Count	Percent
Used Bricklet	5	23.81%	8	38.10%	8	38.10%

In addition to those who used (clicked on) the bricklet to complete Task 4, the attempts of the user were also recorded. An attempt is defined as the number of times a subject used an unsuccessful method for task four before clicking on a bricklet. After an unsuccessful attempt the user was directed to return to the home page and try the task again. Of the 21 subjects that used the bricklet, 13 used it on the first try. Additionally seven subjects used the bricklet on the second try and only one subject took three or more attempts before using the bricklet. The following table, Table 22, shows the percentage of how many attempts the participants took before successfully completing Task 4 by clicking on the bricklet.

Table 22: Attempts by the participants to use the bricklet out of 21 who used the bricklet for Task 4

	<u># of Attempts</u>	<u>Percent</u>
First Try	13	61.90%
Second Try	7	33.33%
3 or more	1	4.76%

Furthermore, of all the 21 participants who used the bricklet, all males used the bricklet to complete Task 4 in one attempt. Six females completed task four on their first try while seven females took more than one try to successfully finish Task 4. Table 23 shows the frequency of attempts by gender.

Table 23: Attempts by Gender out of 21 participants who used the bricklet for Task 4

	Gender			
	Male		Female	
	<u>Count</u>	<u>Percent</u>	<u>Count</u>	<u>Percent</u>
First Try	8	100%	6	46.15%
Second Try	0	0%	6	46.15%
3 or more	0	0%	1	7.69%

In addition to the previous event data, the number of times each individual bricklet was used was recorded. For each of the tests the participant was assigned to a group. Each group was established so that the participant was given the tasks in a random order and viewed each bricklet design in a random order. This was done to prevent order effect [See Section 4.3]. The following table (Table 24) shows the frequency of use for each bricklet design out of the 21 participants who used the bricklet. The bricklet designs can be found in Figure 7. Bricklet B, which has no color and no image, was used the most often between all the participants with a frequency of 38.10%.

Table 24: Number of times each individual bricklet was used by participants

	# Times Used	Percent	
Bricklet A	4	19.05%	Dark color, no picture
Bricklet B	8	38.10%	Light color, no picture
Bricklet C	6	28.57%	Light color, picture
Bricklet D	3	14.29%	Dark color, picture

The use of each individual bricklet was then broken down by gender. Table 25 shows that Bricklet A was used exclusively by females while Bricklet B was used equally between genders. Bricklet C was used twice as often by females than by males, while Bricklet D was used twice as often by males than by females.

Table 25: Number of Time Each Individual Bricklet was used by Gender

	Gender				
	Male		Female		
	Count	Percent	Count	Percent	
Bricklet A	0	0.00%	4	19.05%	Dark color, no picture
Bricklet B	4	19.05%	4	19.05%	Light color, no picture
Bricklet C	2	9.52%	4	19.05%	Light color, picture
Bricklet D	2	9.52%	1	4.76%	Dark color, picture
Total	8	38.10%	13	61.90%	

Table 25 also shows that females in general used the bricklets more often than males, which supports the general observations discussed in Section 5.1. Additionally, females used Bricklet D (the bricklet with dark color and picture) less than males, which support H1 that females tend to look more at the bricklets with pictures. However this also goes against H2a and H2b, that males will notice bricklets with a dark background color more so than females.

5.6.2 Observation Results

While observing the participants we recorded the times in seconds, it took each subject to complete each of the four tasks, known as the task time. The timer was started as the NetBenefits prototype appeared and ended after the subject read the correct answer to the respective task. The four tasks were as follows:

Task 1: What is the total amount of your investments in all of your plans and accounts?

Task 2: How much do you have invested in Fidelity Canada within your Theta non-qualified plan?

Task 3: How much life insurance coverage do you have for this company?

Task 4: Maximize the company match for your contribution in your 401(k) within your Theta Savings Plan.

All possible solutions to these tasks can be found in Appendix G. The subjects were given the tasks in a random order and were presented each bricklet in a random order according to their group and number. This was done to prevent an order effect [See Section 4.3].

Table 26 shows the average task time, standard deviation, maximum, and minimum amount of time it took for each task to be completed. According to Table 26, Task 4 has the highest mean, meaning it took the longest on average to solve that task. Task 2 has the lowest mean, meaning it must have been the easiest task for all of the participants on average.

Table 26: Time per task in seconds for all of the participants (36 total)

	Average	Std Dev	Min	Max
Task 1	69	60	12	230
Task 2	33	22	14	132
Task 3	44	31	14	143
Task 4	159	116	24	369

It is important to note that Task 4 is the only task that could be answered by using any of the four bricklet designs. The other tasks could not be completed by using the bricklet. In Table 27 the average task times for Bricklet D were calculated and broken down by gender. According to the table below, no males used Bricklet A.

Table 27: Average task time (in seconds) for subjects in seconds who used the bricklet on Task 4 by gender

	Gender		
	Male	Female	
Bricklet A	0	116	Dark color, no picture
Bricklet B	99.5	138.5	Light color, no picture
Bricklet C	56	53	Light color, picture
Bricklet D	84.5	56	Dark color, picture

In order to determine the affect of the background color of the bricklets on the task times we broke down the task times based on the background color of the bricklet. Bricklet A and Bricklet D have a dark blue background while Bricklet B and C have a light background. Table 28 shows the difference in average task time between the bricklets with a dark color background and the bricklets with a light color background broken down by gender. According to Table 28, females took longer on average to complete the task using both the bricklets with light and dark color than the males.

Table 28: Average task time (in seconds) dark color vs. light color by gender

	Gender	
	Male	Female
Dark color	77.8	95.75
Light color	42.3	86

Table 29 displays the same information concerning the difference in average times it took to complete the tasks using the bricklets with dark color background vs. bricklets with light color background broken down by age. The table below shows that younger participants ages 20-39 had a longer average task time completing the tasks with

the dark color bricklets (Bricklets A&D) and a shorter average task time completing the tasks with the lighter color bricklets (Bricklets B&C) than the other age groups (40-50+).

Table 29: Average task time dark color vs. light color by age

	Age		
	20-39	40-49	50+
Dark color	75.5	64.25	71
Light color	50.5	105.75	81.58

In addition, it is necessary to perform a one way ANOVA test for the average task times of each group, age and gender, to determine if there is a statistically significant difference between them. The tests were done using a 95% confidence interval. The results of the test are displayed in Table 30 which is separated by gender and Table 31 which is separated by age.

Table 30: One way ANOVA comparison of task times for Task 4 by gender

Gender			
Male		Female	
Mean	St Dev	Mean	St Dev
160.1	125.094	178.5	120.153
df = 1 F = .242 p = .625			

Table 31: One way ANOVA comparison of task times for Task 4 by age

Age					
20-39		40-49		50+	
Mean	St Dev	Mean	St Dev	Mean	St Dev
222.07	127.75	136.73	100.056	146.69	124.776
df = 2 F = 2.316 p = .112					

Since the p-values in Table 30 and 31 are both greater than .05 (0.625 and 0.112 respectively), the data shows that there is no statistically significant difference between gender and average task time for Task 4 or age and average task time for Task 4.

5.6.3 Self Survey Results

At the end of each test session the subject was asked to fill out a debriefing survey. The debriefing survey included questions regarding the usefulness of the bricklets and if they noticed them or not. They were then asked to rank each bricklet on a scale of 1 to 5 (1 being strongly disagree and 5 being strongly agree). The debriefing survey can be found in Appendix H.

The first question on the survey asked which bricklets the participants remembered noticing during the tasks. According to the table below, the participants reported that they noticed Bricklet D the most at 52.6%. The least noticeable bricklet according to the self survey was Bricklet B, with only 31.6%. The frequency of how many people noticed each bricklet can be found in Table 32.

Table 32: Frequency test for Self Survey Question 1 per individual bricklet for all participants

	Noticeability				
	Notice		Did not Notice		
	Frequency	Percent	Frequency	Percent	
Bricklet A	18	47.4%	20	52.6%	Dark color, no picture
Bricklet B	12	31.6%	26	68.4%	Light color, no picture
Bricklet C	17	44.7%	21	55.3%	Light color, picture
Bricklet D	20	52.6%	18	47.4%	Dark color, picture

The second question on the survey asked if the user found the bricklet to be helpful in general. According to Table 33, 86.8% of participants in general answered that they did find the bricklets to be helpful (answered yes on a yes or no question).

Table 33: Survey Question 2: Do you think the bricklets are helpful in general?

	Notice	
	Frequency	Percent
No	5	13.2%
Yes	33	86.8%

The next set of questions was asked for each bricklet individually. There were four questions that pertained to the design of the bricklets. The participants were to rank each bricklet on a scale of 1-5, one being strongly disagree and 5 being strongly agree.

The following table (Table 34) depicts the average ranking of each bricklet in regards to its visual appeal (Question 1 on the Self Survey). Bricklet C was found to be the most visually appealing, with a mean of 3.55 out of 5 while Bricklet B was found to be the least with a mean of 2.95 out of 5. This shows that while Bricklet B was the most used (according to our previous data), it was not considered to be the most visually appealing.

Table 34: Responses (on a scale of 1-5) to the self survey for design question 1: This design is visually appealing.

Treatment	Question 1	
	Mean	St. Dev
Bricklet A	3.37	1.101
Bricklet B	2.95	1.161
Bricklet C	3.55	1.058
Bricklet D	3.47	1.033

Design Question 2 involved users ranking the bricklets on how well the design stands out. Bricklet D received an average ranking of 3.76 out of 5 and was reported to be the design that stands out the best. Bricklet B received the lowest average ranking with

2.53 out of 5. Bricklet A and Bricklet C were ranked equally at 3.5 out of 5. This data is shown in Table 35.

Table 35: Responses (on a scale of 1-5) to the self survey for design question 2: This Design Stands out Well.

Treatment	Question 2	
	Mean	St. Dev
Bricklet A	3.5	1.268
Bricklet B	2.53	1.133
Bricklet C	3.5	0.98
Bricklet D	3.76	1.218

The third design question centered on if the participants considered the bricklet easy to remember. Table 34 below shows that Bricklet D received a ranking of 3.55 out of 5, thus participants reported that Bricklet D was the easiest to remember.

Table 36: Responses (on a scale of 1-5) to the self survey for design question 3: This design is easy to remember.

Treatment	Question 3	
	Mean	St. Dev
Bricklet A	3.45	1.005
Bricklet B	2.82	1.087
Bricklet C	3.42	1.13
Bricklet D	3.55	1.179

The last design question focused on if the users found design of the bricklets to be effective. Although Bricklet D received a rating of 3.39 out of 5, Bricklet C was rated as the most effective with an average ranking of 3.45 out of 5. Table 37 portrays the average ranking of each bricklet in terms of the effectiveness of its design.

Table 37: Responses (on a scale of 1-5) to the self survey for design question 4: This design is effective.

Treatment	Question 4	
	Mean	St. Dev
Bricklet A	3.18	1.159
Bricklet B	2.63	1.149
Bricklet C	3.45	1.224
Bricklet D	3.39	1.198

6 Discussions

According to the results [See Section 5], our hypotheses did not have enough significant data to be considered supported. However, several of our results exhibited a trend in favor of our hypotheses, including H1, H2a, and H4.

Overall, bricklet use was more common among women than men. According to the results, the females clicked the bricklets more than males. This may indicate that females are generally more observant of all information in front of them when browsing, while males are more task oriented. It could also indicate that females desire assistance completing tasks on a website, while males desire independence. Future studies may reveal that this is a statistically significant conclusion, and would aid Fidelity Investments Inc. in directing bricklets towards each gender.

Concerning the hypotheses, due to the large p values in each of our statistical tests, essentially none of our data produced significant results. However, the data for H1 and H2a leaned in the direction of those hypotheses. This implies that with future tests, a larger sample size may reveal significant results to support these hypotheses. The study could also be expanded to include different types of pictures and their placement on the bricklet to determine whether gender differences exist on a more detailed level. Expanding the study to include various light background bricklet colors may also produce more support for H2a. On the other hand, data analyzed for H2b, H3, and H4 were all against the hypotheses and had large p values.

The tasks administered in the study required subjects to participate in search activities throughout a website. Prior research showed that users were more susceptible to banner blindness when searching on a webpage compared general browsing (Pagendam

& Schaumburg 2001). Future studies, therefore, could administer tasks requiring users to analyze a webpage but not necessarily instructed to search for information.

Additional data was analyzed in the post hoc section within the results section. These results brought attention to Bricklet B, the bricklet with a white background and no picture. Though users gave it the lowest rating, through the self survey, on its design, the event data revealed that it was the most utilized bricklet. Bricklets with pictures or colors were noticed more, but they were used less during the study. This again could be attributed to banner blindness. The dark bricklet on the light webpage or picture may have given the bricklet the appearance of a banner. Therefore, the plain design of Bricklet B made it less susceptible to banner blindness.

6.1 Limitations

As with any experimental study, the results of this study were limited by the tasks and the experimental setting. However, we tried to minimize the limitations of the study by using Fidelity employees as participants and designing realistic and relevant tasks.

One of the limitations of this study was its sample size. Though the data from the tested subjects was profound, the small sample sizes resulted in data analyses that could have been significant with larger sample sizes. Reasons for our study's low sample size could be attributed to the time constraint as well as the selection process in which potential subjects were not considered due to criteria which needed to be fulfilled. If the criteria lessened, larger sample sizes could be attained but the variables they controlled may then have had an impact on the results. The time constraint was formed both by the time available before the project deadline and the renovations taking place in the usability

labs and delaying the study. Additionally, we believe that if future studies are able to attain larger sample sizes, the data and results would prove more significant.

Additionally, the bricklet design itself may have been another factor affecting the study. Our results pertain only to two colors for the bricklet (light color and dark blue color) and one picture (of people). Future studies could take place, changing the bricklet's layout, color, wording, format, or location on the page. For example, each bricklet addressed a hypothetical user, Annette Slater. Prior research showed that people are more subjective when they notice their own name (Albert 2006). Future studies could consider the possibility of including the subject's actual name. Our study also offered two colors for the bricklet design: a dark and light color, while the pictures within the bricklets consisted only of people. We believe if the bricklets contained different colors as well as pictures of objects, results would differ. Additional tests could change the placement of the bricklet on the page, to see whether men, women, or different age groups look towards the top, bottom, left, or right sides of the page.

6.2 Future Research

In the future, our study can be expanded to take into account these limitations. For instance, more participants could be used if the study was continued or it could be done over a longer time period. Also, participants of different companies could be used to note a variety of different people rather than only people within Fidelity. In continuing with our study, the bricklet designs could also be expanded upon. Instead of having four bricklet designs, there could be several more with different color backgrounds or with different pictures. It was noted in our data that many people found the picture on the bricklet to be confusing and detracting from the main message. Since the bricklets were

personalized to the fictional Annette Slater, this may have impacted the way the participants perceived the bricklets. Male users may have been more likely to look at a male name in the bricklet. More significantly, this study could be repeated using the participants' actual names to determine whether that has an impact on the noticeability of the bricklets. Perhaps by exploring different options, more people would be attracted to the bricklet.

In addition to expanding our study in the future, other types of usability tests could be conducted on the bricklets. Tests could be conducted regarding the content and also the location of the bricklet on the page. Throughout our study, our results showed that participants looked in several different areas of the webpage and perhaps by placing the bricklet in a different spot on the page, it will be noticed more. Similarly, in our study, the content of what was actually written on the bricklet remained the same for each different bricklet design. A future study could be run with different pieces of information or different ways to state the same information in order to test whether the bricklets are noticed more.

By observing that more women used the bricklets, further research could be done to encourage or attract more males to the bricklets.

6.3 Industry Benefits

Overall, the study we have conducted can be a useful catalyst to the industry for additional studies. The study we conducted is beneficial to the financial services industry, in particular Fidelity Investments, and all industries. Our results help to better understand user's reactions to bricklets on a website. The results can benefit a company in several ways. For instance, knowing that people do use the bricklets and find them generally

helpful, more companies in the industry could use this idea of communicating with external users and internal employees. These companies could effectively contact everyone who uses the website without sending out tedious emails or personal mailings. The users would be able to maneuver the website more efficiently and confidently, making them more satisfied customers. Additionally, by knowing the impacts age and gender have on how users respond to the bricklets, companies can determine the most effective type of bricklet geared towards their target audience to put on their website. The results of this study are valuable today when consumers “demand products and services designed for their unique and particular needs” (Hammer 1993). Bricklets provide a way for companies to do just this and address each consumer’s needs.

7 Conclusion

This study was conducted to the fullest extent given our constraints and obstacles that occurred throughout the process. Collaboration with the NetBenefits and HID departments at Fidelity Investments Inc. led to an examination of the effectiveness of bricklets on the NetBenefits homepage. We focused on bricklets varying two factors (background color and pictures) and the effects gender and age had on their noticeability. In conducting a usability study, we recruited 36 Fidelity employees and took them through a rigorous process, including a briefing, eye tracker calibration, and debriefing. Through testing strictly Fidelity Investments employees we were able to guarantee our participants were knowledgeable of the financial information we were testing. This aids in the validity of our study by keeping this variable constant. Given the time constraint, the shortage of participants, and the unfamiliar eye tracking equipment, our study was properly structure and administered and the results show that future research in this area will benefit the industry and the academic theories. Future research can benefit greatly by using the eye tracker technology applied in this study. This is because the eye tracker can capture a large range of objective data that can be analyzed in several ways by the experimenter. Such methods of data collection can have a significant impact on refining prior findings others have obtained.

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9 Notes

Albert, B. 2006. MQP Meeting at Fidelity (J.Bosch, J. Hsu, E. Mazuera, & K. Osberg, Interviewers) Marlborough, MA. Team meeting at Fidelity in Marlborough discussing bricklet designs on 27 Sept. 2006.

10 Appendix

Appendix A - Eye Tracker Equipment

The Human Interface Design Department at Fidelity Investments has chosen to use Tobii's 1750 Eye Tracker model.

Features of the Tobii 1750 Eye Tracker:

- The Tobii 1750 Eye Tracker is integrated into a 17" TFT monitor. It is ideal for all forms of eye tracking studies with stimuli that can be presented on a monitor, such as websites, slideshows, videos and text.
- Plug and play eye tracking
- Calibration is done in seconds. Ease of use saves time and cost in data collection, and removes need for technical expertise to run the tests. The Tobii 1750 Eye Tracker is easily transported, and can be set up in only five minutes.
- Completely non-intrusive
- The eye tracker is discretely integrated into a monitor without any visible or moving "tracking devices." Test subjects are allowed to move freely in front of the tracker. This non-intrusiveness ensures that respondents behave naturally, thus providing valid data, and allows one to perform long studies without fatigue for the respondent or reduced quality of data. It also allows for the simultaneous collection of eye tracking data with standard test procedures, such as think-aloud usability testing.
- High tracking quality
- Very accurate eye gaze data and excellent head movement compensation, ensuring that what the user looks at is precisely tracked. The system tracks nearly all people.

Specifications of the Tobii 1750 Eye Tracker:

- Accuracy to 0.5°
- Drift of less than 1 degree
- Allowable head movement of 30 x 16 x 20 cm
- Binocular tracking
- 50 Hz Data rate
- 17" TFT Display at 1280 x 1024 pixels
- On-board connectors: Firewire, USB, VGA, Power
- Weight~10 kg (22 lbs)



Tobii 1750
www.tobii.com

Appendix B – Recruiting survey to all Fidelity Employees

What is the purpose of this survey?

- The FeB User Experience team often conducts usability studies of new websites and applications where Fidelity employees are among the target users.
- This survey is simply to help us build a pool of employees who are possibly interested in participating in these studies.
- You're not committing to doing any particular study by completing this survey.
- Many of these studies are conducted in our Usability Labs in Boston, but many are conducted remotely, so people from any location can participate!
- The information you provide in this survey helps us identify the kinds of usability studies that might be appropriate for you.
- Simply by completing this survey you will be entered in a drawing for a \$100 AMEX gift check!
- The drawing will be on Tuesday, November 7, at 5:00 pm Eastern time, so you must complete the survey by then.

Background Questions

Corp. I.D.

Location:

Approximate Years of Service at Fidelity:

Your Age Range (optional):

Gender (optional):

Your level of investing knowledge:

Which, if any, of the following types of accounts do you have? (Check all that apply.)

- Brokerage account
- 401k Retirement savings account
- Traditional IRA
- Roth IRA
- Rollover IRA
- College Savings Account

Which, if any, of the following types of investments do you own? (Check all that apply.)

- Mutual funds
- Individual stocks
- Bonds
- Certificates of Deposit (CDs)
- Annuities

How frequently do you use Fidelity.com?

How frequently do you use NetBenefits?

How frequently do you use eWorkplace?

About how many brokerage trades do you place per year?

Do you trade on margin?

Which, if any, of the following applications do you use? (Check all that apply.)

- Active Trader Pro®
- Wealth-Lab Pro®
- OptionTrader Pro™

Thank you!

Appendix C – Recruiting Email to eligible Fidelity Employees

Dear Fidelity employee,

We are conducting a usability study for the NetBenefits website. According to survey results, you qualify to participate in this study.

Testing will be held on the following dates:

2006

Wednesday, November 29

Friday, December 1

Wednesday, December 6

Friday, December 8

Wednesday, December 13

2007

Monday – Wednesday, January 8- 10

Wednesday, January 17

Wednesday, January 24

Wednesday, January 31

If you are interested in participating, please respond with your first and second available dates by Monday, November 27. We will contact you by phone to confirm a specific date and time. If you choose to participate in this study you will receive two free movie tickets.

Thank you for expressing interest in our study, and we hope to hear from you soon.

Appendix D –Financial Quiz and Answers

Financial Survey

Name: _____

Select one answer for each question.

1. If you buy a company's stock...

- A. You own part of the company
- B. You have lent money to the company
- C. You are liable for the company's debts
- D. The company will return your original investment to you with interest
- E. Don't know/Not sure

2. If you buy a company's bond...

- A. You own a part of the company
- B. You have lent money to the company
- C. You are liable for the company's debts
- D. You can vote on shareholder resolutions
- E. Don't know/Not sure

3. Which type of bond is the safest?

- A. U.S. Treasury bond
- B. Municipal bond
- C. Corporate bond
- D. Don't know/Not sure

4. In general, if interest rates go down, then bond prices...

- A. Go down
- B. Go up
- C. Are not affected
- D. Don't know/Not sure

5. What is an IRA?

- A. An Individual Retirement Arrangement also known as Individual Retirement Account
- B. Something created by the federal government to encourage retirement savings
- C. A way of deferring taxes on some of your income.
- D. All of the above
- E. Don't know/Not sure

6. A "no-load" mutual fund is one that...

- A. Carries no fees
- B. Carries no sales charges
- C. Does not contain high-risk securities
- D. Has no limits on the period of time in which it can be bought and sold
- E. Don't know/Not sure

7. In general, investments that are riskier tend to provide higher returns over time than investments with less risk.

- A. True
- B. False

C. Don't know/Not sure

8. Over the last 20 years in the U.S., the best average returns have been generated by:

- A. Stocks
- B. Bonds
- C. Certificates of Deposit (CDs)
- D. Money market accounts
- E. Precious metals
- F. Don't know/Not sure

9. Which of the following organizations insures you against your losses in the stock market?

- A. FDIC (Federal Deposit Insurance Corporation)
- B. NASD (National Association of Securities Dealers)
- C. SEC (Securities and Exchange Commission)
- D. SIPC (Securities Investor Protection Corporation)
- E. None of the above
- F. Don't know/Not sure

10. If a company files for bankruptcy, which of the following securities is most at risk of becoming virtually worthless?

- A. The company's preferred stock
- B. The company's common stock
- C. The company's bonds
- D. Don't know/Not sure

11. What are the three main forms of unearned income?

- A. Dividends, capital expenditures, interest
- B. Interest, dividends, capital gains
- C. Work, interest, capital gains
- D. None of the above
- E. Don't know/Not sure

12. A Section 529 Plan is a tax-advantaged way to save for:

- A. College
- B. Retirement
- C. Long-term health care
- D. Don't know/Not sure

13. John owns a wide variety of stocks, bonds, and mutual funds to lessen his risk of losing money.

This is called:

- A. Capitalization
- B. Compounding
- C. Diversifying
- D. Don't know/Not sure

14. If you buy the stock of a new company...

- A. You cannot lose money
- B. You can lose all the money you used to buy the stock
- C. You can lose only a portion of the money you used to buy the stock
- D. Don't know/Not sure

15. What is a mutual fund?

- A. A type of investment in the stock of companies with high market capitalization
- B. A tax-exempt investment used for retirement savings
- C. A type of investment that pools money from shareholders and invests in a diversified, professionally managed portfolio

D. Don't know/Not sure

16. From a financial perspective, what is an asset?

- A. Something you own that you cannot sell
- B. Something you own that has cash value
- C. Something you must repay
- D. All of the above
- E. Don't Know/Not sure

17. A 401K plan allows you to contribute to your retirement savings from pre-tax pay.

- A. True
- B. False
- C. Don't Know/Not sure

18. Retirement income paid entirely by a company is called:

- A. Social Security
- B. Rents & Profits
- C. 401k
- D. Pension
- E. Don't Know/Not Sure

Financial Quiz Answer Key

The goal of this survey is to understand your familiarity with financial terms and concepts. We use this information for research purposes to understand how this familiarity may affect user requirements and performance.

This is a difficult survey. Do not be discouraged if you cannot answer many of these questions.

Select one answer for each question.

1. If you buy a company's stock...

- A. You own part of the company**
- B. You have lent money to the company
- C. You are liable for the company's debts
- D. The company will return your original investment to you with interest
- E. The company will return your original investment to you with interest

2. If you buy a company's bond...

- A. You own a part of the company
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- C. Does not contain high-risk securities
- D. Has no limits on the period of time in which it can be bought and sold
- E. Has no limits on the period of time in which it can be bought and sold

7. **In general, investments that are riskier tend to provide higher returns over time than investments with less risk.**

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- B. False
- C. Don't know/Not sure

8. **Over the last 20 years in the U.S., the best average returns have been generated by:**

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- B. Bonds
- C. Certificates of Deposit (CDs)
- D. Money market accounts
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- F. Don't know/Not sure

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- B. Retirement
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- C. Diversifying**
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- B. A tax-exempt investment used for retirement savings
- C. A type of investment that pools money from shareholders and invests in a diversified, professionally managed portfolio**
- D. Don't know/Not sure

16. From a financial perspective, what is an asset?

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- D. All of the above
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- B. False
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- A. Social Security
- B. Rents & Profits
- C. 401k
- D. Pension**
- E. Don't Know/Not Sure

Appendix E – ANOVA Tests Supporting Latin Square Design

According to the table, the p values for fixation and gaze of the bricklet order in Groups A-D are not significant (being greater than 0.05). This indicates that there was no order effect inadvertently created by the Latin square design.

Figure A: One Way ANOVA for bricklets regarding group order

	Treatment			
	Fixation		Gaze	
	Mean	St. Dev	Mean	St. Dev
Group A	142.381	96.934	0.092	0.185
Group B	111.644	92.848	0.225	0.631
Group C	139.021	151.585	0.036	0.073
Group D	83.865	82.703	0.318	0.707
	df = 32, F = 0.586, p = 0.629		df = 32, F = 0.610, p = 0.614	

Appendix F – Briefing Script

WHAT YOU WILL BE DOING TODAY

- Today you will be evaluating a part of the NetBenefits website for Fidelity Investments.
- You will do this by completing some tasks that I will give you in a moment, and also by answering a few questions.
- I want you to know this is not a *test* of your abilities – this is your evaluation of the website. If you ever feel you are having difficulty accomplishing your goals it is the job of the web site to be as user friendly as possible.
- At any time during our evaluation today, of course you may stop, or take a break.

ABOUT MY ROLE

- I am a student at Worcester Polytechnic Institute working on a Usability project for Fidelity Investments. My role is to facilitate this session. To do that I am going to assign you tasks and ask you questions as you go along.
- As a student intern – my job is to help users evaluate this website, not design it. As you go along, if you offer positive feedback about this site - you are not praising me. And if you offer negative feedback about this site - you are not hurting my feelings. I am a neutral party. I am only interested in getting very honest, critical feedback about the site.

ABOUT THE ROOM (IF WE'RE IN THE LAB)

- Before we begin, I'd like to point out some details about the room we're in...
- Cameras here and here (side and ceiling)
- Microphones here and here (either side of computer). We use these to record all of our participant's feedback.
- At any given time there may be people watching the session to see what our users have to say firsthand.
- (We are using a screen-sharing application to allow other Fidelity employees to observe this session from other locations. The only employees who will be observing this session are directly involved with this study. This screen sharing application may cause the site to run a little slow. Let me know if it ever becomes frustrating.)

ABOUT THE SITE

- We won't be using a live website today.
- We will be using a version of the site that is under development, so some areas of the site may not work as you expect them to. Let me know if something unexpected happens while you are trying to accomplish your tasks.
- Do you have any questions about this? Ok then, let's begin with some questions...

FINANCIAL SURVEY

- Please complete the financial survey to the best of your ability.
- Hand out financial survey

LET'S BEGIN

In a moment, we are going to begin the study. Obviously, I can't help you accomplish these tasks or we wouldn't learn anything – but there are a few things I'd like you to remember:

- You will be placed in a hypothetical situation. Your name is Annette Slater and you are an employee of Fidelity Investments.
- Remember that this is not the real website. Try to pretend you are at home. If you ever feel that you would leave the site, use the phone, or try to accomplish your task some other way – it is very important that you tell me exactly what you would do.
- It may not seem natural, but I'm going to ask you to think aloud at all times. I want to know what you're thinking. Please tell me when you have completed the task and the result you get from it.
- There are no right or wrong answers. Anything you say or do is helpful. The only thing you can do is to try to be as honest as you can and say when you find something confusing or helpful. This is a learning experience for us so that we can make the site better for you.

EYE TRACKER PREPARATION

Today we will be using an eye tracker to collect data from this study. An eye tracker is a piece of equipment that detects where you are looking on the screen. In a moment we will be calibrating the eye tracker to make sure it is working properly.

- Please look at the black box on the screen. When you are ready we will begin the calibration process.
- Please follow the blue dot on the screen.
- Now that the calibration process is complete, we can begin the study.

Appendix G- Task List and Answers

Group X:

You are in **Group X**. There will be four tasks for you to complete. For each individual task 1-4, please click on the corresponding start link from the main Personalization Infrastructure page for **Group X**. A new window will pop up asking you to log in. Simply click the “Log In” button and begin the assigned task. When you are finished with the task, return to the main page by using the bookmark.

We will read to you each assigned task, before you begin. When you complete each task, please tell us or the result so we can move on to the next task.

Task

What is the total amount of your investments in all of your plans and accounts?

How to Solve:

1. Show other plans/accounts
2. \$636,532.58

Task

How much do you have invested in Fidelity Canada within your Theta non-qualified plan?

How to Solve:

Option 1:

1. Theta Non-Qualified Plan
2. Look at Fidelity Canada - \$2,220.86

Option 2:

1. Savings & Retirement
2. Portfolio Investments
3. Under Theta Non-Qualified Plan, Fidelity Canada - \$2,220.86

Task

How much life insurance coverage do you have for this company?

How to solve:

1. Health and Life Insurance
2. Employee Life Insurance
3. 3 x Salary

Task

Maximize the company match for your contribution in your 401(k) within your Theta Savings Plan.

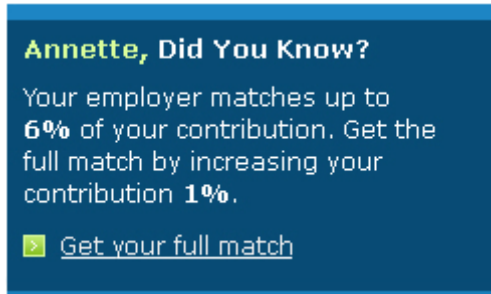
How to solve: bricklet

1. Theta Savings Plan or Savings & Retirement (summary page)
2. Payroll Deductions
3. Regular Deductions and Catch-Up Contributions (first option)
4. Accept recommended changes from 5% to 6%
5. Submit

Appendix H – Debriefing Survey

The study you just took was based on testing the bricklet design for the NetBenefits website.

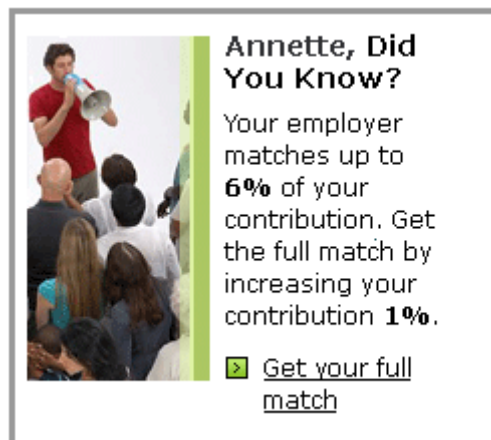
Please take this survey regarding the bricklet noticeability. Use the following letters to correspond with the bricklets you just witnessed:



Bricklet A



Bricklet B



Bricklet C



Bricklet D

1. Which bricklets did you notice during the tasks? (Choose all that apply.)

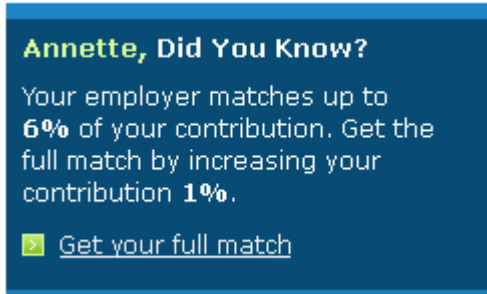
A B C D

2. Do you think the bricklets are helpful in general?

Y N

Please rate the following on a scale of 1 (Strongly Disagree) to 5 (Strongly Agree).

Bricklet Design A



1. This design is visually appealing.

Strongly Disagree 1 2 3 4 5 Strongly Agree

2. This design stands out well.

Strongly Disagree 1 2 3 4 5 Strongly Agree

3. This design is easy to remember.


Strongly Disagree 1 2 3 4 5 Strongly Agree

4. This design is effective.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Bricklet Design B

Annette, Did You Know?
Your employer matches up to **6%** of your contribution. Get the full match by increasing your contribution **1%**.

 [Get your full match](#)

1. This design is visually appealing.

Strongly Disagree 1 2 3 4 5 Strongly Agree

2. This design stands out well.

Strongly Disagree 1 2 3 4 5 Strongly Agree

3. This design is easy to remember.

Strongly Disagree 1 2 3 4 5 Strongly Agree

4. This design is effective.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Bricklet Design C



1. This design is visually appealing.

Strongly Disagree 1 2 3 4 5 Strongly Agree

2. This design stands out well.

Strongly Disagree 1 2 3 4 5 Strongly Agree

3. This design is easy to remember.

Strongly Disagree 1 2 3 4 5 Strongly Agree

4. This design is effective.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Bricklet Design D



1. This design is visually appealing.

Strongly Disagree 1 2 3 4 5 Strongly Agree

2. This design stands out well.

Strongly Disagree 1 2 3 4 5 Strongly Agree

3. This design is easy to remember.

Strongly Disagree 1 2 3 4 5 Strongly Agree

4. This design is effective.

Strongly Disagree 1 2 3 4 5 Strongly Agree

Thank you for your help with this usability study!

Appendix I – Participant Feedback

Gender	Age	Group (Bricklet Order: A,B,C,D and Task Order: 1,2,3,4)	Financial Quiz Results (out of 18)	Administrator (Observations: Kelly Osberg)	Eyes	Notes:	Debriefing Comments:
M	2	A2	18	John Bosch		Task 1: Went to history in theta savings plan to look under quarterly and monthly as he normally would. Link doesn't work as he expected. Next tries to request a statement. Task 2: Finds result immediately after clicking on non-qualified plan. Task 3: Thinks of cashing out plan. Completed task but didn't click market order. Task 4: Completed it without using the bricklet. Got confused since values were already present.	Wanted to complete tasks how he was used to. Confused by the word exchange.
M	2	A1	14	John Bosch	Glasses	Task 1: Didn't click show all accounts so got the wrong total. Task 2: Found accurately and easily. Task 3: Trouble finding exchange link. Doesn't understand Theta Class A. Had to be told to go into Theta Savings Plan. Task 4: Hovered over bricklet but didn't use.	
M	2	B2	18	Joe Hsu		Task 2: Found immediately. Task 1: Found easily but wasn't sure if he was correct. Task 4: Used the bricklet and wasn't sure how to proceed when the values were filled in. Task 3: Found easily.	Confused by matching contribution.
F	3	A1	14	Joe Hsu		Task 1: Found total in accounts, but not on main page. Task 2: Took a few extra clicks to find. Task 3: Found easily. Task 4: Went through site several times without finding how to match contribution. Laughed when she found the blue box and isn't used to looking there.	Used eye tracker before, but had head apparatus.
F	1	A2	16	Erin Mazuera	Glasses-had trouble calibrating, said she could only see out one eye at a time	Task 2: Found immediately. Task 1: Found after first try. Task 4: Went to the Pay tab first and didn't find, then went to Savings and Retirement and clicked on Theta Savings Plan. Then she followed the deductions page as usual. Didn't know employer match and said she never reads the text caption as there was on the top of the page. Task 3: Found easily. Needed to repeat question.	
M	2	C1	16	Joe Hsu		Task 1: Found total but took a while to expand. Task 2: Found easily. Task 3: Program froze and needed to restart. Lost data from task 1 and 2. Clicked Health and Insurance link and found hesitantly. Task 4: Stated that he liked the box that has steadily been giving tips. Used the bricklet.	
F	1	C2	16	Joe Hsu		Task 2: Clicked non-qualified plan. Found easily. Task 1: Didn't expand the button, then noticed it and got the full amount. Task 4: Clicked around to various sites trying to see what is being matched. Gets frustrated not being able to find it anywhere. Gives up and moves to next task. Task 3: Saw the bricklet and realized how to solve the last task. Clicked health and insurance link and found it easily.	Said she didn't notice the bricklet because she's used to looking on the left side of the screen.
M	1	D1	18	Joe Hsu		Task 1: Forgot to expand, then got it correctly. Task 2: Found easily. Task 3: Found easily. Task 4: Didn't use bricklet and had trouble navigating to different pages. Found eventually after much exploring.	Liked the bricklets with the pictures more. He noticed them more.
F	3	D2	15	Joe Hsu	Glasses	Task 2: Found easily. Task 1: Forgot to expand on first guess. Then got as her eyes lost tracking. Task 4: Used bricklet to change match. Confused as to why amount was already in. Task 3: Was easier than expected. Thought there was a page for it.	
F	1	B1	15	Erin Mazuera	Contacts	Task 1: Forgot to expand, but eventually got it correctly. Task 2: Clicked non-qualified plan and found the amount. Task 3: Clicked health and insurance tab at top. Task 4: Clicked theta savings plan, view current contributions. Payroll deductions, but then went back. Clicked payroll deductions again through another path and completed the task. Was confused the amount was already entered.	

M	3	C2	16	John Bosch	Glasses	Task 2: Found easily. Task 1: Forgot to expand on first guess. Then expanded and found. Task 4: Didn't notice bricklet. Went to payroll deductions but then got off track and went to change investments. Gave up looking for the percentage match. Task 3: Found easily.	
F	2	D1	15	Joe Hsu	Glasses	Task 1: Forgot to expand, but did it immediately after we told her it was wrong. Task 2: Found immediately. Task 3: Clicked health and insurance link and found it. Task 4: Looked at bricklet for a long time, clicked the bricklet, and proceeded properly. Was confused the percentages were already entered.	
F	1	B3	15	Erin Mazuera	Glasses	Task 3: Health and insurance tab. Found immediately. Task 4: Said would make it obvious on the savings plan page. Said "this is where I would put it". Then went to change investments. Feels really bad. Went back to the home page. Saw bricklet and clicked on it. Task 1: Didn't mess up the first time! Expanded the box. Task 2: Found instantly.	The blue box should be obvious but it is something she completely overlooked.
M	1	B4	12	John Bosch	Glasses	Task 4: Used bricklet and completed task. Task 3: Clicked the health and insurance link. Task 2: Clicked non-qualified plan and found the answer. Task 1: Clicked show and found amount.	Cell phone rang during first task and he had to look at it. Phone rang again during 4th task.
M	2	D4	18	Joe Hsu	Contacts	Task 4: Used bricklet, but entered the wrong contributions. Task 3: Found easily. Task 2: Clicked non-qualified plan, and found. Task 1: Didn't expand and scrolled around page. Then clicked savings and retirement to find additional plan information. After hinting, found easily.	
F	1	A4	15	Erin Mazuera	Contacts	Task 4: Clicked in savings and retirement. Went home. Clicked bricklet and proceeded correctly. Task 3: Clicked health and insurance link and found answer. Task 2: Clicked non-qualified plan and found answer. Task 1: Immediately expanded and found answer.	Liked the picture with white background.
F	3	B4	8	Erin Mazuera	Glasses	Task 4: Clicked savings plan. After clarifying the question, clicked the bricklet and completed the task. Task 3: Found easily. Task 2: Clicked non-qualified plan and found. Task 1: Expanded to show all accounts but didn't read that amount and continued in savings and retirement. Didn't complete.	Liked the dark background with picture and her name stood out on that one.
F	3	C4	16	Joe Hsu	Glasses	Task 4: Tried to go to profit sharing just as the last participant tried. Went back to home and clicked on bricklet and finished. Task 3: Went to health and insurance link and completed task. Task 2: Clicked non-qualified plan and completed. Task 1: Didn't expand at first. Tried to find pension accounts to add. After help from Joe, found the "show" button and completed task.	Said that standing out is more important than visually appealing.
M	3	A4	17	Erin Mazuera		Task 4: Clicked theta savings plan, found the long way and was stumped that the numbers were entered. Submitted the changes and thought the guidelines of the plan should be clearer. Task 3: Clicked health and insurance tab, and found the answer. Would hit details. Task 2: Clicked non-qualified plan, and found. Task 1: Hit show all accounts and found the answer immediately.	Liked the white without the picture best. White text on dark background is hard to read. Doesn't like pictures because they look squished. Text in plain white bricklet looks more spread out and less words.
F	2	B4	16	Erin Mazuera		Task 4: Clicks on savings plan. Usually knows the percentage ahead of time and her 401k information is on the left menu. Goes back to homepage and wants to focus on finding the match. After re-reading the question, she reads the bricklet and realizes her match isn't there. Clicks the link in the bricklet and completes the task. Surprised to see it filled in already. Task 3: Clicks health and insurance link and finds the answer. Task 2: Clicked non-qualified plan and read amount. Task 1: Reads wrong amount first and then clicked show all. Reads correct answer but wonders why pension plan isn't included.	Noticed the name in the bricklet, but didn't read the rest of the text. Liked dark color and picture, but not the picture we had on the bricklet. Didn't like the white one without picture because it didn't stand out at all.

F	3	A3	15	Erin Mazuera	Contacts, two distances	Task 3: Clicked health and insurance tab, and found answer. Task 4: Clicked the bricklet and submitted the information. Doesn't make sense that you can't change some of the numbers. Task 1: Didn't expand the show button and thought that clicking on it wouldn't change the total. Task 2: Clicked non-qualified plan and found answer.	Liked white with image and blue plain. Blue with image was too busy.
M	1	D2	17	Erin Mazuera	Sometimes wears glasses.	Task 2: Clicked non-qualified plan and found answer. Task 1: Expanded accounts and read total. Task 4: Clicked link in bricklet and proceeded to complete the task. Task 3: Clicked health and insurance tab. Wanted to click details but it wasn't active, so he read the answer.	Blue ones drew attention faster.
F	3	C1	15	Erin Mazuera	Glasses (bifocals)	Task 1: Forgot to expand and took a long time to find the show button. Then found the right answer. Task 2: Read the total of the non-qualified plan. Took a lot of coaching to click on the link and found the answer. Task 3: Clicked health and insurance link and found the total. Task 4: Clicked into savings plan, went back to home page and clicked on the bricklet and submitted the changes.	
F	2	C3	17	Joe Hsu	Reading glasses, uses half the time did not use for test	Task 1: Said first amount then clicked on the show link and said correct amount. Could not find the Home Icon Task 3: Clicked on the Health and Insurance Tab. Floated around the correct answer and clicked on the Details link before stating the correct answer. Task 4: Used bricklet immediately. Task 2: Clicked NonQual Plan and went right to the correct amount.	Wants to know what she should change things to before she goes ahead and changes them in her 401K. She figured out that we were testing for the bricklets. Check DVD for further comments. Said Bricklet 4 caught the eye but was difficult to read. Likes
M	3	B1	18	Joe Hsu	none	Task 1: Assumed the 300,000 number. Back button did not work. Wants to click on everything and add it up. Clicked on Savings and Retirements. Eventually clicked on show other accounts. Task 2: Completed without problem. Tobii Froze for 5 minutes. Fixed it. Continued with recording. Task 3: completed. Task 4: Used bricklet C to get to 401K.	Candid. Check DVD for further comments. White bricklets are easier to read. Bricklet C was the most preferable. Tasks 1 and 2 were not recorded via eye tracker
F	3	D4	16	John Bosch	Glasses	Task 4: Clicked on savings & retirement. Continued searching within S&R page. Clicked on Theta Savings and entered into the Contributions page. Went to change annual election increase. Did not finish task, expected usual website layout Task 3: Went to H&I, clicked on "details" Task 2: Clicked Theta non-qualified and read amount Task 1: Clicked on S&R, read Portfolio total. Read subtotal, clicked show other plans/accounts.	Due to eyesight, white backgrounds were more appealing. Did not notice bricklets and went directly to the left or right of page.
M	1	A3	16	John Bosch	none	Task 3: Clicked H&R. Read 3x Salary. Task4: Clicked S&R. Clicked Theta Savings > Contributions. Clicked Plan Info and Docs for help. Clearview Froze. 2nd try, this time used bricklet. Task1: Read subtotal, Clicked show other plans and accounts, read total Task2: Clicked Theta non-qualified, read Fidelity Canada amount.	
F	2	D3	17	Joe Hsu	Glasses	Task 1: Said the 300,000 number. Joe Said Close. She clicked the show link and got the correct total. Task 4: Clicked on Bricklet C and completed the task. Task 3: clicked in the health and insurance tab and got the correct answer. Task 2: Clicked on Theta Nonqual Plan and got the Fidelity Canada Number.	Wishes Bricklets were currently in use. Found it neat and useful. Likes the Pie chart. More text is too confusing. Thinks pictures are distractions.
M	1	C3	15	Joe Hsu	Lefty	Task 3: Clicked on Health and Insu Tab up top. Read us 3x Salary. Task 4: Read the bricklet and clicked on Savings and Retirement and went the long way. Task 1: Stated the 360, clicked on Show link and read off the 600, amount. Task 2: Clicked on Theta non Qual and found it immediately.	fairly tall, propped ET up with books, stated bricklets would not be as noticeable if users knew exactly what they wanted to do.

F	3	A3	15	Erin Mazuera	Contacts, two distances	Task 3: Clicked health and insurance tab, and found answer. Task 4: Clicked the bricklet and submitted the information. Doesn't make sense that you can't change some of the numbers. Task 1: Didn't expand the show button and thought that clicking on it wouldn't change the total. Task 2: Clicked non-qualified plan and found answer.	Liked white with image and blue plain. Blue with image was too busy.
M	1	D2	17	Erin Mazuera	Sometimes wears glasses.	Task 2: Clicked non-qualified plan and found answer. Task 1: Expanded accounts and read total. Task 4: Clicked link in bricklet and proceeded to complete the task. Task 3: Clicked health and insurance tab. Wanted to click details but it wasn't active, so he read the answer.	Blue ones drew attention faster.
F	3	C1	15	Erin Mazuera	Glasses (bifocals)	Task 1: Forgot to expand and took a long time to find the show button. Then found the right answer. Task 2: Read the total of the non-qualified plan. Took a lot of coaching to click on the link and found the answer. Task 3: Clicked health and insurance link and found the total. Task 4: Clicked into savings plan, went back to home page and clicked on the bricklet and submitted the changes.	
F	2	C3	17	Joe Hsu	Reading glasses, uses half the time did not use for test	Task 1: Said first amount then clicked on the show link and said correct amount. Could not find the Home Icon Task 3: Clicked on the Health and Insurance Tab. Floated around the correct answer and clicked on the Details link before stating the correct answer. Task 4: Used bricklet immediately. Task 2: Clicked NonQual Plan and went right to the correct amount.	Wants to know what she should change things to before she goes ahead and changes them in her 401K. She figured out that we were testing for the bricklets. Check DVD for further comments. Said Bricklet 4 caught the eye but was difficult to read. Likes
M	3	B1	18	Joe Hsu	none	Task 1: Assumed the 300,000 number. Back button did not work. Wants to click on everything and add it up. Clicked on Savings and Retirements. Eventually clicked on show other accounts. Task 2: Completed without problem. Tobii Froze for 5 minutes. Fixed it. Continued with recording. Task 3: completed. Task 4: Used bricklet C to get to 401K.	Candid. Check DVD for further comments. White bricklets are easier to read. Bricklet C was the most preferable. Tasks 1 and 2 were not recorded via eye tracker
F	3	D4	16	John Bosch	Glasses	Task 4: Clicked on savings & retirement. Continued searching within S&R page. Clicked on Theta Savings and entered into the Contributions page. Went to change annual election increase. Did not finish task, expected usual website layout Task 3: Went to H&I, clicked on "details" Task 2: Clicked Theta non-qualified and read amount Task 1: Clicked on S&R, read Portfolio total. Read subtotal, clicked show other plans/accounts.	Due to eyesight, white backgrounds were more appealing. Did not notice bricklets and went directly to the left or right of page.
M	1	A3	16	John Bosch	none	Task 3: Clicked H&R. Read 3x Salary. Task4: Clicked S&R. Clicked Theta Savings > Contributions. Clicked Plan Info and Docs for help. Clearview Froze. 2nd try, this time used bricklet. Task1: Read subtotal, Clicked show other plans and accounts, read total Task2: Clicked Theta non-qualified, read Fidelity Canada amount.	
F	2	D3	17	Joe Hsu	Glasses	Task 1: Said the 300,000 number. Joe Said Close. She clicked the show link and got the correct total. Task 4: Clicked on Bricklet C and completed the task. Task 3: clicked in the health and insurance tab and got the correct answer. Task 2: Clicked on Theta Nonqual Plan and got the Fidelity Canada Number.	Wishes Bricklets were currently in use. Found it neat and useful. Likes the Pie chart. More text is too confusing. Thinks pictures are distractions.
M	1	C3	15	Joe Hsu	Lefty	Task 3: Clicked on Health and Insu Tab up top. Read us 3x Salary. Task 4: Read the bricklet and clicked on Savings and Retirement and went the long way. Task 1: Stated the 360, clicked on Show link and read off the 600, amount. Task 2: Clicked on Theta non Qual and found it immediately.	fairly tall, propped ET up with books, stated bricklets would not be as noticeable if users knew exactly what they wanted to do.

M	1	C4	15	Erin Mazuera		Task 4: Clicked theta savings plan, view current contributions, clicked all eligible sources but the link is inactive. Payroll deductions, profit sharing election, went back and clicked dividend elections. Went home because he was confused and couldn't find it. Clicked savings plan again, then sources tab, gave up and moved on. Task 3: Clicked health and insurance, and read the answer when the link didn't work. Task 2: Clicked non-qualified plan, and read the answer. Task 1: Read the unexpanded answer first, then clicked show and read the answer.	Thought the box was an add and didn't see the link. Noticed the name in the box but didn't care. Blue stood out the most but none compelled him to read. Image caught his eye more, but it made it look like an add.
F	2	A2	14	Erin Mazuera	Wears glasses, but not when online.	Task 2: Nonqualified plan and read the answer. Task 1: Clicked show all and read the correct answer. Task 4: Clicked the bricklet then backtracked and clicked summary for savings plan. Clicked several links and browsed the site. Clicked the bricklet again and changed the deductions appropriately. Task 3: Clicked health and insurance tab and found the answer.	Didn't like the pictures, preferred the plain background.
M	3	D3	17	John Bosch	Wears glasses	Task 3: Clicked health and insurance tab and read the answer. Task 4: Used the bricklet and submitted the changes. Task 1: Read unexpanded answer, then clicked show and read the correct answer. Task 2: Clicked nonqualified plan and read the answer.	Knew about what was being done in NetBenefits because he used to work their 3 years ago.
M	2	B2	16	John Bosch		Task 2: Clicked non-qualified plan and found the answer. Task 1: Expected the total to be what was shown, but saw the show and clicked that and found the answer. Task 4: Clicked the bricklet and saw the answers were pre-filled, so he completed the process. Would expect the bricklet to be there if you weren't maximizin the match. Task 3: Clicked health and insurance tab and read answer.	Liked blue with picture best. It appealed to him more.
M	1	A1	14	John Bosch		Task 1: Familiar with the setup so he looked to the total on the left. When we told him he was wrong, he clicked the show button and got the answer. Thought the total would be displayed originally. Task 2: Clicked non-qualified plan and got the answer. Task 3: Clicked health and insurance tab and read the employee life insurance. Task 4: Would normally go to his profile. Clicked profile. Clicked savings and retirement. Clicked change investments, then contributions. Expected change investments to change his contributions. Went home to start again. Clicked savings plan, explained his difficulties and gave up.	Laughed when he saw the bricklet after he gave up.
F	2	D3	15	Joe Hsu	Contacts	Task 3: Clicked health and insurance tab, read the answer. Task 4: Had trouble completing and understanding task, kept going into savings, did not finish task. Task 1: Noticed Bricklet and it's intended use, read unexpanded answer, felt that all figures should be listed, found correct total. Task 2: Clicked nonqualified plan and read the answer.	
F	1	B3	13	Joe Hsu	Contacts	Task 3: Clicked health and insurance tab, read the answer. Task 4: Did not understand task completely, unsure of where to navigate, did not finish task. Task 1: read unexpanded answer, found correct total. Task 2: Noticed Bricklet and it's intended use, clicked nonqualified plan and read the answer.	

Appendix J – Meeting Minutes

MQP Meeting Notes: August 31, 2006

Attendees: Soussan Djamasbi (faculty advisor), John Bosch, Joe Hsu, Erin Mazuera, Kelly Osberg

Meeting time: 2:00PM- 3:00PM

Agenda for the team meeting (2:00 PM- 3:00 PM):

- 1. Fidelity logistics**
- 2. Project scope and topic**
- 3. Discuss literature review and future deliverables**

Minutes:

Team meeting with Professor Djamasbi 8/23 10:15-11:00AM:

- Went over scheduled deliverable
- Discussed grading policy
- Got to know the group
- Went over MQP guidelines
 - Expense reimbursement for travel to Marsha
- Discussed group members skills
- Discussed project outline and set up requirements
- Scheduled team meeting times at WPI from 2-3pm

Team meeting with client Tom Tullis 8/23 11:00-1PM:

- Started Security ID process
- Discussed project topics
 - Eye tracker
 - General question:
 - Web accessibility to pools of subjects
 - Choose one website
 - Online study
 - Retirement readiness
 - 401k
 - Investments
 - Savings
- Discussed scope: 21 week project, web experience
- Watched usability testing

Team meeting at Fidelity Investments 8/30:

- Reviewed last week's minutes
- Watched usability test
 - John participated as test subject
- Discussed project topics in detail
- Narrowed down project topic with Tom
 - Financial literacy as primary focus
 - Age
 - Fidelity main site
 - Content
 - Multimedia, marketing, usability → competitive advantage
 - Conform to/develop industry and web standards
- Outlined literature review
- Completed ID process

Deliverables:

- 1. Agenda and minutes for the next meeting**
- 2. Project scope and topic**

MQP Meeting Notes: September 7, 2006

Attendees: Soussan Djamasi (faculty advisor), John Bosch, Joe Hsu, Erin Mazuera, Kelly Osberg

Meeting time: 2:00PM- 3:00PM

Agenda for the team meeting (2:00 PM- 3:00 PM):

- 1. Fidelity logistics**
- 2. Project scope and topic**
- 3. Discuss literature review and future deliverables**

Minutes:

Team meeting with Professor Djamasi 9/1 (2 – 3PM):

- Reviewed workday at Fidelity and meeting with Tom and Margie
- Discussed having a theoretical project as opposed to a exploratory project so it has the potential to be published
- Discussed details about the project proposal
 - Clear and professional writing
 - Literature review contents
 - Eye tracker history and information
 - Financial literacy
 - Age groups
 - Gender differences & theories
 - Three drafts (at least) finalized before turning in for review/comments
 - Incorporate suggestions

Team meeting at Fidelity Investments 9/5:

- Reviewed last week's minutes
- Researched and reviewed documents regarding:
 - Eye tracker
 - Fidelity Investments:
 - History
 - NetBenefits
 - Gender theories of website differences
- Met with Margie
 - to discuss new ideas on proving/disproving a theory to be published
 - informed her about how we are using the NetBenefits page

Deliverables:

- **Agenda and minutes for the next meeting**
- **Work plan for completing the project proposal**

- **Literature review outline**
- **Theory regarding gender vs. website layout**

MQP Meeting Notes: September 14, 2006

Attendees: Soussan Djamasi (faculty advisor), John Bosch, Joe Hsu, Erin Mazuera, Kelly Osberg

Meeting time: 2:00PM- 3:00PM

Agenda for the team meeting (2:00 PM- 3:00 PM):

- 1. Improved Timeline**
- 2. Improved Literature Review**
- 3. Gender Theories found**

Minutes:

Team meeting with Professor Djamasi 9/1 (2 – 3PM):

- Reviewed workday at Fidelity and meeting with Tom and Margie
- Discussed contents of the Literature Review and divisions
- Discussed gender differences to test
- Discussed contents of the Project Proposal for end of A Term
- Learned information about the potential for being published and when paper is due (end of B term)

Team meeting at Fidelity Investments 9/5:

- Reviewed last week's minutes
- Discussed weekly meeting times
- Reviewed and added to Literature Review outline and distribution
- Discussed Gender Theories found in our research
- Learned and witnessed usability sessions: on the visually impaired

Deliverables:

- **Agenda and minutes for the next meeting**
- **Outline of Literature Review**

MQP Meeting Notes: September 21, 2006

Attendees: Soussan Djamasi (faculty advisor), John Bosch, Joe Hsu, Erin Mazuera, Kelly Osberg

Meeting time: 2:00PM- 3:00PM

Agenda for the team meeting (2:00 PM- 3:00 PM):

- 1. Literature Review Detailed Outline**
- 2. Meeting with Tom and NetBenefits**
- 3. Research Questions**
- 4. Revised timeline**

Minutes:

Team meeting with Professor Djamasi 9/14 (2 – 3PM):

- MQP Proposal should be a separate document than the research questions
- Determine way to meet next week
- Concentrate on the project proposal rather than the research question, since research for conference isn't due until March
- Discussed AMCIS conference

Team meeting at Fidelity Investments 9/21:

- Meeting with Tom about accomplishments so far
- Discussed research questions
- Discussed usability testing options
- Phone conference with NetBenefits to discuss website options
- Set up meeting with NetBenefits contact, Bill Albert, to meet next Wed, 9/27
- Compiled Literature Review

Deliverables:

- **Agenda and minutes for the next meeting**
- **NetBenefits information**
- **Revisions**

MQP Meeting Notes: September 28, 2006

Attendees: Soussan Djamasi (faculty advisor), John Bosch, Joe Hsu, Erin Mazuera, Kelly Osberg

Meeting time: 2:00PM- 3:00PM

Agenda for the team meeting (2:00 PM- 3:00 PM):

- 1. Meeting with Tom and NetBenefits in Marlboro**
- 2. Research Questions / Areas of Testing**
- 3. Questionnaire for screening (testing)**
- 4. Literature Review Detailed Outline**

Minutes:

Team meeting at Fidelity Investments- Marlboro 9/27:

- Meeting with NetBenefits team: Bill, Janelle, Beth, Donna and Tom
- Learned about NetBenefits website, current and future status: bricklets-personalized messages
- Discussed how to go about testing: age, gender, financial literacy, familiarity of NetBenefits
- Edited literature review layout and contents
- Created questionnaire for screening process (usability testing)

Deliverables:

- **Agenda and minutes for the next meeting**
- **Questionnaire for screening**
- **Literature Review**

MQP Meeting Notes: October 4, 2006

Attendees: Soussan Djamasbi (faculty advisor), John Bosch, Joe Hsu, Erin Mazuera, Kelly Osberg

Meeting time: 2:00PM- 3:00PM

Agenda for the team meeting (2:00 PM- 3:00 PM):

- 1. Literature Review**
- 2. Research Questions**
- 3. Plans for the last week**

Minutes:

Team meeting with Professor Djamasbi 9/14 (2 – 3PM):

- Discussed timeline and dates for literature review and presentation slides submission
- Discussed how to conduct a usability test:
 - Written script
 - Write details
 - Get excerpts from test session for project presentation
- Informed to collect documentation for anytime our group is mentioned within Fidelity for our project

Team meeting at Fidelity Investments 10/4:

- Continued to look up and read articles found for Literature Review sections
- Discussed meeting times for next term
- Finished writing sections of the Literature Review
- Reviewed and edited sections as a group
- Reviewed research questions
- Discussed usability test procedures
- Meeting with Tom:
 - Accomplishments so far
 - Sending out the survey to Fidelity employees
 - Working in the new lab

Deliverables:

- **Research Questions**
- **Usability test procedure**
- **Presentation Slides**

MQP Meeting Notes: October 11, 2006

Attendees: Soussan Djamasbi (faculty advisor), John Bosch, Joe Hsu, Erin Mazuera, Kelly Osberg

Meeting time: 2:00PM- 3:00PM

Agenda for the team meeting (2:00 PM- 3:00 PM):

- 1. Literature Review**
- 2. Eye Tracker**
- 3. Presentation Slides**
- 4. Usability Test Procedure for B Term**

Minutes:

Team meeting with Professor Djamasbi 10/5 (2 – 3PM):

- Be familiar with audience for presentation
- Discussed due dates
- Set up B Term Schedule

Team meeting at Fidelity Investments 10/11:

- Learned about the Eye Tracker & tested ourselves
- Wrote usability test procedure for B Term
- Worked on the power point slides for the presentation
- Discussed literature review revisions

Deliverables:

- **Presentation**

MQP Meeting Notes: October 25, 2006

Attendees: Soussan Djamasi (faculty advisor), John Bosch, Joe Hsu, Erin Mazuera, Kelly Osberg

Meeting time: 2:00PM- 3:00PM

Agenda for the team meeting (2:00 PM- 3:00 PM):

- 1. Research Questions**
- 2. Eye Tracker**
- 3. NetBenefits meeting**

Minutes:

Team meeting with Professor Djamasi 10/23 (2 – 3PM):

- Discussed presentation slides and improvement
- Discussed literature review revisions
- Discussed methodology improvements

Team meeting at Fidelity Investments 10/25:

- Set up eye tracker and continued learning about the equipment
- Presentation on the project proposal
- Decided on a research topic:
- Focusing on the visual format
- Discussion on methodology with Tom

Deliverables:

- **Revised methodology and research questions focus**

MQP Meeting Notes: November 6, 2006

Attendees: Soussan Djamasbi (faculty advisor), John Bosch, Joe Hsu, Erin Mazuera, Kelly Osberg

Meeting time: 2:00PM- 3:00PM

Agenda for the team meeting (2:00 PM- 3:00 PM):

- 1. Bricklets- visual format**
- 2. Tasks and Methodology**

Minutes:

Team meeting with Professor Djamasbi 10/30 (2 – 3PM):

- How to identify subjects – ID numbers
- Never use the name of the subjects
- Randomize the order of the tasks
- Discussed how to store data securely
- How to display tasks to participants – index cards
- Take notes on what each subject does uniquely during the experiment
- Surveys
 - Different colors
 - Recognition surveys
 - Quality of test survey
 - Pre-financial survey
 - Get book from Professor Loiacono

Team meeting at Fidelity Investments 11/1:

- Put together a task list
- Gathered eye-tracker results for Tom to display for visitors
- Discussed bricklet designs
- Standard content – 401k

Deliverables:

- **Briefing/Debriefing Script**
- **Finished Task Testing Procedure**

MQP Meeting Notes: November 13, 2006

Attendees: Soussan Djasmasbi (faculty advisor), John Bosch, Joe Hsu, Erin Mazuera, Kelly Osberg

Meeting time: 2:00PM- 3:00PM

Agenda for the team meeting (2:00 PM- 3:00 PM):

- 1. Task List – prototype**
- 2. Eye Tracker Demo**
- 3. Scheduling**

Minutes:

Team meeting with Professor Djasmasbi 11/6 (2 – 3PM):

- Marketing book
- Bricklet layout and tasks
- SQL Statements for Database

Team meeting at Fidelity Investments 11/10:

- Organized participants to be scheduled
- Received bricklet formats
- Eye Tracker Demo –Boston
- Meeting at NetBenefits Marlboro
 - Keep name – content stays the same
 - Four groups (A-D) with 4 tasks
 - Each group has a set (random) layout
 - Randomize tasks within group
 - Defined Tasks

Deliverables:

- **Updated Timeline**
- **Task list procedure**

MQP Meeting Notes: November 20, 2006

Attendees: Soussan Djamasi (faculty advisor), John Bosch, Joe Hsu, Erin Mazuera, Kelly Osberg

Meeting time: 2:00PM- 3:00PM

Agenda for the team meeting (2:00 PM- 3:00 PM):

- 1. Testing Script**
- 2. Scheduling**

Minutes:

Team meeting with Professor Djamasi 11/13 (2 – 3PM):

- Eye tracker data analysis
- Data dictionary
- Pupil study

Team meeting at Fidelity Investments 11/15:

- Setup contact and scheduling with selected participants
- Revised bricklet requirements
- Finalized briefing, debriefing and tasks
- Finalized debriefing survey

MQP Meeting Notes: December 4, 2006

Attendees: Soussan Djamasi (faculty advisor), John Bosch, Joe Hsu, Erin Mazuera, Kelly Osberg

Meeting time: 2:00PM- 3:00PM

Agenda for the team meeting (2:00 PM- 3:00 PM):

1. Usability Documents

Minutes:

Team meeting with Professor Djamasi 11/27 (2 – 3PM):

- Discussed Literature Review and MQP Documents
- Documentation of Tobii Eye tracker data

Team meeting at Fidelity Investments 11/29:

- Pilot testing for usability study
 - Issues regarding bricklet implementation
- Scheduling
- Accustomed to the usability lab
- Updated usability documents

Deliverables:

- **Literature Review**
- **Methodology**

MQP Meeting Notes: December 14, 2006

Attendees: Soussan Djamasi (faculty advisor), John Bosch, Joe Hsu, Erin Mazuera, Kelly Osberg

Meeting time: 2:00PM- 3:00PM

Agenda for the team meeting (2:00 PM- 3:00 PM):

- 1. Literature review**
- 2. Methodology**
- 3. Appendices**
- 4. Start of Usability Testing**

Minutes:

Team meeting with Professor Djamasi 12/4 (2 – 3PM):

- Discussed Literature Review and MQP Documents

Team meeting at Fidelity Investments 12/6:

- Setting up the usability lab/new equipment
- Usability tests begin!
- Worked on writing the MQP paper

Deliverables:

- **Revisions**

MQP Meeting Notes: January 17, 2007

Attendees: Soussan Djamasbi (faculty advisor), John Bosch, Joe Hsu, Erin Mazuera, Kelly Osberg

Meeting time: 8:30AM- 9:00AM

Agenda for the team meeting (8:30 AM- 9:00 AM):

- 1. Revisions**
- 2. AMCIS document**
- 3. Future Goals**

Minutes:

Team meeting with Professor Djamasbi 12/4 (2 – 3PM):

- Discussed Literature Review and MQP Documents

Team meeting at Fidelity Investments 1/17:

- Sent out emails to further recruit participants
- Revisions on Literature Review and Methodology
- AMCIS 2007 document
- Remote Setup for Usability Testing
- Analyzed current data

Deliverables:

- **Revisions**
- **AMCIS document**

MQP Meeting Notes: January 24, 2007

Attendees: Soussan Djamasbi (faculty advisor), John Bosch, Joe Hsu, Erin Mazuera, Kelly Osberg

Meeting time: 12:00PM – 1:00PM

Agenda for the team meeting (12 – 1PM):

- 1. Revisions**
- 2. AMCIS document**
- 3. Future Goals**

Minutes:

Team meeting with Professor Djamasbi 1/19 (8:30 -9AM):

- Discussed Literature Review and MQP Documents
- Discussed Future Goals

Team meeting at Fidelity Investments 1/17:

- Tested several participants all day
- Collected and briefly looked at current participants data
- Worked on revisions for the MQP Document

Deliverables:

- **Revisions on MQP Document**
- **AMCIS document**

MQP Meeting Notes: January 31, 2007

Attendees: Soussan Djammasbi (faculty advisor), John Bosch, Joe Hsu, Erin Mazuera, Kelly Osberg

Meeting time: 12:00PM – 1:00PM

Agenda for the team meeting (12PM- 1PM):

- 1. Testing Data & Progress**
- 2. AMCIS document**
- 3. MQP Document Revisions**

Minutes:

Team meeting with Professor Djammasbi 1/25 (12 – 1PM):

- Discussed how to go about finding preliminary data
- Corrections for AMCIS document
- Corrections for MQP Document

Team meeting at Fidelity Investments 1/31:

- Many problems! But eventually solved.
- Set up Eye Tracker in other room
- Found out one lab was free, but
- The lab's eye tracker wasn't working
- 1 participant canceled, 1 didn't show up, 2 were sent away due to technical problems
- When problems were resolved:
 - Access to normal testing lab
 - Tested 6 participants
 - Exported Data to be analyzed this week
- Worked on AMCIS document (abstract)
- MQP Document Revisions

Deliverables:

- **MQP Document Revisions**
- **AMCIS document**
- **Preliminary Data Analysis (for next week)**

MQP Meeting Notes: February 7, 2007

Attendees: Soussan Djamasi (faculty advisor), John Bosch, Joe Hsu, Erin Mazuera, Kelly Osberg

Meeting time: 12:00PM – 1:00PM

Agenda for the team meeting (12PM- 1PM):

- 1. Testing Data**
- 2. Testing Progress & Difficulties**
- 3. AMCIS document**

Minutes:

Team meeting with Professor Djamasi 1/25 (12 – 1PM):

- Corrections for AMCIS document
- How to go about data analysis

Team meeting at Fidelity Investments 1/31:

- Many problems!
 - Set up Eye Tracker in other room
 - Eye tracker license code missing, so called tech support
 - Eye tracker not working still even with the tech support
 - Tested with no eye tracker
 - Sent one participant away due to internet failure
- Worked on AMCIS document
- Worked on Data Analysis of current participants

Deliverables:

- **MQP Document Revisions**
- **AMCIS document**
- **Continuation of Data Analysis**

MQP Meeting Notes: February 14, 2007

Attendees: Soussan Djamasi (faculty advisor), John Bosch, Joe Hsu, Erin Mazuera, Kelly Osberg

Meeting time: 12:00PM – 1:00PM

Agenda for the team meeting (12PM- 1PM):

- 1. Testing Progress**
- 2. Current Testing Data**

Minutes:

Team meeting with Professor Djamasi 2/15 (12 – 1PM):

- Data analysis
- Participant recruitment

Team meeting at Fidelity Investments 2/14:

- Participant Testing
 - Collected data on two subjects
 - Several cancellations and reschedules
 - More testing to be done on 02/19/07
 - Consolidated and filtered data
- Worked on Data Analysis of current participants

Deliverables:

- **Data Analysis Progress**

MQP Meeting Notes: February 21, 2007

Attendees: Soussan Djamasi (faculty advisor), John Bosch, Joe Hsu, Erin Mazuera, Kelly Osberg

Meeting time: 12:00PM – 1:00PM

Agenda for the team meeting (12PM- 1PM):

- 1. Testing Progress**
- 2. AMCIS Document**
- 3. Data Analysis**

Minutes:

Team meeting with Professor Djamasi 2/14 (12 – 1PM):

- Requirements for the MQP Document/AMCIS
- Data analysis

Team meeting at Fidelity Investments 2/21:

- AMCIS Document Revisions
- Data Analysis
- Timeline for end of the term

Deliverables:

- **Data Analysis Progress**
- **AMCIS Progress**

MQP Meeting Notes: March 16, 2007

Attendees: Soussan Djamasbi (faculty advisor), John Bosch, Joe Hsu, Erin Mazuera, Kelly Osberg

Meeting time: 12:00PM – 1:00PM

Agenda for the team meeting (12PM- 1PM):

- 1. Schedule for D Term**
- 2. Data Analysis**

Minutes:

Team meeting with Professor Djamasbi 2/14 (12 – 1PM):

- Requirements for the MQP Document/AMCIS

Team meeting 3/14:

- Executive Summary for Award
- Schedule for D Term
- Presentation preparation
- Worked on Lit & Methodology revisions
- Final paper submission is due...?

Deliverables:

- **Schedule for D Term**
- **Data Analysis**

Appendix K – Sponsor Presentation and Attendees

Attendees:

Bill Albert, Usability

Fred Leichter, SVP of FeB Design

Tom Tullis, Usability

Missy Caravale, design Services

Jodi Leo, Information Architecture

Edi Ablavsky, Editorial

Rachel Acker, Usability

Laura Richterich, Usability

Catie Connolly, Usability

Mark Phelps, Information Architecture

Mike Wilkey, Information Architecture

Donna Tedesco, usability

Denise Nangle, Usability

Mary MacDonald, Information Architecture

Jonell Gades, Information Architecture

John Dozier, Usability


Fiona Tranquada, Usability

Alison Savery, Usability

Rick Kemmerer, Style Guide

Michael Kazenel, Design Director

Marlon Violette, Style Guide





Gender Preferences in Web Design: Usability Testing through Eye Tracking

Body
Headline

John Bosch
Joseph Hsu
Erin Mazuera
Kelly Osberg


Fidelity Sponsor Dr. Tullis
Academic Sponsor Dr. Djasasbi
April 11, 2007 12PM






Summary of Project Goals


- To study the noticeability and effectiveness of Bricklets on the NetBenefits website through an eye tracking study
- Additional goals
 - Create an HID database of potential test subjects for future projects
 - Establish eye tracker and assist in use






Overview


- WPI MQP- Senior Project
- Purpose
- Background
- Methods
- Results
- Conclusion
- Recommendations






Literature Review


- Psychology studies
- Web aesthetics
- Web design preferences
- Internet behavior
- Eye tracking studies






WPI's Major Qualifying Project


- Senior, Management Information Systems
- Completing MQP senior project
- Major Qualifying Project allows the student to "apply the skills, methods, and knowledge obtained in their course work to the solution of a real business problem in the MIS area"






Hypotheses

- H1) Female participants will notice bricklets with pictures of people more than males
- H2a) Female participants will notice bricklets with a light background color more than males
- H2b) Males will notice bricklets with a dark background color more than females
- H3) Participants 50 years and older will notice bricklets more than participants 20-49 years old
- H4) Participants 50 years and older will notice bricklets without pictures more than with pictures




Eye Tracker Technology

- Tobii Eye Tracker
- Advanced image processing
 - Eye movement
 - Pupil analysis
- Produces detailed data
- New lab and technology



Tobii 1750



Bricklets

Assessing, Did You Know?
Your employer matches up to 6% of your contribution. Get the full match by increasing your contribution 1%.
 Get your full match

Assessing, Did You Know?
Your employer matches up to 6% of your contribution. Get the full match by increasing your contribution 1%.
 Get your full match

Bricklet A: dark background, no picture Bricklet B: light background, no picture

Assessing, Did You Know?
Your employer matches up to 6% of your contribution. Get the full match by increasing your contribution 1%.
 Get your full match


Assessing, Did You Know?
Your employer matches up to 6% of your contribution. Get the full match by increasing your contribution 1%.
 Get your full match

Bricklet C: light background, picture Bricklet D: dark background, picture




Recruitment Process

- Recruitment survey (web based/email)
- Criteria:
 - Age groups: 20-39, 40-49, 50+
 - Gender
 - People who rarely used the NetBenefits website
 - People with average financial literacy



Tasks


- What is the total amount of your investments in all of your plans and accounts?
- How much do you have invested in Fidelity Canada within your Theta non-qualified plan?
- How much life insurance coverage do you have for this company?
- Maximize the company match for your contribution in your 401(k) within your Theta Savings Plan.



Participants


	20s-30s	40s	50s-60s
Male	7	7	4
Female	6	6	8


Distribution of Participants by Gender and Age



Testing Procedure


- Briefing
- Financial literacy test
- Calibration
- Tasks
- Debriefing survey






Measurements


- Fixation data
- Gaze data
- Event data
- Observation data
- Self report survey






Results - Hypothesis 2B


- Males did not notice bricklets with dark backgrounds (Bricklets A&D) more than females
- Females had greater frequency of fixations
 - Females = 55.6% vs. Males = 44.4%
- Average gaze variance was greater for females
 - Females = .163mm vs. Males = .01mm
- None statistically significant and different directions






Results – Hypothesis 1


- More females than males looked at the bricklets with pictures (Bricklets C&D)
- Frequency of fixations
 - Females= 52.8% vs. Males= 47.9%
- Average gaze variance greater for females
 - Females = 1.407mm vs. Males= 0.608mm
- More females used bricklets C&D for task 4
 - Females = 5 vs. Males= 4
- None statistically significant, but confirmed direction






Results - Hypothesis 3


- Participants 50 years and older did not notice bricklets more than participants 20-49 years old






Results - Hypothesis 2A


- Females noticed bricklets with light colored backgrounds (Bricklets B&C) more than males
- Females had greater frequency of fixations
 - Females = 54.2% vs. Males = 45.8%
- Average gaze variance was greater for females
 - Females = .382mm vs. Males = .103mm
- None statistically significant, but confirmed direction





Results - Hypothesis 4

- Participants 50 years and older did not notice bricklets without pictures more than with pictures



Fidelity

Additional Results

- 21 participants (55%) used a bricklet to solve Task 4
- Bricklet B was used the most (8 users)
- Bricklet D received the highest overall rating on the self survey

WPI

Fidelity

Recommendations for NetBenefits

- Recommend Bricklet B
 - Most utilized
 - Used equally between genders

Annette, Did You Know?
 Your employer matches up to 6% of your contribution. Get the full match by increasing your contribution 1%.

[Get your full match](#)

Bricklet B: light background, no picture

WPI

Fidelity

Conclusions

- Though not statistically significant, results show trends that:
 - Women are more attracted to bricklets with pictures of people than men
 - Women are more attracted to bricklets with light colored background than men
 - Men may not be more attracted to bricklets with darker backgrounds than women

WPI

Fidelity

Recommendations for Future Tests

- Testing with different colors, pictures, content, locations
- Future studies with more participants
- Participants outside Fidelity
- Tasks that involve browsing over searching

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Fidelity

Conclusions (Cont.)

- Participants ages 50+ may not notice bricklets more than younger users
- Participants ages 50+ may not notice bricklets without pictures more than bricklets with pictures


WPI

Fidelity

Acknowledgements


- Dr. Tom Tullis
- Michelle McNulty
- Marguerite Bergel & Ann Chadwick-Dias
- Bill Albert and Jonell Gades
- Steve Borowick and Barbara Finkemeyer
- Maya Jackson
- Fidelity Investments
- Dr. Soussan Djamasbi

WPI



Thank You!

Questions?



Appendix L – MQP Poster



Demographic Preferences in Web Design: Usability Testing through Eye Tracking

Kelly Osberg (MIS), Erin Mazuera (MIS), Joseph Hsu (MIS), John Bosch (MIS)
Advisor: Dr. Soussan Djamasbi



Abstract

This project examined the effectiveness of bricklets on Fidelity Investments NetBenefits web platform. Grounded in previous research, five hypotheses were developed to investigate demographic differences in web design preferences between male and female users in various age groups. Through a laboratory experiment using an eye tracker, the results of this study provided evidence for demographic differences (age, gender) in web design preferences. Based on these results, the study provided future recommendations for the use of bricklets on Fidelity's NetBenefits Site.

Background

In order to enhance customers' online experience, several companies currently offer bricklets on their websites. A bricklet is a window with personally significant information to make browsing the website and attaining information easier for a user. The main purpose of the bricklets is to bring important, relative information to the attention of customers. Fidelity Investments Inc., one of the leaders in web based financial services which includes e-trading and retirement services, has begun using personalized bricklets on their NetBenefits website.



Tobii 1750 Eye Tracker

Gender and age studies regarding the effectiveness of web layouts have been attempted in the past. However, these studies were conducted involving methods of self surveys and focus groups. Our study attempts to use more accurate methods of acquiring data through the use of a state-of-the-art, non-invasive eye tracker. With the results acquired from the eye tracker, results can be analyzed that are more accurate than simply asking participants their opinions. This makes our study unique from the others.

Project Goals/Objectives

- To study the noticeability and effectiveness of bricklets on the NetBenefits website of Fidelity Investments through an eye tracking study
- To show whether there are significant demographic preferences among different genders and age groups

Acknowledgments

Dr. Tom Tutlis, Michelle McNulty, Marguerite Bergel, Ann Chadwick-Dias, Bill Albert and Jonell Gades at NetBenefits, Steve Borowick and Donna Tedesco, Maya Jackson, Fidelity Investments, Inc.

Hypotheses

- H1) Female participants will notice bricklets with pictures of people more than males
- H2a) Female participants will notice bricklets with a light background color more than males
- H2b) Males will notice bricklets with a dark background color more than females
- H3) Participants 50 years and older will notice bricklets more than participants 20-49 years old
- H4) Participants 50 years and older will notice bricklets without pictures more than with pictures

Methods

The hypotheses were based on previous theories regarding demographic preferences in visual layout of websites. In order to test these hypotheses, a usability study was conducted. Upon arrival at the testing location at Fidelity in Boston, participants first filled out a financial survey, were briefed on the equipment and test, completed a set of tasks using the NetBenefits website, and finished by filling out a debriefing survey.

Recruiting & Participants

A survey was created in order to recruit potential participants for this study. The requirements pertained to age, gender, NetBenefits usage, and financial literacy background.

	20-39 years	40-49 years	50-69 years
Male	7	7	4
Female	6	6	8

Bricklets

Four bricklets were designed to test the difference in visual layout.



Bricklet Design A Bricklet Design B Bricklet Design C Bricklet Design D

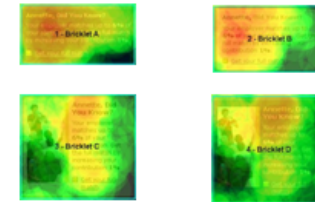
Tasks

Four search orientated tasks required participants to look in areas around the bricklet on the website. One task pertained directly to the information on the bricklet while the other three were filler tasks that drew the attention of the user to areas surrounding the bricklet.

Measurements

In order to examine the noticeability of the bricklets, data regarding the user's fixation, gaze, click action, observations, and self survey were analyzed.

Results/Analysis



Visual Representation of the percentage of all participants who looked within each bricklet

- Colors and images do affect the way different genders and age groups view a bricklet, or more generally, a website
- 55.3% of participants used a bricklet
- Bricklet B was used most (38.1%)
- Bricklet D was rated most visually appealing in the self survey
- Females (34.2%) used bricklets more than males (21.1%)
- Females (54.9%) noticed bricklets more than males (43.9%)
 - Females (52.8%) noticed Bricklets C&D more than males (47.2%)
 - Females (54.2%) noticed Bricklets B&C more than males (45.8%)
- Males (44.4%) did not notice Bricklets A&D more than females (55.6%)
- Participants 50 years and older did not notice the bricklets more than younger participants ages 20-49 except for Bricklet B
- Participants 50 years and older did not notice Bricklets A&B more than Bricklets C&D

Contributions

The results of this study extends our understanding of users' reactions to web usage and have both practical and theoretical implications. These results contribute to the human computer interaction (HCI) research. These results can help companies to increase their web traffic and consequently become more profitable and successful.

Future Research

This study can be extended to examine users' preferences by investigating reactions to bricklets:

- with other colors, layout, content, page location
- when the bricklets are personalized
- using a different set of tasks
- using a different population (other than Fidelity employees)