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A USABILITY STUDY OF ELDER ADULTS UTILIZING

SOCIAL NETWORKING SITES

By

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This is to certify that the dissertation prepared by Jessica Emily Arfaa

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has been approved by the thesis committee as satisfactorily completing the dissertation
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ABSTRACT

A USABILITY STUDY OF ELDER ADULTS UTILIZING
SOCIAL NETWORKING SITES

JESSICA EMILY ARFAA

In order to find out how well current social networking sites serve the elderly especially for the ones with little to no computer experience, a preliminary study involving an accessibility investigation of 19 popular social media sites and a discussion with 8 elder adults in a computer training class was conducted. The result shows various accessibility issues on the popular social media sites and the problems encountered by the elderly.

To further investigate how to design a social networking site that is accessible and usable for the elderly, an iterative design approach containing two rounds of usability study was applied. This research consisted of three phases: a baseline usability study collecting the performance data of 22 participants 65 years of age and older completing a set of tasks on a social media site; a redesign of the social media site interface incorporating design guidelines and feedback received during baseline study; and a

usability study comparing the performance of the new prototype against the original design. In addition, the impact of the computer experience toward individual's performance on using the social networking site was also investigated.

The result of this study shows that the newly designed interface prototype improved the accessibility and usability of the social media site for the elderly. Although the computer experience has association with the actual performance on the social networking sites, the perception of the usability of the site was not significantly different between participants with different level of computer experience.

Simple and consistent layout, readable text, limited scrolling, grouped information, and easy access to training are keys to making the site accessible and usable for the elderly. The accessible social networking site has the potential for the elderly to live a more independent life through the access of resources and ideas, the fostering of communication and collaboration, the facilitation of learning and training, and the building of meaningful relationships with friends, families, and people of similar interests.

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According to the Administration on Aging (AOA, 2011), 39.9 million people in the United States are 65 and older, with the expectation of this demographic to grow to 72.1 million in 2030. As of 2012, 53% of elder adults are engaged online compared to 95% of teens (Brenner, 2013). The number of online elder adults engaged in social networking sites has grown from 7% in 2009 (Brenner, 2009) to 32% in 2012 (Brenner, 2013). However, compared to 81% of online teens using social media, elders aged 65 and older still represent the smallest demographic utilizing the internet and social media (Brenner, 2013).

Social media is a popular internet activity because of its collaborative and resource-rich environment. It allows family, friends, and other users to interact synchronously and asynchronously from any device with internet access (Lerman & Jones, 2007). Therefore, social media can be beneficial to older adults that may become isolated from family, friends, and society due to health and immobility issues.

Despite the benefits of social media, many elders do not engage in these types of sites because of misperceptions, computer illiteracy, and website interface issues (Gatto & Taka, 2008; National Institute of Aging, 2002; Turner, Tuner, & Van de Walle, 2007, Wagner, Hassanein, & Head, 2010). In an effort to help elders maintain and build relationships using social media, an investigation into the barriers is needed.

        To provide background information regarding elder adults and social media, a

literature review examining Web 2.0 concepts, interface design mandates and guidelines,

and studies involving elder adults and computer and social media usage is conducted. In

addition, preliminary study consisting of a social media website evaluation and class

discussion of elderly adults utilizing social media (Arfaa & Wang, 2014a, 2014b) is

discussed.   After the literature review and preliminary studies, the study's methodology

and results are presented. In conclusion, a summary of the usability study and future

steps is discussed.

2.   LITERATURE REVIEW

Computer usage plays an important role in today's daily life, evident by 75% of households having a computer and 71% with internet access (Census.gov, 2013). A popular web trend is the use of social media, in particular, social networking, social bookmarking, blogs, wikis, photo-sharing, and video-sharing websites. Social media sites have a large presence on the internet, and account for at least four of the top ten visited websites in the United States in 2013, including popular sites like Facebook, YouTube, Wikipedia, and Twitter (Alexa.com, 2013).

There are only a limited number of online elder users utilizing social media. For example, Brenner (2013) found that only one third of elders aged 65 years and older used social networking sites. Although this is a growing demographic, their social media presence is much less compared to 50% of users between the ages of 50-64.

Elderly adults account for a small amount of social media users; however, there are many benefits to its usage, such as learning, collaboration, and relationship and community building. For example, many elders can become isolated from family and friends due to immobility; however, the internet and social media blur the lines of location. Social media promotes a centralized resource of relevant and dynamic content, where family and peers actively interact synchronously and asynchronously (Graf, Li, & McGrenere, 2000; Hawthorn, 2000; Administration of Aging, 2011; Lenhart, 2000;

Willis, 2006; Gatto & Tak, 2008; Wagner et al., 2010; Turner et al, 2007; Birdi & Zapf, 1997; Saunders, 2004; Zajicek, 2001).

This review is organized into four sections. The first section looks into the current state of Web 2.0 technologies and the trend of social media applications. Next, available guidelines for accessibility and usability for people with disabilities are discussed. The third section defines elder adults and reviews the available usability and accessibility guidelines for these users.

2.1.   Web 2.0 and Social Media

Before discussing the literature surrounding elderly adult's accessibility and usability of social media, a background of Web 2.0 technologies is necessary. The definition and application types of each social media are reviewed, along with a discussion of the impact, uniqueness, and functionality associated with these types of media.

To define Web 2.0, a look into the history of the internet is necessary. Web 2.0 is the successor of Web 1.0 technologies. Web 1.0 refers to the state of the internet in the 1990's, where the internet was used primarily to displaying fixed information. During this time, internet access was used mainly to browse and relay information from static webpages. Many researchers describe Web 1.0 as a read-only environment where content is produced by one author and little iteration and interaction from other users. However, following the technology industry burst, continued technology advancements shifted the design, function, and usage of web applications. This trend is commonly referred to as Web 2.0, and is shaped by social media, a type of web application that facilitates collaboration and other Web 2.0 characteristics on the web, such as tagging and dynamic user-contributed content (O'Reilly, 2005; Wang & Zahadat, 2009). Its interactive and dynamic nature has changed communication styles, formed new strategies regarding businesses and institutions, and has become part of mainstream life. Social

media usage is a growing trend, with over 69% of online adults using social networking sites and other social media (Brenner, 2013).

There are a multitude of tasks that can be achieved using social media applications that facilitate users to connect through the production and utilization of social media (boyd & Ellison, 2008; Choudhury, Sundaram, & Seligmann, 2009).   With many social media applications, users have administrative rights to their profile, where they can start new discussions, delete posts (Kaplan & Haenlein, 2010), and share ideas/links for educational, work, or entertainment purposes. These sites also allow users to follow companies or brands, tag and organize content, and fill out surveys. In addition, users can modify privacy settings, as well as author, own, and control content and layout. These settings allow users to create their own space for hosting photos, managing connections, content, and links, notifications, and subscriptions to updates (Zajicek, 2001). Users are able to share or re-post information, called retweeting on Twitter, to share information to friends and followers (Kwak, Lee, Park, & Moon, 2010). Other tasks found on sites such as Flickr, Facebook, and Twitter, host and provide feedback functionality on photos and videos posted by numerous users (Lerman & Jones, 2007).

Social media characteristics allow for collaboration between many users, increased communication, information sharing, interoperability, and user-centered design (Carpan, 2010, Lim & Rogers, 2008). This technology trend incorporates social

connections, content creation, and collaboration (Howto.gov, 2012c). The relationships of these entities can be of friendships, professional, academic, location, etc., where uses have numerous functionalities such as friending, reading, creating, and other forms of content contribution (Kaplan & Haenlein, 2010; Susanta, Bagchi, & Bandyopadhyay, 2007).

In terms of communication and collaboration, these sites encourage user participation and allow users to connect people and information in one centralized location (Jazayeri, 2007; National Service Learning, 2008; Dwyer, Hiltz, & Widmeyer, 2008; Redden, 2010). Users are able to connect with family, friends, and classmates through chatting, email, wall posting, blogging, forums, groups and other functions (Carpan, 2010; Lim & Rogers, 2008; Jazayeri, 2007). This allows multiple users to consume and contribute to information, and in this process, build a community (National Service Learning, 2008; Nath, Singh, Lyer, & Ganesh, 2009; Epp, Green, Rahman, 2010).

Regarding text and multimedia content, users are information consumers and contributors (Wang & Woo, 2009; Dwyer, et al, 2008). They use social media as a platform to create, share and edit information, organize their content by tagging, and retrieve results through search and view functions (Lockyer & Patterson; 2008). These tags are keyword labels for content that allow for organization and search. Similar to

tagging, trends can be created by adding a hashtag followed by a keyword or phrase in order to tag content or view similar content sharing the same hashtag phrases.

Social media sites are popular because of their web-based infrastructure. Having an interoperable site allows for easy access through a web-browser or other application provided there is an internet connection. Timing and logistics are also characteristics of social media because of its time and space traits (Fjermestad & Hiltz, 1999). Communication exchanges on the many functions found on social media sites can be made at any time or location. For example, a user is able to post a comment or follow updates in real-time, but also has the option of responding later (asynchronously) (Lerman & Jones, 2007) using any device with internet access.

In addition to the many characteristics listed above, social media sites normally have a user-controlled profile with privacy and account settings or a connections list, showing the relationship of the user that could be made up of numerous connections or a subset of users categorized into meaningful groups (Lee & Bruckman, 2007). These sites normally allow for communication and ongoing interactions between users through posting or other commenting method, such as email, instant messenger, or video-chat. Users are able to share, trend, and tag multimedia content with other users.

In the next sub section, the different web 2.0 applications and social media types, including social networking sites, social bookmarking, blogs and microblogs, discussion

forums, wikis, podcasts, Web/RSS feeds, photo-sharing, and video-sharing, are discussed (Howto.gov, 2012c; Harrison & Barthel, 2009; Carpan, 2010).

2.1.1. Social Networking Sites

Social networking sites, also referred to as social networking applications, social networking services, and social utilities, are one of the most popular types of social media within the Web 2.0 trend (Wasserman & Faust, 1994; Susanta, et al., 2007). These applications focus on the relationship and communication between individuals and groups along with providing multiple communication and posting services (Susanta, et al., 2007). These sites are beneficial because they help forge friendships and relationships and provide a medium for the sharing of photos, links, and videos with connected users (Alexa.com, 2013). Examples of social networking sites include MySpace, LinkedIn, Meetup, and the second most visited website in the USA: Facebook; which had at least 175 million users in 2009, and has grown to over one billion users in 2012 (Alexa.com, 2013).

Many social networking sites emphasize relationships of the user compared to other social media, such as discussion forms, that focus on content, topics, and interests (Owyang, 2008). Similar to most social media applications, users share information that is personal or public to connected users (or a sub-sets of users) by uploading, tagging, sharing images, videos, and other types of multimedia (Susanta, et al., 2007).

2.1.2. Social Bookmarking

Social bookmarking websites allow users to tag and bookmark online content, creating a labeling system based on searchable keywords (Gray, Shepard, & Hamilton, 2010; Marlo, Naaman, boyd, & Davis, 2006). Users are able to tag content based on their interest or the topic of the social bookmarking site (Huang, Thornton, & Efthimiadis, 2010). These types of sites focus on organizing data, which differ from social networking sites that focus on building meaningful relationships (Derek, 2007). Examples of social bookmarking sites include del.icio.us.com, Reddit, and Digg.com, where content is posted by community members rather than editors. Users have the ability to organize links and stories to save for personal use, share with others, or browse other community posted content (Alexa.com, 2013).

Social bookmarking's main characteristic is folksonomy, also known as collaborative tagging or social tagging. Folksonomy is the classification of content defined by users (Golder & Huberman, 2006; Huang et al, 2010) and is beneficial when searching for relatable content. They are also advantageous because they promote sharing of online resources in an organized fashion and eliminate the need to access locally stored links (Redden, 2010).

2.1.3. Blogs and Microblogs

Blogs, also referred to as web logs, are posted by one author (read/write access to their account), with the ability for other users to read and comment on the post. Examples of blogs include Blogger, WordPress, and LiveJournal, which offer free usage and personalization of their applications. Microblogs, such as Twitter or Friend Feed, are similar to blogs; however, there is usually a character limit in posting. For example, Twitter allows a maximum of 140 characters for each post, which sometimes results in a faster real-time response rate. These types of blogs are popular because they are easy to view from a PC or mobile device and have a short amount of content to view for quick, easy reading (Phillips & Young, 2009).

The functionality of blogs can range from simple one-author content updates, to multiple authors, customizable widgets, and multiple media types including links, videos, and photos. Popular blogs today are used for entertainment, business, or personal usage and are beneficial for their simple publishing and instant feedback of the posted content (Rollett, Lux, Strohmaier, Dosinger, & Tochtermann, 2007). They can be run by a company or institution, or individually with the focus on topic rather than the relationship of the users.

2.1.4. Discussion Forums

Discussion forms, often time seen synonymous to bulletin boards and other threaded news groups, consist of posts and threads that are used to create chronological contributions to a theme or topic (Phillips & Young, 2009). Unlike blogs that share a user's record of events (Medina, 2013), discussion forms consist of threads, containing posts responding to a single author's question or comment. This type of media can be a stand-alone application, such as ComputerHelpForum.org, or integrated into a website, such as the comments section of a CNN.com article.

Forums are helpful because they facilitate collaboration. Users are able to post a question, comment, or statement, and have the ability for multiple users to comment on a particular post. Within the online community that it creates, users are able to discuss common topics and interests (Howto.gov, 2012c).

2.1.5. Wikis

Wikis, created by Ward Cunningham, and named after the Hawaiian phrase, "wiki-wiki", meaning 'fast', are named for their characteristic of quick retrieval of information (Slotter, 2010; Parker & Chao, 2007; Evans, 2006; Wikipedia, 2012a). These types of applications are organized and full of content. They are a digital repository of content that can be updated by multiple users (Jazayeri, 2007). The highly-

utilized wiki, Wikipedia.com (2013), a "free encyclopedia built collaboratively using wiki software" is ranked number seven of the most visited sites (Alexa.com, 2013).

Wikis have been described as "facilitating collaborative text production" (Forte & Bruckman, 2007). Some research compares this technology to blogs and other websites; however, the main difference specified by Slotter (2010) is the ownership of the page, where blogs have a single owner whereas wikis are a consensus of many authors (Slotter, 2010; Wang & Woo, 2009; Doyle, 2006; Parker & Chao, 2007; Tonkin, 2005). Wikis have the ability of having multiple authors that are able to interact and modify a unique post, which in time, Jazayeri (2007) suggests "will represent the consensus knowledge (or at least the opinions) of all the users." In addition to its collaboration ability, a major characteristic of wikis is the trust factor built upon the belief that the information provided is accurate or useful. Wikis are beneficial because they allow for searchable content in an organized way, where users can create and edit content, and in some instances be moderated by an owner (Phillips & Young, 2009).

2.1.6. Podcasts

Podcasts are a type of web 2.0 media that holds audio content; however, today there are many types of file formats, including video, PDF, or ePub files (Wikipedia, 2013). Podcasts can be delivered or syndicated via web feeds or can be downloaded in portable media formats such as MP3 and MP4s (Arthur & Schofield, 2007). Podcasting

is popular for its portable file formats, and the ability to watch readily available

syndicated content on demand.

Podcasting is used to distribute information to a number of sources, organizations,

and associations (Jham, Duraes, Strasseler, & Sensi, 2008) and is a popular form of

learning for audible learners (Cebeci and Cukurova, 2006).

2.1.7. Web and RSS Feeds

Users use web or news feeds to receive updated content from a content

distributor.   This type of technology allows a user to bypass checking a website or email

for updates. Instead, feeds allow for subscribing users to receive updated content to a

centralized location, known as an aggregator. There are different types of aggregators

with the ability to receive specific data formats, called web feeds, to publish content.

One popular type of web feed is RSS, which the literature defines as possibility standing

for "Really Simple Syndication", "Rich Site Summary", or "RDF Site Summary". RSS

feeds are beneficial because selective (or new) content is delivered to the subscribing

reader, eliminating the user's need to check for updates (Wikipedia, 2012c).

2.1.8. Photo-Sharing

Photo-sharing applications allow users to upload and distribute pictures, as well as

tag users and keywords, trending hashtags, and captions. Multiple users can post

comments, provide non-text feedback (i.e. "Like" button), and share pictures with other

users. Sites such as Instagram, Flickr, Picasa, and Photobucket are photo-sharing sites that hold billions of photos with the ability to be tagged with keywords for future searches and shared and downloaded by others (Kaplan & Haenlein, 2010; Phillips & Young, 2009). These sites also allow photo collections to be shared through their application as well as by other social media applications (boyd & Ellison, 2008). These sites are beneficial because the owner of image and albums can delegate access to a number of types of users.

2.1.9. Video-Sharing

Videos hold a combination of audio, picture, and videos and are an "effective communication tool for reaching target audiences (HowTo.gov, 2012)." Popular examples of social media sites focusing on video sharing include YouTube and Vimeo. These types of sites are viewed from its website or can be embedded in other sites and pages (Phillips & Young, 2009). These sites also use social media aspects, such as trending topics, tags, subscriptions, and commentary/feedback areas. Social media applications like videos-sharing sites are beneficial for companies and other institutions who contribute information for multiple senses, such as sight and audio.

2.1.10. Conclusion

This section addressed the growing Web 2.0 trend of social media applications such as social networking sites, social bookmarking, blogs and microblogs, discussion

forums, wikis, podcasts, web feeds, photo-sharing, and video-sharing. Social media promotes learning, communication, collaboration, sharing, and interactions, as well as organization through tagging and trending hashtags. Their online presence provides information-rich content and personalization based on user preferences. Each social media type has a set of characteristics that are unique from other media; however, these applications enable collaboration and interactions through easily accessed, viewed, and updated content.

Although social media offers an environment for collaboration, relationship building, and learning, elderly social media usage remains low. To explore the reasoning behind the minimal amount of elderly participation, hindrances based on current web usability and accessibility guidelines are reviewed in the next section.

2.2.   Interface Design Mandates and Guidelines

There are numerous web usability guidelines published for federal and other types of entities. These standards, mandates, and guidelines were formed to address the technology accessibility issues experienced by the disabled. The elderly and the disabled are not synonymous; however, one of the barriers of elderly technology usage are disabilities experienced with the natural aging process.   Therefore, many guidelines associate elder users with the disabled to address age-related issues hindering technology usage.

The best-known mandates and standards include the federal requirement of Section 508 Compliance of the Rehabilitation Act of 1973, along with general guidelines created from government sponsored agencies such as Usability.gov and Howto.gov, as well as the World Wide Web Consortium (W3C). Text and non-text equivalents, page and design formatting (such as color, background, and style sheets), content and content organization (regarding headings and tables), as well as page identification and organization (links, image maps, navigation, and frames) are some criteria discussed in these guidelines. Other criteria include assistive technologies and user agents, third party requirements (such as applets and plugins), and page functionality (page flickering and page time-outs) (Section 508.gov, 2012; Usability.gov, 2012; W3C.org, 2012a; W3C.org, 2012b).

2.2.1. Web Content Accessibility Guidelines (WCAG)

The World Wide Consortium (W3C) is responsible for developing the first set of guidelines discussed in this review. Web Content Accessibility Guidelines (1.0 and 2.0) are highly respected for their guidance in developing sites that are usable and accessible for the disabled. WCAG 1.0 is the predecessor of WCAG 2.0. Both include best practices for texts, images, audible features, as well as guidelines on layout and infrastructure in order to meet the needs of the disabled.

2.2.1.1.   *WCAG 1.0*

The WCAG 1.0 guidelines were first introduced in 1999 to address accessibility issues and design solutions (W3C, 2012). These guidelines have a checklist with three priority levels corresponding with accessibility criteria. Higher levels of priorities can only be achieved after satisfying lower priority levels; however, guideline numbers do not correspond with the ordering of priorities.

Priority 1 represents guidelines that must be met, and those sites that achieve this level receive an "A" designation. According to WCAG 1.0 (2012), if guidelines for this priority are not met, the site cannot achieve level 2 or level 3 priorities. The first level addresses text (text equivalents), color-based alternatives (information understandable with or without the use of color), and document language clarification (text equivalents for text elements that do not naturally flow with the document language and

organization). It also discusses style sheet independence (organization possible without the use of style sheets), dynamic content equivalents, flickering reduction, and the use of concise and clear language throughout the site. In addition, this checkpoint asks for image and image maps to have redundant links available, and client-side image maps as an alternative to server-side image maps. In addition, frames should be titled for identification purposes and multimedia have auditory descriptors of important information and simultaneous captions for auditory portions. The guidelines also urge that if the site is unable to be Priority 1 compliant, a link to alternative pages that utilize these guidelines be provided (W3C, 2012b).

Priority 2 consists of requirements that meet both guidelines for Priority 1 and Priority 2, resulting in "AA" designation. This priority suggests website foreground and background colors be viewable by someone with vision issues, text over images to display information, formal concise language, cascading style sheets for consistent layout, and proper utilization of list items, quotations, and dynamic content. Additional guidelines surround tables, frames (identified by names), forms (labeled correctly), and scripts and applets (event handlers independent per device). Pages should have limited movement and be accessible to assistive technologies, while event handlers should not be device dependent (W3C, 2012b).

Priority 3 is a website achieving Level 1, 2, and 3 Priorities, earning an "AAA" designation. These priorities include meeting criteria based on content (acronyms

explained, natural language used, text and graphic combinations), organization (order of web elements, searchable through multiple criteria), input devices (keyboard shortcuts used for important items), and layout (consistency through all pages, ideas grouped together, important information shown at beginning of elements). Again, guidelines for images and image maps are discussed, as well as tables (contain summaries, abbreviated header labels, text-alternative table), and forms (placeholders available for empty control boxes) (W3C, 2012b).

Reviewing the guidelines, WCAG 1.0 addresses content, format, and display criteria. Text equivalents need to be provided for a page and other multimedia and non-text elements need to be provided. Page identification should be clear, with redundant links. In addition, assistive technologies should be functional, such as having user agents automatically reading aloud text equivalents (Section 1.3). Past research has identified weaknesses in WCAG 1.0 for its dependence on past or obsolete technologies (Kapsi, Vlachogiannis, Darzentas, & Spyroual, 2009) and vague requirements (Anderson, Bohman, Burmeister, & Sampson-Wild, 2004). These guideline improvements are reflected in the second version of WCAG, called WCAG 2.0.

2.2.1.2. *WCAG 2.0*

The successor of WCAG 1.0 is WCAG 2.0, developed in 2008 to address the weaknesses and additional feedback of WCAG 1.0. WCAG 2.0 is accepted internationally (ISO standard: ISO/IEC 40500:2012) (ISO, 1998). It reflects a structure

different than its previous version; as well as new criteria to be adaptable to changing technologies. It is also designed to be more testable with automatic and human evaluation (W3C, 2012b).

As previously discussed, WCAG 1.0 consists of an uncategorized list of guidelines with checkpoints called Priorities. Conversely, WCAG 2.0's guidelines are organized into the following four principles: perceivable, operable, understandable, and robustness; and within these checkpoints are testable success criteria not found in the previous version. Similarities between the two versions include the requirement of achieving lower levels before meeting higher conformance levels: priority levels (1, 2, & 3) of WCAG 1.0 and success criteria (A, AA, AAA) of WCAG 2.0.

The first principle of "Perceivable" relates to a website's ability to be understood through multiple senses (visually, auditory, etc.). A website should be able to perceive in multiple ways for it to be accessible to its users. The second principle is "Operable", meaning that a user should be able to interact with a website without additional support. The third principle is "Understandable", requiring a website to be understandable on both an information content level and an operational level. The last principle is "Robust", and refers to the accessibility of content on a website by agents and assistive technologies.

The four principles under WCAG 2.0 have some overlap of WCAG 1.0 and Section 508 Compliance criteria (discussed in the next section). The first principle has four guidelines associated with perceiving, including providing text alternatives, time-

based media alternatives, adaptable content for many layouts, and distinguishable content. The second principle of operability also includes four guidelines, including keyboard accessibility, appropriate time sessions, non-seizure stimulating content, and proper navigation. The third principle's criteria include content that is readable, predictable, and able to be utilized with input assistance. Finally, the last principle of robustness contains guidelines for user agents and assistive technologies, that these should be compatible with current and future technologies.

2.2.2. WCAG Comparison

WCAG 1.0 and 2.0 are guidelines developed by the W3C for web content accessibility. Both guidelines include best practices for texts, images, audible features, as well as guidelines on layout and infrastructure in order to meet the needs of the disabled. There are similarities and differences between the two versions (Appendix A), most notably regarding conformance and non-text alternatives; however, much of the criteria found in WCAG 2.0 has been elaborated.

Notable similarities include the following criteria:

- Conformance: WCAG 1.0 and 2.0 follow similar conformance levels (Level A, AA, and AAA) that build upon each other. In both versions, no conformance is met until the previous level has been achieved.

- Non-Text Alternatives: both versions require non-text element alternatives (WCAG 1.0 –1.1 & WCAG 2.0 1.1 – 1.2); however, the newer version goes into further detail, such as situations when dealing with controls and inputs, time-based media, and CAPTCHAS. It also provides success criteria for testing in an easy to read checklist.

- Format: the format for both versions mentions color. Both also mention that color should not be the only way of distinguishing information (WCAG 1.0 –2.1 & WCAG 2.0 1.4).

- User agents: both mention user agents; however, this technology is now able to support various technologies and situations, such as form controls, freezing movement, and flickering (WCAG 1.0 –1.2, 7.1, 7.4, 7.5, 10.1, 10.2) & WCAG 2.0 1.1 – 1.2). Some techniques offered by user agents in WCAG 1.0 are no longer supported or needed.

These two versions also have a number of differences. WCAG 2.0 can be applied to a broader spectrum of web technologies; a weakness found in 1.0. It also includes better testable criteria. Many items have been reorganized into different conformance levels and a number of items are new criteria not found in WCAG 1.0. Some instances include:

- *Inputs*: Level A mentions that keyboard interfaces should be operable and functional. They should not require the elimination of timing and specific keystrokes (WCAG 2.0 - 2.1). Level AA mentions that suggestions should be provided if there is an input error (WCAG 2.0 – 3.3.3).

- *Format*: The format, in particular color, should not be in the only way of distinguishing information (Level A). Information pertaining to understanding or operating content should not rely only on sensory characteristics. Level AA conformance for WCAG 2.0 mentions headings and labels should describe their purpose and Level AAA states that users should be able to select foreground and background colors, and width and alignment are set to 80 characters justified.

- *Pre-recordings*: Under WCAG 2.0, audio content should have sign language interpretation.

Some studies suggest future iterations of WCAG. For example, a study by Rømen and Svanæs (2012) found through two usability tests that WCAG 1.0 alone could not identify all issues experienced. Of the 47 identified website accessibility issues, 13 were direct violations found in WCAG 1.0. Due to the low level of identified WCAG issues, this study suggested future iterations of guidelines using validated empirical data.

Similarly, the Disability Right's Commission (2004) concluded that after evaluating 1000 websites, 81% failed basic Web accessibility categories, and that 45% of

accessibility issues were not direct violations of WCAG 1.0. They suggested expanding the current Web Accessibility Initiative guidelines to include coverage of the information architecture and navigation design. This includes reviewing the number of links and verifying they are clear and necessary, preserving home page links, improving search design, simple site structures, and proper and informative page titles. In addition, the recommendations also noted that more detail should be offered regarding information architecture and information blocking, foreground and background colors, text equivalents, avoiding pop-ups, identifiable links, clear language, supported infrastructure, and limiting movement on pages. The report also concluded that disabled users should always be involved during the design and testing phases.

Another study by Power, Pumenta, Petrie, and Swallow (2012) found that from 16 evaluated websites, only half of the issues were covered by criteria found in WCAG 2.0. The six missing criteria were identified as (1) content found in pages where not expected by users, (2) content not found on pages where expected by users, (3) pages too slow to load, (4) no alternative to document format, (5) information architecture too complex, and (6) broken links. This accounted for almost 50% of user problems documented in the study. This is in comparison to 42% of issues that were covered in WCAG 2.0 but not implemented on the websites, and 8% that were covered and implemented. In addition to studies based on criteria, other studies, such as Alonso, Fuertes, Gonzalez, and Martinez (2010), showed that manual evaluations of a website (for Priority 1 conformance) had many instances of misinterpreted success criteria. Despite these studies, both guideline

versions are accepted by well-received institutions: Section 508 compliance is based on

Web 1.0 and is found in Usability.gov, and WCAG 2.0 is recognized as an international

standard (ISO, 2013).

2.2.3. Section 508 Compliance

Section 508 refers to the requirement that all federal agencies electronic and

information technology (referred to as EIT) be accessible to users with disabilities

(Section508.gov, 2012; HHS.gov, 2005). It was amended in 1998 to the Rehabilitation

Act of 1973 (29 U.S.C. 794d) to make EIT items accessible to federal employees with

disabilities. Therefore, any electronic items used for "communication, duplication,

computing, storage, presentation, control, transport and production" as well as any

"computers, software, networks, peripherals and other types of electronic office

equipment" (Section508.gov, 2012) are required to be accessible to people with

disabilities. Section 508 is revered as a guideline for web accessibility and is referred in

other official documentation, such as the Health and Human Service's usability

guidelines on Usability.gov (Usability.gov, 2013).

The guidelines found in Section 508 are based on WCAG 1.0 findings, although

the WCAG 1.0 priority 1 level does not include all criteria found in Section 508

compliance. All guidelines (A-P) in Section 508 must be met to be compliant; however,

for priority 1 of WCAG 1.0 compliance, guidelines A-K of Section 508 must be met.

There are numerous sections of this mandate, such as software applications and operating systems, telecommunications, video and multimedia, desktop and portable computers, as well as functional performance criteria; however, this paper focuses on the web-based intranet and internet information and applications found in section 1194.22. Standards found in this section refer to web-based applications and interfaces, such as text, multimedia, format, and other page attributes, in addition to infrastructure guidelines. The following table shows the 16 guidelines divided into two sections: criteria affecting the page and criteria affecting the infrastructure of a webpage.

Table 1: Section 508 guidelines

Website Component	Section 508 Criteria
Page (Information Content, Format, and Display)	Text & Multimedia Equivalents (a, b, k) Page Design and Format (c, d) Content Identification, Organization, and Layout (g, h) Page Identification, Organization, Links, and Navigation (e, f, i, o,)
Infrastructure	Assistive Technologies (l, n) Third Party Requirements (m) Page Functionality Requirements (j, p)

At the page level, Section 508 addresses format, and display guidelines. Text equivalents such as alternative text and equivalent alternatives are suggested to be associated with every non-text element and multimedia. Therefore, a text equivalent page should always be provided and mirror all changes made to its counterpart. These guidelines also address page content, design and formatting, such as having a webpage's

information understandable with or without color or a style sheet, and content found in tables labeled accordingly. In addition, page identification, organization, and navigation guidelines are addressed, such as having identified frames, client-side image maps, redundant links on server-side image maps, and a structure that omits redundant navigation links.

Regarding the infrastructure of a compliant website, a large portion of Section 508 addresses the need for assistive technologies to be functional. Assistive technologies should be able to comprehend scripting and electronic forms. The infrastructure of the site should also support third-party applications, such as applets and plugins, and should be provided and comply with the guidelines. Finally, the page should function with minimal flickering (>2 Hz; <55Hz) and should provide an alert when a task is time-constrained.

Section 508 compliance's goal is to assist those with disabilities and to ensure assistive technologies are usable during internet usage. They do not prohibit the usage of elements such as images or colors, but instead address the need for equivalent items that can be understood by the disabled, provide a framework for page design, navigation, and assistive technologies as well as focus on infrastructure elements, such as third party requirements.

2.2.4. Usabillity.gov

The US Department of Health and Human Services (HHS) manages

Usability.gov, a website compiling best practices for the public. These guidelines are

published on Usabililty.gov, under the name "Research-Based Web Design & Usability

Guidelines" with the goal of making websites "more usable, useful, and accessible"

(Leavitt & Shneiderman, 2006; Usability.gov, 2012). Topics include user experience,

accessibility, navigation, scrolling, titles, links, and in particular, interface design.

Subjects found under these guidelines include the design process and evaluation of a

website, including extensive collaboration of user requirements and usability tests in

order to ensure website accessibility. In total, there are 18 chapters, each with multiple

sections that describe the document type, topic, guideline, comment, sources, related

sources, and related usability guidelines.

Chapter 1, Design Process and Evaluation, suggests having different designs for

evaluation. Content should be meaningful to the end-user with the design of the website

meeting a user's expectation by having comprehensive user requirements that reflect

infrastructure, content, and the user. When designing, a site's performance should trump

aesthetics and meaningful metadata should result in better rankings in search engines.

This chapter focuses on the overall design of a website and is important because it

addresses concepts to be discussed before development, such as user requirements and

expectations, usability goals, and content. This guideline is very thorough because it

suggests different perspectives from users and prototypes, such as elder adults or the disabled; however, can be exhaustive and time consuming because of the suggested iterative approach for prototypes. Usability.gov is the only guideline that addresses the design process, such as use cases and prototyping, as well as specifics search engine results.

The second chapter, Optimizing the User Experience, provides feedback on ease of website usage. It focuses on the interaction between the user and the computer and calls for an experience that is intuitive with most of the processing completed by the computer. Similar to Section 508 compliance and WCAG 2.0, having content that is understandable is reiterated; however, specifics such as printing and website credibility. Guidelines include that tasks should follow a similar process for completion and be delegated to a computer or human based on the strengths of performing the function. Users should not be required to remember a large amount while utilizing the site. Content should be displayed in a format that easy to understand and should provide help to those who need additional assistance. In addition, unsolicited windows, text or graphics should be suppressed as a step to increase website credibility. In terms of performance, a user should not experience down-time and should be warned for delays or download times.

Accessibility, the next chapter, reflects many criteria found in the WCAG guidelines and references Section 508 compliance, agreeing that a site designed for the

government should be compliant with the mandate. The purpose of this section is to ensure that all users are able to utilize a site despite issues with vision, auditory, or physical movements, issues experienced by the elderly and disabled. As with WCAG and Section 508, assistive technologies should be able to read forms, information should be able to be conveyed without color or style sheets, and text equivalents should be displayed for all non-text elements. Additional similarities include avoiding screen flickering, providing client side image maps, and synchronizing equivalent alternatives for multimedia.

Chapter 4 discusses best practices for hardware and software, stressing the importance of designing and testing for common browsers, operating systems, internet speeds, and screen resolutions. This guideline goes into more detail compared to WCAG, and is important because it reminds the designer that they must design based on commonly used software and hardware constraints. It also suggests that the user should be kept in mind, such as one using an older operating system or plugins or others that use a special assistive technology device to comprehend pages.

Chapters 5, 6, and 7 discuss the homepage, page layout, and navigation. Unlike the other guidelines, Usability.gov highlights the importance of the homepage, the main page that provides users a main impression and understanding of the site, being accessible from all pages of the website. Best practices include having the homepage accessible from any page of the site. Important links and options should be displayed. In

addition, the site should reflect positively, not be too wordy and announce any changes to the site. As with the homepage, the layout of a page should be simple, aligned, brief, and place important information at the top center where it can be seen easily. A webpage with a simple layout is easily understood and consistent is the key to a successful website. Having a page with the right amount of white space or having the right amount of text or content increases the ease of use of the page. All pages should have navigation options that are easy to understand and be identifiable with sitemaps and breadcrumb navigation. Having a user understand where and how to navigate can give a user a positive experience on a site. This includes the use of breadcrumbs and sitemaps that help simplify navigation and location.

In addition, scrolling and paging criteria are discussed in Chapter 8. It is important that a page does not horizontally scroll; however, vertical scrolling is acceptable depending on the content and reading comprehension. In lieu of scrolling, paging is accepted as a fast and simple form of displaying more information. It is up to the designer on how to implement a page; however, the audience must always be kept in mind when considering page layout, navigation, and scrolling. For example, "older users tend to scroll more slowly than younger users; therefore, long scrolling pages may slow them down considerably" (Usability.gov, 2013).

Many users depend on headings and other descriptors to identify a page or items in a page, therefore it is important that each page be identified properly both visually and

by subject matter for ease of use and content purposes. This includes page headings, section headings, lists, images, headers, and other types of content. Similarly, links should be identifiable as users utilize the website, successfully clicking on links to find content. Accordingly, Chapter 9 states that headings, titles, and labels be clearly identified, and important information highlighted. Links, as discussed in Chapter 10, should be clearly identified and meaningful, repeated when necessary, and intuitive. Text (Chapter 11) should also be clear and consistent, using high contrasting backgrounds, common fonts and appropriate font sizes. When listing items, Chapter 12 suggests that the lists be properly identified, formatted and clear for easy reading, and have an appropriate list types applied.

Chapter 13, screen-based controls, discusses widgets and other screen-based controls needed for the user to interact with the computer in a way that is functional and intuitive. Having a site that has standardized and user friendly controls, such as radio buttons, checkboxes, option boxes, text boxes and more is influential for usability. Optional and required items should be clearly identified and labeled in an understandable manner. There should be little user data-entry input, instead having more default data and non-case sensitive data.

Chapter 14, Graphics, Images, and Multimedia, suggest these types of content be used when necessary and not excessively. In addition to widgets, images and graphics, such as logos or labels, can be helpful for the user understanding and enjoying the site.

Chapter 14 also suggests that modest backgrounds, the use of thumbnails for previews, appropriately sized images and quantities of images should be observed.

Chapters 15, 16, and 17 describe web content, organization, and search. Content is significant as it is the reason a user is visiting the site. Unlike other guidelines, specific guidelines on the content, organization, and searchability are discussed to provide better content matter. Content should be written clearly and sequentially, using simple and appropriate verbiage, identified acronyms and abbreviations; as well as be organized properly, grouped by color or other ways, where a user can scan easily for information without digging into numerous pages. Content should be searchable, not case sensitive, and provide tips for better results. Usability.gov also includes a final section dedicated to usability testing.

Chapter 18 suggests that tasks should be prioritized based on the Usability Magnitude Estimation (UME). Important usability items should be addressed first, using an iterative design approach to build the site with an inspection evaluation tool.

Usability.gov is a very comprehensive best practices list that goes into more detail than other guidelines such as WCAG and Section 508 compliance. These guidelines contain detailed comments; however, there is no official checklist associated for testing, making it hard to evaluate. The guidelines suggest testing using multiple methods such as usability testing, focus groups, card sorting, wireframes, and surveys. The 18 chapters provide guidelines and test criteria; however, no conformance levels need to be met for

compliance. Other facets are reviewed on this site, such as a section specifically targeting web usability and aging, which is discussed further in this literature review. These HHS guidelines are popular because of their "simple language and illustrated examples" (Bevan, 2009). However, a study by Bevan (2009) showed that the guidelines on Usability.gov had a deviation of 68 guidelines in comparison to WCAG and ISO standards. New guidelines are being developed by HHS to include responsive design, mobile strategies, applications, and social media; although, nothing official has been published.

2.2.5. Information Architecture

Website design and development have a number of mandates and guidelines promoting successful usability and accessibility for elderly and disabled users. In addition to these standards and guidelines, having an intuitive interface with a simple, clear, structured, consistent layout provides an overall better experience for the adult user (IAI, 2013). This science regarding the structure and layout of user interfaces is referred to as Information Architecture (IA).

IA is the practice of organizing, labeling, and classifying information found on web applications in a meaningful hierarchical structure (IAI, 2013; Howto.gov, 2012ab). A website can hold an abundance of information; however, the way a site is structured can affect the ease of use and retrieval of information. A website should be evaluated for its structured to ensure it is free of navigation, hierarchical, and organizational issues.

In some research, information architecture is used synonymously with information clustering, or information chunking, a facet of data management; and is characterized by the grouping of similar objects (Dillon, Mallela, & Modha, 2003; Jain & Dubes, 1998). Other researchers characterize the technique of information chunking as card sorting, where there is participation of the users to "organize the content" to make sense for users (Usability.gov, 2012).

The overall goal of organizing information is to "increase web information accessibility, understand user's navigation behavior, improve information retrieval and content deliver on the Web" (Vakali, Pokorny, & Dalamagas, 2004). For example, Downey and Banerjee's (2000) case study found discussed different focuses on information architecture, such as user experience and metadata (Morville & Callender 2010; Dillon, 2002). They find that others such as Reith (2003) and Deacon (2009) gear more towards website design. After much iteration, they find that the IA checklist consists of information consumption, information generalization, information organizing, information access, and information governance.

Information clustering, spatial clusters of information, table, and sequence access (Luk, Yeung, Qi, Leung, Li, & Leung, 2000) are terms used in the research that affect content organization, layout, page structure, search engines and the resulting images and documents (Cai, He, Li, Ma, & Wen, 2004). Creating a website that is structured is

important during the early stages of design and planning and should accommodate the visually impaired and the elderly.

2.2.6. Conclusion

Several mandates and guidelines exist to promote website usability and accessibility; these include the government directive of Section 508 compliance, consortium recommendations of WCAG 1.0 and 2.0, government guidelines of HHS's Usability.gov, and sciences such as information architecture. This section also shows that there are many weaknesses to the existing guidelines. Some studies found that many usability and accessibility issues were not identified by guidelines alone and suggest further studies involving the user and generating more comprehensive guidelines.

The guidelines discussed do have specific criteria; with the goal to provide guidance and best practices for technologies that are accessible to the public, including users that are disabled or impaired. Although the disabled and elderly are not the same, many elders do experience disabilities associated with the aging process. Therefore, much usability and accessibility research identifies elders and the disabled as suffering from the same technology barrier issues. It is important to note that disabilities are not the only types of obstacles experienced by the elderly. Many are at a disadvantage because technologies today were not available during their youth. Many lived an analog life and a digital world means a learning curve for these digital immigrants. Additional details regarding elderly and available guidelines are discussed in the next section.

2.3.   Elder Adults

With a foundation of Web 2.0 applications and website accessibility standards and guidelines, elders and their computer usage are discussed next. This includes discussing a variety of characteristics of the elderly, the benefits of computer usage and social media for this age group, as well as barriers to their internet usage.

Elders are a growing demographic, as their life expectancies have increased and internet usage has grown (Wagner et al, 2010; Hart, Ridley, Taher, Sas, & Dix, 2008; OECD, 2013).   By 2020, it is expected that the elder population will grow larger than one billion (Zaphiris, Ghiawadwala, Mughal, 2005), making it imperative that websites be sufficient for elderly usage.

2.3.1. Elders Defined

Elder adults are commonly referred to as senior citizens and older adults. They can be defined in the literature by numerous objective and subjective criteria:

- Age and/or Generation: Elders can be defined by their age or their generation of birth. This criterion is used largely for its objectivity. For example, some researchers find that an elder adult is age 60 or greater (Becker, 2004; Zajicek, 2001) while others see current elders as the Baby Boomer generation, born after the end of World War II, between 1946 to 1964 (Brossoie, Roberto, Willis-Walton, & Reynolds, 2010;

HealthyPeople.gov, 2012).

Legal/Mandates/Generalizations: Elder adults can also be defined in legal

or mandated terms, set forth by the federal, state, or other entity.

According to the Social Security Administration (2012), retirement

benefits are granted to people based by their year of birth. For example,

an elder may retire starting at age 62 to 70 to be able to receive

government benefits, although age 65 is seen as the normal retirement age.

Another example of age as a criteria are elders age 65 and older, eligible

to receive Medicare benefits (Social Security Administration, 2012). In

terms of retirement benefits, the minimum age of withdrawing money

from retirement accounts with no penalties is that of age 55, assuming that

other criteria is met to qualify for withdrawal.

- Health (Appearances, Physical, and Mental): Subjectively, an adult can be

  seen as older based on appearance or physical health. Someone that

  physically looks older based on the natural aging process, such as wrinkles

  or gray hair, may be assumed an elder.   Along with their general

  appearance, an elder may have health aliments that can be characteristics

  of elders, such as using an assisted-walking devices or special corrective

  lenses for vision correction. According to Healthypeople.gov (2012),

  "older adults are at high risk for developing chronic illnesses and related

  disabilities" such as "Diabetes mellitus, Arthritis, Congestive heart failure,

Dementia." The natural aging process can bring physical and vision problems, as well cognitive issues which affect their ability to use the internet. As a person ages, the body can deteriorate both physically and mentally. A person with cognitive issues can be seen as an elder person because their thought process is degraded. For example, a person that looks older and who also has dementia characteristics may be assumed to be an elder.

- Dependence (Mobility, Living Conditions): Healthypeople.gov (2012) also shows that many aging characteristics are connected. Along with health issues seen by elders, "many experience hospitalizations, nursing home admissions, and low-quality care. They also may lose the ability to live independently at home." Dependence and mobility is also seen as a way to define an adult. Someone can be seen as an older adult because they are bound to a particular location because they cannot legally drive anymore or relocated to a nursing home or assisted living home.

- Life Milestones & Historical Perspectives: A person can be seen as an elder based on their life milestones and accomplishments, historical perspectives, and beliefs (Ke & Xie, 2009a). For example, a person who has grandchildren may be seen as an elder because of this milestone. Or if a person is able to retire from their job/career, they may be seen as

achieving an elderly person's milestone. In another instance, a person who seems to have lived through the Great Depression or after World War II, and talks about their past experiences may be seen as an elder.

Many researchers refer to elders objectively by their age as well as when government and private entities release retirement and other benefits in the next phase of their life (Wagner et al, 2010). Therefore, based on the literature, this study will refer to elders as people aged 65 years and older.

2.3.2. Advantages for Elders Utilizing Social Media

There are numerous advantages of elderly adults engaging in computer activities. Research has shown that many elders feel they will benefit from computer usage because of available resources and communication features (Wagner et al., 2010; Saunders, 2004). This can result in more informed, social, and independent elders, discussed further:

- Independence: Elders that are able to become more self-sufficient with the use of social media that can improve self-worth and self-esteem (Wagner et al., 2010; Saunders, 2004). Many elders that interact with computers can increase their self-confidence by gaining new computer skills, in turn making them more self-reliant. They are able to search for answers online and interact with others on social media, which could result in less

dependence on others. With additional familiarity, they can interact with computers without assistance, improving independence, self-confidence; boosting growth and happiness.

- Resources: The computer, internet, and other digital media can provide excellent resources for the elderly (Becker, 2005). Information is free and a number of subjects can be obtained from a single website. Many elders currently utilize health-related resources (Morrell, Mayhorn, & Bennett, 2000; Tak & Hong, 2005; Macias & McMillan, 2008). In addition to accessing resources, elders can perform daily tasks, such as health-related searches, email, or instant messaging. Researchers feel that this accessibility empowers elders because they are able to "find out information about new drugs, treatments, and explore new options" (Karavidas, Lim, & Katsikas, 2005).

- Communication: Web-based applications and sites allow for facilitated communication (Graf et al., 2005). Much research shows that loneliness can hinder the quality of life in elders (Pope, 2012). Many elders experience isolation, as mortality rates increase for friends, relatives, and peers (Karavidas et al., 2005). Other reasons of solitude include immobility; as many elders become physically home bound due to dependence on mobile assisting device or loss of license. However,

connecting with people via the internet and social media allows elders to network and build relationships with others that have similar backgrounds and interests which can improve the quality of life and overall mental health of these individuals (Karavidas et al., 2005; Coulson, 2000; Lawhorn, Ennis, & Lawhorn, 1996; Ogozalek, 1991; Ryan & Heaven, 1986).

2.3.3. Barriers for Elder Adults Utilizing Social Media

Despite the numerous advantages for elders utilizing the internet and social media, there are many barriers to entry, such as health issues, monetary concerns (income), computer illiteracy (jargon, privacy concerns, etc.), and perception. Research has shown that these associations hinder elders from using computers and technologies despite the many advantages of using digital applications.

- Impairments/Disabilities: The natural aging process affects elder adults physically, cognitively, and physiologically (Graf, et al., 2005; Hawthorn, 2000). These ailments are also seen as barriers for elder computer usage. Some of these changes occur expectedly with the body's degeneration; however, other impairments can occur spontaneously or with severity. For example, physically, a large amount of elders experience vision loss and arthritis. According to W3C (2013b), vision, color, and contrast decline rapidly. At age 65-74, 16% experienced vision loss, compared to 45% by

age 85.   In terms of cognitive aspects, as a person ages, it is normal for

their memory to decline or for elders to process information slower in

comparison to adults (Administration on Aging, 2006). Many find it

harder to concentrate, memorize, and digest information, with over 20% of

elders aged 70 and older experiencing mild cognitive impairments (W3C,

2013a).   In addition, physiological loss can occur, such as the loss of

motor skills that make user reaction and response time lag. Current

solutions proposed for these barriers include formatting font size to a size

larger than 12 point with a contrasting background and font color. Many

elders can experience eyelid issues, therefore not being able to move their

eye in the appropriate area of the screen could affect their computer usage.

For those that have complete loss of vision, screen readers and other

assistive technologies are used.

- Computer Literacy: Today, many tasks and activities require some sort of

  computer interaction; however, there are numerous users, such as the

  elderly, that do not engage in computer activities because of computer

  illiteracy. One study observed that the majority of 65 year olds and

  greater "were not online and had no plans to go online" (Lenhart, 2000;

  Willis, 2006).   Many elders are not aware of buzzwords or common

  website layouts, such as posting or settings. Other studies show that many

  elders can become frustrated with their lack of computer skills (Gatto &

Tak, 2008). The National Institute of Aging (2002) noted that "many older adults have had little training in the use of computers and the Internet and are unfamiliar with the way information on websites are organized". Engagement in computer training classes and more exposure to computer activity can increase computer literacy for this demographic.

- Perceptions: Elders have a number of negative perceptions that hinder their assimilation into technology. Several researchers found that many elders feel that they are too old or not computer savvy enough to use a computer (Wagner et al., 2010; Turner et al, 2007). The fear of breaking a computer device, causing an error, privacy issues, and the fear of unwanted monetary transactions constitute a small amount of fears that elders feel when engaging in online activities (Birdi & Zapf, 1997; Saunders, 2004; Gatto & Tak, 2008). These perceptions are fed through a large amount of coverage found on the news and other popularly consumed media, which perpetuate the idea that the internet and social media harbor inappropriate content. Stories, such as Gross and Acquisti's (2005) evaluation of 4000 compromised Carnegie Mellon Facebook accounts can incite fear of their own information being exposed and exploited. Finally, many elders do not find value with social media as "it is hard for them to see the benefit of web services" (Zajicek, 2001). Many are unaware of the options available or do not know how the application

can be used in daily life. These perceptions result in many elders choosing

not to engage in internet activity despite the incentives.

2.3.4. Mandates & Guidelines for Elders

As discussed previously, many guidelines available are geared towards the

disabled. It is assumed that elders suffer from disabilities that hinder technology usage.

For example, many elders wear glasses or increase their screen resolution size to alleviate

vision issues. Regarding motor skills, many elders find it difficult to utilize a mouse.

Holding, clicking, or scrolling become obstacles and many elders are limited in

alternatives, choosing to slow the mouse click and mouse movement. Cognitively, the

memory of an elder adult can be affected, and many elders require extensive training or

very descriptive pages to identify next steps when utilizing a website (Graf, et al., 2005;

Hawthorn, 2000).

Despite the overlap between the disabled and the elderly, there are guidelines

found in the World Wide Web Consortium (W3C), HHS' Administration on Aging

(AOA) and Usability.gov that focus primarily on elder usability and accessibility. They

are discussed in the next section.

2.3.4.1. *WCAG Accessibility for Elders*

WCAG focusses on the accessibility of people with disabilities. Many of the

suggestions found in these guidelines overlap with the needs of elders, such as vision,

physical, hearing, and cognitive issues (W3C, 2013). It also offers resources to additional research and group initiatives, such as the European Commission (2011) funded project. Their research focuses on the needs of elder adults, specifically touching on the demographic in numerous countries, details the declining skills of the elderly.

In addition to outside projects, the W3C offers a literature review based on existing research. Redish and Chisnell (2004) categorized elderly adult design into four categories: interaction design, such as link formatting and mouse activities; information architecture, including appropriate labeling and headings; visual design, such as font size and coloring; and information design, paying attention to the content. Many of these points reflect guidelines already included in WCAG guidelines; however, this study goes into more detail regarding best practices.

Interaction design takes into account the way users interact with a website, including scrolling, links, buttons, and other navigational elements. Some guidelines include using standard link treatments, such as blue underlined keywords as links and eliminating scrolling as it requires a controlled moment often difficult for the elderly. Buttons are also suggested to be used for clickable items, as many elders find problems deciphering a link area. In addition, menus and navigation elements such as breadcrumbs should show a full directory to confirm location of a page on the site.

Information architecture addresses the organization of content and emphasizes the need to classify content into categories. In addition to the taxonomy of a site's content,

links should be labeled clearly so that elders can predict the content to be received by the link. Additional content, such as details regarding the link or content should be included in order to best predict the destination link's content. It is stressed that labeled items, such as links, should be familiar to the language of the audience.

Visually, a website for the elderly should visually appealing and best practices regarding color, content, contrast, and content arrangement. Pages should be limited in distractive elements, such as flashing advertisements, and should contain an adequate amount of white space to improve performance of the elders.

Elders comprehend pages slower than the youth and therefore need time to study the content, instead of younger age groups that can understand a page with shorter glances. As with WCAG guidelines, font size should be large enough and colors should be distinguishable for elder adults declined vision and the placement of elements should be in intuitive proximity of other related elements.

Information Design is the final category that includes writing and formatting content for the elderly. It is suggested that elder adults and younger users skim content to quickly find the content they are looking for, and that the content, labels, and other written elements should have purpose on a website. Also, it is suggested to use an active voice, action verbs, concise and brief sentences, and to use lists whenever possible. As with WCAG, language should be suited for the user and the writing style should be easy to read and straightforward.

In addition, the review also mentions other guidelines, such as federally sponsored National Institute of Aging, as well as Holton (2000) and Coyne and Nielsen (2002). There is much overlap between these reviews and WCAG 1.0, most encompassing recommendations on design, layout, content, and multimedia, items similar in WCAG 1.0.

Overall, this review gives a broad overview of guidelines available for the elderly but it does not include specifics to criteria to be followed such as success or testable criteria for evaluation. It also lacks information pertaining to navigation mechanisms and layout. However, this review gives the reader information on numerous guidelines available for the elderly.

2.3.4.2. *National Institute of Aging Web Guidelines (aoa.gov)*

Under the Department of Health and Human Services (HHS), National Institute of Health (NIH), is the Administration of Aging (AOA), dedicated to aging services. Under this institution are published guidelines by the National Institute of Aging and the National Library of Medicine called "Making your Web Site Senior Friendly" which evaluates the usability of a website for "people over 60" (Administration on Aging, 2006). Throughout this study, these guidelines will be referred to as the National Institute of Aging Web Guidelines.

According to the National Institute of Aging Web Guidelines, a website best designed for elderly usage needs to consider their lack of computer skills and declining health. The following categorizes the criteria found in the guidelines:

- Text & Multimedia Requirements: When choosing display text, the best options are to use upper and lower-case letters in sans-serif font, with a minimum of 12pt -14pt font in a medium to bold face type. In regard to paragraph formatting, a website should be at least double-spaced and be aligned left-justified. The display color of a screen should be understandable on a black and white monitor and background colors should contrast text. Images and other media relevant to the text should be used and be accommodating to older computers. As with other guidelines, alternative text should be provided for media.

- Content & Language: To accommodate an elder's slower processing skills and lack of computer experience, it is suggested that content be simple, clear, and written in a positive, active voice. Contact information should be supplied on the site for people who need additional assistance or prefer a different method of connection.

- Structure, Design, and Format: A successful website will incorporate a standard design with content organized in a way where information can be

easily read, with larger sections broken into smaller sections for easier

reading. Pages should avoid scrolling text unless clearly identified.

- Page Identification and Navigation: Basic and straightforward navigation

    should be incorporated into a site, where links are clearly labeled.

    Previous and forward buttons or text should be added to the site, along

    with site maps. Drop-down menus should be avoided with single mouse-

    clicks as a main technique for accessing information.

There is no rating scale like WCAG 1.0 or 2.0, and it does not go into detail like

WCAG Section 508 compliance or Usability.gov. However, unlike these other

checklists, the AOA checklist is geared towards the elderly, not just the symptoms of

natural aging that are normally associated with people with disabilities. Consequently,

the AOA guidelines are frequently referenced in research studies involving the elderly.

2.3.4.3. *Usability.gov*

As discussed previously, Usability.gov is a website run by the US Department of

Human Services for guidance on developing usable and useful websites. Similar to

W3C, there are some publications based on web usability and aging (Usability.gov,

2008). Although not as comprehensive and utilized in institutions, this website provides

a few sections of guidance on interface design, including font size and navigation based

on the physical and mental issues associated with the aging process.

It is important to note that Usability.gov does not have any official specific guidelines offered for the elderly; however, there are comments found in this documentation that reference best practice for elder adults. For example, in the section General User Experience: Design for Working Memory Limitations (2.5), a website should not require a user to remember information from page to page of a website. In particular, the guideline references a study comparing the working memory of two age groups: 23-44 and 61-68 showing a large difference in working memory between the two groups. Another example can be found in the section Text and Styles: Use at Least 12pt Font (11.8). The comments section of this guideline specifically reference elders aged 65 years and older and suggests using a font of 14pt or larger. Similarly, the Facilitate Scanning of Web Content Organization (16.2) suggests that elder users need to have a clear, thought-out organization of headings and content, especially for "older uses (70 and over) that tend to scan much more slowly though a webpage that younger users" (ages 39 and younger) (Usability.gov, 2012).

Although Usability.gov provides a highly respected set of guidelines for its comprehensive list and details. These guidelines do not provide many specifics regarding best practices for elder adults. There are only a handful of details relating to elder adults, similar to those found on WCAG and Section 508 compliance. The guideline could benefit from more examples of elders as well as a section based on perceptions.

2.3.5. Conclusion

People aged 65 and older account for 40 million people in the United States (Brenner, 2013). These elder adult are a growing demographic that can benefit from plentiful resources and communication media found on social media sites. Having elders participate in computer activity as well as educated on computer functionalities, truths and myths can help improve their perception on computers and the internet. These positive experiences are hindered by a number of factors, such as physical and mental disabilities, along with frustration and other negative perceptions that result from computer illiteracy. As previously discussed, there are a number of guidelines focusing on the disabled; however, this section explores guidelines, such as the National Institute of Aging, that focus on elder adult computer usage.

Although there is a large amount of usability research dedicated to people with disabilities, only an overlap of these guidelines apply to elder adults, defined into this study as people aged 65 and older. Certain disabilities such as declined vision and motor skills are associated with the natural aging process. However, other hindrances experienced by elders, such as limited computer skills and negative perceptions are not disabilities but rather deficiencies in computer skillsets and familiarity. Therefore, only a limited amount of disability research can be applied to elders and additional research is needed to address cognitive deficits and attitudes towards technology.

2.4.   Evaluation of Current State of Accessibility and Usability for Elder Adults

The previous sections provide an overview of Web 2.0 applications and mandates and guidelines associated with the disabled and the elderly. To achieve a better understanding of the current state of website accessibility for older adults, the following section covers the:

- Comparison of the mandates and guidelines

- Literature of elders using computers, the internet, and social media usage

- Literature on website evaluations

- Preliminary evaluation of popular social media websites.

- Discussion of elderly computer class' perception of social networking sites

2.4.1. Mandate & Guidelines Comparison

There is much overlap between the numerous web accessibility standards and guidelines of Section 508 Compliance (GSA), WCAG 1.0 and 2.0 (W3), Usability.gov (HHS), and the National Institute of Aging (HHS). These guidelines include best practices for texts, images, audible features, as well as guidelines content, layout, and infrastructure in order to meet the needs of the disabled and similar groups.   These mandates and guidelines are well-respected in website development and design and are a conglomeration of numerous sources, reflecting changing times and trends. Below is a comparison of each guideline's unique characteristics (Appendix A):

- Type/Audience: Section 508 Compliance is mandatory for all Federal entities; however, these website standards do not need to be met for private industries and businesses. WCAG, Usability.gov, and the National Institute of Aging Guidelines are not mandates, but best practices for web accessibility.

- Purpose: Section 508 Compliance and WCAG are mandates and guidelines geared towards people with disabilities in an effort to have a similar user experience for both disabled and non-disabled persons. However, the National Institute of Aging's guidelines focus on the elder adult, including sections on understanding the user's needs and expectations. It is important to note that Usability.gov does not mention a particular user; its goal is for usability and usefulness of digital content, stating that "setting clear and concise goals for a Web site, determining a correct and exhaustive set of user requirements, ensuring that the Web site meets user's expectations, setting usability goals, and providing useful content" are a part of successful website design and should be approached first (Usability, 2012).

- Rating Scale: Section 508 requires that all standards are achieved to be deemed compliant. Similarly, in both versions of WCAG, no conformance is met until the previous level has been achieved. WCAG

1.0 and 2.0 each have criteria, referred to as Priority Checkpoints (WCAG 1.0) and Success Criteria (2.0), which must be met to achieve a particular conformance level. For Usability.gov (2013), there are the rating criteria of "Relative Importance" and "Strength of Evidence". Both Usability.gov and the National Institute of Aging have no levels of conformance; as the chapters only list guidelines and suggestions.

- Text/Multimedia Requirements: Section 508, WCAG, Usability.gov, and the National Institute of Aging guidelines require non-text element alternatives as well as the synchronizing of multimedia with text. Usability.gov and the National Institute of Aging go into further detail about text, recommending a font size that is at least 12 pt. and adding font weight for important items. Each suggest that there should be white space between paragraphs and visually aligning pages, however, the National Institute of Aging goes into further detail, suggesting double spacing and left-justified alignment.

- Content/Language/Tasks: Unlike Section 508 Compliance, both versions of WCAG, Usability.gov, and the National Institute of Aging discuss the content, language, and tasks associated with a website. This section is more subjective than the others, noting to use natural language for simplicity and understanding.

- Structure/Design/Format and Experience: Each of the guidelines suggests that format, in particular color, should not be the only way of distinguishing information and that a page should be understood without identifying colors.

- Page Identification/Navigation: Section 508 compliance, as well as WCAG, Usability.gov, and the National Institute of Aging all reference how a page should be identified and best practices for navigation. Each of these guidelines reference redundant links and note that a text equivalent or title should be accompanied by a frame or page.

- Inputs/Output/Performance Requirements: Many performance requirements are documented within Section 508 and Usability.gov including page flickering, applet compatibility, and timed response times. Similarly, both WCAG guidelines and NIH/AOA discuss supported scripts or applets, in addition to mentioning guidelines regarding media, animation, and video download times based on network connections.

- References: The guidelines discussed in this review all are well respected. Section 508 is closely based on guidelines found in WCAG 1.0. Guidelines found in WCAG 2.0 are valued in the management standards of the International Organization for Standardization. HHS's usability.gov website references many core guidelines found in Section 508 compliance.

Finally, the NIH's National Institute of Aging list many resources used to develop their guidelines, including usability.gov.

- Elder Adults: Section 508 compliance is a very general list of mandates while WCAG and Usability.gov do mention elder adult criteria or comments within their guidelines. The National Institute of Aging is the only set of guidelines geared towards the elderly.

There are numerous guidelines available, such as Section 508 compliance, WCAG, Usabilty.gov, and the National Institute of Aging; however, each of these guidelines provides a unique and overlapping perspectives on best practices regarding type/audience, purpose, rating scale, text/multimedia, content/language/tasks, structure/design/format, page identification/navigation, inputs/outputs, performance, and references.

2.4.2. Elder Adult & Website Design

Numerous studies recognize that there is a need to design websites that are accessible and usable for elder adults (Wagner et al, 2010; Riman, Ghusn, & Monacelli, 2011; Emery et al, 2003; Lin, Neafsey, & Strickler, 2009). Research shows that websites often do not accommodate elder users as they experience only half of what younger users encounter (Coyne and Nielsen, 2002). Best practices of website design should take into consideration deficiencies experienced by older users. Impairments such as vision, hand

dexterity, and cognitive abilities, as well as computer illiteracy and perceptions are major issues plagued by elders website interfaces filled with "small buttons and multitasking windows" (Zajicek, 2001), scrolling and overwhelming screens (Nahm, Singh, Lyer, & Ganesh, 2004; Ellis & Kurniawan, 2000; Lustig, et al., 2000).

A large amount of the accessibility and usability research utilizes usability studies to detect issues. For example, a usability study by Nahm et al. (2004) used a heuristic evaluation and usability test to evaluate three health websites geared towards elders. The results of this study showed that younger users were more fluent in usage. This included using improved and concise terminology and jargon, consistent formatting, reducing details, scrolling, and tabbing on pages. Although this study used guidelines found in the National Institute of Aging, there are numerous other comprehensive guidelines that could have been utilized to improve the three websites. It is important to note that many of these studies evaluate websites subjectively from guidelines without success or testing criteria. A future iteration of this study would be an objective approach utilizing well-recognized guidelines with success and test criteria.

Another example of website redesign for elders is Patsoule & Koutsabasis' (2012) case study involving a redesign of a tourist site. The study did not go into detail or list particular suggestions, but instead broadly suggested using a number of guidelines to follow best-practices, such as WCAG 2.0, WebAIM, and other guidelines. Although not detailed, the creation of a prototype was based on numerous guidelines (7 principles and

45 guidelines). After the prototype based on these guidelines was delivered, a

questionnaire was distributed to 12 participants. The results of the heuristic evaluation

concluded that a site that is organized, useful, and relevant must be implemented for elder

comprehension.   Content should be high quality; colors should be appealing and non-

distracting; language and vernacular should be appropriate; and the design should be

aesthetically pleasing with a welcoming layout.

Similar to other research that suggests following best practices and guidelines, the

IA Experience's User Experience and Information Architecture (IAI, 2010) guidelines

focus on layout, suggesting paths that are easy to navigate, grouping appropriate

information together, creating a visual hierarchy, and consistency. Fonts, font-sizes,

windows, colors, and images are just a few items that should be consulted before

designing a website (Kim, 2008). Kurniawan & Zaphiris (2005) suggest following

numerous HCI guidelines; however, advise on classifying content by card sorting so that

information is organized in a fashion that is easy to follow and retrieve.

Additional suggestions on layout include having simple content and avoiding any

extraneous words on the screen. Important words should be highlighted for better

notification, information should be centered, and the navigation should be easy to follow

(Kurniawan & Zaphiris, 2005).   Others suggest not having a large amount of content on

a page. Logos and other imagery elements should be useful for the user in navigating to

the correct pages. Information should be grouped accordingly, paying close attention to

sequence, importance, precedence, contrast, and white space (Moore & Matthews, 2004)

Following these best practices can help those with computer illiteracy, vision, and

cognitive issues (Redish & Chisnell, 2004).

The research described above shows studies that focus on elder adults and website

design. Each followed a particular guideline, focusing on design, layout, and navigation.

Although each study chooses a different guideline, the resulting factors show that there

are deficiencies for elder usage.

2.4.3. Elder Adult & Social Media Usage

Social media is a relatively new trend. Despite literature that perceives elder

adults as less inclined to utilize computers, the internet, and social media compared to

younger users; more than half (53%) of elders account for online users. What is more

significant is that social media adoption rates have increased drastically in past years,

from 7% in 2009 to 32% in 2012 (Brenner, 2013).

Although this elder demographic has increased their social media usage, there is

little usability research on social media interfaces for this group. Instead, the majority of

the research on elder adults and social media involve perceptions versus an evaluation

based on standards or usability studies.

A study by Braun (2013) conducted research to understand what factors hinder

elders from using social media by using a survey based on perception. Using the

technology acceptance model, the study focused on the perceived usefulness and use of social media, social norms and pressures, as well as trust. The 124 participants aged 60 years and older in the study had some computer knowledge, with 100% of the participants using a computer at least once a week. The 95 question survey used many Likert scale questions to measure perceived usefulness and ease of use. They reported perceived usefulness and trust increased, so did the intention to use social media.

The perception of social media by the elderly was also examined by Xie, Watkins, Golbeck, & Huang (2012) through a usability study. Training sessions of 10 adults aged 61 years and older were conducted, focusing on social media concepts and functions. Utilizing the inductive thematic analysis, it was evident that positive perception increased as more training sessions were conducted. Elders noted that many of them did not use a computer or did not see the relevance of utilizing the site. Also, privacy remained a concern; however, elders had continued interest to learn.

Similarly, Lehtinen, Nasanen, and Sarvas (2009)'s qualitative interview study of 8 elder adult participants aged 58 and older show that elders perceive the internet in a negative light, finding it unpleasant for socializing and full of superficial relationships. In addition to these perceptions, the researchers found that limited computer skills were a major factor in their negative outlook of social media, including lack of confidence in computer skills, fear of breaking something, and previous negative perceptions regarding relationships. Suggestions to these issues included updating and automating privacy.

Gibson, Moncur, Forbes, Arnott, Martin, and Bhachu (2010) conducted interviews and focus groups to identify deficiencies needed to support the elderly's social media usage. Similar to other studies, 17 elders aged 63 and greater were asked their opinion on social networking sites. Elders in this study had similar fears as other studies, sensationalized by the media, fearing false relationships, promoting bad behavior, and invading privacy.

All the above research involves elder adult's social media perception. Each try to answer similar research questions based on elder adults perceptions and understanding of social media. These studies used different research methodologies, from focus groups, interviews, and surveys; however, the results show that elders need training and ways to tie the applications to be more relevant in their lives. It is important to note that each of these studies has a limitation regarding the comparison of younger counterparts. They also do not have a control on education, computer experience, or social media experience.

Overall, the studies show that user perception, such as fear or lack of computer confidence, relates to the user's willingness to use social media. However, they also suggested training may alleviate perception barriers and computer illiteracy. The results of these studies show that elder adults do have the capacity to use social media and that more education needs to be provided for elders to participate.

2.4.4. Evaluation of Websites

There is a large amount of research on the accessibility and usability for elderly adults and the disabled using computers and the internet. A large area of this research focuses on evaluating websites for the elderly and the disabled utilizing available guidelines.

For example, Hart (2004) evaluated 36 websites based on a checklist of 25 guidelines found on the National Institute of Aging. It was found that most navigation and content guidelines were not violated; however, formatting standards were not followed. Similarly, in two studies, Becker (2004, 2005) evaluated 100 and 125 websites using the National Institute on Aging Web Guidelines and Nielsen and Tahir guidelines (2002). These studies showed that visual, language, and infrastructure issues existed under these websites which ranged from government websites, commercial, and nonprofits.   All three of these studies found that most websites did not adhere to guidelines presented for elders based on the National Institute of Aging Web Guidelines (2013).

All guidelines could invite room for bias and human error, as there are little to no objective tests that use the National Institute on Aging Web guidelines. On the other hand, testing and rating criteria are integrated in other guidelines and there are many tools that automatically sweep for an evaluation. Parmanto and Zeng (2003)'s study of 108 consumer health information websites used descriptive statistics based on an evaluation

against WCAG and Section 508 that showed sites with lower violations had higher website rankings. The researchers chose to use these guidelines because they were a "stable international specification developed through a voluntary industry consensus."

Evaluating websites for elder usability is a first step in assessing usability and accessibility. Many studies choose to follow the National Institute on Aging Web guidelines because of its popularity and focus on elder adults. However, these guidelines can be seen as subjective because of the lack of testing criteria and ratings scale of conformance. Overall, the studies conducted showed that many websites did not follow suggested guidelines found in the National Institute on Aging Web guidelines.

3.   PRELIMINARY STUDIES

3.1.   Evaluation of Social Media Websites

The following section is an accessibility evaluation of current social media applications (Arfaa & Wang, 2014a). As with previous studies, it is important to understand the usability and accessibility of these types of websites by comparison of available guidelines (Hart, 2004; Becker, 2005; Chadwick-Dias, McNulty, & Tullis, 2003; Nahm et al., 2004). The purpose of this assessment is to identify the most frequently violated usability and accessibility guidelines by social media website types. To evaluate these websites, an automated tool, SiteSort was chosen because of its ability to evaluate websites based on Section 508 compliance, WCAG 1.0, and WCAG 2.0 criteria. The results were then verified by the researcher by sampling and verifying the results of the report.

As discussed previously, Section 508 compliance and WCAG guidelines hold similar criteria for designing websites to be accessible and usable for people with disabilities (Appendix A). Section 508 guidelines should be met for any government agency, and the Web-based Intranet and Information and Applications section of this mandate references numerous WCAG criteria. Regarding WCAG guidelines, both the 1.0 and 2.0 versions follow a similar rating scale, where items in the first level must be met or the site could be unusable to a disability group. To increase conformance, a website would need to meet both the prior levels.

In February 2013, nineteen popular social media websites, ranging from social networking (Facebook, LinkedIn, MySpace, Google+, Meetup), social bookmarking (Delicious, Digg, Reddit), blogs (Twitter, Blogger, WordPress, LiveJournal), photo-sharing (Pinterest, Flickr, Instagram), video-sharing (YouTube, Vimeo), and wiki sites (Wikia, Wikipedia), were reviewed for violations against Section 508 compliance and both versions of WCAG. Within these sites, the researcher used both unauthenticated and authenticated (personal or dummy accounts) accounts to evaluate up to 100 pages of each site (Table 2):

Table 2: Evaluated social media sites

Social Media Site	Type	Account	Starting Page	Number of Pages/ Images
Blogger	Blog	None	http://googleblog.blogspot.com	69
LiveJournal	Blog	Dummy	http://www.livejournal.com	99
Twitter	Blog	Personal	https://twitter.com	98
WordPress	Blog	Unauthenticated	http://wordpress.org/news	97
Flickr	Image-Sharing	Dummy	http://www.flickr.com	82
Instagram	Image-Sharing	Dummy	http://blog.instagram.com	95
Pinterest	Image-Sharing	Personal	http://pinterest.com	100
Delicious	Social Bookmarking	Personal	https://delicious.com	97
Digg	Social Bookmarking	Dummy	http://digg.com	98

Reddit	Social Bookmarking	Unauthenticated	http://www.reddit.com	100
Facebook	Social Networking	Dummy	https://www.facebook.com	97
Google+	Social Networking	Personal	https://plus.google.com	100
LinkedIn	Social Networking	Personal	http://www.linkedin.com	94
Meetup	Social Networking	Personal	http://www.meetup.com	56
MySpace	Social Networking	Dummy	https://www.myspace.com	84
Vimeo	Video-Sharing	Dummy	http://vimeo.com	91
YouTube	Video-Sharing	Unauthenticated	http://www.youtube.com	96
Wikia	Wiki	Unauthenticated	http://www.wikia.com/Wikia	97
Wikipedia	Wiki	Unauthenticated	http://vimeo.com	100

Of all the violations, the overall results showed that social networking sites (54 total violations, 21% of all violations per social media type), video-sharing (53, 21%), and image-sharing (45, 17%) sites totaled the most combined violations, while social bookmarking sites (27, 10%) and wikis (36, 14%) recorded the least amount of infractions (Figure 1). According to the SiteSort report, many disabled users could find it impossible to use some pages of these sites.

Total Number of Violations per Social Media Type

■ Total Number of Violations per Social Media Type

Blog	ImageSharing	Social Bookmarking	Social Networking	Video Sharing	Wikis
42	45	27	54	53	36
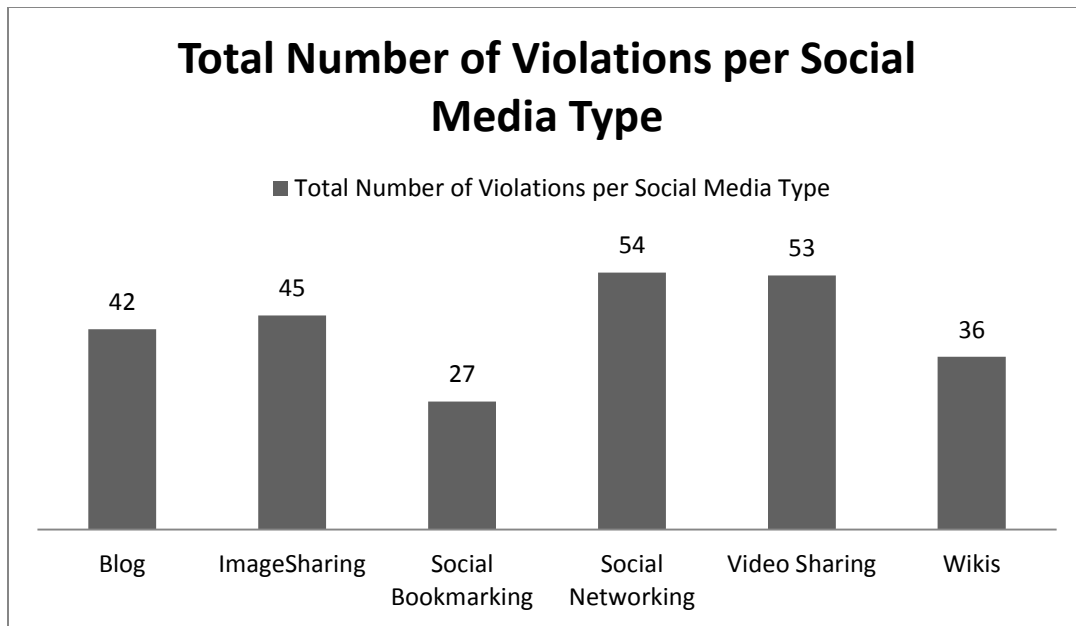
Figure 1: Total Violations per social media type

The social networking sites MySpace (71, 8%) and Facebook (70, 8%) had the highest total amount of all social media site violations, along with Flicker (63, 7%) and Delicious (61, 7%), which is in contrast with the social-bookmarking sites Instagram (23, 2%) and Wikipedia (15, 2%) (Table 3). This difference could be attributed to the different intensity of using multimedia elements in each site tested.

Table 3: Total number of violations per social media site

Social Media Site	Total Number of Violations (Percentage)	Average Number of Violations per Guideline (Percentage)	Standard Deviation of Violations per Guideline
MySpace	71 (8%)	8 (8%)	7.17
Facebook	70 (8%)	10 (8%)	8.85
Flickr	63 (7%)	9 (7%)	6.63
Delicious	61 (7%)	9 (7%)	7.95
Wikia	61 (7%)	9 (7%)	7.95
Twitter	60 (7%)	9 (7%)	6.29
LiveJournal	59 (6%)	8 (6%)	8.06
YouTube	59 (6%)	8 (6%)	7.48
Vimeo	54 (6%)	8 (6%)	5.99
LinkedIn	52 (6%)	7 (6%)	7.3
Pinterest	51 (6%)	7 (6%)	5.5
Google+	50 (5%)	7 (5%)	4.53
Reddit	44 (5%)	6 (5%)	4.11
MeetUp	44 (5%)	6 (5%)	5.59
WordPress	38 (4%)	5 (4%)	3.51
Digg	25 (3%)	4 (3%)	2.15
Blogger	23 (2%)	3 (2%)	2.14
Instagram	23 (2%)	3 (2%)	2.5
Wikipedia	15 (2%)	2 (2%)	1.57

Evaluating against Section 508 compliance, social networking sites (51, 33%) had the majority of total violations, followed by blogs (28, 18%), image-sharing sites (24, 15%), and video-sharing sites (21, 14%) (Table 4).

Table 4: Section 508 total number of violations per social media type

Social Media Type	Total Number of Section 508 Violations (Percentage)	Average Number of Violations per Section 508 Guideline (Percentage)	Standard Deviation of Violations per Section 508 Guideline
Social Networking	51 (33%)	10 (10%)	3.03
Blog	28 (18%)	7 (14%)	2.00
Image-Sharing	24 (15%)	8 (16%)	4.58
Video-Sharing	21 (14%)	11 (22%)	0.71
Social Bookmarking	16 (10%)	5 (11%)	2.52
Wikis	15 (10%)	8 (16%)	6.36

The most violated guideline (50, 32%) was Section 508 1194.22 (a), where a text equivalent should accompany a non-text element, either with an alt tag or other type of descriptor, followed by Section 508 1194.22 (n), where electronic forms should be able to be completed by assistive technology. SiteSort identifies the following page as an example of the Section 508 1194.22 (a) violation (Appendix AC, Figure 23): https://myspace.com/onetwowatch?pm_cmp=ed_spl_5top_sky.

A manual review of the source code confirms the violation that there is no alternative text associated with an image on this page (Figure 2):
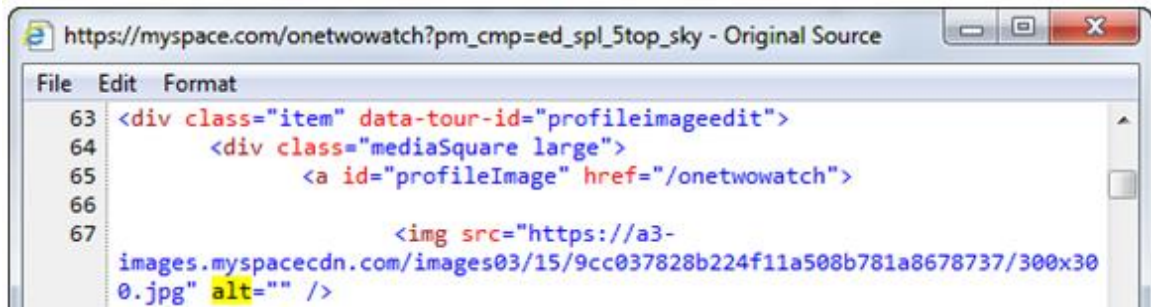
Figure 2: MySpace source code

In terms of WCAG 1.0, the social networking site MySpace had 8% of all total

violations, tied by Facebook (24, 8%) and Flickr (24, 8%). Social networking sites

totaled the most violations (100, 32%), with wikis (25, 8%) having the least amount of

violations (Table 5).

Table 5: WCAG 1.0 total number of violations per social media type

Social Media Type	Total Number of WCAG 1.0 Violations (Percentage)	Average Number of Violations per WCAG 1.0 (Percentage)	Standard Deviation of Violations per WCAG 1.0
Social Networking	100 (32%)	20 (21%)	4.64
Blog	66 (21%)	17 (17%)	6.40
Image-Sharing	52 (17%)	17 (18%)	6.51
Video- Sharing	37 (12%)	19 (19%)	0.71
Social Bookmarking	31 (10%)	10 (11%)	3.21
Wikis	25 (8%)	13 (13%)	10.61

In regard to the priority levels, Wikipedia had the least amount of total priority 1

violations (0, 0%), in comparison to Flickr with (8, 10%). The blog LiveJournal had the

most total priority 2 violations (17, 8%), in comparison to Wikipedia (4, 2%). And the

social networking site MySpace, micro-blog Twitter, and the video-sharing site Vimeo

had about (3, 10%) total priority 3 violations each. Overall, social networking sites had

the most priority 1 (100, 45%), priority 2 (66, 33%) and priority 3 issues (Figure 3).
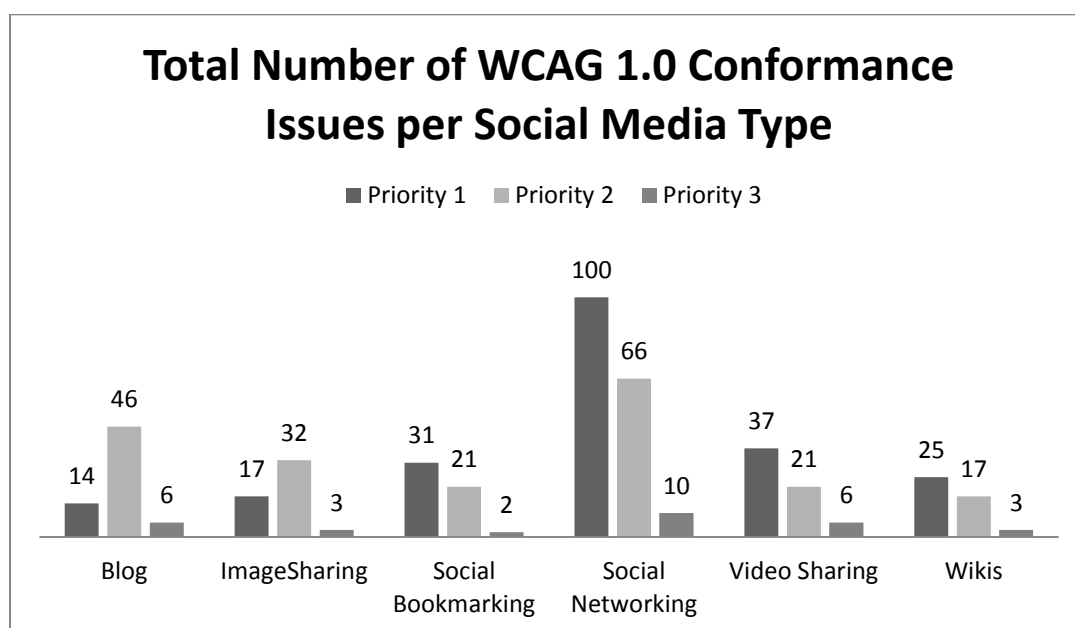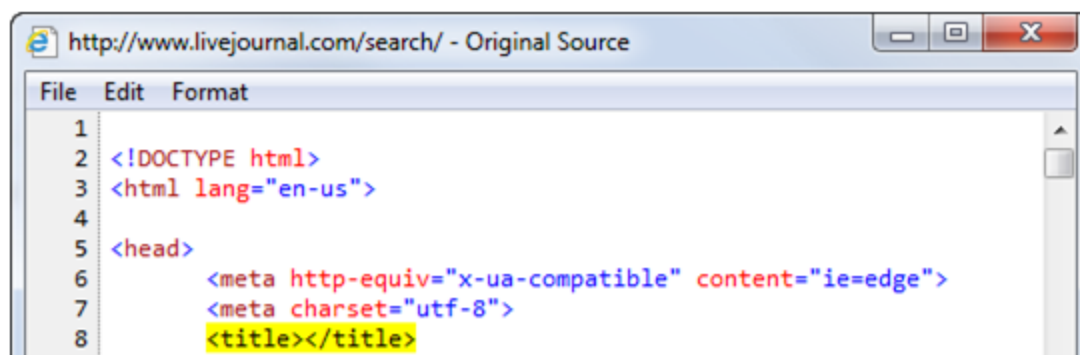
Figure 3: WCAG 1.0 conformance issues per social media type

Similar to Section 508, most violations (51, 16%) were found for guideline

WCAG 1.1, priority 1, suggesting incorporating text equivalents for every non-text

element, including images, graphics, image maps, animations, audio, and video files.

Another highly violated guideline was priority 2, WCAG 13.1 (50, 16%), where each

link's target should be clearly identified. SiteSort identifies the following page as an

example of a WCAG 1.1 violation, stating that title attributions should be accompanied

with each page: http://www.livejournal.com/search (Appendix AC Figure 24).

A view of the source confirms that no title was added to the page (Figure 4):

Figure 4: Screenshot of LiveJournal source code

An evaluation of WCAG 2.0 shows similar results. Again, social networking sites

(117, 32%) and blogs (73, 20%) totaled the most number of violations per social media

type, with the majority of violations from sites such as MySpace, YouTube, Facebook,

and Flickr (29, 8% each). The least amount of total violations were from wikis (32, 9%)

(Table 6).

Table 6: WCAG 2.0 violations per social media type

Social Media Type	Total Number of WCAG 2.0 Violations (Percentage)	Average Number of Violations per WCAG 2.0 (Percentage)	Standard Deviation of Violations per WCAG 2.0
Social Networking	117 (32%)	23 (21%)	9.3
Blog	73 (20%)	18 (16%)	10.3
Image-Sharing	58 (16%)	19 (17%)	6.2
Video-Sharing	48 (13%)	24 (21%)	5.1
Social Bookmarking	33 (9%)	11 (10%)	5.7
Wikis	32 (9%)	16 (14%)	12.7

In regard to conformance levels, the social networking sites MySpace (23, 8%) and Facebook (23, 8%) had the most total amount of level 1 priority violations, in comparison to Blogger (4, 1%) and Wiki (4, 1%). For priority level 2, Pinterest (5, 11%) and YouTube (5, 11%) had the most amount of violations, with the least amount coming from the social bookmarking site Delicious (0, 0%). Flickr (5, 13%) and YouTube (5, 13%) had the most violations for priority level 3. Overall, social networking sites (19, 22%) were the biggest violators of level 1, in comparison to social bookmarking sites (8, 9%). For level 2, video-sharing sites (5, 29%) were the biggest offender, followed by

wikis (13, 15%) and image-sharing sites (14, 16%). Level 3 shows that image-sharing

sites had the most violations (3, 24%) in contrast to wikis (1, 9%) (Figure 5).

Total Number of WCAG 2.0 Conformance Issues per Social Media Type

■ Priority 1   ■ Priority 2   ■ Priority 3

	Blog	ImageSharing	Social Bookmarking	Social Networking	Video Sharing	Wikis
Priority 1	14	14	8	19	19	13
Priority 2	3	3	2	2	5	2
Priority 3	2	3	2	3	1	1
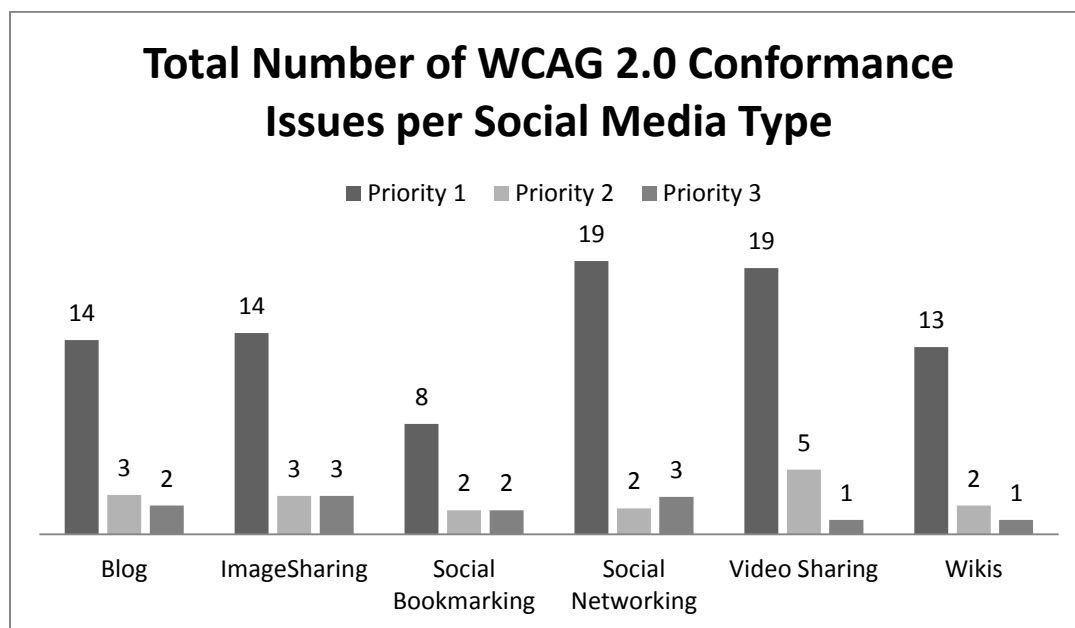
Figure 5: WCAG 2.0 conformance issues per social media type

The most violated criteria for this guideline was regarding navigation. Level 1,

WCAG 2.4.1 had 7% of all violations, showing that there was no mechanism to bypass

blocks of content that are repeated on other pages. There should be a way to skip

repetitive links.

The second most violated guideline was priority 1, WCAG 1.4.4, where content

should distinguishable; in particular, text should be able to be resized without assistive

technology. The most violated priority 2 level dealt with predictability; in particular,

WCAG 2.0 AA 3.1.2 suggests that content should be readable and understandable.

In conclusion, this evaluation assessed the accessibility of nineteen popular social media sites, based on Section 508 compliance and WCAG 1.0 and 2.0. Social media usage and elderly computer usage has grown, making it important that these types of sites be usable for this demographic. Although there are many mandates available for the disabled and elderly, the number of violations by the tested sites show that many of these popular sites do not follow available guidelines. Many sites continue to be designed without the accessibility consideration.

Statistics show that elder adults already have issues using technology, and the violations found in this study could decrease the usability and accessibility of these sites. The websites could improve by adhering to known guidelines. These include fixing missing labels, titles, headings, and subheadings; and providing text-equivalents. Additional improvements include identifying all links, creating content that is readable and understandable, and providing pages that can be resized with or without assistive technology.

3.2.   Class Discussion of Social Media with Elderly Adults

In May of 2013, a class discussion with elderly computer users was conducted to better understand the current state of elders utilizing social media (Arfaa & Wang, 2014b). In conjunction with a church in Baltimore, Maryland and an education institution, a free computer class with five sessions was offered to elderly adults with little to no computer experience. Adults accepted in the elderly class were chosen based

on age requirements and those that did not meet the age requirement were offered to attend a different class as part of the same program.

Within this class, eight female participants learned how to turn on and off a computer, use the drawing program Microsoft Paint, perform internet searches, and use email. At the end of the program, most of the elderly adults were able to master using a mouse, including clicking, scrolling, and moving the cursor, except for those with hand/dexterity issues. However, some adults still had issues on the number of clicks, typing, opening and closing a program, understanding how to use an internet browser, and email. For example, many elder adults did not know when to double click or single click on a page or link. Others did not know how to exit a program, instead, minimizing or maximizing the page after clicking on the wrong button or toggling between applications. Others did not understand the internet browser window, often opting to type search terms in the address bar. Other issues included elders not understanding the difference between subject lines and the body text of an email. After the final session of review, which was heavily based on using the internet for searches and email, there was a class discussion on social media with the following research questions asked:

- Do elder adults use social media?

- Do elder adults understand what social media is along with Web 2.0 concepts?

- What are the accessibility and usability challenges faced by elders using social media?

- How can social media be encouraged among elderly adults?

Throughout this class discussion, the teacher added and corrected any of the elderly adults' answers. Afterwards, users were given a demo of Facebook, and were shown concepts such as viewing a person's timeline, posting and receiving comments, and tagging.

For the start of the class discussion, the instructor asked the users their definition of social media. Instead of giving a clear definition or any characteristics, such as collaboration, tagging, or sharing information, the participants named the social media applications YouTube and Facebook. Two other participants assumed that social media was 'the internet' or a chatroom.

When asked if they could provide additional examples of social media and the purpose of these sites, most were not able to contribute or had heard of the teacher's suggestions of LinkedIn, Instagram, or Google+. A majority of the adults assumed that social networking sites were geared towards all users for the purpose of sharing pictures. After explaining the numerous uses of these sites, the instructor asked if they would be open to utilizing these sites for business connections or current events. Most of the participants were hesitant because of their computer skills and unfamiliarity with social media; however, two were willing to use it to find a job and most of the students never thought of using social media for news purposes.

Regarding Web 2.0 concepts, most users did not fully understand the terms, such as wall, timeline, instant messaging, posting, sharing links, or tagging. When asked what

was "posting to someone's wall or timeline", a participant answered that it is writing on someone's "homepage" (homepage is a term learned in the internet session of class) and that everyone would be able to see what was written. Additionally, the instructor asked what they think is 'sharing a link', and a participant answered that "it's sharing something that is interesting to you." Only three of the eight participants had ever engaged in social media usage, pointing out that they had received a Facebook link in their email or were told by the poster to navigate to Facebook to view pictures. These terms were further explained in the class demonstration.

During the demonstration of Facebook, the instructor asked the students their initial thoughts on the main page (after login). Most participants were confused by the layout and did not know where to start or what functions were available on the site.

Regarding the interface, all users asked to enlarge the text on Facebook before further continuing the exercise. After adjusting the projector, the instructor asked the participants help in completing a few tasks.

The instructor first asked how to view the instructor's main profile page. None of the users knew to click on the instructors name at the top of the page, but seemed to understand after the instructor asked them a few more times when toggling back and forth from the news feed and profile page. When viewing the tagged pictures of the instructor, the participants did not understand that tagging would pull pictures associated with the

person. Each user continued to be surprised that the next picture in the series contained the instructor.

On the main activity feed, the instructor pointed to a random post and asked students to point out specific fields on the screen, such as the title of post and any hyperlinks. Most understood that the first line was the poster's name; however, they were confused with the actual post and its purpose, along with the concept of a news feed posting numerous people's posts.

After the teacher explained that the purpose of the particular person's post was for personal reasons, the instructor showed a few more examples of posting on the news feed, such as links and images. Most participants did not know if something was a link when there was general text (and no link). For posts with links, images, and text, they were not sure where to click to view the entire post.

After this task, users were asked how to find a friend's profile. Most participants skipped over the search bar in the middle and told the instructor to click on the "Find Friends" label at the top right of the window. When asked for additional questions on the demonstration, a participant asked if the instructor could show her how to view her friend's pictures. After navigating to the photos section, the participant was still confused on how she would be able to complete this task at home without any help.

The last task the instructor asked was to sign-out of the website. None of the users were able to find the "log out" button, which was a sub-link after rolling over the settings icon.

At the end of the discussion, the instructor asked how she could encourage the elders to use social networking sites. Their responses included having some sort of support to guide them in using a computer and the internet, as well as having a way to verify that their information is safe without privacy issues. Most users were very interested in learning more about social media, particularly so they could look at pictures posted by family and friends. It was also suggested that there be a class dedicated to just using social media, so that they could have someone create the account for them and to show them how to view pictures.

3.3. Conclusion

Many studies suggest that focus groups, usability testing, and other methods of "soliciting unbiased comments" (AOA, 2011) are an excellent way of evaluating usability and accessibility of a website. Regarding the class discussion, eight female elderly adults participated in a free computer class geared towards the elderly with little to no computer experience. The majority of students were motivated in learning how to use a computer; however, they had little to no experience in their daily or work lives and relied on others to complete computer-related tasks for them.

Regarding social media, elder user's motivation in using these types of sites is to stay connected with family and to view family and friend's pictures. Most participants found an issue with the interface of these sites either due to the text size, layout, or navigation, as well as the lack of understanding of Web 2.0 concepts such as posting, walls, and tagging. In addition, it was suggested by the users that more classes need to focus strictly on social media and that they would need some type of support while learning how to use these types of sites, as well as verification that their security and privacy would not be compromised.

Limitations of the preliminary research include the small sample size and homogeneous participants. Of the eight participants, all were female, had little to no computer experience and did not have major accessibility problems. Therefore, no generalization could be made from these preliminary studies.

However, the preliminary studies solidified the elder adult's interest in using social media; despite the barriers that hinder their usage. Therefore, the objective of this research study became to improve social networking site interfaces through a proposed redesign so that elders can reap the benefits of these sites. The next chapter discusses the methodology to achieving this goal.

4. RESEARCH METHODOLOGY

4.1. Introduction

The goal of this research was to improve the usability and accessibility of social networking sites for the elderly. Through preliminary studies, it was evident that social media applications (e.g. social networking, social bookmarking, blogs, forums, photo-sharing, and video-sharing sites) did not adhere to common usability and accessibility principles. During the social networking site evaluation and class discussion, there was a common theme of concerns including text and multimedia, language, structure, layout, format, and navigation (Arfaa & Wang, 2014ab). In particular, social media sites did not offer ways to resize text, provide text equivalents for non-text elements, or clearly identify links on a page. These violations, in addition to elderly deficiencies, such as computer illiteracy, negative perceptions, and declining health; negatively affected the usability and accessibility of social networking sites (Arfaa & Wang, 2014ab). Despite these issues, the elders still expressed interest in using social media to stay connected to family and friends.

To continue our exploration of the elderly utilizing social media, this research followed three phases, including phase 1's baseline study, phase 2's prototype design, and phase 3's final usability study. Phase 1's baseline study identified usability and accessibility issues experienced by elders utilizing a current social networking site. The results and feedback from this baseline study were used to design an interface prototype

addressing the usability and accessibility issues faced by the elder adults engaged in the social networking site. Afterwards, a second usability study was conducted utilizing the redesigned social media interface.   The results of the baseline usability study and the final usability study were compared and analyzed.

The first research question in phase 1 addressed the current state of elderly social media usage. We wanted to know:

- RQ1: Do the elderly use social media?

This research question would be used to determine if the elderly are currently using social media and their reasons why they choose to use/not use this application. Next, we evaluated their understanding of common functions found on these types of sites. Preliminary research showed that elder adults had limited knowledge of computers and social media.

Once we knew their social media exposure and knowledge, we then ask them about the barriers affecting their usage, posed by the question:

- RQ1.2 How well can the elderly interact with social media?
- RQ1.2.1 What are the accessibility and usability problems experienced by the elderly when utilizing social networking sites?
- RQ1.2.2 Does computer experience play a role in the elder's social media experience?

With the feedback from phase 1, we wanted to know how a social networking site interface should be designed to improve accessibility and usability for elder adults (RQ2).

After implementing the changes, we compared phase 1's results to phase 3's, ultimately determining whether the redesigned prototype from phase 2 improve accessibility and usability for elder adults (RQ3). These research questions are summarized in table 7.

Table 7: Research Questions

Phase 1: Baseline Study	
RQ1.1.	Do the elderly use social media?
RQ1.2.	How well can the elderly interact with social media?
RQ1.2.1	What are the accessibility and usability problems experienced by the elderly when utilizing social networking sites?
RQ1.2.2	Does computer experience play a role in the elder's social media experience?
Phase 2: Prototype Development	
RQ2	How should a social networking site interface be designed to improve accessibility and usability for elder adults?
Phase 3: Final Usability Study	
RQ3	Does the redesigned prototype improve accessibility and usability for elder adults?

To improve social networking site usability and accessibility for the elderly, the next section describes the iterative approach used to answer the study's research questions. This chapter details the methodology used to examine usability and accessibility for elder adults utilizing social networking sites. Each of the three phases is discussed in detail next.

4.2.   Phase 1 Research Design

This phase was conducted to understand the current usability and accessibility issues experienced by the elderly. The following steps were executed:

1. Receive IRB Approval

2. Recruit Participants

3. Collect Consent Forms (Appendix D)

4. Create Test Environment

5. Collect Background Questionnaires (Appendix E)

6. Social Media Training

7. Complete Tasks (Appendix F)

8. Collect Post-Test Questionnaires (Appendix G)

9. Complete Data Analysis

10. Report Findings

The details of these procedures are discussed next.

4.2.1. Receive IRB Approval

On January 27, 2014, the researcher submitted her completed IRB application for the usability study. The expedited submission included the completed form with signatures, proposal, and appendixes. On February 3, 2014, the IRB committee found the study exempted and subsequently approved for research (Appendix AI).

4.2.2. Recruit Participants

Twenty-two participants were recruited from personal connections and through visits to the library and elderly community centers. The participants were informed about the researcher's study purpose and potential benefits of participating in this study. In addition to being able to contribute to the design of a better interface for social networking site, the participants were also offered a potential learning experience and $10 incentive for their participation in each session. In some instances, the participants did not accept the money as they were excited for the learning opportunity. All the study sessions were completed within a two-week time period. After meeting the personal connections at their homes or at the Harford County Library, some were further able to connect the researcher with senior friends for participation. The researcher also worked with the Harford County Maryland Senior Center for additional recruits on their premises.

The participants were categorized into one of the following two groups:

- Group 1: None to Basic Computer Experience
- Group 2: Intermediate to Advanced Computer Experience

Those in group 1 (None to Basic Computer Users) characterized themselves as having no computer experience or had engaged in light word processing, such as typing a document with little formatting; or using the internet to research information. Participants in group 2 had more computers experience, such as heavy word-processing

(i.e. adding images and paragraph formatting), paying bills online, programming, database usage, graphics-editing, and web development. The eligibility of the participant was verified by a computer experience group based on their response to a question in the demographic section of the pre-survey: How would you describe your computer experience? The researcher planned to have at least 8 participants in each group for the usability study. There was no special requirement regarding gender, education, employment, or social media experience, however, participants had to meet the age requirement of 65 years or older.

4.2.3. Collect Consent Forms

Prior to starting the study, participants were asked to read and sign a consent form which included the researcher's name, pursuing degree, contact information, dissertation title, and purpose of the research. In addition, the consent noted the participant's voluntary participation and confidentiality of information. The form was printed in large-text (18 pt. font); however, in some instances the researcher read aloud the consent form for participants with vision issues.

4.2.4. Create Test Environment

The baseline study consisted of a mock-up replicating the behavior of current social networking sites. Using Facebook as a basis because of its popularity (Alexa.com, 2014), the interface design was created using SnagIt and Photoshop. Simulation usage

was chosen so that the participants would not have to enter any personal information to create an account in addition to not violating Facebook's account creation policy. At no time were participants required to enter any information with the keyboard, however, some used the arrow keys on the keyboard instead of the mouse to scroll through a page.

InVision (2014), an online prototyping application, was utilized to host the prototype during the study. Participants completed the assigned tasks on a 1366 x 768 wide-screen laptop running Windows 7 and their input consisted of using the built-in or external mouse to move the cursor and to the appropriate hotspots.

The interaction of the screen during the usability session was recorded utilizing Camtasia (2014). This program ran in the background in order to track the activities. Timestamps from this video capturing software were used to verify recorded times of the stopwatch.

4.2.5. Collect Background Questionnaires

After receiving consent from the participants, a pre-test questionnaire inquiring about their demographics, previous work experience, computer experience, and social media experience was completed. The participants were given a copy of the large-text (18 pt. font) questionnaire while the researcher read aloud the questions and recorded their responses.

Demographic questions included their age, highest education level received, work experience and current working status. Next, participants were asked to describe their computer experience, subsequently categorizing them into two computer experience groups. This information was used to verify their designated group.

Additional computer-usage related questions were asked, such as their access to computers and the internet and their need for computer assistance. If they did not use a computer, they were asked the reasons preventing them from using it. The final section consisted of social media usage questions, such as their exposure, number of accounts, purpose, and difficulties experienced in the past.

4.2.6. Social Media Training

After collecting the background questionnaire, the researcher started a brief introduction to social media and discussed current social networking sites such as Facebook, Google+, LinkedIn, etc. Next, the researcher went over social media concepts which intimidated many of the participants due to their computer illiteracy and lack of social networking site experience. After the social media preface, the researcher adjusted the laptop, mouse, and chair to accommodate the participant. Those that had little computer experience were shown how to use the external mouse or alternatively asked to physically point to the correct area on the screen.

4.2.7. Complete Tasks

The baseline usability study included six main tasks:

- Task 1: Log into your account
- Task 2: Understanding the homepage
- Task 3: Understanding your profile
- Task 4: Navigating
- Task 5: Understanding and comprehending information on a profile
- Task 6: Commenting on other profiles

Each main tasks were further divided into a set of subtasks which resulted in a total of 52 subtasks (Appendix F) completed by the participants by clicking in the correct area.

There was no interaction between the participants and the researcher while working on the task. The participants were told at any point they may stop and move onto the next session if they did not want to proceed with the current task before the 3-minutes time limit for the session runs out.

During the session, the researcher manually recorded pass/fail outcomes, as well as the times (in seconds) for successfully completed tasks. The times and clicks were validated using the screen capturing software Camtasia. Although there was no discussion during the completion of the task, the researcher's observations for each task were recorded.

The following are the screen captures of the interface the participants utilized.

In task 1, logging into your account, participants were asked to click on the area where they would enter their username and password (Figure 6).
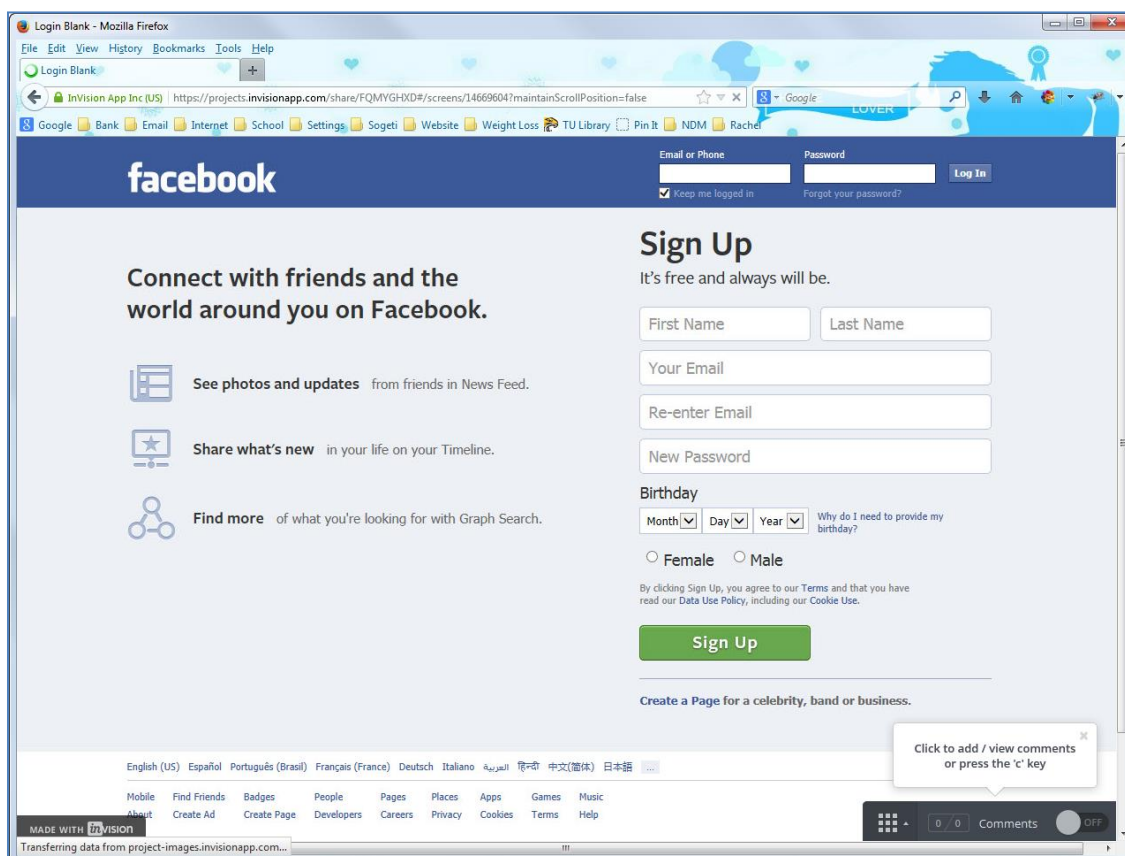
Figure 6: Phase 1 Login Screen

The next screen shows the user's homepage divided into three parts: the right-hand navigation, left-hand navigation, and body (Figure 7). During task 2, understanding your homepage, participants were asked to identify a number of areas on the homepage, such as the newsfeed, advertisements, and stories.

Figure 7: Phase 1 Homepage

Task 3 asked questions pertaining to the user's profile page, such as identifying

the posts section and understanding their sequence (Figure 8).
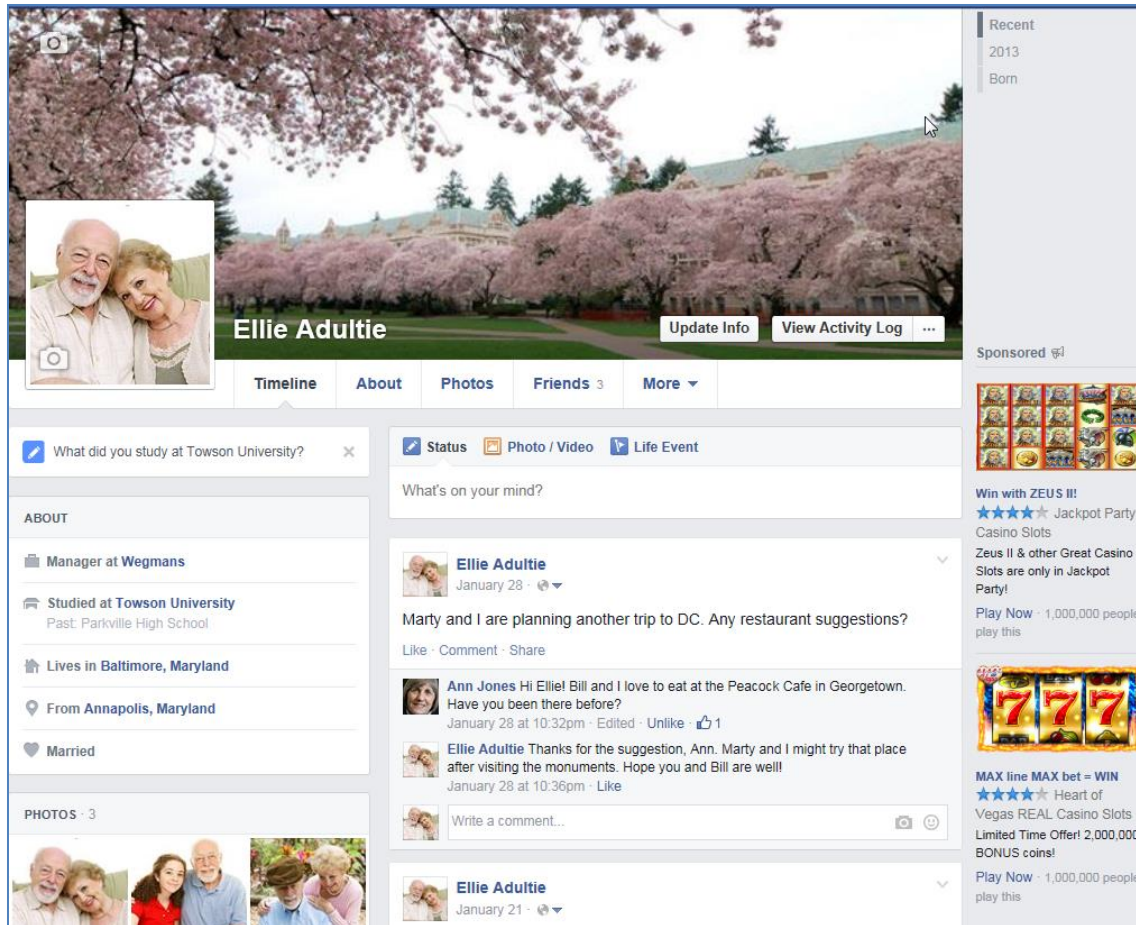
Figure 8: Profile Page

The homepage also housed additional functionality, such as commenting, tagging, and searching for friends. During task 4, participants were asked to identify the notification button to view messages regarding their profile's activity (Figure 9).
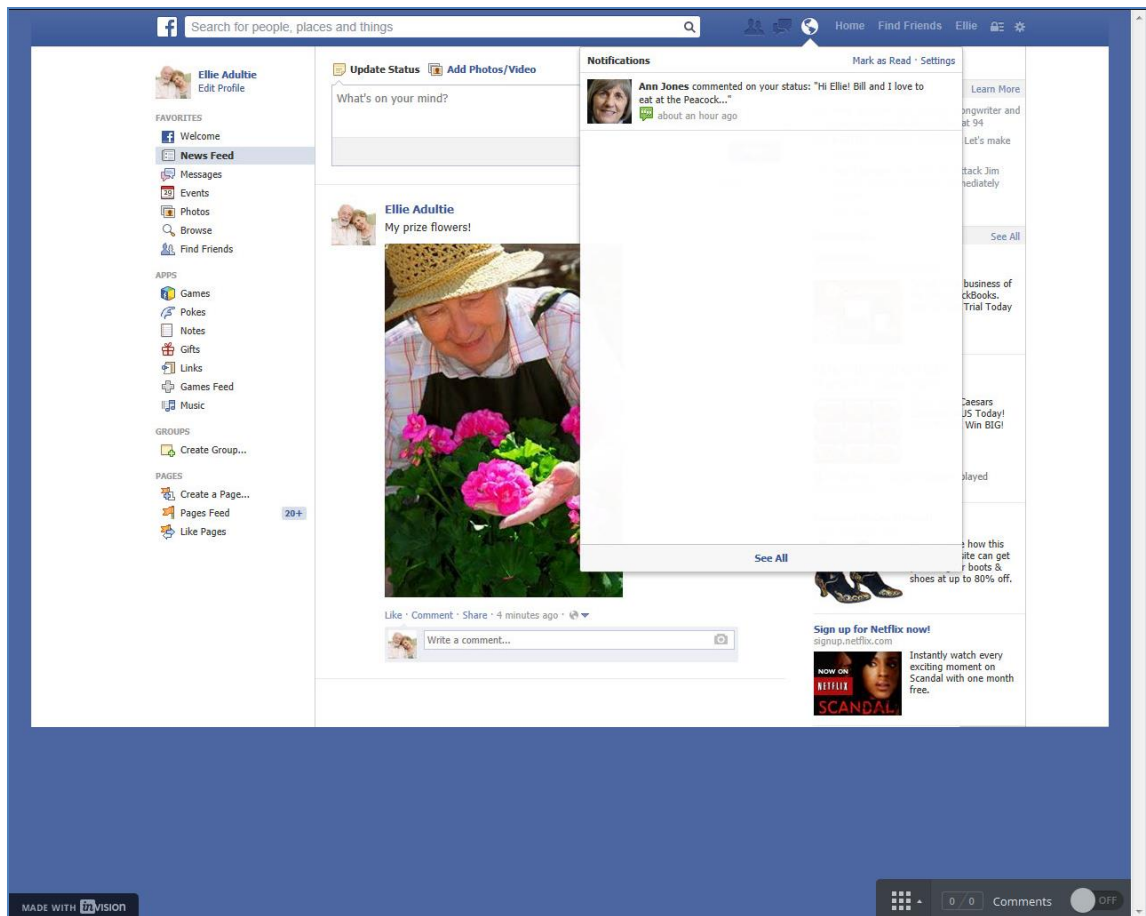
Figure 9: Phase 1 Notifications

During this task, searching for friends, viewing photos, and commenting on posts were

additional activities on the user's profile page. Similar tasks were asked on the user's

friend's profiles. During task 5, participants were asked to identify their friend's lists,

photos, and interests (Figure 10).

Figure 10: Phase 1 Eldie Adultie Profile

Task 6 required participants to engage in social media activities such as writing

on walls or tagging friends. In some instances, they were asked to complete a task in

more than one step. For example, to complete the tagging task, participants were

required to click on the tag button and the tag recipient list (Figure 11).
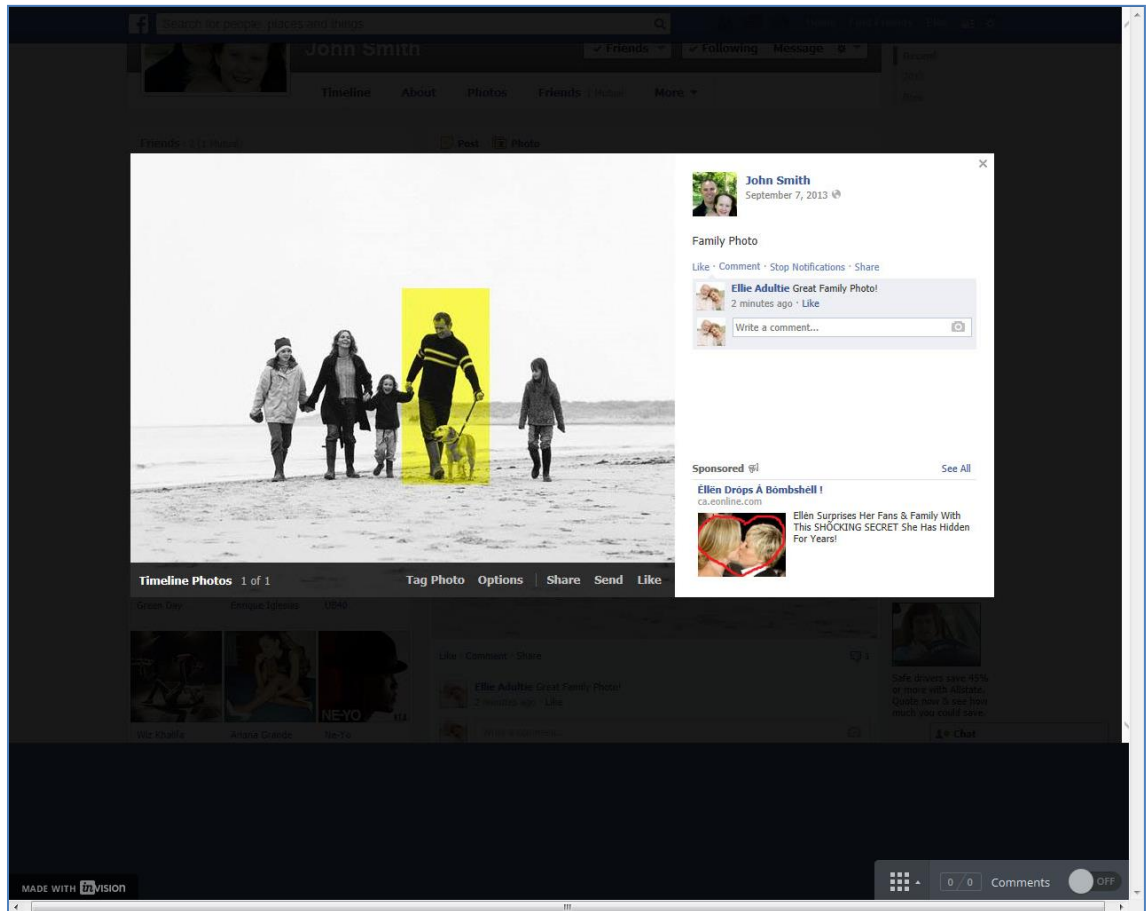
Figure 11: Phase 1 Tagging

In some instances, participants had different options to finish a task. When

asked the type of music they enjoyed, participants had the option to click on the user's

profile page or the user's "About" page (Figure 12).

Figure 12: Phase 1 Friends List

4.2.8. Post-Test Questionnaire

After completing the tasks, a post-test questionnaire was conducted for participants.   Similarly to the pre-test questionnaire, participants were provided an 18-pt. large print copy; however, the researcher read aloud all questions and recorded all responses.

Elders ranked their overall experience using the current site as well as their feelings toward the general tasks. They were asked to choose if they experienced any difficulties from a list of possible choices, such as font-size, colors, layout, and navigation issues. A Likert scale was also used to rate the overall ease of the interface for each task, such as tasks related to logging into their account, understanding their homepage, navigating through the site, and understanding and commenting on profiles. Additionally, open-end questions inquired the aspects they liked, disliked, and suggested improvements. Elders were welcome to respond about images, layout, and other features experienced. The entire session ranged from 30-90 minutes.

4.2.9. Data Collections

This study collected and recorded qualitative and quantitative data. The goal of using both research methods was to "gain an understanding of underlying reasons and motivations" and to "quantify data and generalize results from a sample to the population of interest" (SnapSurveys.com; 2013). Using these explorative techniques, the researcher

hoped to gain a deeper understanding for further studies regarding elder adult social

networking site design.

Data sources of the study included the pre-test and post-test questionnaires, the

task completion status, completion times, observations, and the video screen captures

(Table 8).

Table 8: Data variables, sources, types, and measurements

Variable	Data Source	Type of Data Collected	Analysis Method
Demographics (Age, Sex, Work, Computer, and Social Media Experience)	Pre-test Questionnaire	Quantitative	Frequencies (Average, and Standard Deviations for age and years of experience).
Perceptions (Social Media)	Pre-test and Post-test Questionnaire	Quantitative	Frequencies
Perceptions (Social Media)	Pre-test and Post-test Questionnaire open-ended questions	Qualitative	Content coding
Performance (Task Completion Failure Rate)	Manual recording	Quantitative	Frequencies and percentage of Pass/Fail tasks
Performance (Task Completion)	Observations	Qualitative	Coding
Performance (Task Completion Time)	Manual recording and stopwatch	Quantitative	Average time and standard deviation of completion status and time
	Time Stamp on Screen Captures	Quantitative	Verification Purposes

The data collected gauged how fast and successfully a task could be completed by the participant using the current interface.

4.2.10. Data Analysis

Quantitative analysis such as descriptive and inferential statistics were calculated to describe and compare the data collected.

The frequencies were calculated to understand the distributions of categorical/nominal data, such as completion success pass/fail rates. The mode and frequency was calculated for ordinal data, such as computer and social media experience levels.

For the interval data, such as the completion times, the median, arithmetic mean, and standard deviation were used to measure the central tendency.

In addition, statistical comparisons on non-normally distributed data were completed through nonparametric tests.   For example, to compare the task performance in terms of tasks completion time between group 1 and group 2, the Mann Whitney U Test was applied. In addition, the Chi-Squared test was used to compare the success and failure of task completion between the two groups.

Content analysis was applied to the researcher's notes as well as the answers from the open-ended questions. During this analysis, data was coded and then analyzed for further exploration.

To address the weaknesses of interpretation, the wording and behavior was independently analyzed by two research assistants with social media experience working as coders. Prior to coding the scripts, they were trained in order to understand the meaning of the codes and the method of applying the codes to the transcript. The sample contained sentences randomly extracted from the research data set, and served as the training materials for the coders. During the training, two coders were instructed to highlight the phrases in the script and identify a category for it. If the coder was not sure which category the highlighted text belonged to, they would write down the category they thought the highlighted text matched the closest, and then they would write down all the category they thought the highlighted text may belong to. After explaining how to do the coding, each coder coded the training material individually.

The codes were then compared. When a disagreement was identified between the two sets of codes, the coders meet and discussed how they determine their code until a consensus was reached. This process continued until the coders felt confident that they understood the meaning of each code and how to properly identify lines that represented the codes in the sample data.

After the training exercise was complete, to the satisfaction of the two coders, the actual transcript was coded.

Cohen's Kappa was calculated to determine the agreement between the coders after the codes were done. A Cohen's Kappa of 0.7 or greater was considered as being acceptable level of agreement.

4.2.11. Summary

This study addressed the research questions posed in the beginning of this section. In order to understand how well participants interact with social media, the participants were asked to complete common activities found on social media. In addition to task completion time and accuracy results, the pre-test and post-test questionnaires added insight to the accessibility and usability issues experienced by the participants. This study also addressed whether computer experience plays a role in an elder's social media experience by categorizing elders into two participant groups. The information from this phase was collected and used as a baseline comparison to the third phase of the usability study.

4.3.   Phase 2: Prototype Development

Phase two involved the development of a usable and accessible social networking site interface. To address the research question, "How should a social networking site interface be designed to improve accessibility and usability for elder adults?", the design of this new prototype was based on the literature review and findings from phase 1's baseline study. This included the preferences and suggestions noted by the participants.

It also considered the accessibility issues elders can experience due to deteriorated health impairments. Two versions were offered with the same redesign concepts, with the exception of the main navigation buttons found either on the top or left-side of the page.

The mock-up of the new prototype was created using screen captures from SnagIt as well as text and graphic elements created in PowerPoint. Images were then manipulated in the photo-editing software, Photoshop. The final screens were then uploaded to the prototyping software InVision.

4.4.   Phase 3 Research Design

In June 2014, a final usability study was conducted to evaluate the redesign of a social networking site website for the accessibility and usability of elders. The research during this phase followed the same procedures as in Phase 1, such as the same participants, training, and data collection and analysis, except completing the tasks utilizing the new prototype. However, there were noted differences for the test environment, completed tasks, and questionnaires.

4.4.1. Complete Tasks

Phase 3 had two different versions of the newly designed prototype, with the sub-navigation residing either on the top or left-hand side. To ensure unbiased results, half of the participants were randomly assigned to start with the top navigation design of the prototype, and the rest started with the left-hand navigation design.

Since the scrolling functionality was removed from the prototype, two tasks involving scrolling used in phase 1 were removed. In addition, five new tasks were added to address the learning activities found on the new prototype. These included navigating to the "Learn" button and searching for social media terminology.

4.4.2. Post-Test Questionnaire

In addition to the questions asked in phase 1, participants were asked which prototype seemed easier to use overall and which social networking site they preferred to use in the future, with the choices being the first application from the baseline study, or versions 1 or 2 from the final usability study.

4.4.3. Summary

The purpose of phase 3 was to evaluate the redesigned social networking site prototype to see if there were any improvements in task performance comparing to the ones using the original design. The completion time and status results, in addition to the questionnaires from the first and final phases were used to answer the final research question, "Does the redesigned prototype (Phase 2) improve accessibility and usability for elder adults"? In addition, the results of this phase were used to evaluate whether the level of computer experience has any impact on the successfulness of completing tasks on social networking sites.

5.   DATA ANALYSIS

5.1.   Introduction

This chapter presents the data analysis based on the data collected throughout the three phases of this dissertation. The results from the baseline study (phase 1), including the pre-test questionnaire, post-test questionnaire, and task performance results are first discussed. Next, the prototype design considerations and implementation (phase 2) are examined. Finally, the results of the final usability study (phase 3) are calculated and compared to the findings of the baseline study.

5.2.   Phase 1: Baseline Study Results

The following section reports the analysis of the data gathered during phase 1 (baseline study). Data was collected from the pre-test questionnaire, task performance results, and the post-test questionnaire. A summary of the results are discussed at the end.

5.2.1. Individual Characteristics

A total of 22 elderly aged 65 or older participated in this study. Ten (45%) of the participants were males and 12 (55%) were females. The average participant age was 73, with the youngest being 65 and oldest being 89 years old. More than half of the participants (14, 64%) continued their education past high school, including undergraduate (7, 32%), graduate (5, 23%), and doctoral degrees (2, 9%). Fourteen (64%) of the participants were retired and not working, with the remaining retired and

working part-time (3, 14%), retired and working full-time (1, 5%), non-retired and working full-time (3, 14%), and one participant that had never entered the workforce (5%). Sixteen (73%) of the participants with an employment history used a computer at some point during their working career.

Regarding computer experience, participants identified themselves as either having no computer experience, little to basic, intermediate, or advanced computer experience. Based on their answer to this question, the participants were then categorized into one of two groups: none to basic (group 1) and intermediate to advanced (group 2). In group 1, one participant identified himself as having no computer experience, while the remaining ten participants had some experience, such as surfing the internet and light word processing. Group 2 had four participants that considered themselves intermediate users that were able to do heavy word processing, spreadsheet and presentation software usage, paying bills online, or advanced online research and database usage. The seven remaining participants considered themselves advanced users, with experience with graphics editing, programming, database management, and web development.   A majority of the participants from group 1 used a computer at least several times a week (4, 36%) to daily (5, 46%). Only a small amount (2, 18%) used a computer yearly or not at all. All participants in group 2 used a computer in their daily lives.

Although many had some sort of computer experience, their social media experience was lacking. Of the participants in group 1, four (36%) had no social media

experience, five (45%) had little exposure either from watching someone use the application or personally using it less than five times, two (18%) were able to view pictures, read messages on walls, visit profiles, comment and post on walls and pictures. Of participants in group 2, a little more than half (6, 55%) considered themselves as advanced users while the rest (5, 45%) had none-to-little experience. Surprisingly, even though participants in group 1 reported having none to basic experience in social networking, a larger amount of them had social media profiles (6, 55%) compared to four (36%) in group 2 who reported to have social media profiles. When asked why the members in group 1 possess social media profiles while reporting having little experience using it, many participants explained that a family member or friend set-up the account for them; however, they indicated they did not use it.

The data analysis on the background information indicated that the participants in this study represent an array of elder backgrounds for unbiased results. This includes a diverse age range of elders with a number of different work, computer, and social media experiences.

5.2.2. Task Performance Results

The success status and completion time in seconds for each participant was recorded during the baseline usability sessions. The frequencies and percentages of the participants who passed each task (success rate) were calculated for group 1 and group 2 (Appendix T).

The subtasks for each designated task were grouped together to represent one task. Each group's average time, standard deviation, and the success rates for each main task are presented below in Table 9.

Table 9: Phase 1 - task completion time and success rates of main tasks

Task	Average Task Completion Time in seconds (standard deviation)		Success Frequency (Success Rate)	
	Group 1	Group 2	Group 1	Group 2
Task 1: Logging into your account	4 (4.3)	5 (7.9)	2 (18%)	8 (72%)
Task 2: Understanding the homepage	9 (11.48)	2 (2.17)	2 (18%)	3 (27%)
Task 3: Understanding your profile	(N/A)	3 (2.78)	0 (0%)	2 (18%)
Task 4: Navigating through the site	24 (11.0)	3 (2.19)	1 (9%)	2 (18%)
Task 5: Understanding information on a profile	6 (5.54)	3 (3.24)	5 (45%)	6 (55%)
Task 6: Commenting on other profiles	(N/A)	(N/A)	0 (0%)	0 (0%)

In some instances, a subtask's success depended on the outcome of the previous task. For example during task 1, logging into your account, subtask 1 required the participants to click on the username field before proceeding to the next subtask. In those instances where subtask 1 was not completed successfully resulted in a failure for the main task when the success rate for the main task was considered. These results are shown in the table above (Table 9).

For group 1, task 5, understanding information on a profile, had the highest success rates. For group 2, task 1, logging into your account was most successful. On the other hand, commenting on profiles (task 6), understanding your profile (task 3) and navigating through the site (task 4) had the lowest success rates (for both groups).

On average, participants completed most of the main tasks within 10 seconds on average except for participants in group 1 while working on tasks 4 (navigating through the site). The detailed results of the participants' task performance on all the subtasks, including the average task completion time and success rates, can be found in Appendixes K, L, and T.

Due to the low success rate for the main tasks, a more detailed analysis on subtasks was conducted. The subtask(s) served as gatekeepers that led to the failure of the participants. Table 10 shows the subtasks that presented the most problems for the participants. None of the less experienced participants were able to complete the task which required them to identify the location for posting comments to a photo. For several of the sub-tasks (e.g. identify link for viewing notifications, tagging a photo), only one participant was able to successfully complete the task. Therefore, there was no standard deviation for those specific sub-tasks.

Table 10: Phase 1 problematic sub-tasks

Sub-Task	Average Time for Completion in Seconds (standard deviation)		Success Rate (Percentage)	
	Group 1*	Group 2**	Group 1	Group 2
Click the appropriate link to go to your profile page	37 (N/A)	13 (16.8)	1 (9%)	3 (27%)
Click the appropriate link to view notifications	30 (N/A)	9 (8.3)	1 (9%)	3 (27%)
Click where you would leave a comment on John Smith's family photo	N/A(N/A)	8 (10.6)	0 (0%)	2 (18%)
Demonstrate how you would tag John Smith in his family picture	33 (N/A)	17 (N/A)	1 (9%)	1 (9%)
Click where you would leave a new post on Ann Jones' wall.	10 (4.1)	15 (20.2)	4 (36%)	6 (55%)

Overall, the time that it took the group 1 participants to complete a task was almost double that of many completion times for Group 2 (on average). For example, finding the profile page link took a group 1 participant an average of 37 seconds to complete, almost more than double the time it took to be completed by group 2 (13 seconds). However, in both cases the success rate was low: group 1 (9%) and group 2 (27%).

A more detailed discussion on the task success rate and task completion time are presented in the following subsections. In addition, to verify whether there's significant

task performance difference between the two groups, non-parametric analysis was conducted regarding success rates and completion times.

5.2.2.1.   *Task Success Rates*

For each group, the task success rate was recorded by calculating the frequency and percentage of the successful completion attempts for each subtask. In addition, the completion times of the 52 tasks where compared between the two computer experience groups.

The results identified a number of tasks that were particularly difficult for group 1 participants. For example, the "login to your account" tasks included three subtasks: click where they would enter their username (subtask 1), click where they would enter their password (subtask 2), and click the log in button (subtask 3). When the participants were asked to click where they would enter their username, only three participants in group 1 (28%) successfully completed this task. However, in group 2, eight participants (72%) passed the same subtask. These results could have been due to group 2's familiarity with the expected location of the username field. However, once group 1 participants were familiar with the location of the username field, they were more inclined to successfully identify the password field to complete the second subtask. Only two individuals from group 1 failed to identify the password field on the screen after knowing where the username field is, potentially showing their learning during the process. Similarly, learning seemed to have also occurred with the task when the

participants were asked to identify the login button. Only one participant in group 1 failed to complete this task while all participants (11, 100%) in group 2 were able to complete this subtask successfully.

There were subtasks where the participants in both group 1 and group 2 had similar success rates; however, in each instance group 2's success rate was higher. For example, when asked to open the latest post in their newsfeed (subtask 6), seven (63%) of the participants in group 1 and eight (72%) in group 2 were able to complete it successfully. Following this subtask, when asked to read out loud the latest post in their newsfeed (subtask 7), six (54%) of the participants in group 1 and seven (63%) group 2 participants were able to complete it successfully.

In some cases, both group 1 and 2 had the same results. During subtask 26, participants were asked to identify where they would view photos. For both groups, 9 of the 11 elders (81%) were able to complete it successfully. Similarly, for subtask 48, when asked to demonstrate how to tag a person in a photo, both groups had 10 (90%) participants fail the task, with only one participant (9%) from each group completing it successfully. Task 49 requested the identification of fictional character John Smith's friend's list, which, resulted in 9 (81%) of the participants passing in each group.

There was one instance where there were no failures for both group 1 and group 2. During subtask 28, participants were asked to identify their friend's list. All participants from both groups were able to complete this task. The successfulness of this

subtask could be attributed to the Friend's list button location: in addition to the button's location next to the previous subtask's Photos button (subtask 26), the Friend's button was clearly visible in the top-center of the main navigation.

In very few instances, group 1 was more successful than group 2. During task 5, understanding and comprehending information on a profile, participants were asked to find information about a fictional character John Smith by answering questions, such as where he worked (subtask 37), lives (subtask 40), and his music preference (subtask 41). For these tasks, elders had the option to click on additional links to find the answer; however, the answers to the questions were also available on the current screen. During these subtasks, group 1 completed subtask 37 (11, 100%), subtask 40 (10, 91%), and subtask 41(11, 100%) better than group 2 did for subtask 37 (10, 91%), subtask 40 (8, 72%), and subtask 41(10, 91%)

The Chi-Square test was used for the comparison of the success rates between the two computer experience groups. P values of less than .05 were identified as significant.

Significant differences were found for subtask 2, click in the field where you would enter your username ($X^2(1) = 4.545$; p=.033), subtask 17, read out loud a title of an advertisement on the homepage ($X^2(1) = 4.889$; p=0.027), and subtask 22, read out loud your latest post ($X^2(1) = 4.701$; p=0.030). Therefore, higher levels of computer experience could have made a participant more successful when identifying the password field, finding an advertisement, and viewing additional posts.

5.2.2.2. *Overall Task Completion Time*

The arithmetic mean and standard deviation of the task completion time for each group was calculated to measure the central tendency. Non-parametric analysis was conducted to compare the performance of the two groups. The detailed results of these analyses can be seen in appendix Q.

The least time-consuming task for group 1 was subtask 10, click on a post to read the full story. This subtask took an average of three seconds to complete, compared to group 2's two seconds. The success of this subtask could be because of the previous subtask (subtask 9), in which the participant was asked to identify a post on the newsfeed. It is important to note that these particular subtasks (subtask 9 and 10) were sequential steps to complete a major task; therefore, the successfulness of sub-sequential tasks may highly depend on the success of a previous task.

The least time-consuming task for group 2 was subtask 38, find where John Smith went to high school. Participants were able to complete the subtask in an average of 1 second. However, it took the participants from group 1 at least 10 seconds to answer, possibly because the text font color was a light gray opposed to other pieces of content that were black or dark blue.

The most time-consuming task for group 1 was subtask 20, asking participants to click on the appropriate link to view their profile page. Within group 1, only one participant was able to complete this task, which took a total of 37 seconds. Group 2 had three participants complete this task in an average of 13 seconds, more than twice as fast as group 1. The low success rate and slow times could be attributed to group 1's lack of familiarity with a typical website layout's location of the links to accounts and profile pages.

The most time-consuming task for group 2 was related to terms that are associated to social media concepts. Subtask 48 asked participants to tag a photo in a series of 3 steps. Both groups had only 1 participant completed the task successfully, taking group 2 seventeen seconds to complete the request and group 1 thirty-three seconds to complete. The low number of successful completions and high completion time could be attributed to the fact that many participants, despite computer experience, are not familiar with Web 2.0 terminology. During the study, many elders brought up that they did not understand the terminology "tagging" or its purpose.

Additional time consuming tasks included subtasks 34 and 35, asking participants to demonstrate how they would search for someone by name (subtask 34) and then finding the appropriate connection to visit their profile (subtask 35). Both these tasks took group 1 participants 14 seconds on average to complete, while participants from group 2 took an average of 12 seconds for subtask 34 and 8 seconds for subtask 35.

From observations and post-test questionnaire questions, participants noted it took them a long time to complete these tasks because they did not know where on the screen they could find the search for friend's button. For subtask 35, participants complained of the unreadable friend name due to the dark background and white text highlight. Elders suggested inverting the highlight so that selected text would stand out.

Before comparing the task completion time between the two groups, a check on the normal distribution of each variable was performed. Because of the limited number of participants in the study and the non-normally distributive nature of the data, non-parametric analysis (the Mann Whitney U Test) was applied to compare the task completion time between group 1 and group 2.

The non-parametric analysis (Mann-Whitney U Test) showed that there was significant difference in the time spent on a set of subtasks between group 1 and 2. This result shows that the computer experience does play a role in the performance on tasks involving a social networking site. Detailed analysis result can be found in Appendix Q. The subtasks resulted in significant differences are discussed next.

For subtask 3 ($p=0.033$) and subtask 4 ($p=0.010$), the significant difference indicates that higher computer experience could have contributed to higher performance in completing the task that involves commenting on profiles and navigation. The Group 2's previous exposure to login pages housing usernames, passwords, and the submit button led to their higher performance in locating the elements for logging into a site.

Significant differences were also found in subtask 14 (p=0.042), open the latest post in the newsfeed by clicking on it, and subtask 17 (p=0.001), read out aloud a title of an advertisement on the homepage. Therefore, computer experience did have some positive impact in the timeliness of the task completion. Participants that had more computer experience were more familiar with scrolling, allowing them to find the last post in the newsfeed when it was not displayed in the first screen as well as typical advertisement locations.

The performance on clicking to view your friend's list (subtask 28) showed significant difference between the two groups (p=0.028) showing higher computer experience can lead to faster completion of the task. This could be attributed to participants with computer experience having a better understanding of the top navigation button as a source to new pages.

Unlike the previous tasks, all subtasks for task 4 (navigation), including clicking on the homepage, notifications, and search friend's link, showed no significant difference when comparing group 1 and group 2. This could partially be because of the low success rate of both groups for this task, as only 1 participant from group 1 (1, 9%) and two participants from group 2 (2, 18%) completed it successfully.

When comparing the times of group 1 and 2 for task 5, there were a number of subtasks that showed significance. The following subtasks asked questions referencing information on the "About" section on the profile page. When asked about where John

Smith went to college (subtask 39; p=0.020), the music he listens to (subtask 41; p=0.031), the movies he likes (subtask 42; p=0.012), the TV shows he watches (subtask 43; p=0.00), and books he reads (subtask 44; p=0.002), the familiarity of computers could allow for a participant to locate information on a page faster than non-experienced users.

Finally, for task 6, commenting on profiles, subtasks 49 (p=0.038) and 50 (p=0.001), clicking links to find friends and go to a friend's profile page showed significant difference. Again, a participant with experience with search fields could possibly complete a task faster than a less experienced user.

5.2.3. Post-Test Questionnaire Results

After completing the tasks, participants were asked to complete a post-test questionnaire with follow-up questions regarding their experience with the simulated social media site (Appendix AD). Overall, four (45%) of the participants in group 1 felt that the simulated social media site was difficult to very difficult to use, while only one (9%) participant felt the site was easy to use. No participant thought the site was very easy to use, stating they needed more familiarity.

Although Group 2 had a little better performance using the social networking site, 28% from group 2 noting that the site was not easy to use, 36% with a neutral opinion, and 36% finding the site easy-to-very easy to use.

When asked to choose all the problems from a list of choices with the site they interacted, 73% of participants in group 1 chose having trouble with the navigation and 45% complained about the small font size.   These items were also selected by participants in group 2; however, they did not have as much issue with the navigation (64%) or font size (27%). Overall, problems mentioned by both groups included text that was too small (36%), lack of contrasting text and background colors (50%), and difficulties understanding the layout and navigation (68%).

When asked their opinion about the tasks they performed, both the less experienced (55%) and more experienced participants (63%) felt that logging into the social networking site and understanding information on a profile was neutral to very easy (Figure 13, 14).

Logging into your account

(bar chart with y-axis from 0 to 6; categories: Very Difficult, Difficult, Neutral, Easy, Very Easy; legend: Group 1, Group 2)
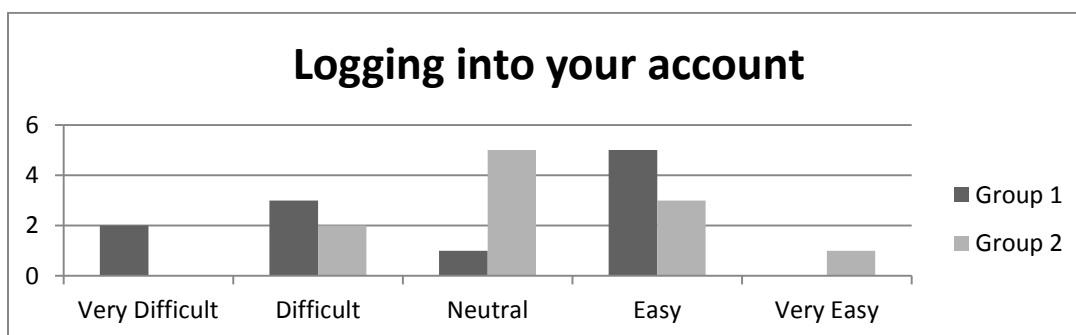
Figure 13: Perception comparison between the two groups on the task of logging into your account

Understanding the profile page
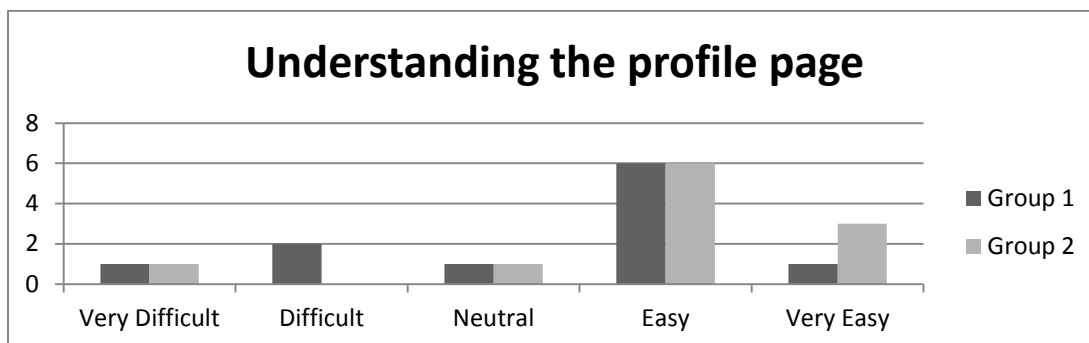
Figure 14: Perception comparison between the two groups on the task of understanding the profile

However, more than half of participants in both groups found that tasks associated with understanding the homepage, such as identifying posts (group 1: 55%, group 2: 64%) as well as navigating through the site (group 1: 64%, group 2: 55%), were difficult to complete because of the complexities in identifying/locating the correct button or area for the action (Figure 15, 16).
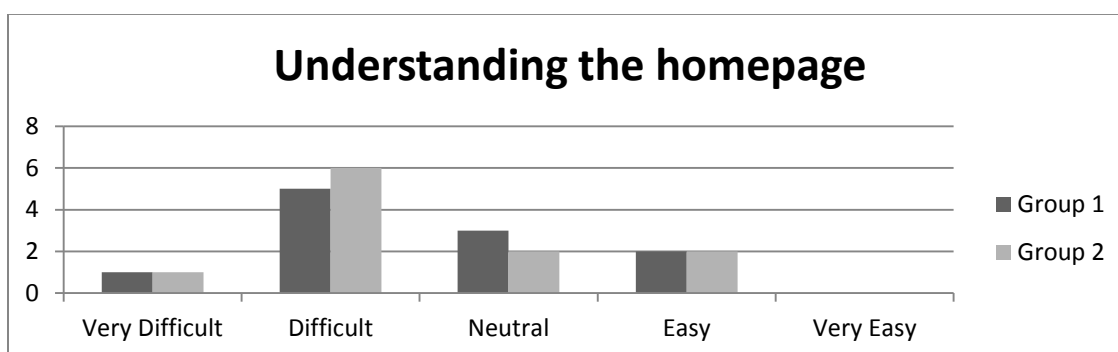
Understanding the homepage

Navigating through the site
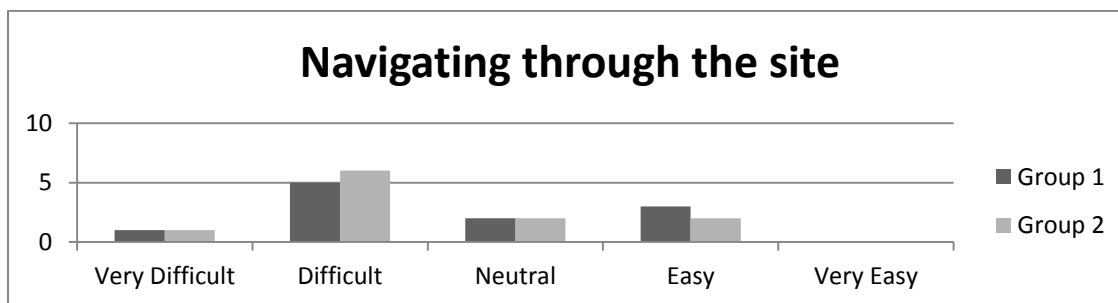
Figure 16: Perception comparison between the two groups on the task of navigating through the site

The majority of both groups (group 1: 63%; group 2: 54%) also agreed that commenting on profiles, such as writing a new post or commenting on pictures was difficult to very difficult (Figure 17).

Commenting on profiles
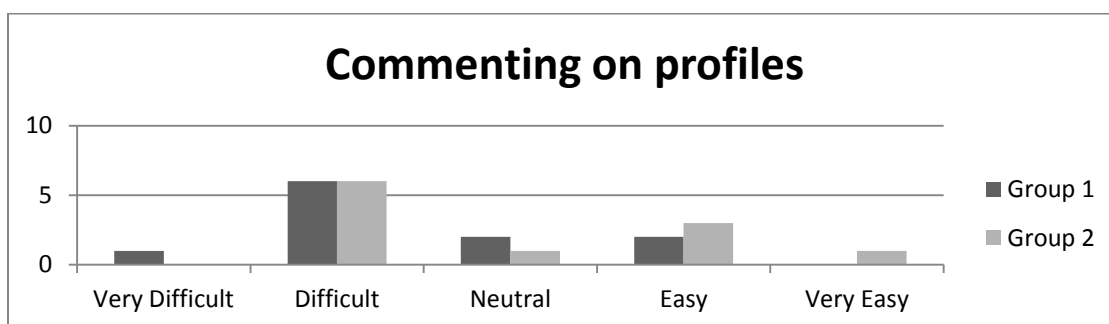
Figure 17: Perception comparison between the two groups on the task of commenting on profiles

Despite their inexperience, the majority of participants with less computer experience felt more comfortable with the tasks compared to the more experienced users. Based on the open-ended questions in the post-test questionnaire, the less experienced participants reported that they felt more confident interacting with a computer when sitting next to an experienced computer user.

Participants were also asked what could be done to improve social networking site usage. In addition to alleviating the issues mentioned above, the participants suggested:

- highlighting important words,

- incorporating an appendix or other feature defining Web 2.0 terminology,

- removing extraneous options such as groups, pages, and tagging, and

- using consistent layout, navigation, and terminology.

Furthermore, the majority of the participants discussed the need for training. For example, when the participants were asked to identify where they would click to view their account's notifications, many did not know how to proceed, asking "*What's a notification?*" Other examples of Web 2.0 terminology confusion include the term "*posts*", as one participant explained that during her era, posts were associated with postal mail.

The Chi-Square test was used for the comparison of the perception between the two computer experience groups. The results show no significant difference between the two groups regarding perception of the difficulties of the main tasks (Appendix AD).

5.2.4. Summary

Phase 1 of this study demonstrated that the elderly experience a number of usability and accessibility issues when using social media. Despite the results showing that more experienced computer users complete tasks faster and more successfully than

less experienced users, participants from both groups felt that the current social networking site is difficult to use. Complaints included problems with the format and interface, navigation, and web 2.0 terminologies.

Many elders have the desire to use a computer and the majority of the participants are interested in maintaining a relationship with friends, families, and other important entities through viewing photos or communicating through social networking. Based on this study, there is opportunity to redesign social media site interfaces to improve usability and accessibility for the elderly. Redesign considerations should include the suggestions noted by the participants, such as providing an option to use a larger font. In addition, considerations should include the reduction of features to reduce the cognitive load, as well as providing an intuitive layout and navigation, and training.

The results from this study were used as a baseline for the design of an improved social networking site interface prototype for the elderly. The detailed prototype design was discussed in next section.

5.3.   Phase 2: Prototype Design and Implementation

The following section describes design considerations taken during phase 2's prototype development. The recommendations, implementations, and summary are discussed next.

The baseline study established that a low number of participants use social media (19%); however, it was voiced that this demographic was interested learning how to use this type of technology. The first phase showed that elder adults, despite varying computer experience, have problems completing social media tasks, such as tagging, comments, and posts. In addition, layout and navigational questions, such as finding the notifications button or profile page link proved challenging and resulted in low pass/fail rates.

Based on these results, a redesigned social networking site interface prototype was constructed to accommodate elder adults utilizing social networking sites. To accommodate the elderly utilizing these types of websites, the following design considerations were implemented based on available guidelines as well as the baseline study, including the pre-test questionnaire, the task results (completion status, time, and observations), as well as responses from the post-test questionnaire.

Guidelines found in Section 508 Compliance (2014), WCAG 1.0 and 2.0 (2014), Usability.gov (2014), and Administration on Aging (AOA) (2006) were extracted as design criteria for the social networking site redesign for the elderly. The referencing mandates, guidelines, and best practices for each guideline are illustrated in Table 11 and explained further.

Table 11: Extracted criteria found in popular guidelines

Guideline Topic	Section 508 Compliance	WCAG 1.0	WCAG 2.0	Usability.gov	AOA
Accessibility	X	X	X	X	X
Formatting				X	X
Multimedia				X	
Training and Terminology				X	
Content and Objectives		X	X	X	X
Layout				X	
Navigation	X	X	X	X	

5.3.1. Accessibility

Accessibility of a website signifies that all types of users, including the disabled and elderly, should be able to use a website (Section 508, 2014, Usability.gov, 2014). All the guidelines in this study address accessibility concepts, such as providing text alternatives to non-text alternatives and having information that can be conveyed with or without color. In addition, information displayed on the redesigned site is recommended to limited scrolling and instead use pagination as many elders often fail to scroll down to view additional information displayed on the page (Fidgeon, 2006).

Therefore, the redesigned pages were constructed to reduce scrolling and instead incorporate pagination to view additional information on a page. This need was evident during the preliminary usability study, where many participants failed to scroll to
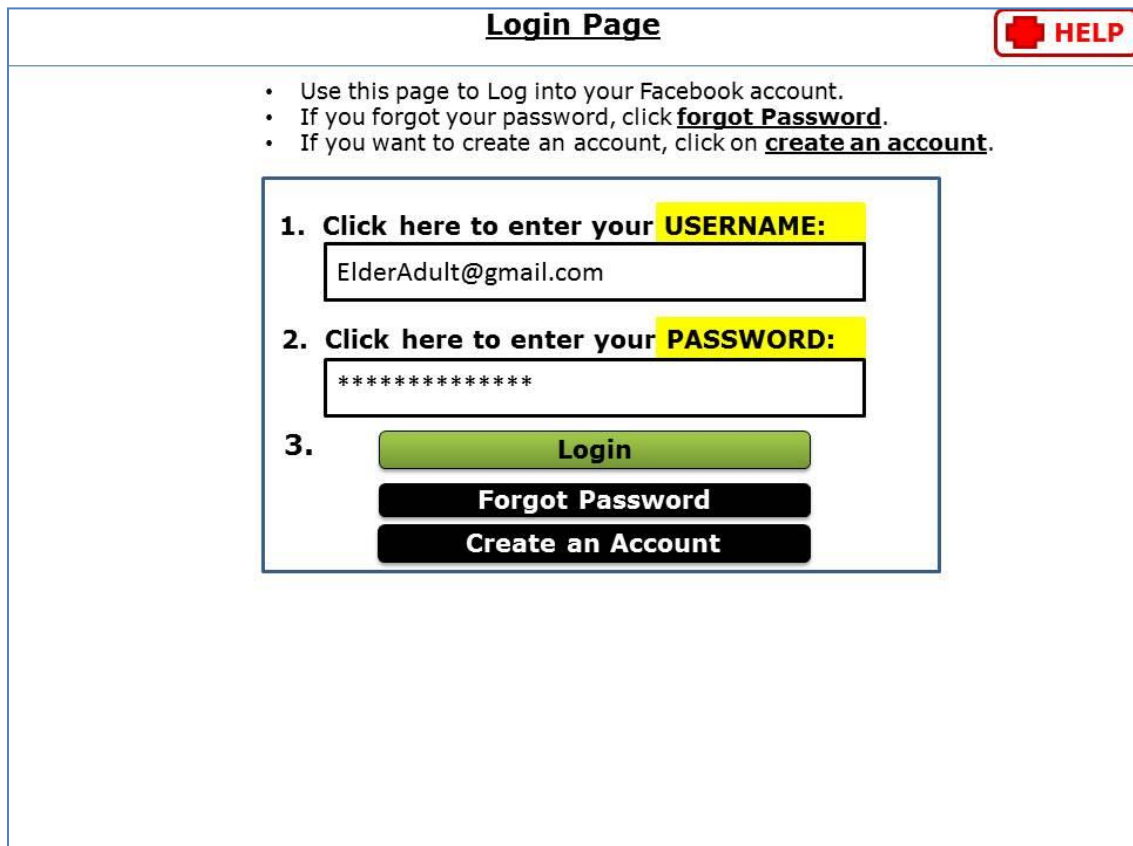
complete a task that required viewing more information not available on the current

screen. Also, the range of possible disabilities an elder can experience should be

considered, such as mobility, vision, or cognitive issues. In addition, each page was

designed so that it could be understood with or without the use of color.

5.3.2. Formatting

Text characteristics should be readable and facilitate communication for elders

(Administration on Aging, 2014). Usability.gov (2014) and AOA (2014) both suggest

formatting practices addressing text and color. For example, the guidelines suggest the

use of black text on a contrasting color. In addition, many studies reference elder adult's

preferences of larger text of at least 14 pt. serif font (Bernard, 2003). The use of patterns,

pastels, and similar colors for the foreground and background should be avoided as elder

adults have a particular trouble with these types of aesthetics (Becker, 2005; Bernard,

2001; Bernard, 2003).

Inappropriate font size, color, and type were concerns voiced by the elder adults

during the post-test questionnaire of the preliminary study. When completing tasks,

many were observed to move closer to the screen to read items. In some cases, the font

was so light that the participants were unable to answer content questions based on their

examination of the page. To combat these formatting issues, Verdana, a font made

specifically for electronic media was utilized and text on the page was displayed to be at

least 14 point font (Webaim.org, 2014). Gradients were avoided and text and buttons

were fashioned to contrast with the white background of the website. In some instances,

key words were highlighted for better visibility, such as the word "username" and

"password" on the login page (Figure 18).

Figure 18: Login Page

5.3.3. Multimedia

The use of images, graphics, and multimedia can accelerate learning and highlight

important features of a site (Usability.gov, 2014). Image use should be deliberate and the

usage of image maps should be obvious and labeled. In addition, thumbnails should be

considered as they provide a preview of an image without taking up space on a page (Usability.gov, 2014).

For the redesign, large images were avoided especially on the first screen of a page (Usability.gov, 2014). Images were used sparingly and only in meaningful situations, such as viewing photos, profile pictures, and advertisements.

5.3.4. Content and Objectives

Content should be able to be understood and navigable by the user (W3C, 2014). A major principle of WCAG 2.0 (W3C, 2014) states that content should be understandable and at an appropriate reading level. For example, a study regarding designing a portal for older users concluded that jargon and buzzwords were recognized barriers for elder adults (Janicki, 2002; Newell, Dickinson, Smith, Gregor, 2006).

The mock-up social network site had all pages equipped with instructions for elders to distinguish the purpose of a page. These directions were written in a straightforward and sequential manner. The organization of content was also scrutinized, so that information appeared clear and grouped in ways that made the interface more intuitive. For example, information pertaining to the user was grouped together, such as their favorite music, movies, and shows and flowed along with other personal information.   Also, many of the elder adults expressed that they were not interested in numerous activities offered by the social networking site and instead preferred to view

photos and communicate with friends by writing on people's walls. Therefore, a

simplistic approach was taken, and references to games, interest pages and groups were

removed from the prototype. In addition, familiar words were used along with jargon and

technical terminology. Also, buttons were used when possible as studies show that elder

adults prefer buttons over text and image links (Wagner et al, 2010; Riman, Ghusn, &

Monacelli, 2011; Emery et al, 2003; Lin, Neafsey, & Strickler, 2009). To take away any

confusion on the button's destination, specific keywords on the navigation buttons were

added, such as "Read Next Post" or "Read Previous Post" (Figure 19).
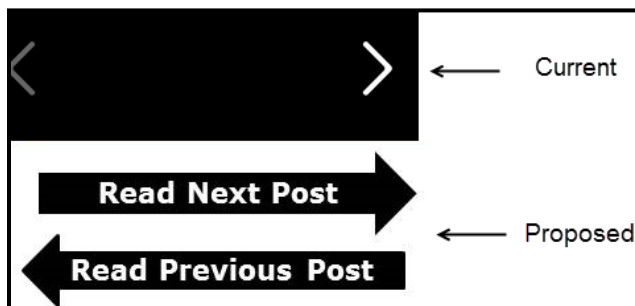
Figure 19: Comparison of Navigation Buttons

5.3.5. Layout

The layout of a site refers to the site's structure. The layout should be intuitive

with information grouped together, in addition to incorporating a palatable amount of

white space to avoid a cluttered appearance (Administration on Aging, 2014). A study by

Bernard (2002) showed that participants aged 66+ expected login fields to be specifically

in the upper-left corner of a webpage, while help features were expected in the upper-

right side. They also specifically noted that advertisements were expected to be found on

the top area of the website. This is in contrast to younger counterparts whom did not have a specific expected location for sign-in fields. In addition, elders expected the left-side of the webpage to hold navigation links, while younger users expected navigation links closer to the middle of the page.

Digital immigrants, people with little technology exposure in their youth, are used to viewing items in a serialized fashion. Therefore, the redesigned interfaces showed elements listed in a sequential fashion when possible on the site. Adequate whitespace was used and extraneous text and images were removed to conserve space and improve overall appeal.

The login page from Phase 1 had many different links which proved confusing to the elder adults during the preliminary study. During the phase 1 usability study, the first task had the elders logging into an existing account by entering their username and password. Instead of clicking on the top right corner's Login section, the users clicked the fields under the "Sign-Up" section. To eliminate this issue, the login page was designed to include instructions and the login and sign-up sections were split to two separate pages. In addition, the username and password fields were highlighted per the elder adult's suggestion of emphasizing important words.

To accommodate different preferences, elders were given two scenarios for the sub-navigation placement. Version 1 consisted of the sub-navigation placed at the top of

the page. For example, the figure below shows the read pervious post and read next post

arrow buttons at the top of the page (Figure 20).
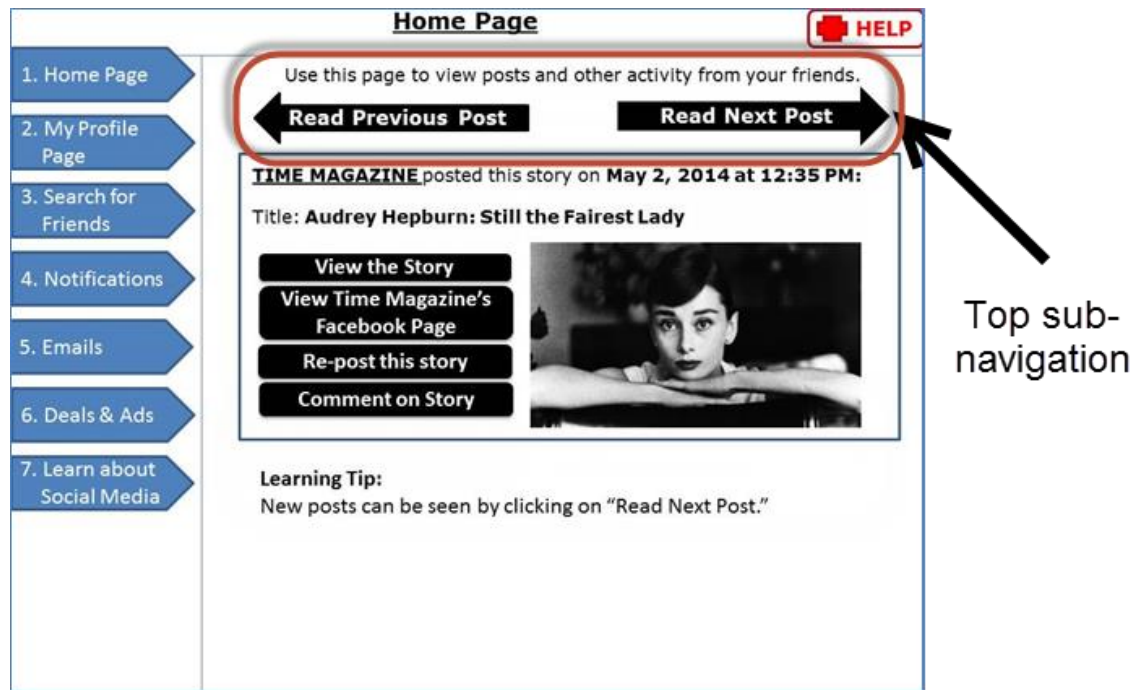
Figure 20: Top Sub-Navigation for Read Previous and Next Post Arrows

In the second version, the sub-navigation links were placed on the left-side of the

page. The figure below shows the read previous post and read next post buttons on the

side of the page (Figure 21).
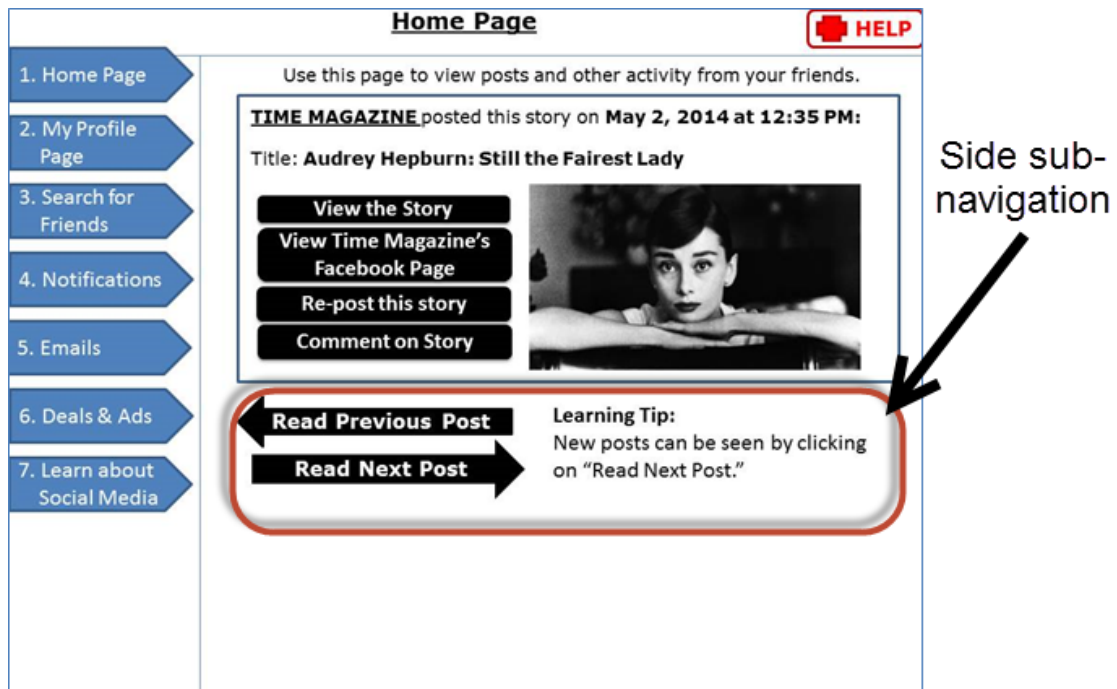
Figure 21: Side Sub-Navigation for Read Previous and Next Post Arrows

For both versions, the main content of the page was found at the center of the screen, while the help button was placed at the top-right per Bernard (2002). To facilitate an understandable layout, content was grouped together by an outlined box (Figure 22).
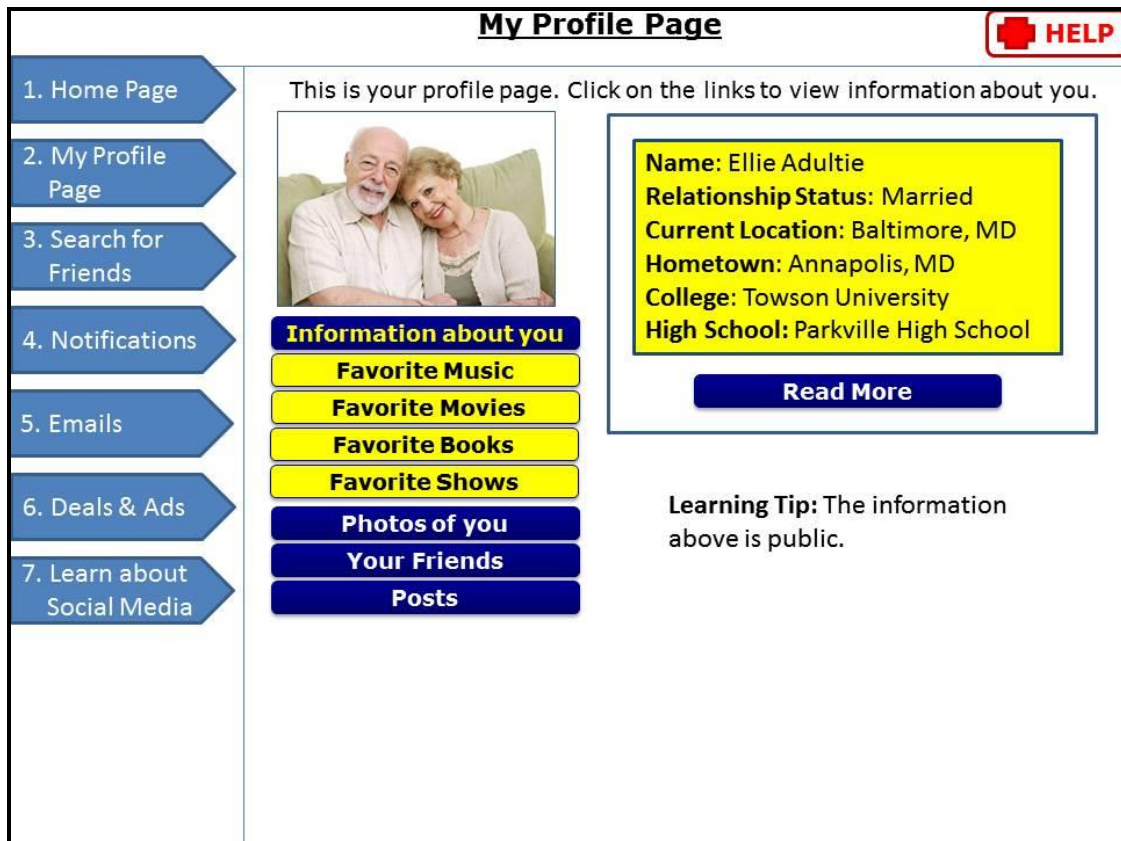
Figure 22: Profile page with grouped information

5.3.6. Navigation

Navigation elements need to be consistent throughout a website, while providing a destination with a few clicks (Administration on Aging, 2014). As elder adult's age, their memorization capacity decreases. Therefore it is imperative that a website's layout is intuitive and that the amount of clicks to complete a task is minimal. Elder adults find and process pages slower compared to younger users due to decreasing cognitive abilities. Therefore, the structure of the site should require tasks to be completed in less than three clicks (Administration on Aging, 2014). Also, pages, links, and headers

should be clearly labeled as many older users depend on these pointers to interact with a website.

To improve navigation, an overview of pages and activities was mapped. After the login page, the main pages included the home, profile, search for friends, notifications, emails, deals and ads, and the learning page. Afterwards, the subpages included common activities such as viewing a story or post, viewing a friend or company's profile page, as well as Web 2.0 trend activities such as sharing and commenting on a post, story, or profile. When navigating to the next story or photo, descriptive arrows were used to denote viewing past or future posts.

5.3.7. Training

Training can assist in the accessibility and usability of elders utilizing social networking by increasing trust and perception of these types of sites. Elders should be aware of the benefits as well as be knowledgeable to understand the reliability and validity of content. A study by Braun (2013) which included 124 elder participants aged 60 years and older concluded that as perceived usefulness and trust increased the intention of using the social media increased. In addition, a study by Xie and colleagues (2012) showed that training sessions for 10 adults aged 61 years and older improved the perception of social media for the elders. Therefore, it is imperative that training and learning be incorporated for elders participating in social media.

5.3.8. Computer Literacy

To address issues with computer illiteracy, the redesign incorporated a number of ways to facilitate learning for elder adults. Instructions were added to each page so that elders would understand the purpose of the page and its content. Tips associated with content from the current page were added as well, especially those that related to Web 2.0 terms. In addition, two separate pages "Help" and "Learn about Social Media" were added for independent learning and troubleshooting.

5.3.9. Negative Perceptions

The fear of compromised security and privacy is a barrier for elders who want to use computers, the internet, and social media. Therefore, the site was designed to be more transparent of each page's information, links, and intentions. For example, advertisements were given their own navigation tab and page, however, were labeled as "Deals and Ads" to spark elder adults looking for a deal or coupons.

In addition, each element was labeled clearly, and tips displayed on a page reminded the elders if the information displaying was public. For the redesign, personal information of an elder adult had a learning tip showing that the information displayed was of public view (Figure 23).

Figure 23: Notifications page

5.3.10. Summary

The above sections described a number of usability and accessibility best practices found within Section 508 Compliance (2014) WCAG 1.0 and 2.0 (2014) Usability.gov (2014), and AOA (2014). Accessibility and disability issues, formatting, multimedia, content, layout and navigation are extracted topics found throughout these guidelines. Training is also an important aspect as it increases trust and perception, therefore increasing the likelihood of usage for the elder adults who engage in social media. In addition to following guidelines, additional features such as a help and training section should be incorporated to assist elder adults that are not familiar with social media technology. Having a section dedicated to addressing Web 2.0 terminology allows

elders to be independent and to learn at their own pace. Regarding distrust of the online world, advertisements and other third-party sites should be clearly labeled so that elders are aware of what they are clicking.

Elder adults show an interest in utilizing social media; however, online elders account for the smallest demographic utilizing social networking sites. Therefore, an examination regarding the usability and accessibility of these types of sites was investigated through a literature review of elder adult usability studies and a preliminary usability study of elder adults utilizing an existing social networking site. It was the goal of this research to distinguish design factors that can improve the overall accessibility and usability for elder adults utilizing social networking sites.

It was concluded that a combination of methods can be implemented to improve the accessibility and usability of social networking site interfaces. Social media should be designed by utilizing existing best practices found in a variety of guidelines. However, a site should not use guidelines alone to guarantee the ease of use for elders. Other aspects should be reflected including design considerations addressing elder adult social media barriers such as computer illiteracy and negative perceptions.

5.4. Phase 3: Final Usability Study Results

The following section reports the results found during phase 3's final usability study with the newly designed social networking site interface prototype utilized by the

same participants from phase 1. The task performance results, post-test questionnaire, data analysis, and summary are discussed next.

5.4.1. Task Performance Results

Similar to phase 1, participants completed social media activities while interacting with a social networking site simulation. Based on the design considerations of phase 2, prototypes used in phase 3 offered either a top or side sub-navigation on pages that used sub-navigation links. In addition to the layout differences, an additional task, learning about social media, was added to evaluate a design consideration from phase 2. The final usability study (phase 3) captured the success rate and completion time in seconds for each task. Each group's average time to complete a task, standard deviation, as well as success rates are presented below.

Table 12 below shows the average time and success rate of tasks completed using version 1 (top sub-navigation) prototype.

Table 12: Phase 3: Task performance using top sub-navigation prototype

Task	Average Time for Completion in seconds (standard deviation)		Success Frequency (Success Rate)	
	Group 1	**Group 2**	**Group 1**	**Group 2**
Task 1: Logging into your account	2 (3.39)	4 (4.79)	11 (100%)	11 (100%)
Task 2: Understanding the homepage	5 (5.57)	5 (5.39)	8 (73%)	11 (100%)
Task 3: Understanding your profile	6 (6.88)	4 (3.88)	2 (18%)	8 (73%)
Task 4: Navigating	4 (3.65)	2 (1.81)	8 (73%)	10 (91%)
Task 5: Understanding information on a profile	3 (4.02)	4 (3.88)	11 (100%)	10 (91)%
Task 6: Commenting on other profiles	5 (6.02)	3 (2.60)	7 (64%)	7 (64%)
Task 7: Learning about Social Media	4 (4.04)	3 (3.59)	8 (73%)	10 (91%)

Table 13 shows the average time and success rate of tasks completed using

version 2 (side sub-navigation) prototype:

Table 13: Phase 3: Task performance using side sub-navigation prototype

Task	Average Time for Completion in seconds (standard deviation)		Success Frequency (Success Rate)	
	Group 1	Group 2	Group 1	Group 2
Task 1: Logging into your account	1(0.0)	1 (0.00)	11 (100%)	11(100%)
Task 2: Understanding the homepage	2 (1.30)	3 (3.85)	8 (73%)	9 (82%)
Task 3: Understanding your profile	3 (2.45)	2 (1.45)	4 (36%)	3 (27%)
Task 4: Navigating	1 (0.85)	2 (1.05)	8 (73%)	9 (82%)
Task 5: Understanding information on a profile	2 (1.25)	2 (1.37)	9 (82%)	8 (73%)
Task 6: Commenting on other profiles	3 (3.34)	5 (5.17)	6 (54%)	8 (73%)
Task 7: Learning about Social Media	2 (0.96)	2 (3.02)	9 (82%)	11 (100%)

Overall, both groups were successful in completing the tasks. For both groups and versions, participants achieved the highest success rate when logging into their account (task 1).

Additional successfully completed tasks were version 1's task 5. 100% of group 1 participants were able to complete tasks regarding understanding and comprehending information on a profile. For group 2, all (11, 100%) participants were able to complete task 2, understanding the homepage. In addition, when utilizing version 2, all participants from group 2 were able to complete task 7, learning about social media. Conversely, task 3, understanding your profile, had the lowest success rate for both

versions of group 1 and group 2 version 2. Task 6, commenting on profiles, had the lowest success rate for group 2 when using version 1.

During phase 1, the performance of the intermediate to advanced computer experience group (group 2) surpassed the performance of less experienced group (group 1) in most of the tasks. However, phase 3's results show that group 1 had higher performance than group 2 in a number of tasks. For version 1, logging into your account (task 1) and understanding information on a profile (task 5) were faster than group 2 by one second on average. For version 2, understanding the homepage (task 2) and navigating (task 4) were also completed on average one second faster than group 2. The faster times could be attributed to the easy to understand layout. For example, a participant from group 1 noted during the post-test questionnaire that "information was presented clearly and did not require [me] to search" after using the newly designed interface prototype. Another elder stated that buttons were in the general areas she expected to see them.

The following table shows phase 3's results of the five most problematic subtasks identified in phase 1 (Table 14). The same five subtasks that were the most problematic in phase 1 were also the ones with the lower success rate in phase 3. It is worth noting, even for these more problematic tasks, the majority of the participants were still able to complete them successfully. Overall, there was improvement from phase 1; however,

participants still experienced issues with web 2.0 concepts, such as the concept of

tagging.

Table 14: Phase 3 Version 1 and Version 2 results on phase 1's most problematic subtasks

Phase 3, Version 1				
	Average Time for Completion in seconds (standard deviation)		**Success Frequency (Success Rate)**	
Sub-Task	**Group 1***	**Group 2****	**Group 1**	**Group 2**
Click the appropriate link to go to your profile page	3 (1.27)	2 (0.73)	11 (100%)	10 (91%)
Click the appropriate link to view notifications	4 (2.84)	1 (0.92)	11 (100%)	11 (100%)
Click where you would leave a comment on John Smith's family photo	5 (4.24)	3 (3.16)	10 (91%)	10 (91%)
Demonstrate how you would tag John Smith in his family picture	10 (3.55)	8 (4.46)	9 (82%)	8 (73%)
Click where you would leave a new post on Ann Jones' wall.	3 (2.08)	1 (0.65)	9 (82%)	11 (100%)

Phase 3, Version 2				
	Average Time for Completion in seconds (standard deviation)		**Success Frequency (Success Rate)**	
Sub-Task	**Group 1***	**Group 2****	**Group 1**	**Group 2**
Click the appropriate link to go to your profile page	3 (1.27)	2 (0.63)	11 (100%)	10 (91%)
Click the appropriate link to view notifications	4 (1.79)	2 (0.81)	10 (91%)	11 (100%)
Click where you would leave a comment on John Smith's family photo	5 (4.24)	3 (4.62)	9 (82%)	11 (100%)
Demonstrate how you would tag John Smith in his family picture	10 (3.55)	10 (4.21)	7 (64%)	8 (73%)
Click where you would leave a new post on Ann Jones' wall.	3 (2.08)	2 (3.60)	11 (100%)	11 (100%)

There was drastic improvement regarding the subtask asking the participant to leave a comment on John Smith's family photo. Previously, none of phase 1's group 1 could complete this task because they did not scroll to view additional information. However, the redesign removed scrolling completely from the interface, resulting in the participants increased visibility of the comment's box.

When asked to identify the link to go to their profile page, phase 1's results were low, with one (9%) participant from group 1 and three (27%) from group 2 successfully completing the task. A consideration of the phase 3 redesign identified labeling all items

clearly and consistently. The results show that both groups had a large improvement, with 100% of group 1 and 94% of group 2 completing it successfully.

A number of task completion times and success rates were improved with the development of the redesigned interface prototype. To illustrate this further, the frequencies and additional statistical calculations are discussed next. Additionally, nonparametric analysis between the two groups in phase 1 and phase 3 are discussed.

5.4.1.1. *Phase 3 Task Success Rates*

For each group, the success rate and frequencies of successful completion attempts for each subtask were captured. The two computer experience groups' completion times and success rates were collected for the 52 subtasks.

Overall, the results showed a positive outcome. In many subtasks, all participants were able to complete the task successfully. For example, during subtask 9, read out loud the title of another post in your newsfeed was completed by all group 1 and group 2 participants using both versions of the prototype. For subtask 29, all participants were able to read out loud one of their friend's names. Regarding navigating, subtask 32 (go to your homepage) and subtask 34 (identify where they would search for someone by name) was completed by all participants. For subtasks 37, 38, 43, and 44, questions about John Smith were able to be answered by all participants in both groups in phase 3. Finally, all were able to identify where to search for a term (subtask 54).

There were a number of tasks where the participants in both group 1 and group 2 had similar results. This includes both versions of subtask 6, where 10 participants (91%) in group 1, using version 1 and 11 participants (100%) of group 2 using both versions were able to identify the latest post in the newsfeed.

Problematic tasks still occurred, such as with subtask 24, where elders were asked to view information about themselves. Most elders did not realize they were on the profile page with the information sub-navigation indicating "information about themselves". When using version 1, five (45%) of group 1 and nine (82%) of group 2 elders were able to complete the subtask successfully. Explaining the failure, the participant told the researcher that they had expected to see the button in the main navigation by clicking on "profile page". This task did not affect version 2, as nine (82%) of group 1 and eleven (100%) of group 2 successfully completed the task. One elder said they were able to see the button because their eye was already looking at the subtask menu. Regarding this problematic task, group 1's success rate stayed the same (5, 45%) and a slight improvement for group 2 (8, 72%) was observed.

The Chi-Squared test was used for the comparison of the success rate between phase 3's two computer experience groups. For version 1, some significant differences were found when comparing the group 1 and group 2's completion of a task. Subtask 17 ($X^2(1) = 15.387$; p=0.031) asked the participant to read out loud an advertisement on the homepage. Similar to phase 1, many experienced computer users would have a better

understanding on where to look for this option if the advertisements were clearly labeled. Similarly, for subtask 28 ($X^2(1) = 13.074$; p=0.042), the participants were asked to view their friend's list. Those that were familiar with the concept of a friend's list could have had an idea to look for the criteria on the main navigation.   Continuing with subtask 29 ($X^2(1) = 6.667$; p=0.036), those elders that know where the friend's list would also be able to successfully answer the next question, read out loud the name of one of your friends.

For subtasks 36 ($X^2(1) = 13.074$; p=0.041) and subtask 40 ($X^2(1) = 11.120$; p=0.049), significant difference was found when completing questions based on the About page. Many elders with computer experience would be familiar with this typical type of page.

Subtasks 54 ($X^2(1) = 13.600$; p=0.018), searching for a term, and subtask 55 ($X^2(1) = 13.176$; p=0.022), clicking on the definition of tagging, showed some significant difference with computer experience, as a more familiar computer user would have less trouble identifying on computer terminology and search terms. For version 2, Chi-Square test also showed fewer significant differences between the two computer experience groups. These include two tasks: subtask 29 ($X^2(1) = 6.667$; p=0.036), which is discussed above, and subtask 50 (($X^2(1) =2.828$; p=0.027), asking the participant to go to Ann Jones profile page. The lack of significant differences could be because of the both group's familiarity with sidebar navigation. Overall, computer experience had some

part in the successful completion of a number of tasks during the redesign; however, computer experience is less of a factor compared to the phase 1's simulation of a current social networking site.

5.4.1.2. *Comparison of Success Rates between Phase 1 and Phase 3*

Participants utilizing both phase 3 prototypes performed better in comparison to the current social networking site prototype from the baseline study. For most tasks, the average success rate increased to greater than 70%, a far cry from phase 1's novice group's average success rates.

A large improvement can be seen for both groups in phase 3 compared to phase 1 (Table 15). For each task, phase 3 surpassed the success rate in comparison to phase 1.

Table 15: Comparison of success rates

Sub-Task	Frequency and Success Rate Phase 1		Frequency and Success Rate Phase 3 Version 1		Frequency and Success Rate Phase 3 Version 2	
	Group 1	Group 2	Group 1	Group 2	Group 1	Group 2
Task 1: Logging into your account	1 (9%)	3 (27%)	11 (100%)	11 (100%)	11 (100%)	11(100%)
Task 2: Understanding the homepage	1 (9%)	3 (27%)	8 (73%)	11 (100%)	8 (73%)	9 (82%)
Task 3: Understanding your profile	0 (0%)	2 (18%)	2 (18%)	8 (73%)	4 (36%)	3 (27%)
Task 4: Navigating through the site	1 (9%)	1 (9%)	8 (73%)	10 (91%)	8 (73%)	9 (82%)
Task 5: Understanding information on a profile	4 (36%)	6 (55%)	11 (100%)	10 (91)%	9 (82%)	8 (73%)
Task 6: Commenting on other profiles	1 (9%)	3 (27%)	7 (64%)	7 (64%)	6 (54%)	8 (73%)
Task 7: Learning about Social Media	-	-	8 (73%)	10 (91%)	9 (82%)	11 (100%)

Comparing both versions, both prototypes had a 100% success rate when logging

into their account (task 1). This could be attributed to the clearly labeled username,

password, and submit button located in the middle of the screen. Overall, version 1 did

the same or slightly better than version 2.

The Chi-Squared test was used for the comparison of the success rate between

phase 1 and phase 3 (Appendix Z, AA). The results show a number of significant

differences between the phases. For example, a significant difference can be seen with

both phase 3 versions for subtask 2 ($X^2(1) = 14.667$; p=0.000), where the user is asked to

click in the fields to enter their username. Phase 3's redesign took into consideration the

formatting, colors, and locations of these buttons, resulting in positive results. In

addition, detailed instructions were provided for novice users.

Regarding task 2, in both versions, significant differences were found when

participants completed subtasks related to the homepage. When asked questions

regarding their latest posts, positive changes can be seen in phase 3 (Table 16). This

could be attributed to the intuitive layout and large headline text.

Table 16: Phase 1 and Phase 3 Task 2 Chi Square Results

Task 2	Phase 1 and Phase 3 Version 1		Phase 1 and Phase 3 Version 2	
	Value (X2)	Asymp. Sig (2-sided) (p)	Value (X2)	Asymp. Sig (2-sided) (p)
Subtask 6: Read out loud the title of the latest post in your newsfeed	5.500	.019	5.500	.019
Subtask 7: Click the appropriate link to read the next post	5.939	.015	4.125	.042
Subtask 9: Read out loud the title of another post in your newsfeed	8.324	.004	8.324	.004
Subtask 10: Open this post by clicking on it	6.844	.009	4.659	.031

Improvements can also be seen for numerous subtasks in task 3 (Table 17). For example, subtask 14 asked participants to click on an advertisement. Previously, elders had to decipher an advertisement from content on the homepage. The improved success rate could be attributed to the separation of the advertisement page into its own clearly labeled page. Another example is with subtask 22 and 23, read and click on your latest post. An improvement can be seen with this subtask, as the user's wall postings in phase 3 were clearly marked, as opposed to phase 1.

Table 17: Chi Square Results - Comparison of phase 1 and phase 3 on Task 3

Task 3	Phase 1 and Phase 3 Version 1		Phase 1 and Phase 3 Version 2	
	Value (X2)	Asymp. Sig (2-sided) (p)	Value (X2)	Asymp. Sig (2-sided) (p)
Subtask 14: Click where you would view deals and advertisements	6.947	.008	4.247	.039
Subtask 22: Read out loud your latest post.	8.282	.004	11.314	.001
Subtask 23: Click on your latest post	6.844	.009	6.844	.009

Task 4, navigation, had a significant difference for both versions of subtask 32 $(X^2(1) = 14.667; p=0.000)$, asking elders to click the appropriate link to go to their homepage and subtask 33 $(X^2(1) = 14.667; p=0.000)$, click on the appropriate link to view notifications. Previously, the homepage link was denoted by the username and the notifications link was an unlabeled icon; however, the newer versions clearly labeled the homepage and notification links in the main navigation.

There was also a significant difference when utilizing version 2 of subtask 34, identify where you would search for someone by name by clicking on this area $(X^2(1) = 5.641; p=0.018)$. When elders tried to complete this task in phase 1, many did not know to click on the unmarked search text box located at the top of the homepage. To alleviate this issue, the function to search for friends was given its own link in the main navigation as well as its own separate page from the homepage.

Task 5 required elders to answer questions about friend's profile. Major improvements could be seen with subtask 38, read where the user went to high school ($X^2(1) = 9.778$; p=0.002). Previously, the font was small and light gray, making it difficult to view. However, the redesign's font and placement was more pronounced, thus improving the participant's completion of the task.

For task 6, commenting on profiles, improvements can be seen on the social media tasks, such as subtasks 47, 48, and 51. When asked to leave a comment on John Smith's family photo, (subtask 47) many understood where to click to leave a comment (Table 18).

Table 18: Chi Square Results - Comparison of phase 1 and phase 3 on Task 6

Task 6	Phase 1 and Phase 3 Version 1		Phase 1 and Phase 3 Version 2	
	Value (X2)	Asymp. Sig (2-sided) (p)	Value (X2)	Asymp. Sig (2-sided) (p)
Subtask 47: Click where you would leave a comment on John Smith's family photo.	29.455	.000	29.455	.000
Subtask 48: Demonstrate how you would tag John Smith in this family picture by clicking the appropriate links	20.842	.000	16.200	.000
Subtask 51: Click where you would leave a comment on Ann Jones' wall	10.476	.001	16.500	.000

Previously, many had missed this subtask because they did not understand what a comment was and did not realize they had to scroll to view the comments text box. Tagging was also improved, (subtask 48), as the instructions clearly detailed how to tag a person. Finally, leaving a comment on someone's wall was improved (subtask 51), as the text box was clearly defined and the profile page had a more intuitive layout.

5.4.1.3. *Phase 3 Task Completion Time*

For phase 3's evaluation, the arithmetic mean and standard deviation was applied for the completion time of each group. Following is a comparison of times by group utilizing nonparametric analysis. Results for both versions are shown in Appendix Q, R, S, and AB.

The most time consuming task on average for both groups and versions in phase 3 was subtask 48, demonstrate how you would tag John Smith in his family photo. This required participants to complete a series of three steps to complete the subtask. When utilizing version 1, group 1 completed the task in 14 seconds on average, which is almost double the time it took group 2 to complete the task (8 seconds on average). Both groups also utilized a second version with sidebar navigation to complete this subtask. It took an average of 10 seconds for group 1 and an average of eight seconds for group 2. Although these results are an improvement from phase 1 group 1 (33 seconds) and group 2 (17 seconds), many of the participants continued to demonstrate issues with Web 2.0 concepts during phase 3, stating they still did not know the purpose of tagging a photo.

While they could follow the steps on the screen to advance to the next step, the concept was still very abstract for them. This indicates that clear instructions were helpful in completing the task, however, future design considerations should include more training that uses clear and simple easy wording in the instructions.

The results of phase 3's least time consuming subtasks were mirrored between the groups and versions. For both versions, it took one second for both groups to complete subtask 3, click where you would enter your password in one second. Another fast time was from subtask 39, read out loud where John went to college. This subtask was completed in 1 second for both groups while using either version. During phase 1, the participants from group 1 had problems reading the screen, taking them an average of 3 seconds to complete the task; however, during phase 3 one participant exclaimed, "All the information is right there in big letters!"

An improvement in time can be seen in subtask 20, click on the appropriate link to view your profile page. Previously in phase 1, this subtask took one participant from group 1 thirty-seven seconds and one participant from group 2 thirteen seconds because the link was not clearly labeled and in an unexpected location. However, while using both versions, both groups were able to complete this task in under an average of five seconds. The clearly labeled profile link within the main navigation proved to be beneficial for the participants.

There were a number of improvements to the completion times compared to phase 1. For subtasks 34 and 35, participants were asked where they would search for someone by name (subtask 34) and then click on their friend's profile to view their page (subtask 35). Previously it took group 1 and 2 participants 14 seconds on average to complete subtask 34 and it took group 1 an average time of twelve seconds and group 2 eight seconds to complete subtask 35. With the redesign, completion times were reduced in more than half. For version 1, subtask 34 ended up taking group 1 participants five seconds and group 2 one second on average. For version 2, subtask 34 took group 1 seven seconds and group 2 two seconds on average. When completing subtask 35, the participants were able to clearly distinguish where to click to visit a profile page. For version 1, group 1 took an average of four seconds to complete and group 2 one second to complete on average. For version 2, both groups took an average of one second for the participants to complete the subtask.

For version 1, the nonparametric tests (Mann Whitney U Test) showed a significant difference between group 1 and group 2 on task completion time, which indicates that computer experience potentially plays a positive role in the timeliness of task completion.

For subtasks 6 and 7, the participants were asked to read and open the title of the post. In this situation, computer experience did play a positive role in time to complete a

task, as those familiar with computers would know how to identify and open a story (task 6 p=0.002; task 7 p=0.001).

Subtasks 17, 20, 21, and 23 relate to understanding a profile page. Understanding the title of the advertisement (p=.006), identifying the profile page link (p=.002), read your latest posts (p=.023), and opening your latest posts (p=.030) are common activities on found on many websites, therefore easier to identify by a more experienced user.

For all navigation subtasks (task 4), computer experience did make a positive difference in term of the time need to complete a task (Table 19). Many less experienced users did not understand terminology such as homepage or navgiation because of lack of exposure to technology.

Table 19: Mann Whitney U Test: Task 4

Task 4		
Subtask 32: Click the appropriate link to go to your homepage.	.034	Reject the null hypothesis
Subtask 33: Click the appropriate link to view notifications.	.001	Reject the null hypothesis
Subtask 34: Identify where you would search for someone by name by clicking on this area	.000	Reject the null hypothesis
Subtask 35: Click on John Smith (Redmond Washington) to visit his profile.	.035	Reject the null hypothesis

When understanding and comprehending profile (task 5), significance was only seen when answering questions about music (subtask 41; p=0.001) and movies (subtask

42; p=0.034). Many elders from group 1 were unsure where to look to find this information. Others had issues reading the page and took longer to complete.

The remaining subtasks show signifance when asking social media related questions. For example, group 2 was able to complete tasks that involve social media (p=0.043), searching (p=0.000), and terminology (p=0.001).

For version 2, having a sidebar sub-navigation, significant difference was found with fewer subtasks when comparing group 1 and group 2: subtask 7 (p=0.041), subtask 28 (p=0.019), subtask 29 (p=0.028), subtask 32 (p=0.002), subtask 33 (p=0.002), subtask 34 (p=0.002), subtask 51 (p=0.019), subtask 53 (p=0.019), and subtask 54 (p=0.034).

As with subtasks 7, 32, 33, 34, and 54 for version 1, results from version 2 show that computer experience played a role when the participants were asked to click the appropriate link to read the next story, view homepage and notifications, and search for terminology (Table 20).

Table 20: Version 2 Mann Whitney U Test

Task 2		
Subtask 7: Open the latest post in your newsfeed section by clicking on it.	.041	Reject the null hypothesis
Task 4		
Subtask 32: Click the appropriate link to go to your homepage.	.002	Reject the null hypothesis
Subtask 33: Click the appropriate link to view notifications.	.002	Reject the null hypothesis
Subtask 34: Identify where you would search for someone by name by clicking on this area	.002	Reject the null hypothesis

Task 7		
Subtask 54: Click where you would search for a terminology.	.034	Reject the null hypothesis

Unlike version 1 with the top sub-navigation, version 2 utilizing the side sub-navigation showed significance for subtasks 28, 29, 51, and 53 (Figure 21). Viewing friend's lists, viewing examples of specific terminology, and knowing where to click to learn about social media had significance between the two computer experience groups.

Table 21: Mann Whitney U Test: Task 3, 6, and 7 version 2

Task 3		
Subtask 28: Click where you would view your friend's list.	.019	Reject the null hypothesis
Subtask 29: Read out loud one of your friend's names.	.028	Reject the null hypothesis
Task 6		
Subtask 51: Click where you would leave a comment on Ann Jones' wall.	.019	Reject the null hypothesis
Task 7		
Subtask 53: Click where you would learn about social media.	.019	Reject the null hypothesis
Subtask 54: Click where you would search for a terminology.	.034	Reject the null hypothesis

5.4.1.4. *Comparison of Task Completion Time between Phase 1 and Phase 3*

Using the Wilcoxon test, phase 1 and the two versions of the prototype used in phase 3 were compared based on the participant's time to complete a subtask (Appendix AB). P values of less than .05 were considered as significant. A significant difference was seen when comparing phase 1 to both versions of phase 3.

For example, when completing task 1, all three subtasks were improved when utilizing either version of the redesigned prototype (Table 22):

Table 22: Wilcoxon Test: Comparing task 1 performance among three versions

Task 1: Logging into your account			
	Phase 3 V1/ Phase 1	Phase 3 V1/ Phase 3 V2	Phase 3 V2/ Phase 1
Enter Username			
Z	-2.402	.000	-2.402
Asymp. Sig. (2-tailed)	.016	1.000	.016
Enter Password			
Z	-2.699	-1.342	-2.699
Asymp. Sig. (2-tailed)	.007	.180	.007
Click Submit Button			
Z	-3.053	-1.000	-2.836
Asymp. Sig. (2-tailed)	.002	.317	.005

Previously, the participants clicked on "sign-up" instead of "login" during phase 1. However, based on our design considerations, we separated these pages for simplicity and added a larger header with instructions.

Another example of a significant difference is with subtasks 9 and 10, asking the

participant to read and open another post in the newsfeed (Table 23).

Table 23: Wilcoxon Test: Comparing task 2 performance among three versions

Task 2: Understanding your homepage			
	Phase 3 V1/ Phase 1	Phase 3 V1/ Phase 3 V2	Phase 3 V2/ Phase 1
Subtask 9: Read out loud the title of another post in your newsfeed.			
Z	-3.124	-.851	-3.317
Asymp. Sig. (2-tailed)	.002	.395	.001
Subtask 10: Open this post by clicking on it.			
Z	-1.897	-1.494	-.513
Asymp. Sig. (2-tailed)	.058	.135	.608

Previously, during phase 1 many participants did not know they had to scroll to

view additional posts (15, 68%). Many were not sure where they could click to open the

post (14, 64%). However, the phase 3 redesign implemented an intuitive "next" button

shaped like an arrow. In addition, labeled buttons also let the participants know how to

open a post.

Task 3 also had similar results. Phase 3's versions were an improvement on

phase 1 based on tasks related to the profile page (Table 24).

Table 24: Wilcoxon Test: Comparing task 3 performance among three versions

Task 3: Understanding your profile			
	Phase 3 V1/ Phase 1	**Phase 3 V1/ Phase 3 V2**	**Phase 3 V2/ Phase 1**
Subtask 26: Click where you would view photos of yourself			
Z	-2.674	-.498	-2.506
Asymp. Sig. (2-tailed)	.007	.619	.012
Subtask 29: Read out loud one of your friend's names.			
Z	-3.108	.000	-2.665
Asymp. Sig. (2-tailed)	.002	1.000	.008

The participants were able to click successfully on the location to view their

friend's photos and the font was large enough to read one of the friend's names.

When navigating, the participants improved in their ability to locate the homepage

and search for someone by name (Table 25).

Table 25: Wilcoxon Test: Comparing task 4 performance among three versions

Task 4: Navigating			
	Phase 3 V1/ Phase 1	Phase 3 V1/ Phase 3 V2	Phase 3 V2/ Phase 1
Subtask 32: Click the appropriate link to go to your homepage.			
Z	-2.807	-.258	-2.952
Asymp. Sig. (2-tailed)	.005	.796	.003
Subtask 34: Identify where you would search for someone by name by clicking on this area.			
Z	-3.297	-1.295	-3.286
Asymp. Sig. (2-tailed)	.001	.195	.001

This can be attributed to the fact that these subtasks were given separate pages as well as placed as options in the navigation links. Reading where John works (subtask 37) and went to high school (subtask 38) were more successful for both versions during phase 3 because the text was larger and towards the center of the screen (Table 26).

Table 26: Wilcoxon Test: Comparing task 5 performance among three versions

Task 5: Understanding and comprehending information on a profile			
	Phase 3 V1/ Phase 1	Phase 3 V1/ Phase 3 V2	Phase 3 V2/ Phase 1
Subtask 37: Read out loud where John works.			
Z	-2.600	-1.486	-3.728
Asymp. Sig. (2-tailed)	.009	.137	.000
Subtask 38: Read out loud where John went to high school.			
Z	-2.809	-.504	-2.762
Asymp. Sig. (2-tailed)	.005	.614	.006

The most significant changes based on this research are the subtasks associated with web 2.0 concepts (Table 27). The participants were able to go to their friend's profile and leave a comment on the friend's wall.

Table 27: Wilcoxon Test: Comparing task 6 performance among three versions

Task 6: Commenting on other profiles			
	Phase 3 V1/ Phase 1	Phase 3 V1/ Phase 3 V2	Phase 3 V2/ Phase 1
Subtask 50: Click on your friend Ann Jones to go to her profile page.			
Z	-2.825	.000	-3.222
Asymp. Sig. (2-tailed)	.005	1.000	.001
Subtask 51: Click where you would leave a comment on Ann Jones' wall.			
Z	-2.19	-.687	-2.505
Asymp. Sig. (2-tailed)	.028	.492	.012

This is a major improvement, as previously the elders did not know where to locate the box to enter a comment. However, the resign added instructions and heading that clearly facilitated learning when the elders were interfacing with the redesigned prototypes.

There were only a few subtasks that did not see a significant difference between phase 1 and phase 3 (Table 28). For example, most were able to read aloud the title of the latest post (subtask 6), opening an advertisement (subtask 18), find the profile page link (subtask 20), and view their friend's list (subtask 24).

Table 28: Wilcoxon Test: No significance task performances among three versions

	Phase 3 V1/ Phase 1	Phase 3 V1/ Phase 3 V2	Phase 3 V2/ Phase 1
Subtask 6: Read out loud the title of the latest post in your newsfeed.			
Z	-.597	-.769	-1.134
Asymp. Sig. (2-tailed)	.551	.442	.257
Subtask 18: Open an advertisement on the page by clicking on it			
Z	-.492	-.360	-.667
Asymp. Sig. (2-tailed)	.622	.719	.505
Subtask 20: Click on the appropriate link to go to your Profile page			
Z	-1.826	-1.917	-1.826
Asymp. Sig. (2-tailed)	.068	.055	.068
Subtask 24: Click on the area where you would view information about yourself.			
Z	-.775	-1.219	-1.249
Asymp. Sig. (2-tailed)	.438	.223	.212

When comparing phase 3's versions which offered multiple screens with altering sub-navigation, no significant difference was seen except during subtask 23 ($X^2(2) = -1.993$; $p=0.046$)., when asked to click on the latest post. Version 2's side-navigation layout appeared to be more visible and intuitive, as the story appeared higher on the page compared to the top sub navigation version.

5.4.2. Post-Test Questionnaire

After completion of the phase 3 tasks, the participants answered a post-test questionnaire regarding their experience using the newly redesigned social networking site prototype. Overall, the results were positive, with ten (91%) participants from group 1 and all participants (11,100%) from group 2 stating the overall ease of use of the prototype was easy to very easy.

The issues mentioned in phase 1 were alleviated by the design improvements and additional considerations designed during phase 2. For example, 64% of group 1 and 55% of group 2 participants felt the text on the site was easy to read. In addition, 82% of group 1 and 100% of group 2 felt the site was intuitive.

The participants were then asked to rate their opinion of logging into their account (Figure 24). Ten (91%) participants from group 1 and 11 (100%) participants from group 2 felt the site was easy to very easy to use (Figure 24). Previously, phase 1 login screen's username and password button were too small for the page. Only 1 elder from phase 1 thought that logging into your account was very easy, compared to 100% of elders from

phase 3. Most users from phase 1 felt that logging into an account was difficult (18%) to

neutral (45%). To improve the visibility, the phase 3 login page was designed to clearly

show the username and password fields in the center of the screen.
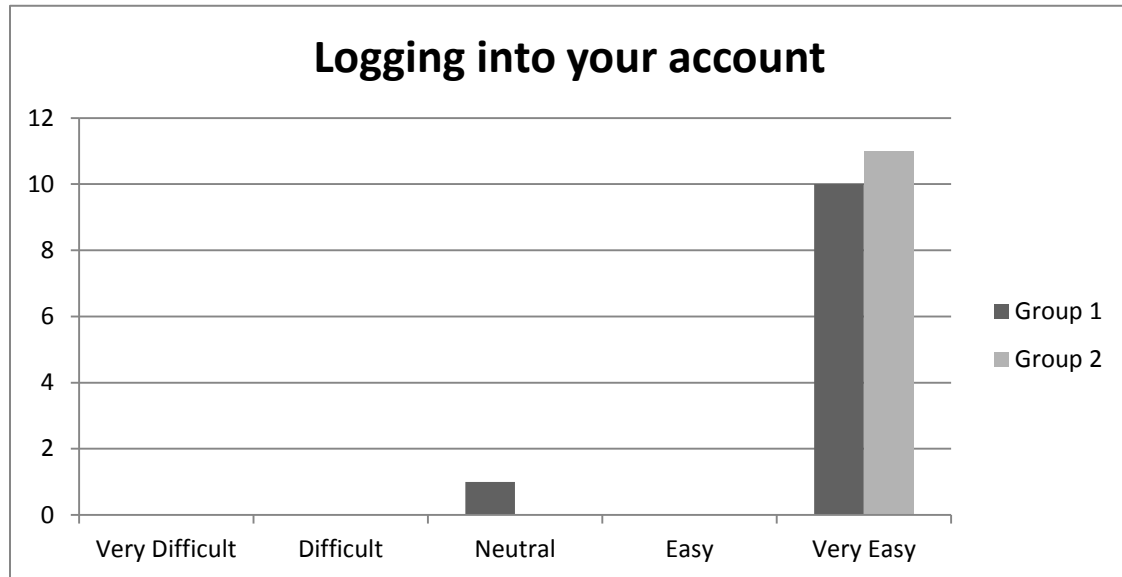
Figure 24: Phase 3: Perception comparison between the two groups on the task of easiness of logging into your account

The participant's opinions towards the homepage were similar to their feelings

towards the login subtasks (Figure 25). For example, 91% of group 1 felt the site was

very easy, with one participant having a neutral opinion (Figure 25). Similarly, none of

the participants in group 2 had a negative opinion about the prototype. Participants

appreciated the reduction of scrolling and liked having one story per screen. This is a

large improvement of opinion for phase 2 as group 1 had a large amount of elders feel

this task was difficult (55%) to very difficult (9%).
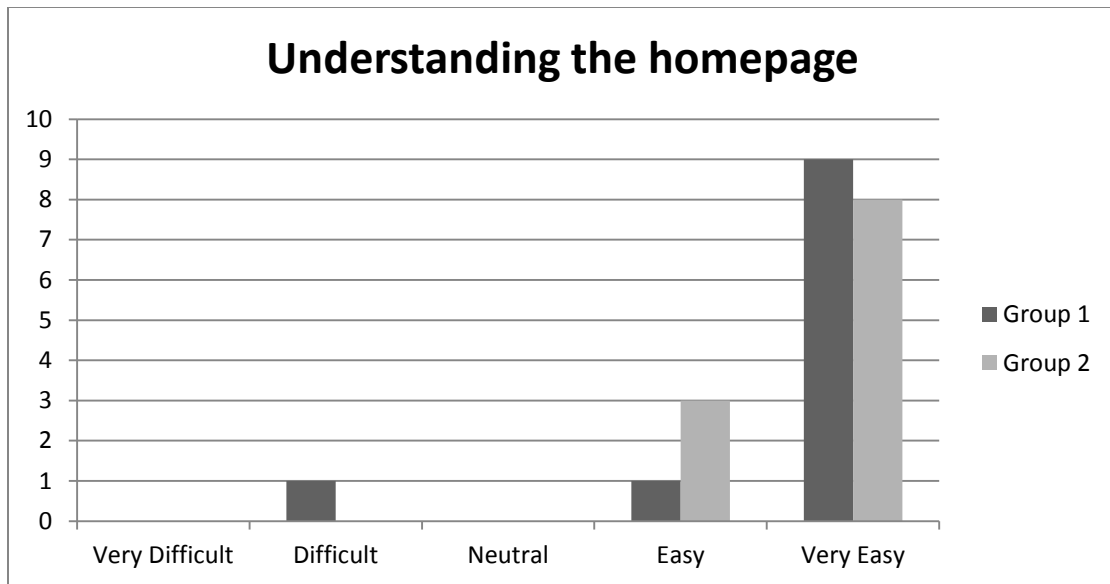
Figure 25: Phase 3: Perception comparison between the two groups on the task of understanding the homepage

Subtasks for understanding the profile page were also greatly improved, with only 1(9%) participants stating it was difficult, while the majority of elder adults from both group 1 (10, 91%) and group 2 (11, 100%) had a positive opinion (Figure 26). Almost (7, 64%) from group 1 felt these tasks from phase 1 were difficult; however, with the redesign their opinions rose. Previously, elders were confused by the stories and advertisements on the side of the page. However, many appreciated the ads having a designed page for deals and coupons.

Understanding the profile page
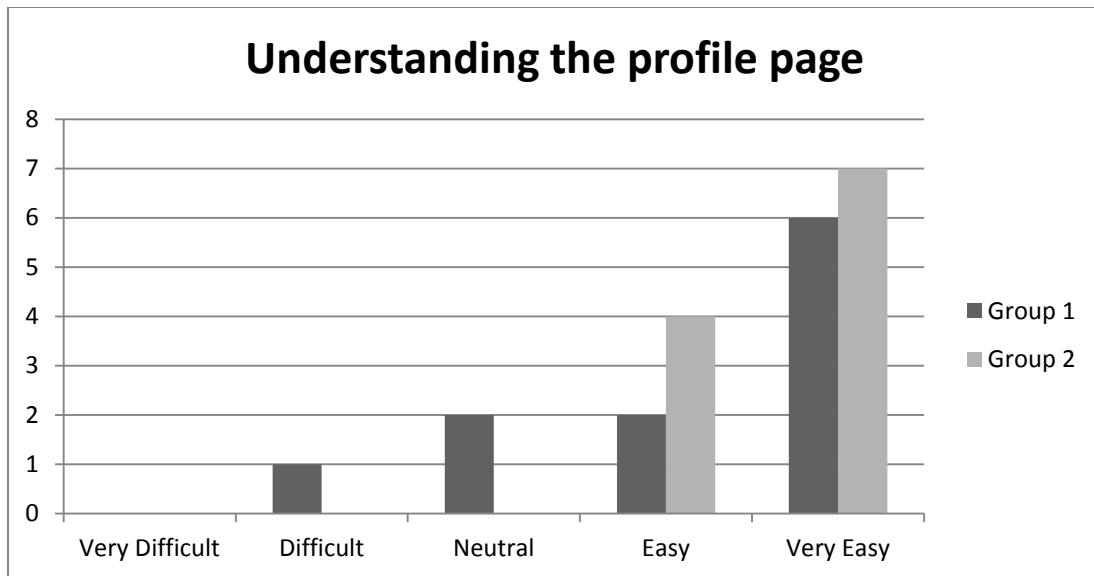
Figure 26: Phase 3: Perception comparison between the two groups on the task of understanding the profile page

Navigating through the site opinions were greatly improved compared to phase 1 (Table 27). All the participants for group 1 (81%) and group 2 (100%) had a positive opinion and felt the site was easy to very easy to use (Figure 14). When asked why, the elders stated that the main navigation buttons were large and descriptive. Previously, both group 1 (6, 55%) and group 2 (7, 65) from phase 1 did not find this task easy to complete.

Navigating through the site
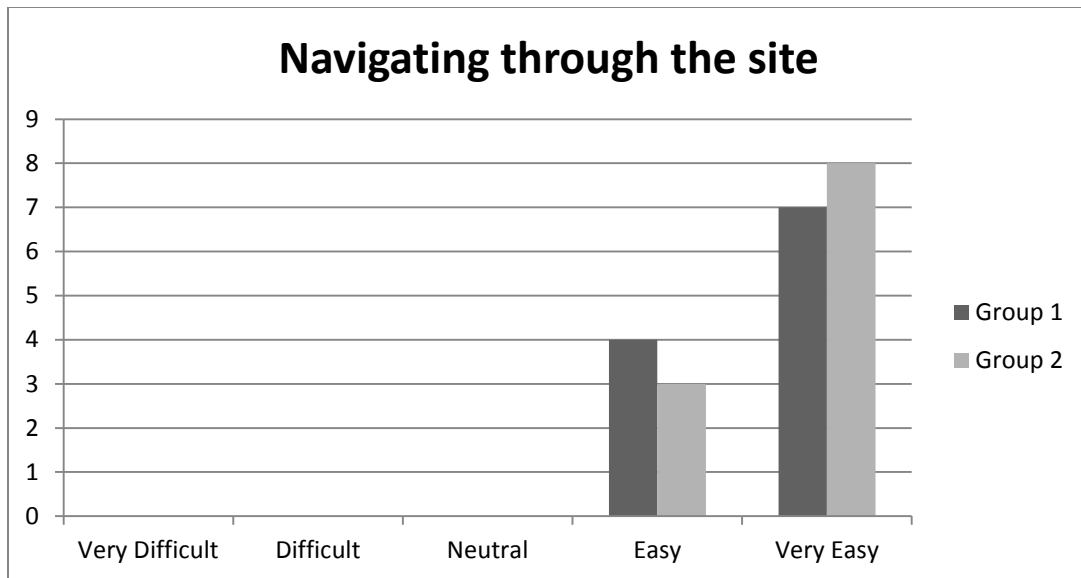
Figure 27: Phase 3: Perception comparison between the two groups on the task of navigating through the site

Commenting on profiles (task 6) was positive with most participants feeling the task was easy to very easy (Figure 28). When asked group 1, one (9%) participant thought this task was difficult and another had a neutral opinion (9%). However, the majority of group 1 felt that the site was easy (5, 45%) to very easy (5, 45%) to use. Similarly, group 2 felt that the site was easy (3, 27%) to very easy (8, 73%). Previously, even the more experienced group felt that commenting on profiles was difficult (1, 9%) to very difficult (6, 55%).
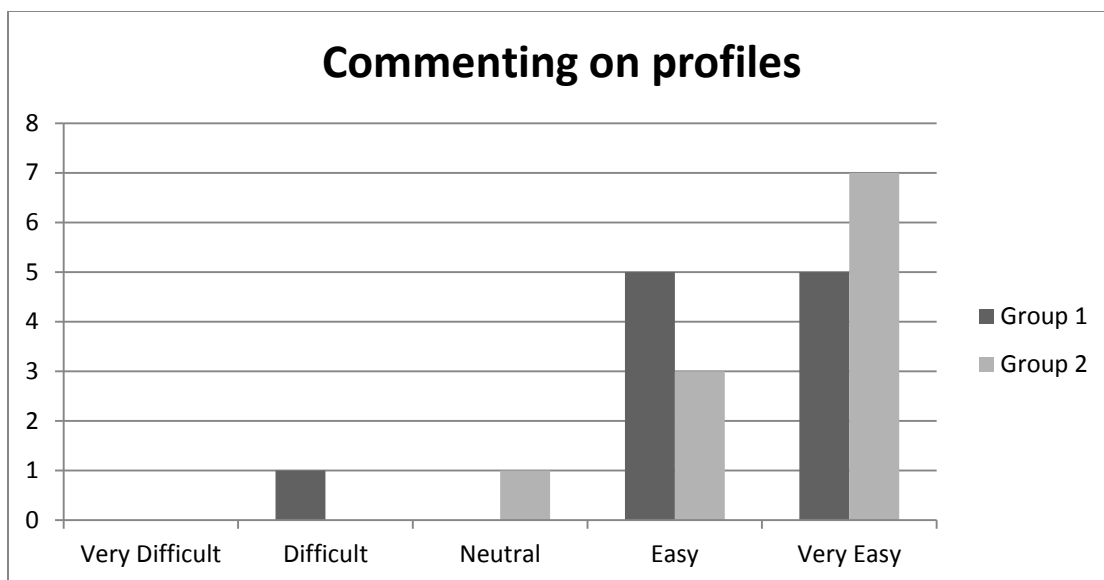
Figure 28: Phase 3: Perception comparison between the two groups on the task of commenting on profiles

Many participants mentioned that they did not understand the terminology, however, were happy to see that additional training sections were created to facilitate learning. They also stated they would use the site's learning section to become better accustomed to Web 2.0 concepts. When asked, one (9%) elder from group 1 felt that the learning about social media task was very difficult; stating they still did not understand the terminology despite the subtasks. However, the majority of group 1 felt the section was easy (4, 36%) to very easy (5, 45%) to use, with only one (9%) other participant having a neutral opinion about it (Figure 29).

Learning about social media
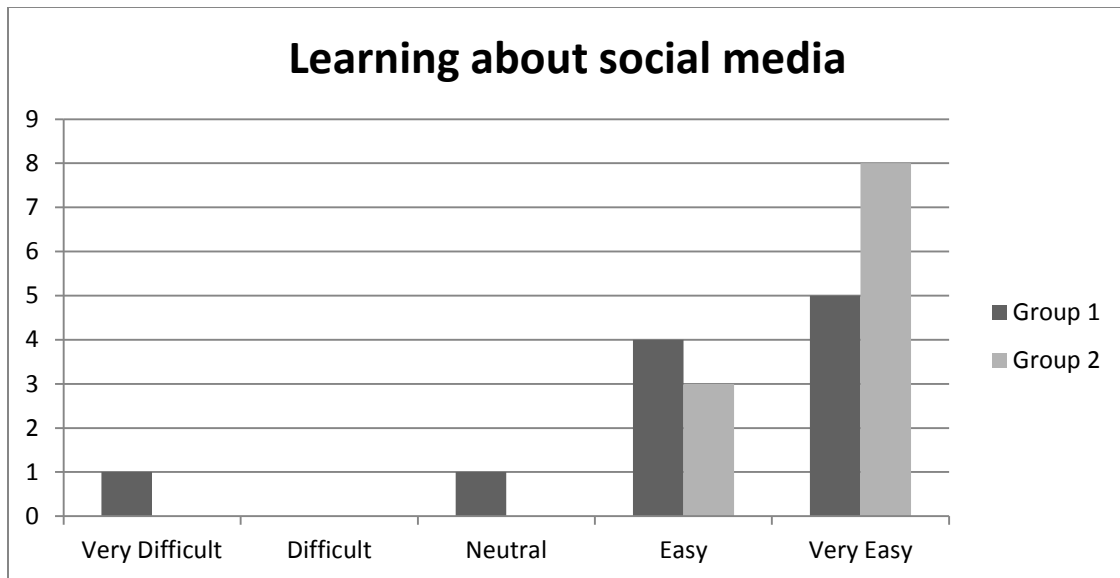
Figure 29: Phase 3: Perception comparison between the two groups on the task of learning about social media

When asked to choose their preference in the three versions, all (22,100%) participants choose a version of phase 3 as the preferred prototype. Group 1 preferred version 2 (side navigation) (55%) over version 1 (top navigation) (45%), however, more than two-thirds of the more advanced group preferred version 1 (8, 73%) over version 2 (3, 27%). When asked, the more advanced group noted they were more familiar with top-navigation than the side-navigation. One participant noted that their eyes were drawn to the upper portion of the page. None chose phase 1's prototype.

The Chi-Square test was used for the comparison of the opinions between the two phases. For group 1, task 1, logging into your account ($X^2(4)=20.000$; p=0.000), task 2, updating your profile ($X^2(4)=16.000$; p=0.003), task 3, navigating through the social

networking site ($X^2(4)$=9.867; p=0.043), task 4, understanding social networking sites ($X^2(4)$=8.900; p=0.064), task 5, commenting on profiles ($X^2(4)$=12.857; p=0.012). The lower level group's perception has significantly improved compared to phase 1.

Similar results can be seen for group 2 for phase 1 and 3. Task 1 ($X^2(4)$=12.571; p=0.006), task 2 ($X^2(4)$=12.444; p=0.006), task 3 ($X^2(4)$=16.667; p=0.002), and task 5 ($X^2(4)$=10.500; p=0.015), however, there is no significance during task 4 understanding social networking sites. Therefore, the phases did not have great significance when understanding web 2.0 concepts. Overall, the results show that the changes in phase 3 had a positive impact on the opinions of the participants.

5.4.3. Summary

Phase 3 of this study showed that the redesign of the social networking site improved usability and accessibility for elders. During the final phase, participants completed the same tasks from phase 1, in addition to a seventh task section addressing learning.

Complaints experienced from phase 1 were reduced by the font size, colors of the website, task steps, layout, and navigation improvements implemented during phase 2. In addition, the success rate and completion times for all tasks greatly progressed when utilizing the prototype in either version and for both computer experience groups.

The majority of the elders in this study stated they would use social media more often if it had an easier interface, as many want to stay connected to friends and family. Based on the third phase of this study, the redesign improvements to the format and functions provide a more usable and accessible interface for elders who suffer from a number of health issues (cognitive or physical), computer illiteracy, and negative perceptions.

5.5.   Final Discussion

Chapter 5 discussed the results of a three phased usability study. Based on the findings of phase 1, it was shown that despite computer experience, many elders currently do not utilize social media and that many elders encounter numerous interface issues such as small font, navigation, and layout issues. Phase 1's usability study results, including the pre-test, post-test, and interaction show that the elderly do not interact with social media well. Evident by the low success rates and long completion times, it was discovered that barriers for usage do not end with health issues, such as declined vision and immobility. Additional hindrances, such as issues with computer illiteracy, trust and perceptions and web 2.0 concepts are difficulties experienced by the elderly.

Knowing this, a redesign of a social networking site was implemented, following known guidelines and considerations to facilitate learning and computer literacy, as well as improve trust and perception.

Afterwards, the phase 3 usability study determined that the redesigned prototype did improve the usability and accessibility and usability of elder adults utilizing social media. This could be seen through improved success rates and completion times compared to the results found in phase 1.

6.   CONCLUSION

Social media usage has the ability to increase communication and collaboration for the elderly who find themselves dependent or isolated due to physical, mental, and cognitive barriers. However, their social media usage remains relatively low compared to their younger counterparts. It is known that the elderly have issues interacting with websites due to physical impairments and disabilities, computer illiteracy, and negative perceptions; however, preliminary research shows that issues are compounded by the Web 2.0 trend that introduces new layouts, terminology, and content (Arfaa & Wang, 2014ab). Therefore, the objective of this study became to improve the usability and accessibility of social networking sites for the elderly by redesigning the interfaces to accommodate this demographic. This research is significant because improving interfaces allows for increased accessibility and usability for elder adults utilizing sites with Web 2.0 characteristics. Elder adults are more inclined to utilize a site that has an easy-to-use interface that allows for learning and support. This could lead to a more independent living for elders that are bound logistically due to physical impairments.   In addition, having social media incorporated in their lives provides a medium to communicate with family, friends, and peers as well as the ability to access a number of resources and stories.

Based on the objective, the goal of this study was successful. The tested prototype was implemented using current website design research, existing guidelines,

and additional social media usage feedback from the usability studies (Arfaa & Wang, 2014b). Elders were not left confused by interfaces or web 2.0 concepts and felt comfortable completing tasks without assistance and intervention. It is also important to note that a majority of the participants enjoyed this study because they are interested in learning about computers and increasing their social media usage so that they can view photos, connect with family and friends, and communicate through email, instant message, and posts.

6.1. Research Plan Executed

This research began with two preliminary studies investigating the current state of social networking sites and elder adult usage of these sites. Next, three phases were planned in order to answer six research questions. Research questions were answered during the execution of the three phases.

This research is significant because it provided an improved design of social networking site interface for elders who have difficulties with current social networking site interfaces and Web 2.0 concepts. The majority of the elder participants were eager to involve themselves with the study because of their enthusiasm of utilizing social networking sites to connect with family and improve their communication, collaboration, and outreach of resources.

6.2.   Preliminary Research Steps Executed

In order to evaluate the current state of elders utilizing social media, following the

literature review, two preliminary studies were conducted to gain a better understanding

of interface issues experienced by the elderly.

The first preliminary study reported a class discussion of elderly adults observing

a social networking site demonstration in a basic computer class. During this study,

opinions about utilizing these types of sites as well as issues viewing the interface were

noted.

Next, a second preliminary study was conducted to evaluate the accessibility and

usability of nineteen popular social media sites against known mandates and guidelines.

This study showed that all evaluated social media sites violated a number of website

guidelines that could leave a page inaccessible for an elder with disabilities.

6.3.   Research Questions Answered

The results of the preliminary studies clarified areas of further research regarding

elder's utilizing social media. Social networking sites and improving their interface

became the focus of this research based on the number of accessibility issues found in the

social media evaluations and experience by the elders during the class discussion. To

improve usage for this demographic, research questions were developed to provide a

framework for this study. Table 29 summarizes the research questions and corresponding

results.

Table 29: Summary of Findings

Research Question	Finding
Phase 1 Baseline Study	
RQ1.1: Do the elderly use social media?	More than half of the participants had no social media experience. Some have noted they do not have time for it or do not see a benefit. Others have stated they have trouble with the interface.
RQ1.2 How well can the elderly interact with social media?	Elder adults had trouble understanding the interface and navigation. Many expressed a fear of utilizing these sites as well as not knowing where to start interacting with the interface.
RQ1.2.1 What are the accessibility and usability problems experienced by the elderly when utilizing social networking sites?	Elders experienced issues including formatting, multimedia, content, layout, and navigation of the social networking site. In addition, negative perceptions and elders noted the lack of training on computers and technology.
RQ1.2.2 Does computer experience play a role in the elder's social media experience?	Computer experience had a possible influence in the success of using these types of sites. In some of the tasks, more computer experience produced significant higher success rates and faster completion times. Despite computer exposure, many participants had issues with a number of tasks involving Web 2.0 concepts.
Phase 2: Prototype Development	
RQ2 How should a social networking site interface be designed to improve accessibility and usability for elder adults?	The redesign should be designed to follow existing best practices found in a number of accessibility and usability guidelines. In addition to the guidelines, design considerations addressing elder adult social media barriers such as computer illiteracy and negative perceptions should be incorporated. An interface prototype was design and implemented following best practices and considerations from the literature and feedback from the elders.

Phase 3: Final Usability Study	
RQ3 Does the redesigned prototype improve accessibility and usability for elder adults?	Yes, the final usability study shows that the redesigned website improved accessibility and usability for the elderly. All subtasks were improved upon compared to the results from phase 1.

6.4.   Main Study Executed

Following the preliminary studies, a baseline study, prototype design and development, and a final usability study were performed. The baseline study, conducted in phase 1, established the baseline performance, such as the completion time and success rate of elder adults completing a number of tasks on a current social networking site. Phase 2 used these results to create a new social networking site prototype. The final usability study in phase 3 tested the elder adults completing the same tasks of phase 1. These results were then compared.

6.5.   Limitations

With all studies, there are limitations. Regarding the preliminary studies, the automated tool SiteSort was able to evaluate websites based on Section 508 compliance, WCAG 1.0, and WCAG 2.0 criteria. However, it was not able to evaluate other objective guidelines found on Usability.gov or the National Institute of Aging. Using these types of automated tools also provided a limited number of results based on the 100 page crawl limit. In addition, the tool is not 100% accurate, as many violations were overlooked based on their subjective criteria. The results could also show false-positives regarding

the evaluation criteria. To verify results, manual verification of the results by the researcher was completed.   Considering the class discussion, the main limitations include the small sample size, same sex, and homogenous computer experience level of the participants. All eight participants were women and the elders in the class were all novice computer users and did not provide a diverse sample of elder adults.

The baseline and final usability study had similar limitations. As with the preliminary studies, the low number of participants limited the statistical analysis that could be completed by the study; however, at least eight participants in each group participated. The participant's also did not demonstrate a wide range of impairments, such as mobility, cognitive or vision issues. Therefore the findings may not be able to be applied to a specific group. For example, an elder with eyelid issues may not have the strength to look at different parts of a site, even though they expect to find the activity or link in a particular location. Despite these limitations, the prototype relied mainly on vision and involved minimal dexterity for completing tasks.

Another limitation included utilizing Facebook during the preliminary study as it provided only one perspective of social media; however, the application was chosen because of its popularity. To eliminate any website navigation preferences affecting the time, two different layouts were presented to the elder adults.

There were further limitations with the usability study. The participants could have experienced a learning effect while completing phase 1's baseline study. This could

result in bias results as many of the elder's participation was motivated by gaining exposure to social media. Although this factor cannot be eliminated, the effect could have been reduced as the two sessions took place months apart.

In addition, the prototyping software utilized during the baseline and final usability had limited functionality. For example, the number of clicks before a hotspot was revealed could not be adjusted to more than one click. Other settings, such as a timer feature were not available with the tool; therefore, the researcher chose to time the activities with a digital stopwatch as well as verify the time through recorded video captures.

6.6.   Results

The research questions developed in this study were investigated during the three phases of the study, including the baseline study, prototype development, and final usability study. During the preliminary and phase 1 usability study, it was revealed that a small number of elder adults currently utilize social media and that many elders do not understand computer or Web 2.0 concepts. They had issues understanding the social media interface, knowing where to navigate, and understanding what were clickable areas. In addition, many elders did not understand or appreciate social media activities. It was found the elderly adult computer experience did play a small factor, however, was not a significant criterion in improving their overall social media experience.

During phase 2, the social networking site interface was designed following known guidelines and mandates, in addition to providing training and other learning and development features. Increasing trust and confidence was also a large portion of the redesign, such as having a separate page identifying itself as advertisement content.

Phase 3 showed that the redesigned prototype created in phase 2 improved the usability and accessibility for elder adults. On almost every task, the times decreased for both the novice and experienced computer group. In addition, the results showed that 100% of the elders preferred the newly designed prototype versus the current social networking site.

Even though the more advanced group did perform better than the less experienced group, their perception on the ease of use of the site was not significantly different. This indicated that users' performance on the system did not influence their perception when it comes to using social networking sites. Therefore, the interface design and features provided may not be the only factors that can contribute to the actual use of a system. Instead, user's attitude toward the system may lead to their positive or negative perception of the system as well.

In terms of the partiality in the placement of sub-navigation items, the preference between the groups was different; the participants in less experienced group preferred side menu for sub-navigation while majority of the participants with more computer experience preferred sub-navigation menu to be placed on the top of the screen.

However, no conclusion on the specific preference in terms of the placement of the sub-navigation menus could be made.

6.7.   Recommendations for Future Work

Utilizing the newly designed prototypes, continued research with a larger and more diverse sample is suggested. Diversity could include involving participants from a broader location than Maryland and a larger and more categorized look of multiple elder age groups and physical impairments. In addition, this research strictly focused on social networking site usage on a laptop/desktop computer; however, many elder adults expressed their desire in using tablets and other mobile technologies. Therefore, future studies could involve the trend of social media websites and applications on mobile devices.

7.   APPENDIX A

Accessibility Guidelines Compared

The following matrix compares accessibility criteria found in mandates and

guidelines offered in the United States.

Criteria	Section 508 Compliance	WCAG 1.0	WCAG 2.0	Usability.gov	National Institute of Aging
Type	Mandate	Guidelines	Guidelines	Guidelines	Guidelines
Rating Scale	All standards must be met to be compliant.	Priority checkpoints satisfied for Conformance Levels A, AA, AAA	Success Criteria satisfied for Conformance Levels A, AA, AAA	Relative Importance & Strength of Evidence	None
Purpose & Goal	§ 1194.1 Purpose	11.1-11.4	Introduction	Chapters 1:1 to 1:10; 3.1	Research based accessibility guidelines for website design
Text & Multimedia Requirements	Points A, B, L, K, N of §1194.22 Web-based intranet and internet information and applications.	Checkpoints 1.1, 1.4, 2.1, 3.4, 6.3, 6.4,8.1, 9.3, 11.4, of WCAG 1.0	Guidelines 1.1.1, 1.2.1, 1.2.3, 1.2.4, 1.2.5, 1.2.7, 1.2.9, 1.3.2, 1.4.4	Chapters 2.9, 3.3, 3.9, 3.10, 3.11, 10.13, 11.1-11.11, 12.9, 14.1-14.6	Designing Readable Text for Older Adults: Typeface, Text size, text weight, capital and lowercase letters, physical spacing, Justification, color, background. Incorporating Other Media: Illustrations and Photographs, Animation,

Criteria	Section 508 Compliance	WCAG 1.0	WCAG 2.0	Usability.gov	National Institute of Aging
Type	Mandate	Guidelines	Guidelines	Guidelines	Guidelines
					Vide, and Audi, Text Alternatives
Content, Language & Tasks	None	Checkpoints 4.1, 4.3, 6.2	Guidelines 1.4.5, 1.4.9, 3.1.2	Chapters 1.1, 2.1, 2.3 2.2, 2.3, 2.4, 2.14, 3.5, 10.1, 10.2, 15.1-15.11, 16.1, 17.1-17.9	Presenting Information to Older Adults: Style, Phrasing, and Simplicity. Increasing the Ease of Navigation: Help and Information.
Structure, Design, Format, & Experience	Points C, D, G, H of §1194.22 Web-based intranet and internet information and applications.	Checkpoints 2.1, 2.2, 6.1, 3.1, 3.5, 3.6, 3.7, 5.1, 5.2, 12.1-12-4, 14.1, 14.2, 14.3 of WCAG 1.0	Guidelines 1.3.1, 2.4.10, 1.4.1, 1.4.3, 1.4.6, 1.4.9	Chapters 1.10, 2.4, 2.5, 2.8, 2.10, 2.11, 2.12, 2.13, 2.14, 2.15. 2.16, 6.1-6:13, 6, 8.1-8.5, 12.1-12.9, 13.1-13.25, 16.1-16.9, 18.1-18.3.	Presenting Information to Older Adults: Organization. Increasing the Ease of Navigation: Consistent Layout, Style and Size of Icons and Buttons, Scrolling.
Page Identification and Navigation	Points E, F, I, O of §1194.22 Web-based intranet and internet information and applications.	Checkpoints 1.2, 1.3, 9.1, 12.1, 13.1-13.10 of WCAG 1.0	Guidelines 1.1.1, 1.2.3, 1.2.5, 1.2.7, 2.1.1, 2.4.4	Chapters 7.1-7.12, 3.4,3.12,9:1-9:8, 10.1-10.14	Increasing the Ease of Navigation: Navigation, The Mouse, Menus, Backward/Forward Navigation, Site Maps, Hyperlinks

Criteria	Section 508 Compliance	WCAG 1.0	WCAG 2.0	Usability.gov	National Institute of Aging
Type	**Mandate**	**Guidelines**	**Guidelines**	**Guidelines**	**Guidelines**
Plugins, Agents, Functionality, Output, & Performance Requirements	Point J, M, P of §1194.22 Web-based intranet and internet information and applications.	Checkpoints 6.3, 6.4, 7.1, 8.1, 9.1-9.5, 10.1-10.5 of WCAG 1.0	Guidelines 1.1, 1.2, 2.2	Chapters 1.2, 1.6, 2.6, 2.7, 3.6, 3.7, 3.8, 4.1-4.5,	Incorporating Other Media: Animation, Video, and Audio
References	WCAG 1.0	Section 508 Compliance	ISO	Section 508 Compliance	
Authors	GSA.gov	W3.org	W3.org	HHS.gov	HHS.gov NIH/AOA

8.   APPENDIX B

Elder Website Accessibility Research Summary

The following matrix shows studies evaluating websites for elderly usability.

Research	Area of Focus	Website/Social Media	Guidelines Used	Tool Used	Contribution
Hart, T. (2004)	Elder Website Usability	36 websites evaluated	National Institute on Aging Web guidelines	Manual	Majority followed basic navigation and content phrasing but many did not adhere to text formatting standards. 98% Did not use Physical Spacing 95% No Previous or Next Button
Becker, S.	Elder Website Usability	125 websites evaluated	National Institute on Aging Web guidelines	Manual	93% Used small font sizes 40% No text resizing 24% Site Navigation Issues
Becker, S.	Elderly Website Usability	100 websites evaluated	Nielsen & Tahir's homepage	Manual	Many websites did not follow

Research	Area of Focus	Website/Social Media	Guidelines Used	Tool Used	Contribution
			guidelines National Institute on Aging Web guidelines Holt & Morrell Resources		guidelines for elderly usability. Issues included visual, language, and infrastructure issues.
Chadwick-Dias, A. McNulty, M., & Tullis, T. (2003)	Elderly Website Usability	Prototype & Usability Test 49 Participants 20-82 Year Olds	None, based on prototype, created updated website.	N/A	Text size did not help elders in usability of site. Did still prefer larger size. Changes to website helped young and old users.
Nahm, E., Preece, J., Resnick, B., Mills, M. (2004)	Elderly Website Usability	10 participants Age 55 or older	National Institute on Aging Web guidelines	Specific tasks, measured by learnability, efficiency, error rates, and satisfaction	Out of 3 Health promoting websites, Site B, which followed most of the NIA guidelines were perceived as most useful.

9. APPENDIX C

Elder and Social Media Usage Summary

The following matrix shows studies regarding the elderly utilizing social media.

Research	Area of Focus	Website/Social Media	Research Questions	Method	Contribution
Lehtinen (2009)	Elderly using Social Media	Qualitative Research with Intervention Period Baby Boomers (1945-1955) 8 elder adults (58-66) Social networking sites: Netlog.com	How do older adults understand SNS How do these understanding fit certain aspects of their life How should these conceptions be taken into account in the design of SNS?	Given a brief overview of the tool, but not in detail.	Elders are afraid of using SNS from fear of the internet and the superficiality of these sites. It is also hard to move from a face-to-face relationship to a digital one. Find that usability needs to be evaluated, "difficulties deriving from unfamiliar principles of user interfaces"
Zajicek, M (2009)	Elderly using Social Media	Holistic Approach Case Studies of failed accessibility for the disabled	Worrying trends and positive signs of improvement.		Physical limitations are only part of the issue of low participation of elder

Research	Area of Focus	Website/Social Media	Research Questions	Method	Contribution
		and elderly.			adults. A Holistic approach to accessibility is needed that addresses the user's life.
Xie, B. (2002)	Elderly perceptions of Social Media	Exploratory Study Thematic Map 10 adults	What are older adults' perception of social media What educational strategies can facilitate their learning of social media?	7 Weekly discussion groups	Elders were worried about privacy concerns. Educational strategies were put into place, explaining concepts, privacy concerns, and making it relevant.
Braun	Elderly perceptions of Social Media	TAM 124 elder adults Age 60-90	What Factors encourage or discourage older adults from using SNS Perceived usefulness of SNS is positively related to intention to use SNS Perceived ease of use of websites is positively related to intention to use	Regression analysis TAM Factors	Provide elders training, experience, and detailed guidance.

Research	Area of Focus	Website/Social Media	Research Questions	Method	Contribution
			SNS. Social pressures from family and friends positively related to intention to use SNS.		
Gibson	Elderly perceptions of Social Media	Focus Groups Ethnographic interviews 17 users 63-86	Who is in their social network? What mechanism do they use to communicate with social network members, and how often? What is their understanding of SNSs and What do they base this opinion on? What do they expect to be able to do on a SNS? What benefits and concerns do they have with SNSs?	Thematic Analysis	Elders nervous about privacy, need to know the purpose of social media.

10.   APPENDIX D

Consent

This is a research project being conducted by Jessica Arfaa, a doctoral candidate for the degree of Doctor of Science in Applied Information Technology from Towson University. The title of this study is "A usability study of elder adults utilizing social networking sites".

We are inviting you to participate in this research project because you are an older adult, age 65 years or older. This interview is expected to take 1 hour.

The purpose of this research project is to assess the current social media interface for usability and accessibility for elder adult users. We hope that in the future, older adults might benefit from this study through an improved interface for these types of sites.

As a participant, you will be invited to participant in a survey and tasks regarding your experience with social networking sites.

All information will remain strictly confidential. To help protect your confidentiality all data will be stored on an access-restricted encrypted drive. Although the descriptions and findings may be published, at no time will your name be used. There are no known risks with participating in this research project.

Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify.

Participating in this study will give you the opportunity to contribute to the project that investigating the realized benefits of social networking from adult learners perspective.

This research is being conducted by Jessica Arfaa under the supervision of Dr. Yuanqiong Wang, in the Department of Computer and Information Sciences at Towson University. If you have any questions about the research study itself, please contact Jessica Arfaa at JessicaArfaa@yahoo.com or at phone number 410-804-3439, or Dr. Wang at ywangtu@gmail.com.

Your signature indicates that:
• You are at least 18 years of age;
• The research has been explained to you;
• Your questions have been fully answered; and
• You freely and voluntarily choose to participate in this research project

---

NAME OF SUBJECT (Print)

SIGNATURE OF SUBJECT

DATE

11.   APPENDIX E:

Phase 1 – Pre-Survey

Below, you will see a series of questions concerning your experience and opinion with social networking sites. Please read each question carefully. There are no correct or incorrect responses. Please *respond to all items*.

Part I. Demographics

1. I am a:
____ Male
____ Female

2. My age is: _____

3. My **highest** education level completed is (Choose one):
____ Elementary/Middle
____ GED
____ Technical High School
____ High School
____ Technical College
____ Undergraduate Degree
____ Graduate (Master's Degree)
____ Graduate (Doctoral/Post-Doctoral)
____ Other, please specify

4. My major during my highest completed education (if applicable):
    _____

Part II. Work Experience

5. I am currently (Choose one):
    ____ Retired and not working
    ____ Retired from primary career and working part-time
    ____ Retired from primary career and working full-time
    ____ Employed, Full-time
    ____ Employed, Part-time
    ____ Unemployed (looking for unemployment)
    ____ Not in labor force (not looking for employment)

6. I have _____years' lifetime work experience.
   ____ From 0 to 1 years
   ____ From 2 to 10 years
   ____ From 11 to 20 years
   ____ From 21 to 30 years
   ____ From 31 to 40 years
   ____ From 41 to 50 years
   ____ From 51 to 60 years
   ____ From 61 and over

7. If you have work experience, did you use a computer at work?
   ____ Yes
   ____ No

Part III. Computer Experience

8. How would you describe your computer experience? (Choose one)
   ____ No Computer Experience
   ____ Little to Basic Computer experience (Surfing the internet, Light word possessing)
   ____ Intermediate (Heavy word processing, spreadsheet and presentation software usage, Paying bills online, Advanced online research and database usage)
   ____ Advanced User (Graphics editing, Programming, Database management, Web development)

9. How often do you use a computer? (Choose one)
   ____ Daily
   ____ Several times a week
   ____ Once a week
   ____ Monthly
   ____ Yearly
   ____ Do not use computer at all

10. Are you interested in using a computer?
    ____ Yes
    ____ No

11. Do you have access to a computer?
    ____ Yes
    ____ No

12. Do you have access to the internet (home, community center, library, work, etc.)?
    ____ Yes
    ____ No

13. What are reasons hindering you from learning about computers? (Choose all that apply)
    ____ Do not know how to use it
    ____ Have trouble reading the screen
    ____ Do not have time for it
    ____ Do not see a benefit
    ____ Do not trust using a computer.
    ____ Do not want to compromise privacy.
    ____I do not have issues learning how to use a computer.

14. When using a computer, do you require assistance?
    ____ Yes
    ____ No
    ____ I do not use a computer

Part IV. Social Media Experience

15. Please select one description that best describes your social media experience?
    ____ No experience (No Experience)
    ____ Little exposure (Watched someone use it; Personally used it less than 5 times)
    ____ Basic user (Able to view pictures, read walls, visit profiles, Comment and post on walls and pictures)
    ____ Intermediate/Advanced User (Able to add pictures and other media, Create groups, add trends and hashtags, Share links, Play games)

16. Do you have a social networking site account (examples include Facebook, MySpace, Twitter, LinkedIn, Google+)?
    ____ Yes
    ____ No
    ____ I am not familiar with this terminology.

17. If you have no account on any of the social networking sites, is there a reason why you do not use social networking services? (Choose all that apply)
   _____ I have an account
   _____ Not aware of social networking services
   _____ Have trouble reading the screen
   _____ Do not know how to use it
   _____ Do not have time for it
   _____ Do not see a benefit
   _____ Do not trust people online.
   _____ Do not want to compromise my privacy.
   _____ Other, please specify
   _____ None/No reason

18. Which social networking site do you have account with? (Choose all that apply)
   _____ Facebook
   _____ LinkedIn
   _____ Twitter
   _____ Google+
   _____ Other, _____
   _____ None, I do not use social networking sites.

19. Which website do you use the most frequently? (Please select one)
   _____ Facebook
   _____ LinkedIn
   _____ Twitter
   _____ Google+
   _____ Other: _____
   _____ None, I do not use social networking sites.

20. What is (or would be) your purpose of your social networking usage? (Choose all that apply)
____ Uploading or viewing photos
____ Connecting with friends
____ Connecting with classmates
____ Reading and viewing status updates
____ Reading or writing on friend/classmates walls
____ Reading and writing emails
____ Viewing or sharing ideas/links on wall
____Reading latest news and trends
____ Chatting (using IM or video chat)
____ Joining and participating in groups
____ Following companies or brands
____ Blogging
____ Other: _____
____None/N/A

21. If you have used a social networking site, what difficulties have you experienced? (Choose all that apply)
____ Font is too small to read
____ Colors of website make it hard to read
____ Cannot complete a task in time
____ Do not understand the layout
____ Do not understand the navigation
____ Cannot find certain pages, links, or people
____ Uploading or viewing photos
____ Social Networking site does not work on home computer or other computer
____ Other: _____
____None/N/A

12.   APPENDIX F:

Phase 1 & 3– Tasks

Social Media explanation:
Social media refers to web-based applications that allow users to connect. These connections can be of any type of relationship, such as friends, family, professional, or hobbies. A particular type of social media is called social networking sites. Facebook, for example, lets you connect with friends, post, comment, tag, and view pictures, write emails, instant messages, or public messages to people, play games, and other features.

Demonstration of functionalities:
The following tasks will be completed by the participant (a copy in 18 font will be provided to the user). Seconds will be rounded.

Task 1: Log into your account:
1. Click anywhere to continue.
2. Click in the field where you would enter your username.
3. Click in the field where you would enter your password.
4. Click on Login to enter the site.

Task 2: Understanding the homepage:
5. Click anywhere to continue.
6. Read out loud the title of the latest post in your newsfeed.
7. Click the appropriate link to read the next post – (Phase 3
8. Click anywhere to continue.
9. Read out loud the title of another post in your newsfeed.
10. Open this post by clicking on it
11. Click anywhere to continue.

Task 3: Understanding your profile:
12. Click anywhere to continue.
13. Click where you would view deals and advertisements
14. Read out loud a title of an advertisement on the homepage
15. Open an advertisement on the page by clicking on it
16. Click anywhere to continue.
17. Click on the appropriate link to go to your Profile page
18. Click on an appropriate link to view your posts
19. Read out loud your latest post.
20. Click on your latest post.
21. Click on the area where you would view information about yourself.

22. Click where you would view photos of yourself (not your profile pictures).
23. Click anywhere to continue.
24. Click where you would view your friend's list.
25. Read out loud one of your friend's names.
26. Click anywhere to continue.

Task 4: Navigating:
27. Click the appropriate link to go to your homepage.
28. Click the appropriate link to view notifications.
29. Identify where you would search for someone by name by clicking on this area
30. Click on John Smith (Redmond Washington) to visit his profile

Task 5: Understanding and comprehending information on a profile:
31. Click anywhere to continue.
32. Read out loud where John works.
33. Read out loud where John went to high school.
34. Read out loud where John went to college.
35. Read out loud where John currently lives.
36. Read out loud the music John likes.
37. Read out loud the movies John likes
38. Read out loud the TV shows does John likes.
39. Read out loud the books John likes.
40. Click anywhere to continue.

Task 6: Commenting on other profiles:
41. Click anywhere to continue.
42. Click where you would leave a comment on John Smith's family photo.
43. Demonstrate how you would tag John Smith in this family picture by clicking the appropriate links.
44. Click on the appropriate link to view John's friend's list.
45. Click on your friend Ann Jones to go to her profile page.
46. Click where you would leave a comment on Ann Jones' wall.

Task 7: Learning about Social Media (Phase 3 only)
47. Click anywhere to continue.
48. Click where you would learn about social media
49. Click where you would search for a terminology
50. Click on the definition of tagging.
51. Click where you would view an example of tagging.
52. Click anywhere to continue.

13.   APPENDIX G

Phase 1 – Post-Survey

Below, you will see a series of questions concerning your experience and opinion with social media. Please read each question carefully. There are no correct or incorrect responses. *Please respond to all items*.

1. How would you rate your overall ease of use using the social networking sites?
   ____ Very difficult
   ____ Difficult
   ____ Neutral
   ____ Easy
   ____ Very Easy

2. Please explain why you chose the rating above.

3. What difficulties did you experience while using the social networking sites? (Choose all that apply)

   ____ Font is too small to read
   ____ Colors of website make it hard to read
   ____ Cannot complete a task in timely fashion
   ____ Do not understand the layout
   ____ Do not understand the navigation
   ____ Other
   ____None/N/A

In the following section, please rate your experience with the tasks you engaged in:

4. Logging into your account
   ____ Very difficult
   ____ Difficult
   ____ Neutral
   ____ Easy
   ____ Very Easy

5. Understanding your homepage
   ____ Very difficult
   ____ Difficult
   ____ Neutral
   ____ Easy
   ____ Very Easy

6. Navigating through the social networking site
   ____ Very difficult
   ____ Difficult
   ____ Neutral
   ____ Easy
   ____ Very Easy

7. Understanding information on a profile
   ____ Very difficult
   ____ Difficult
   ____ Neutral
   ____ Easy
   ____ Very Easy

8. Commenting on other profiles
   ____ Very difficult
   ____ Difficult
   ____ Neutral
   ____ Easy
   ____ Very Easy

9. If social networking sites had an easier interface, would you use the application?
   ____ Never
   ____ Rarely
   ____ Occasionally/Sometimes
   ____ Often
   ____ Always

10. What features, such as images, photos, layout, did you like about the social networking site?

11. What features did you not like or understand about the social networking site?

12. What improvements could be made to the screens/interface?

14.   APPENDIX H

Phase 3 – Post-Survey

1. How would you rate your overall ease of use using the new prototype?
   ____ Very difficult
   ____ Difficult
   ____ Neutral
   ____ Easy
   ____ Very Easy

2. Please explain your answer.

3. What difficulties did you experience while using the prototype? (Choose all that apply)

   ____ Font is too small to read
   ____ Colors of website make it hard to read
   ____ Cannot complete a task in timely fashion
   ____ Do not understand the layout
   ____ Do not understand the navigation
   ____ Other
   ____None/N/A

In the following section, please rate your experience with the tasks you engaged in:
1. Logging into your account
   ____ Very difficult
   ____ Difficult
   ____ Neutral
   ____ Easy
   ____ Very Easy

2. Understanding your homepage
   ____ Very difficult
   ____ Difficult
   ____ Neutral
   ____ Easy
   ____ Very Easy

3. Navigating through the social networking site
____ Very difficult
____ Difficult
____ Neutral
____ Easy
____ Very Easy

4. Understanding information on a profile
____ Very difficult
____ Difficult
____ Neutral
____ Easy
____ Very Easy

5. Commenting on other profiles
____ Very difficult
____ Difficult
____ Neutral
____ Easy
____ Very Easy

4. If social media had an easier interface, would you use the application?
____ Never
____ Rarely
____ Occasionally/Sometimes
____ Often
____ Always

5. What features did you like about social networking sites?

6. What features did you not like or understand about the redesigned social networking site?

7. What improvements could be made to the new interface?

Part II: Comparison of Current and Prototype

1. Which social networking site seemed easier to use **overall**?

    ____ Current (First application)
    ____ Prototype (Second application, Version 1)
    ____ Prototype (Second application, Version 2)

2. Which social networking site would you prefer to use in the future:
    ____ Current (First application)
    ____ Prototype (Second application, Version 1)
    ____ Prototype (Second application, Version 2)

15.   APPENDIX I

Accounts

	Password	Comments
Facebook		
ElderAdult@gmail.com	Edplus99	Ellie Adultie
Jessica.TU.SNS.1@gmail.com	Edplus99	John Smith
Jessica.TU.SNS.2@gmail.com	Edplus99	Ann Jones
InVision		
JessicaArfaa@gmail.com	Edplus99	Phase 1
JessicaArfaa@yahoo.com	Edplus99	Phase 3, Version 1 & 2

16. APPENDIX J

Demographics

Table 30: Demographic Data

Demographical Data	None-to-basic Computer Experience % (#)	Intermediate to Advance Computer Experience
Gender		
Male	72% (8)	36% (4)
Female	27% (3)	63% (7)
Age Range		
65-70	18% (2)	72% (8)
71-75	27% (3)	36% (4)
76-80	27% (3)	0% (0)
81+	27% (3)	0% (0)
Work Experience		
Retired and not working	72% (8)	54% (6)
Retired from primary career and working part-time	9% (1)	18%(2)
Retired from primary career and working full-time	0% (0)	9% (1)
Employed, Full-time	9% (1)	18% (2)
Employed, Part-time	0% (0)	0% (0)
Unemployed (looking for unemployment)	0% (0)	0% (0)
Not in labor force (not looking for employment)	9% (1)	0% (0)
Computer Experience		
No Computer Experience	9% (1)	0% (0)
Little to Basic Computer experience (Surfing the internet, Light word	90% (10)	0% (0)

Demographical Data	None-to-basic Computer Experience % (#)	Intermediate to Advance Computer Experience
possessing)		
Intermediate (Heavy word processing, spreadsheet and presentation software usage, Paying bills online, Advanced online research and database usage)	0% (0)	36% (4)
Advanced User (Graphics editing, Programming, Database management, Web development)	0% (0)	63% (7)
Computer Usage		
Daily	45% (5)	100% (11)
Several times a week	36% (4)	0% (0)
Once a week	0% (0)	0% (0)
Monthly	0% (0)	0% (0)
Yearly	9% (1)	0% (0)
Do not use computer at all	9% (1)	0% (0)
Social Media Experience		
No experience (No Experience)	36% (4)	18% (2)
Little exposure (Watched someone use it; Personally used it less than 5 times)	45% (5)	27% (3)
Basic user (Able to view pictures, read walls, visit profiles, Comment and post on walls and pictures)	18% (2)	0% (0)
Intermediate/Advanced User (Able to add pictures and other media, Create groups, add trends and hashtags, Share links, Play games)	0% (0)	54% (6)
Social Media Profile		
Yes	54% (6)	36% (4)
No	36% (4)	63% (7)
I am not familiar with this terminology.	9% (1)	0% (0)

17.   APPENDIX K

Descriptive Statistics on Completion Time Phase 1 Group 1

Table 31: Descriptive Statistics on Completion Time Phase 1 Group 1

Type of statistics		Results on Subtasks				
		Subtask 2	Subtask 3	Subtask 4	Subtask 6	Subtask 7
N	Valid	3	8	11	7	5
	Missing	8	3	0	4	6
Mean		5.00	5.25	4.18	16.14	5.60
Median		.00	4.50	3.00	10.00	4.00
Mode		0	5	3	3[a]	1[a]
Std. Deviation		8.660	5.036	2.639	19.463	6.025
Variance		75.000	25.357	6.964	378.810	36.300
Range		15	16	9	56	15
		Subtask 9	Subtask 10	Subtask 12	Subtask 13	Subtask 14
N	Valid	6	5	7	8	6
	Missing	5	6	4	3	5
Mean		16.33	3.00	6.71	3.88	4.50
Median		10.00	4.00	5.00	3.00	3.00
Mode		9	4	5	3	3
Std. Deviation		16.096	1.414	4.192	3.227	5.206
Variance		259.067	2.000	17.571	10.411	27.100
Range		45	3	12	10	14
		Subtask 17	Subtask 18	Subtask 20	Subtask 21	Subtask 22
N	Valid	7	8	1	7	4
	Missing	4	3	10	4	7
Mean		6.43	11.13	37.00	13.43	6.25
Median		4.00	3.00	37.00	9.00	6.50
Mode		4	1[a]	37	3[a]	8
Std. Deviation		3.867	22.668		16.400	2.062
Variance		14.952	513.839		268.952	4.250
Range		9	66	0	47	4

Type of statistics	Results on Subtasks				
	Subtask 23	Subtask 24	Subtask 26	Subtask 28	Subtask 29
N Valid	5	6	8	11	10
Missing	6	5	3	0	1
Mean	3.00	7.50	7.13	5.18	4.90
Median	2.00	7.50	4.00	3.00	3.00
Mode	2	4[a]	2[a]	3	2
Std. Deviation	2.000	2.881	8.442	5.344	5.646
Variance	4.000	8.300	71.268	28.564	31.878
Range	5	7	25	19	19
	Subtask 32	Subtask 33	Subtask 34	Subtask 35	Subtask 37
N Valid	5	1	8	8	11
Missing	6	10	3	3	0
Mean	10.60	30.00	14.00	14.00	10.64
Median	10.00	30.00	12.50	10.00	6.00
Mode	4	30	16	3[a]	3[a]
Std. Deviation	6.986		9.517	14.263	9.511
Variance	48.800		90.571	203.429	90.455
Range	16	0	31	41	27
	Subtask 38	Subtask 39	Subtask 40	Subtask 41	Subtask 42
N Valid	6	10	10	11	8
Missing	5	1	1	0	3
Mean	10.17	3.60	7.30	10.82	7.88
Median	9.50	2.00	1.50	10.00	6.50
Mode	7	1[a]	1	2	5[a]
Std. Deviation	6.463	4.812	12.824	8.761	4.257
Variance	41.767	23.156	164.456	76.764	18.125
Range	18	16	40	30	13

Type of statistics	Results on Subtasks				
	Subtask 43	Subtask 44	Subtask 47	Subtask 48	Subtask 49
N Valid	8	9	0	1	8
Missing	3	2	11	10	3
Mean	11.63	4.33		33.00	10.00
Median	7.00	4.00		33.00	5.50
Mode	5^a	4		33	4^a
Std. Deviation	14.142	2.062			10.474
Variance	199.982	4.250			109.714
Range	43	6		0	31
	Subtask 50	Subtask 51	Subtask 53	Subtask 54	Subtask 55
N Valid	9	4	0	0	0
Missing	2	7	11	11	11
Mean	10.11	10.25			
Median	5.00	10.50			
Mode	2^a	5^a			
Std. Deviation	16.632	4.113			
Variance	276.611	16.917			
Range	52	10			

18. APPENDIX L

Descriptive Statistics on Completion Time Phase 1 Group 2

Table 32: Descriptive Statistics on Completion Time Phase 1 Group 2

Type of Statistics	Results on Subtasks				
	Subtask 2	Subtask 3	Subtask 4	Subtask 6	Subtask 7
N Valid	8	11	11	9	6
Missing	3	0	0	2	5
Mean	10.38	1.73	1.91	2.22	1.33
Median	6.50	1.00	2.00	2.00	1.00
Mode	1a	1	1	1a	1
Std. Dev	11.300	1.421	1.044	1.093	.516
Variance	127.696	2.018	1.091	1.194	.267
Range	33	4	3	3	1
	Subtask 9	Subtask 10	Subtask 12	Subtask 13	Subtask 14
N Valid	9	9	10	9	10
Missing	2	2	1	2	1
Mean	3.56	2.11	3.10	2.00	1.70
Median	3.00	2.00	2.00	1.00	1.00
Mode	2a	2	2	1	1
Std. Deviation	2.651	1.269	1.853	1.225	1.567
Variance	7.028	1.611	3.433	1.500	2.456
Range	9	4	5	3	5
	Subtask 17	Subtask 18	Subtask 20	Subtask 21	Subtask 22
N Valid	11	10	4	9	9
Missing	0	1	7	2	2
Mean	2.18	1.80	13.00	8.56	3.78
Median	2.00	1.00	6.00	5.00	4.00
Mode	2	1	2a	3a	2a
Std. Deviation	1.168	1.135	16.852	7.230	1.481
Variance	1.364	1.289	284.000	52.278	2.194
Range	4	3	36	19	4

Type of Statistics	Results on Subtasks				
	Subtask 23	Subtask 24	Subtask 26	Subtask 28	Subtask 29
N Valid	9	7	9	11	11
Missing	2	4	2	0	0
Mean	3.11	6.14	6.00	2.27	2.00
Median	3.00	3.00	5.00	1.00	2.00
Mode	2	2[a]	3[a]	1	1
Std. Deviation	1.616	8.355	4.183	1.954	1.265
Variance	2.611	69.810	17.500	3.818	1.600
Range	5	23	12	5	4
	Subtask 32	Subtask 33	Subtask 34	Subtask 35	Subtask 37
N Valid	7	3	9	9	10
Missing	4	8	2	2	1
Mean	5.57	9.33	11.78	8.00	7.90
Median	4.00	5.00	11.00	6.00	6.00
Mode	1[a]	4[a]	2[a]	1	2[a]
Std. Deviation	4.198	8.386	10.592	9.042	7.355
Variance	17.619	70.333	112.194	81.750	54.100
Range	11	15	29	29	24
	Subtask 38	Subtask 39	Subtask 40	Subtask 41	Subtask 42
N Valid	8	11	9	9	11
Missing	3	0	2	2	0
Mean	4.50	1.18	2.11	4.22	4.00
Median	2.00	1.00	2.00	4.00	3.00
Mode	2	1	1	2	3
Std. Deviation	4.175	.603	1.364	2.863	2.324
Variance	17.429	.364	1.861	8.194	5.400
Range	10	2	4	9	7
	Subtask 43	Subtask 44	Subtask 47	Subtask 48	Subtask 49
N Valid	11	11	2	1	8
Missing	0	0	9	10	3
Mean	2.18	1.82	8.50	17.00	3.75
Median	2.00	2.00	8.50	17.00	3.50
Mode	2	1	1[a]	17	2[a]
Std. Deviation	1.168	.874	10.607		2.252
Variance	1.364	.764	112.500		5.071
Range	4	2	15	0	7

Type of Statistics	Results on Subtasks				
	Subtask 50	Subtask 51	Subtask 53	Subtask 54	Subtask 55
N Valid	11	7	0	0	0
Missing	0	4	11	11	11
Mean	1.55	15.71			
Median	1.00	4.00			
Mode	1	4			
Std. Deviation	.688	20.221			
Variance	.473	408.905			
Range	2	50			

19. APPENDIX M

Descriptive Statistics on Completion Time Phase 3 Group 1 Version 1

Table 33: Descriptive Statistics on Completion Time Phase 3 Group 1 Version 1

Type of Statistics	Results on Subtasks				
	Subtask 2	Subtask 3	Subtask 4	Subtask 6	Subtask 7
N Valid	11	11	11	10	8
Missing	0	0	0	1	3
Mean	2.82	1.82	2.27	5.00	6.88
Median	1.00	1.00	1.00	2.00	6.00
Mode	1	1	1	2	2
Std. Deviation	4.020	2.089	2.832	5.011	5.384
Variance	16.164	4.364	8.018	25.111	28.982
Range	13	7	9	14	12
Minimum	1	1	1	1	2
Maximum	14	8	10	15	14
Sum	31	20	25	50	55
	Subtask 9	Subtask 10	Subtask 12	Subtask 13	Subtask 14
N Valid	11	10	0	0	11
Missing	0	1	11	11	0
Mean	3.27	4.60			8.55
Median	1.00	2.00			5.00
Mode	1	1[a]			3[a]
Std. Deviation	4.292	5.562			9.771
Variance	18.418	30.933			95.473
Range	14	14			32
Minimum	1	1			1
Maximum	15	15			33
Sum	36	46			94

Type of Statistics	Results on Subtasks				
	Subtask 17	Subtask 18	Subtask 20	Subtask 21	Subtask 22
N Valid	11	10	11	10	11
Missing	0	1	0	1	0
Mean	3.64	5.90	2.73	6.10	2.82
Median	2.00	3.00	2.00	6.00	2.00
Mode	2	1	2	6	1[a]
Std. Deviation	3.264	8.812	1.272	2.767	2.523
Variance	10.655	77.656	1.618	7.656	6.364
Range	11	29	4	9	8
Minimum	1	1	1	3	1
Maximum	12	30	5	12	9
Sum	40	59	30	61	31
	Subtask 23	Subtask 24	Subtask 26	Subtask 28	Subtask 29
N Valid	10	7	9	10	11
Missing	1	4	2	1	0
Mean	4.50	6.43	3.33	2.60	1.91
Median	3.00	4.00	3.00	3.00	2.00
Mode	1	2	1	3	1
Std. Deviation	4.035	5.224	2.598	.966	1.221
Variance	16.278	27.286	6.750	.933	1.491
Range	11	14	7	3	4
Minimum	1	2	1	1	1
Maximum	12	16	8	4	5
Sum	45	45	30	26	21
	Subtask 32	Subtask 33	Subtask 34	Subtask 35	Subtask 37
N Valid	11	10	11	8	11
Missing	0	1	0	3	0
Mean	4.82	3.90	7.09	1.88	2.73
Median	3.00	4.00	6.00	1.00	1.00
Mode	2	4	2	1	1
Std. Deviation	4.490	1.792	4.847	1.458	2.453
Variance	20.164	3.211	23.491	2.125	6.018
Range	14	6	13	4	6
Minimum	1	1	2	1	1
Maximum	15	7	15	5	7
Sum	53	39	78	15	30

Type of Statistics	Results on Subtasks				
	Subtask 38	Subtask 39	Subtask 40	Subtask 41	Subtask 42
N Valid	11	11	11	11	11
Missing	0	0	0	0	0
Mean	1.82	1.45	2.00	4.18	1.91
Median	2.00	1.00	2.00	4.00	1.00
Mode	1	1	1	2[a]	1
Std. Deviation	.982	.820	1.095	2.714	1.514
Variance	.964	.673	1.200	7.364	2.291
Range	3	2	3	10	5
Minimum	1	1	1	1	1
Maximum	4	3	4	11	6
Sum	20	16	22	46	21
	Subtask 43	Subtask 44	Subtask 47	Subtask 48	Subtask 49
N Valid	11	11	9	7	9
Missing	0	0	2	4	2
Mean	2.36	2.00	5.00	10.43	3.78
Median	2.00	2.00	3.00	11.00	3.00
Mode	2	1	2[a]	11	2
Std. Deviation	1.433	1.265	4.243	3.552	2.386
Variance	2.055	1.600	18.000	12.619	5.694
Range	5	4	13	11	7
Minimum	1	1	1	5	2
Maximum	6	5	14	16	9
Sum	26	22	45	73	34
	Subtask 50	Subtask 51	Subtask 53	Subtask 54	Subtask 55
N Valid	10	11	11	11	9
Missing	1	0	0	0	2
Mean	1.80	2.82	4.64	4.82	3.11
Median	1.50	2.00	4.00	2.00	2.00
Mode	1	2	3	2	2
Std. Deviation	.919	2.089	2.063	6.555	4.137
Variance	.844	4.364	4.255	42.964	17.111
Range	2	7	7	22	13
Minimum	1	1	2	1	1
Maximum	3	8	9	23	14
Sum	18	31	51	53	28

Type of Statistics		Results on Subtasks
		Subtask 56
N	Valid	10
	Missing	1
Mean		3.90
Median		2.00
Mode		1[a]
Std. Deviation		4.841
Variance		23.433
Range		16
Minimum		1
Maximum		17
Sum		39

## 20.	APPENDIX N

Descriptive Statistics on Completion Time Phase 3 Group 2 Version 1

Table 34: Phase 3 Group 2 Version 1 Completion Times

Type of Statistics		Results on Subtasks				
		Subtask 2	Subtask 3	Subtask 4	Subtask 6	Subtask 7
N	Valid	11	11	11	11	11
	Missing	0	0	0	0	0
Mean		1.00	1.00	1.00	2.00	1.91
Median		1.00	1.00	1.00	1.00	2.00
Mode		1	1	1	1	2
Std. Deviation		.000	.000	.000	1.612	.701
Variance		.000	.000	.000	2.600	.491
Range		0	0	0	4	2
Minimum		1	1	1	1	1
Maximum		1	1	1	5	3
Sum		11	11	11	22	21
		Subtask 9	Subtask 10	Subtask 12	Subtask 13	Subtask 14
N	Valid	11	11	0	0	11
	Missing	0	0	11	11	0
Mean		1.82	1.73			3.73
Median		1.00	1.00			2.00
Mode		1	1			1[a]
Std. Deviation		1.834	.905			3.197
Variance		3.364	.818			10.218
Range		5	2			9
Minimum		1	1			1
Maximum		6	3			10
Sum		20	19			41

Type of Statistics	Results on Subtasks				
	Subtask 17	Subtask 18	Subtask 20	Subtask 21	Subtask 22
N Valid	11	11	10	10	11
Missing	0	0	1	1	0
Mean	1.82	2.18	1.90	4.10	1.82
Median	1.00	1.00	2.00	4.00	1.00
Mode	1	1	2	1[a]	1
Std. Deviation	2.136	2.401	.738	2.183	.982
Variance	4.564	5.764	.544	4.767	.964
Range	7	8	2	6	2
Minimum	1	1	1	1	1
Maximum	8	9	3	7	3
Sum	20	24	19	41	20
	Subtask 23	Subtask 24	Subtask 26	Subtask 28	Subtask 29
N Valid	11	9	11	11	11
Missing	0	2	0	0	0
Mean	1.55	4.78	2.73	2.18	1.18
Median	1.00	5.00	2.00	1.00	1.00
Mode	1	1[a]	1	1	1
Std. Deviation	1.214	3.153	3.101	2.960	.603
Variance	1.473	9.944	9.618	8.764	.364
Range	4	8	10	10	2
Minimum	1	1	1	1	1
Maximum	5	9	11	11	3
Sum	17	43	30	24	13
	Subtask 32	Subtask 33	Subtask 34	Subtask 35	Subtask 37
N Valid	11	11	11	10	11
Missing	0	0	0	1	0
Mean	1.55	1.36	1.55	1.40	2.00
Median	2.00	1.00	2.00	1.00	1.00
Mode	2	1	2	1	1
Std. Deviation	.522	.924	.522	1.265	1.342
Variance	.273	.855	.273	1.600	1.800
Range	1	3	1	4	4
Minimum	1	1	1	1	1
Maximum	2	4	2	5	5
Sum	17	15	17	14	22

Type of Statistics	Results on Subtasks				
	Subtask 38	Subtask 39	Subtask 40	Subtask 41	Subtask 42
N Valid	11	11	10	10	11
Missing	0	0	1	1	0
Mean	1.45	1.09	2.00	1.60	1.27
Median	1.00	1.00	1.00	2.00	1.00
Mode	1	1	1	2	1
Std. Deviation	.688	.302	1.491	.516	.467
Variance	.473	.091	2.222	.267	.218
Range	2	1	4	1	1
Minimum	1	1	1	1	1
Maximum	3	2	5	2	2
Sum	16	12	20	16	14
	Subtask 43	Subtask 44	Subtask 47	Subtask 48	Subtask 49
N Valid	11	11	10	8	10
Missing	0	0	1	3	1
Mean	2.55	1.27	2.70	8.25	2.70
Median	1.00	1.00	1.00	6.50	2.00
Mode	1	1	1	4	2
Std. Deviation	2.583	.467	3.164	4.464	2.710
Variance	6.673	.218	10.011	19.929	7.344
Range	8	1	10	11	9
Minimum	1	1	1	4	1
Maximum	9	2	11	15	10
Sum	28	14	27	66	27
	Subtask 50	Subtask 51	Subtask 53	Subtask 54	Subtask 55
N Valid	11	11	10	11	11
Missing	0	0	1	0	0
Mean	1.27	1.27	2.50	1.18	1.36
Median	1.00	1.00	3.00	1.00	1.00
Mode	1	1	1	1	1
Std. Deviation	.905	.647	1.354	.405	.674
Variance	.818	.418	1.833	.164	.455
Range	3	2	3	1	2
Minimum	1	1	1	1	1
Maximum	4	3	4	2	3
Sum	14	14	25	13	15

Type of Statistics		Results on Subtasks
		Subtask 56
N	Valid	11
	Missing	0
Mean		1.09
Median		1.00
Mode		1
Std. Deviation		.302
Variance		.091
Range		1
Minimum		1
Maximum		2
Sum		12

21. APPENDIX O

Descriptive Statistics on Completion Time Phase 3 Group 1 Version 2

Table 35: Descriptive Statistics on Completion Time Phase 3 Group 1 Version 2

Type of Statistics	Results on Subtasks				
	Subtask 2	Subtask 3	Subtask 4	Subtask 6	Subtask 7
N Valid	11	11	11	10	8
Missing	0	0	0	1	3
Mean	2.82	1.82	2.27	5.00	6.88
Median	1.00	1.00	1.00	2.00	6.00
Mode	1	1	1	2	2
Std. Deviation	4.020	2.089	2.832	5.011	5.384
Variance	16.164	4.364	8.018	25.111	28.982
Range	13	7	9	14	12
Minimum	1	1	1	1	2
Maximum	14	8	10	15	14
Sum	31	20	25	50	55
	Subtask 9	Subtask 10	Subtask 12	Subtask 13	Subtask 14
N Valid	11	10			11
Missing	0	1			0
Mean	3.27	4.60			8.55
Median	1.00	2.00			5.00
Mode	1	1[a]			3[a]
Std. Deviation	4.292	5.562			9.771
Variance	18.418	30.933			95.473
Range	14	14			32
Minimum	1	1			1
Maximum	15	15			33
Sum	36	46			94

Type of Statistics	Results on Subtasks				
	Subtask 17	Subtask 18	Subtask 20	Subtask 21	Subtask 22
N Valid	11	10	11	10	11
Missing	0	1	0	1	0
Mean	3.64	5.90	2.73	6.10	2.82
Median	2.00	3.00	2.00	6.00	2.00
Mode	2	1	2	6	1[a]
Std. Deviation	3.264	8.812	1.272	2.767	2.523
Variance	10.655	77.656	1.618	7.656	6.364
Range	11	29	4	9	8
Minimum	1	1	1	3	1
Maximum	12	30	5	12	9
Sum	40	59	30	61	31
	Subtask 23	Subtask 24	Subtask 26	Subtask 28	Subtask 29
N Valid	10	7	9	10	11
Missing	1	4	2	1	0
Mean	4.50	6.43	3.33	2.60	1.91
Median	3.00	4.00	3.00	3.00	2.00
Mode	1	2	1	3	1
Std. Deviation	4.035	5.224	2.598	.966	1.221
Variance	16.278	27.286	6.750	.933	1.491
Range	11	14	7	3	4
Minimum	1	2	1	1	1
Maximum	12	16	8	4	5
Sum	45	45	30	26	21
	Subtask 32	Subtask 33	Subtask 34	Subtask 35	Subtask 37
N Valid	11	10	11	8	11
Missing	0	1	0	3	0
Mean	4.82	3.90	7.09	1.88	2.73
Median	3.00	4.00	6.00	1.00	1.00
Mode	2	4	2	1	1
Std. Deviation	4.490	1.792	4.847	1.458	2.453
Variance	20.164	3.211	23.491	2.125	6.018
Range	14	6	13	4	6
Minimum	1	1	2	1	1
Maximum	15	7	15	5	7
Sum	53	39	78	15	30

Type of Statistics	Results on Subtasks				
	Subtask 38	Subtask 39	Subtask 40	Subtask 41	Subtask 42
N Valid	11	11	11	11	11
Missing	0	0	0	0	0
Mean	1.82	1.45	2.00	4.18	1.91
Median	2.00	1.00	2.00	4.00	1.00
Mode	1	1	1	2[a]	1
Std. Deviation	.982	.820	1.095	2.714	1.514
Variance	.964	.673	1.200	7.364	2.291
Range	3	2	3	10	5
Minimum	1	1	1	1	1
Maximum	4	3	4	11	6
Sum	20	16	22	46	21
	Subtask 43	Subtask 44	Subtask 47	Subtask 48	Subtask 49
N Valid	11	11	9	7	9
Missing	0	0	2	4	2
Mean	2.36	2.00	5.00	10.43	3.78
Median	2.00	2.00	3.00	11.00	3.00
Mode	2	1	2[a]	11	2
Std. Deviation	1.433	1.265	4.243	3.552	2.386
Variance	2.055	1.600	18.000	12.619	5.694
Range	5	4	13	11	7
Minimum	1	1	1	5	2
Maximum	6	5	14	16	9
Sum	26	22	45	73	34
	Subtask 50	Subtask 51	Subtask 53	Subtask 54	Subtask 55
N Valid	10	11	11	11	9
Missing	1	0	0	0	2
Mean	1.80	2.82	4.64	4.82	3.11
Median	1.50	2.00	4.00	2.00	2.00
Mode	1	2	3	2	2
Std. Deviation	.919	2.089	2.063	6.555	4.137
Variance	.844	4.364	4.255	42.964	17.111
Range	2	7	7	22	13
Minimum	1	1	2	1	1
Maximum	3	8	9	23	14
Sum	18	31	51	53	28

Type of Statistics		Results on Subtasks
		Subtask 56
N	Valid	10
	Missing	1
Mean		3.90
Median		2.00
Mode		1[a]
Std. Deviation		4.841
Variance		23.433
Range		16
Minimum		1
Maximum		17
Sum		39

22. APPENDIX P

Descriptive Statistics on Completion Times Phase 3 Group 2 Version 2

Table 36: Descriptive Statistics on Completion Times Phase 3 Group 2 Version 2

Type of Statistics	Results on Subtasks				
	Subtask 2	Subtask 3	Subtask 4	Subtask 6	Subtask 7
N Valid	11	11	11	11	11
Missing	0	0	0	0	0
Mean	1.00	1.00	1.00	3.09	2.64
Median	1.00	1.00	1.00	2.00	2.00
Mode	1	1	1	2	2
Std. Deviation	.000	.000	.000	2.737	2.693
Variance	.000	.000	.000	7.491	7.255
Range	0	0	0	9	9
Minimum	1	1	1	1	1
Maximum	1	1	1	10	10
Sum	11	11	11	34	29
	Subtask 9	Subtask 10	Subtask 12	Subtask 13	Subtask 14
N Valid	11	10			10
Missing	0	1			1
Mean	1.45	4.00			3.80
Median	1.00	1.00			3.50
Mode	1	1			1[a]
Std. Deviation	1.214	6.864			2.440
Variance	1.473	47.111			5.956
Range	4	22			7
Minimum	1	1			1
Maximum	5	23			8
Sum	16	40			38

Type of Statistics	Results on Subtasks				
	Subtask 17	Subtask 18	Subtask 20	Subtask 21	Subtask 22
N Valid	11	9	10	10	11
Missing	0	2	1	1	0
Mean	4.18	1.67	1.80	4.70	1.91
Median	2.00	1.00	2.00	5.00	1.00
Mode	1	1	2	6	1
Std. Deviation	6.194	1.000	.632	2.163	1.221
Variance	38.364	1.000	.400	4.678	1.491
Range	21	3	2	6	3
Minimum	1	1	1	2	1
Maximum	22	4	3	8	4
Sum	46	15	18	47	21
	Subtask 23	Subtask 24	Subtask 26	Subtask 28	Subtask 29
N Valid	11	7	11	10	11
Missing	0	4	0	1	0
Mean	2.55	4.14	2.18	1.50	1.00
Median	2.00	3.00	2.00	1.00	1.00
Mode	1	3[a]	1	1	1
Std. Deviation	1.635	2.795	1.722	.707	.000
Variance	2.673	7.810	2.964	.500	.000
Range	4	7	5	2	0
Minimum	1	1	1	1	1
Maximum	5	8	6	3	1
Sum	28	29	24	15	11
	Subtask 32	Subtask 33	Subtask 34	Subtask 35	Subtask 37
N Valid	11	11	11	9	11
Missing	0	0	0	2	0
Mean	1.36	1.64	2.00	1.67	1.55
Median	1.00	1.00	1.00	1.00	1.00
Mode	1	1	1	1	1
Std. Deviation	.505	.809	1.414	1.323	.688
Variance	.255	.655	2.000	1.750	.473
Range	1	2	4	4	2
Minimum	1	1	1	1	1
Maximum	2	3	5	5	3
Sum	15	18	22	15	17

Type of Statistics	Results on Subtasks				
	Subtask 38	Subtask 39	Subtask 40	Subtask 41	Subtask 42
N Valid	11	11	10	10	11
Missing	0	0	1	1	0
Mean	1.45	1.27	2.00	2.30	1.27
Median	1.00	1.00	1.50	1.50	1.00
Mode	1	1	1	1	1
Std. Deviation	.688	.905	1.247	1.636	.647
Variance	.473	.818	1.556	2.678	.418
Range	2	3	3	4	2
Minimum	1	1	1	1	1
Maximum	3	4	4	5	3
Sum	16	14	20	23	14
	Subtask 43	Subtask 44	Subtask 47	Subtask 48	Subtask 49
N Valid	11	11	11	8	10
Missing	0	0	0	3	1
Mean	2.91	1.36	3.27	10.00	4.90
Median	2.00	1.00	2.00	12.50	2.00
Mode	1	1	1	13	1
Std. Deviation	2.427	.674	4.628	4.209	5.301
Variance	5.891	.455	21.418	17.714	28.100
Range	7	2	16	10	13
Minimum	1	1	1	4	1
Maximum	8	3	17	14	14
Sum	32	15	36	80	49
	Subtask 50	Subtask 51	Subtask 53	Subtask 54	Subtask 55
N Valid	11	11	11	11	11
Missing	0	0	0	0	0
Mean	1.00	2.18	2.73	1.64	2.45
Median	1.00	1.00	3.00	1.00	1.00
Mode	1	1	3	1	1
Std. Deviation	.000	3.601	1.191	1.286	2.464
Variance	.000	12.964	1.418	1.655	6.073
Range	0	12	4	4	8
Minimum	1	1	1	1	1
Maximum	1	13	5	5	9
Sum	11	24	30	18	27

Type of Statistics		Results on Subtasks
		Subtask 56
N	Valid	11
	Missing	0
Mean		2.82
Median		1.00
Mode		1
Std. Deviation		5.400
Variance		29.164
Range		18
Minimum		1
Maximum		19
Sum		31

23.   APPENDIX Q

Completion Times Mann–Whitney Phase 1 Group 1 & 2

Table 37: Completion Times Mann–Whitney Phase 1 Group 1 & 2

Task	Phase 1 Times Group 1 & 2	Decision
Task 1		
Subtask 2: Click in the field where you would enter your username.	.279	Retain the null hypothesis
Subtask 3: Click in the field where you would enter your password.	.033	Reject the null hypothesis.
Subtask 4: Click on Login to enter the site.	.010	Reject the null hypothesis.
Task 2		
Subtask 6: Read out loud the title of the latest post in your newsfeed.	.001	Reject the null hypothesis.
Subtask 7: Open the latest post in your newsfeed section by clicking on it.	.082	Retain the null hypothesis
Subtask 9: Read out loud the title of another post in your newsfeed.	.026	Reject the null hypothesis.
Subtask 10: Open this post by clicking on it.	.298	Retain the null hypothesis
Subtask 12: Scroll down to the last post on the newsfeed.	.055	Retain the null hypothesis

Task	Phase 1 Times Group 1 & 2	Decision
Subtask 13: Read out loud the title of the last post in your newsfeed.	.200	Retain the null hypothesis
Subtask 14: Open the last posting in your newsfeed section by clicking on it.	.042	Reject the null hypothesis.
Task 3		
Subtask 17: Read out loud a title of an advertisement on the homepage.	.001	Reject the null hypothesis.
Subtask 18: Open an advertisement on the page by clicking on it.	.101	Retain the null hypothesis
Subtask 20: Click on the appropriate link to go to your Profile page	.800	Retain the null hypothesis
Subtask 21: Click on any part of the timeline area.	.470	Retain the null hypothesis
Subtask 22: Read out loud your latest post.	.076	Retain the null hypothesis
Subtask 23: Click on your latest post.	.797	Retain the null hypothesis
Subtask 24: Click on the area where you would view information about yourself.	.051	Retain the null hypothesis
Subtask 26: Click where you would view photos of yourself (not your profile pictures).	.673	Retain the null hypothesis
Subtask 28: Click where you would view your friend's list.	.028	Reject the null hypothesis.

Task	Phase 1 Times Group 1 & 2	Decision
Subtask 29: Read out loud one of your friend's names.	.114	Retain the null hypothesis
Task 4		
Subtask 32: Click the appropriate link to go to your homepage.	.149	Retain the null hypothesis
Subtask 33: Click the appropriate link to view notifications.	.500	Retain the null hypothesis
Subtask 34: Identify where you would search for someone by name by clicking on this area	.541	Retain the null hypothesis
Subtask 35: Click on John Smith (Redmond Washington) to visit his profile.	.321	Retain the null hypothesis
Task 5:		
Subtask 37: Read out loud where John works.	.557	Retain the null hypothesis
Subtask 38: Read out loud where John went to high school.	.142	Retain the null hypothesis
Subtask 39: Read out loud where John went to college.	.020	Reject the null hypothesis.
Subtask 40: Read out loud where John currently lives.	.780	Retain the null hypothesis
Subtask 41: Read out loud the music John likes.	.031	Reject the null hypothesis.
Subtask 42: Read out loud the movies John likes.	.012	Reject the null hypothesis.
Subtask 43: Read out loud the TV shows does John likes.	.000	Reject the null hypothesis.

Task	Phase 1 Times Group 1 & 2	Decision
Subtask 44: Read out loud the books John likes.	.002	Reject the null hypothesis.
Task 6		
Subtask 47: Click where you would leave a comment on John Smith's family photo.	.	
Subtask 48: Demonstrate how you would tag John Smith in this family picture by clicking the appropriate links.	1.00	Retain the null hypothesis
Subtask 49: Click on the appropriate link to view your friends.	.038	Reject the null hypothesis.
Subtask 50: Click on your friend Ann Jones to go to her profile page.	.001	Reject the null hypothesis.
Subtask 51: Click where you would leave a comment on Ann Jones' wall.	.412	Retain the null hypothesis

24.   APPENDIX R

Completion Times Mann–Whitney Phase 3 Times Group 1 & 2 V1

Table 38: Completion Times Mann–Whitney Phase 3 Times Group 1 & 2 V1

Task	Phase 3 Times Group 1 & 2 V1	Decision
Task 1		
Subtask 2: Click in the field where you would enter your username.	.478	Retain the null hypothesis
Subtask 3: Click in the field where you would enter your password.	.478	Retain the null hypothesis
Subtask 4: Click on Login to enter the site.	.300	Retain the null hypothesis
Task 2		
Subtask 6: Read out loud the title of the latest post in your newsfeed.	.002	Reject the null hypothesis
Subtask 7: Open the latest post in your newsfeed section by clicking on it.	.001	Reject the null hypothesis
Subtask 9: Read out loud the title of another post in your newsfeed.	.217	Retain the null hypothesis
Subtask 10: Open this post by clicking on it.	.251	Retain the null hypothesis
Subtask 12: Scroll down to the last post on the newsfeed.	.	

Task	Phase 3 Times Group 1 & 2 V1	Decision
Subtask 13: Read out loud the title of the last post in your newsfeed.	.	
Subtask 14: Open the last posting in your newsfeed section by clicking on it.	.101	Retain the null hypothesis
Task 3		
Subtask 17: Read out loud a title of an advertisement on the homepage.	.006	Reject the null hypothesis
Subtask 18: Open an advertisement on the page by clicking on it.	.272	Retain the null hypothesis
Subtask 20: Click on the appropriate link to go to your Profile page	.002	Retain the null hypothesis
Subtask 21: Click on any part of the timeline area.	.023	Retain the null hypothesis
Subtask 22: Read out loud your latest post.	.512	Reject the null hypothesis
Subtask 23: Click on your latest post.	.020	Reject the null hypothesis
Subtask 24: Click on the area where you would view information about yourself.	.190	Retain the null hypothesis
Subtask 26: Click where you would view photos of yourself (not your profile pictures).	.251	Retain the null hypothesis
Subtask 28: Click where you would view your friend's list.	.007	Retain the null hypothesis

Task	Phase 3 Times Group 1 & 2 V1	Decision
Subtask 29: Read out loud one of your friend's names.	.101	Retain the null hypothesis
Task 4		
Subtask 32: Click the appropriate link to go to your homepage.	.034	Reject the null hypothesis
Subtask 33: Click the appropriate link to view notifications.	.001	Reject the null hypothesis
Subtask 34: Identify where you would search for someone by name by clicking on this area	.000	Reject the null hypothesis
Subtask 35: Click on John Smith (Redmond Washington) to visit his profile.	.035	Reject the null hypothesis
Task 5:		
Subtask 37: Read out loud where John works.	.797	Retain the null hypothesis
Subtask 38: Read out loud where John went to high school.	.217	Retain the null hypothesis
Subtask 39: Read out loud where John went to college.	.438	Retain the null hypothesis
Subtask 40: Read out loud where John currently lives.	.173	Retain the null hypothesis
Subtask 41: Read out loud the music John likes.	.001	Reject the null hypothesis
Subtask 42: Read out loud the movies John likes.	.034	Reject the null hypothesis

Task	Phase 3 Times Group 1 & 2 V1	Decision
Subtask 43: Read out loud the TV shows does John likes.	.438	Retain the null hypothesis
Subtask 44: Read out loud the books John likes.	.088	Retain the null hypothesis
Task 6		
Subtask 47: Click where you would leave a comment on John Smith's family photo.	.075	Retain the null hypothesis
Subtask 48: Demonstrate how you would tag John Smith in this family picture by clicking the appropriate links.	.059	Retain the null hypothesis
Subtask 49: Click on the appropriate link to view your friends	.156	Retain the null hypothesis
Subtask 50: Click on your friend Ann Jones to go to her profile page.	.412	Retain the null hypothesis
Subtask 51: Click where you would leave a comment on Ann Jones' wall.	.175	Retain the null hypothesis
Task 7		
Subtask 53: Click where you would learn about social media.	.043	Reject the null hypothesis
Subtask 54: Click where you would search for a terminology.	.000	Reject the null hypothesis

Task	Phase 3 Times Group 1 & 2 V1	Decision
Subtask 55: Click on the definition of tagging.	.001	Reject the null hypothesis
Subtask 56: Click where you would view an example of tagging.	.010	Reject the null hypothesis

25. APPENDIX S

Completion Times Mann–Whitney Phase 3 Times Group 1 & 2 V2

Table 39: Completion Times Mann–Whitney Phase 3 Times Group 1 & 2 V2

Task	Phase 3 Times Group 1 & 2 V2	Decision
Task 1		
Subtask 2: Click in the field where you would enter your username.	.300	Retain the null hypothesis
Subtask 3: Click in the field where you would enter your password.	.300	Retain the null hypothesis
Subtask 4: Click on Login to enter the site.	.300	Retain the null hypothesis
Task 2		
Subtask 6: Read out loud the title of the latest post in your newsfeed.	.557	Retain the null hypothesis
Subtask 7: Open the latest post in your newsfeed section by clicking on it.	.041	Reject the null hypothesis
Subtask 9: Read out loud the title of another post in your newsfeed.	.243	Retain the null hypothesis
Subtask 10: Open this post by clicking on it.	.393	Retain the null hypothesis
Subtask 12: Scroll down to the last post on the newsfeed.	.	

Task	Phase 3 Times Group 1 & 2 V2	Decision
Subtask 13: Read out loud the title of the last post in your newsfeed.	.	
Subtask 14: Open the last posting in your newsfeed section by clicking on it.	.282	Retain the null hypothesis
Task 3		
Subtask 17: Read out loud a title of an advertisement on the homepage.	.519	Retain the null hypothesis
Subtask 18: Open an advertisement on the page by clicking on it.	.095	Retain the null hypothesis
Subtask 20: Click on the appropriate link to go to your Profile page	.315	Retain the null hypothesis
Subtask 21: Click on any part of the timeline area.	.315	Retain the null hypothesis
Subtask 22: Read out loud your latest post.	.438	Retain the null hypothesis
Subtask 23: Click on your latest post.	.426	Retain the null hypothesis
Subtask 24: Click on the area where you would view information about yourself.	.456	Retain the null hypothesis
Subtask 26: Click where you would view photos of yourself (not your profile pictures).	.295	Retain the null hypothesis
Subtask 28: Click where you would view your friend's list.	.019	Reject the null hypothesis

Task	Phase 3 Times Group 1 & 2 V2	Decision
Subtask 29: Read out loud one of your friend's names.	.028	Reject the null hypothesis
Task 4		
Subtask 32: Click the appropriate link to go to your homepage.	.002	Reject the null hypothesis
Subtask 33: Click the appropriate link to view notifications.	.002	Reject the null hypothesis
Subtask 34: Identify where you would search for someone by name by clicking on this area	.002	Reject the null hypothesis
Subtask 35: Click on John Smith (Redmond Washington) to visit his profile.	.815	Retain the null hypothesis
Task 5:		
Subtask 37: Read out loud where John works.	.562	Retain the null hypothesis
Subtask 38: Read out loud where John went to high school.	.438	Retain the null hypothesis
Subtask 39: Read out loud where John went to college.	.562	Retain the null hypothesis
Subtask 40: Read out loud where John currently lives.	.973	Retain the null hypothesis
Subtask 41: Read out loud the music John likes.	.061	Retain the null hypothesis
Subtask 42: Read out loud the movies John likes.	.300	Retain the null hypothesis

Task	Phase 3 Times Group 1 & 2 V2	Decision
Subtask 43: Read out loud the TV shows does John likes.	1.00	Retain the null hypothesis
Subtask 44: Read out loud the books John likes.	.243	Retain the null hypothesis
Task 6		
Subtask 47: Click where you would leave a comment on John Smith's family photo.	.131	Retain the null hypothesis
Subtask 48: Demonstrate how you would tag John Smith in this family picture by clicking the appropriate links.	1.00	Retain the null hypothesis
Subtask 49: Click on the appropriate link to view your friends	.549	Retain the null hypothesis
Subtask 50: Click on your friend Ann Jones to go to her profile page.	.051	Retain the null hypothesis
Subtask 51: Click where you would leave a comment on Ann Jones' wall.	.019	Reject the null hypothesis
Task 7		
Subtask 53: Click where you would learn about social media.	.019	Reject the null hypothesis
Subtask 54: Click where you would search for a terminology.	.034	Reject the null hypothesis

Task	Phase 3 Times Group 1 & 2 V2	Decision
Subtask 55: Click on the definition of tagging.	.656	Retain the null hypothesis
Subtask 56: Click where you would view an example of tagging.	.085	Retain the null hypothesis

26. APPENDIX T

Success Rates Phase 1 Group 1 & 2

Table 40: Success Rates Phase 1 Group 1 & 2

Subtask Rates					
Click in the field where you would enter your username.					
			Group 1	Group 2	
Subtask 2	Fail	Count	8	3	11
		% within Subtask 2	72.7%	27.3%	100.0%
	Pass	Count	3	8	11
		% within Subtask 2	27.3%	72.7%	100.0%
Total		Count	11	11	22
		% within Subtask 2	50.0%	50.0%	100.0%
Click in the field where you would enter your password.					
Subtask 3	Fail	Count	2	0	2
		% within Subtask 3	100.0%	0.0%	100.0%
	Pass	Count	9	11	20
		% within Subtask 3	45.0%	55.0%	100.0%
Total		Count	11	11	22
		% within Subtask 3	50.0%	50.0%	100.0%

Subtask Rates					
Click on Login to enter the site.					
Subtask 4	Fail	Count	1	0	1
		% within Subtask 4	100.0%	0.0%	100.0%
	Pass	Count	10	11	21
		% within Subtask 4	47.6%	52.4%	100.0%
Total		Count	11	11	22
		% within Subtask 4	50.0%	50.0%	100.0%
Read out loud the title of the latest post in your newsfeed.					
Subtask 6	Fail	Count	4	3	7
		% within Subtask 6	57.1%	42.9%	100.0%
	Pass	Count	7	8	15
		% within Subtask 6	46.7%	53.3%	100.0%
Total		Count	11	11	22
		% within Subtask 6	50.0%	50.0%	100.0%
Click the appropriate link to read the next post					
Subtask 7	Fail	Count	5	4	9
		% within Subtask 7	55.6%	44.4%	100.0%
	Pass	Count	6	7	13
		% within Subtask 7	46.2%	53.8%	100.0%
Total		Count	11	11	22
		% within Subtask 7	50.0%	50.0%	100.0%

Subtask Rates					
Read out loud the title of another post in your newsfeed					
Subtask 9	Fail	Count	5	2	7
		% within Subtask 9	71.4%	28.6%	100.0%
	Pass	Count	6	9	15
		% within Subtask 9	40.0%	60.0%	100.0%
Total		Count	11	11	22
		% within Subtask 9	50.0%	50.0%	100.0%
Open this post by clicking on it					
Subtask 10	Fail	Count	6	2	8
		% within Subtask 10	75.0%	25.0%	100.0%
	Pass	Count	5	9	14
		% within Subtask 10	35.7%	64.3%	100.0%
Total		Count	11	11	22
		% within Subtask 10	50.0%	50.0%	100.0%
Scroll down to the last post on the newsfeed.					
Subtask 12	Fail	Count	4	1	5
		% within Subtask 12	80.0%	20.0%	100.0%
	Pass	Count	7	10	17
		% within Subtask 12	41.2%	58.8%	100.0%
Total		Count	11	11	22
		% within Subtask 12	50.0%	50.0%	100.0%

Subtask Rates					
Read out loud the title of the last post in your newsfeed					
Subtask 13	Fail	Count	3	2	5
		% within Subtask 13	60.0%	40.0%	100.0%
	Pass	Count	8	9	17
		% within Subtask 13	47.1%	52.9%	100.0%
Total		Count	11	11	22
		% within Subtask 13	50.0%	50.0%	100.0%
Open the last posting in your newsfeed section by clicking on it.					
Subtask 14	Fail	Count	5	1	6
		% within Subtask 14	83.3%	16.7%	100.0%
	Pass	Count	6	10	16
		% within Subtask 14	37.5%	62.5%	100.0%
Total		Count	11	11	22
		% within Subtask 14	50.0%	50.0%	100.0%
Read out loud a title of an advertisement on the homepage.					
Subtask 17	Fail	Count	4	0	4
		% within Subtask 17	100.0%	0.0%	100.0%
	Pass	Count	7	11	18
		% within Subtask 17	38.9%	61.1%	100.0%
Total		Count	11	11	22
		% within Subtask 17	50.0%	50.0%	100.0%

Subtask Rates					
Open an advertisement on the page by clicking on it					
Subtask 18	Fail	Count	4	1	5
		% within Subtask 18	80.0%	20.0%	100.0%
	Pass	Count	7	10	17
		% within Subtask 18	41.2%	58.8%	100.0%
Total		Count	11	11	22
		% within Subtask 18	50.0%	50.0%	100.0%
Click on the appropriate link to go to your Profile page					
Subtask 20	Fail	Count	10	8	18
		% within Subtask 20	55.6%	44.4%	100.0%
	Pass	Count	1	3	4
		% within Subtask 20	25.0%	75.0%	100.0%
Total		Count	11	11	22
		% within Subtask 20	50.0%	50.0%	100.0%
Click on any part of the timeline area.					
Subtask 21	Fail	Count	4	1	5
		% within Subtask 21	80.0%	20.0%	100.0%
	Pass	Count	7	10	17
		% within Subtask 21	41.2%	58.8%	100.0%
Total		Count	11	11	22
		% within Subtask 21	50.0%	50.0%	100.0%

Subtask Rates					
Read out loud your latest post.					
Subtask 22	Fail	Count	7	2	9
		% within Subtask 22	77.8%	22.2%	100.0%
	Pass	Count	4	9	13
		% within Subtask 22	30.8%	69.2%	100.0%
Total		Count	11	11	22
		% within Subtask 22	50.0%	50.0%	100.0%
Click on your latest post.					
Subtask 23	Fail	Count	5	3	8
		% within Subtask 23	62.5%	37.5%	100.0%
	Pass	Count	6	8	14
		% within Subtask 23	42.9%	57.1%	100.0%
Total		Count	11	11	22
		% within Subtask 23	50.0%	50.0%	100.0%
Click on the area where you would view information about yourself.					
Subtask 24	Fail	Count	6	3	9
		% within Subtask 24	66.7%	33.3%	100.0%
	Pass	Count	5	8	13
		% within Subtask 24	38.5%	61.5%	100.0%
Total		Count	11	11	22
		% within Subtask 24	50.0%	50.0%	100.0%

Subtask Rates					
Click where you would view photos of yourself					
Subtask 26	Fail	Count	2	2	4
		% within Subtask 26	50.0%	50.0%	100.0%
	Pass	Count	9	9	18
		% within Subtask 26	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Subtask 26	50.0%	50.0%	100.0%
Click where you would view your friend's list.					
Subtask 28	Pass	Count	11	11	22
		% within Subtask 28	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Subtask 28	50.0%	50.0%	100.0%
Read out loud one of your friend's names					
Subtask 29	Fail	Count	1	1	2
		% within Subtask 29	50.0%	50.0%	100.0%
	Pass	Count	10	10	20
		% within Subtask 29	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Subtask 29	50.0%	50.0%	100.0%
Click the appropriate link to go to your homepage.					
Subtask 32	Fail	Count	7	4	11
		% within Subtask 32	63.6%	36.4%	100.0%
	Pass	Count	4	7	11
		% within Subtask 32	36.4%	63.6%	100.0%
Total		Count	11	11	22
		% within Subtask 32	50.0%	50.0%	100.0%

Subtask Rates					
Click the appropriate link to view notifications.					
Subtask 33	Fail	Count	10	8	18
		% within Subtask 33	55.6%	44.4%	100.0%
	Pass	Count	1	3	4
		% within Subtask 33	25.0%	75.0%	100.0%
Total		Count	11	11	22
		% within Subtask 33	50.0%	50.0%	100.0%
Identify where you would search for someone by name by clicking on this area					
Subtask 34	Fail	Count	3	2	5
		% within Subtask 32	60.0%	40.0%	100.0%
	Pass	Count	8	9	17
		% within Subtask 32	47.1%	52.9%	100.0%
Total		Count	11	11	22
		% within Subtask 32	50.0%	50.0%	100.0%
Click on John Smith (Redmond Washington) to visit his profile					
Subtask 35	Fail	Count	2	1	3
		% within Subtask 35	66.7%	33.3%	100.0%
	Pass	Count	9	10	19
		% within Subtask 35	47.4%	52.6%	100.0%
Total		Count	11	11	22
		% within Subtask 35	50.0%	50.0%	100.0%

Subtask Rates					
Read out loud where John works					
Subtask 37	Fail	Count	0	1	1
		% within Subtask 37	0.0%	100.0%	100.0%
	Pass	Count	11	10	21
		% within Subtask 37	52.4%	47.6%	100.0%
Total		Count	11	11	22
		% within Subtask 37	50.0%	50.0%	100.0%
Read out loud where John went to high school.					
Subtask 38	Fail	Count	5	3	8
		% within Subtask 38	62.5%	37.5%	100.0%
	Pass	Count	6	8	14
		% within Subtask 38	42.9%	57.1%	100.0%
Total		Count	11	11	22
		% within Subtask 38	50.0%	50.0%	100.0%
Read out loud where John went to college.					
Subtask 39	Fail	Count	1	0	1
		% within Subtask 39	100.0%	0.0%	100.0%
	Pass	Count	10	11	21
		% within Subtask 39	47.6%	52.4%	100.0%
Total		Count	11	11	22
		% within Subtask 39	50.0%	50.0%	100.0%

Subtask Rates					
Read out loud where John currently lives.					
Subtask 40	Fail	Count	1	3	4
		% within Subtask 40	25.0%	75.0%	100.0%
	Pass	Count	10	8	18
		% within Subtask 40	55.6%	44.4%	100.0%
Total		Count	11	11	22
		% within Subtask 40	50.0%	50.0%	100.0%
Read out loud the music John likes.					
Subtask 41	Fail	Count	0	1	1
		% within Subtask 41	0.0%	100.0%	100.0%
	Pass	Count	11	10	21
		% within Subtask 41	52.4%	47.6%	100.0%
Total		Count	11	11	22
		% within Subtask 41	50.0%	50.0%	100.0%
Read out loud the movies John likes					
Subtask 42	Fail	Count	3	0	3
		% within Subtask 42	100.0%	0.0%	100.0%
	Pass	Count	8	11	19
		% within Subtask 42	42.1%	57.9%	100.0%
Total		Count	11	11	22
		% within Subtask 42	50.0%	50.0%	100.0%

Subtask Rates					
Read out loud the TV shows does John likes.					
Subtask 43	Fail	Count	3	0	3
		% within Subtask 43	100.0%	0.0%	100.0%
	Pass	Count	8	11	19
		% within Subtask 43	42.1%	57.9%	100.0%
Total		Count	11	11	22
		% within Subtask 43	50.0%	50.0%	100.0%
Read out loud the books John likes.					
Subtask 44	Fail	Count	3	1	4
		% within Subtask 44	75.0%	25.0%	100.0%
	Pass	Count	8	10	18
		% within Subtask 44	44.4%	55.6%	100.0%
Total		Count	11	11	22
		% within Subtask 44	50.0%	50.0%	100.0%
Click where you would leave a comment on John Smith's family photo.					
Subtask 47	Fail	Count	11	9	20
		% within Subtask 47	55.0%	45.0%	100.0%
	Pass	Count	0	2	2
		% within Subtask 47	0.0%	100.0%	100.0%
Total		Count	11	11	22
		% within Subtask 47	50.0%	50.0%	100.0%

Subtask Rates					
Demonstrate how you to tag John Smith in his family picture by clicking the appropriate links.					
Subtask 48	Fail	Count	10	10	20
		% within Subtask 48	50.0%	50.0%	100.0%
	Pass	Count	1	1	2
		% within Subtask 48	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Subtask 48	50.0%	50.0%	100.0%
Click on the appropriate link to view your friends					
Subtask 49	Fail	Count	2	2	4
		% within Subtask 49	50.0%	50.0%	100.0%
	Pass	Count	9	9	18
		% within Subtask 49	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Subtask 49	50.0%	50.0%	100.0%
Click on your friend Ann Jones to go to her profile page.					
Subtask 50	Fail	Count	2	1	3
		% within Subtask 50	66.7%	33.3%	100.0%
	Pass	Count	9	10	19
		% within Subtask 50	47.4%	52.6%	100.0%
Total		Count	11	11	22
		% within Subtask 50	50.0%	50.0%	100.0%

Subtask Rates					
Click where you would leave a comment on Ann Jones' wall.					
Subtask 51	Fail	Count	7	5	12
		% within Subtask 51	58.3%	41.7%	100.0%
	Pass	Count	4	6	10
		% within Subtask 51	40.0%	60.0%	100.0%
Total		Count	11	11	22
		% within Subtask 51	50.0%	50.0%	100.0%

27. APPENDIX U

Success Rates Phase 3 Group 1 & 2 Version 1

Table 41: Success Rates Phase 3 Group 1 & 2 Version 1

Subtasks					
Click in the field where you would enter your username					
			Group 1	Group 2	
Task 2	Pass	Count	11	11	22
		% within Task 2	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 2	50.0%	50.0%	100.0%
Click in the field where you would enter your password.					
Task 3	Pass	Count	11	11	22
		% within Task 3	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 3	50.0%	50.0%	100.0%
Click on Login to enter the site.					
Task 4	Pass	Count	11	11	22
		% within Task 4	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 4	50.0%	50.0%	100.0%
Read out loud the title of the latest post in your newsfeed.					
Task 6	Fail	Count	1	0	1
		% within Task 6	100.0%	0.0%	100.0%
	Pass	Count	10	11	21
		% within Task 6	47.6%	52.4%	100.0%
Total		Count	11	11	22
		% within Task 6	50.0%	50.0%	100.0%

Subtask Rates					
Open the latest post in your newsfeed section by clicking on it.					
Task 7	Fail	Count	2	0	2
		% within Task 7	100.0%	0.0%	100.0%
	Pass	Count	9	11	20
		% within Task 7	45.0%	55.0%	100.0%
Total		Count	11	11	22
		% within Task 7	50.0%	50.0%	100.0%
Read out loud the title of another post in your newsfeed.					
Task 9	Pass	Count	11	11	22
		% within Task 9	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 9	50.0%	50.0%	100.0%
Open this post by clicking on it					
Task 10	Fail	Count	1	0	1
		% within Task 10	100.0%	0.0%	100.0%
	Pass	Count	10	11	21
		% within Task 10	47.6%	52.4%	100.0%
Total		Count	11	11	22
		% within Task 10	50.0%	50.0%	100.0%
Scroll down to the last post on the newsfeed.					
Task 12		Count	11	11	22
		% within Task 12	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 12	50.0%	50.0%	100.0%
Read out loud the title of the last post in your newsfeed					
Task 13		Count	11	11	22
		% within Task 13	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 13	50.0%	50.0%	100.0%
Read out loud a title of an advertisement on the homepage					

Subtask Rates					
Task 14	Pass	Count	11	11	22
		% within Task 14	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 14	50.0%	50.0%	100.0%
Read out loud a title of an advertisement on the homepage					
Task 17	Fail	Count	1	0	1
		% within Task 17	100.0%	0.0%	100.0%
	Pass	Count	10	11	21
		% within Task 17	47.6%	52.4%	100.0%
Total		Count	11	11	22
		% within Task 17	50.0%	50.0%	100.0%
Open an advertisement on the page by clicking on it					
Task 18	Fail	Count	3	0	3
		% within Task 18	100.0%	0.0%	100.0%
	Pass	Count	8	11	19
		% within Task 18	42.1%	57.9%	100.0%
Total		Count	11	11	22
		% within Task 18	50.0%	50.0%	100.0%
Click on the appropriate link to go to your Profile page					
Task 20	Fail	Count	0	1	1
		% within Task 20	0.0%	100.0%	100.0%
	Pass	Count	11	10	21
		% within Task 20	52.4%	47.6%	100.0%
Total		Count	11	11	22
		% within Task 20	50.0%	50.0%	100.0%
Click on an appropriate link to view your posts					
Task 21	Fail	Count	1	1	2
		% within Task 21	50.0%	50.0%	100.0%
	Pass	Count	10	10	20
		% within Task 21	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 21	50.0%	50.0%	100.0%
Read out loud your latest post.					

Subtask Rates					
Task 22	Fail	Count	1	0	1
		% within Task 22	100.0%	0.0%	100.0%
	Pass	Count	10	11	21
		% within Task 22	47.6%	52.4%	100.0%
Total		Count	11	11	22
		% within Task 22	50.0%	50.0%	100.0%
Click on your latest post.					
Task 23	Fail	Count	1	0	1
		% within Task 23	100.0%	0.0%	100.0%
	Pass	Count	10	11	21
		% within Task 23	47.6%	52.4%	100.0%
Total		Count	11	11	22
		% within Task 23	50.0%	50.0%	100.0%
Click on the area where you would view information about yourself.					
Task 24	Fail	Count	6	2	8
		% within Task 24	75.0%	25.0%	100.0%
	Pass	Count	5	9	14
		% within Task 24	35.7%	64.3%	100.0%
Total		Count	11	11	22
		% within Task 24	50.0%	50.0%	100.0%
Click where you would view photos of yourself (not your profile pictures).					
Task 26	Fail	Count	1	0	1
		% within Task 26	100.0%	0.0%	100.0%
	Pass	Count	10	11	21
		% within Task 26	47.6%	52.4%	100.0%
Total		Count	11	11	22
		% within Task 26	50.0%	50.0%	100.0%

Subtask Rates					
Click where you would view your friend's list.					
Task 28	Fail	Count	2	0	2
		% within Task 28	100.0%	0.0%	100.0%
	Pass	Count	9	11	20
		% within Task 28	45.0%	55.0%	100.0%
Total		Count	11	11	22
		% within Task 28	50.0%	50.0%	100.0%
Read out loud one of your friend's names.					
Task 29	Pass	Count	11	11	22
		% within Task 29	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 29	50.0%	50.0%	100.0%
Click the appropriate link to go to your homepage.					
Task 32	Pass	Count	11	11	22
		% within Task 32	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 32	50.0%	50.0%	100.0%
Click the appropriate link to view notifications.					
Task 33	Pass	Count	11	11	22
		% within Task 33	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 33	50.0%	50.0%	100.0%
Identify where you would search for someone by name by clicking on this area					
Task 32	Fail	Count	1	0	1
		% within Task 32	100.0%	0.0%	100.0%
	Pass	Count	10	11	21
		% within Task 32	47.6%	52.4%	100.0%
Total		Count	11	11	22
		% within Task 32	50.0%	50.0%	100.0%

Subtask						Rates
Click on John Smith (Redmond Washington) to visit his profile						
Task 35	Fail	Count	2	1	3	
		% within Task 35	66.7%	33.3%	100.0%	
	Pass	Count	9	10	19	
		% within Task 35	47.4%	52.6%	100.0%	
Total		Count	11	11	22	
		% within Task 35	50.0%	50.0%	100.0%	
Read out loud where John works.						
Task 37	Pass	Count	11	11	22	
		% within Task 37	50.0%	50.0%	100.0%	
Total		Count	11	11	22	
		% within Task 37	50.0%	50.0%	100.0%	
Read out loud where John went to high school.						
Task 38	Pass	Count	11	11	22	
		% within Task 38	50.0%	50.0%	100.0%	
Total		Count	11	11	22	
		% within Task 38	50.0%	50.0%	100.0%	
Read out loud where John went to college.						
Task 39	Pass	Count	11	11	22	
		% within Task 39	50.0%	50.0%	100.0%	
Total		Count	11	11	22	
		% within Task 39	50.0%	50.0%	100.0%	
Read out loud where John currently lives.						
Task 40	Fail	Count	0	1	1	
		% within Task 40	0.0%	100.0%	100.0%	
	Pass	Count	11	10	21	
		% within Task 40	52.4%	47.6%	100.0%	
Total		Count	11	11	22	
		% within Task 40	50.0%	50.0%	100.0%	

Subtask Results					
Read out loud the music John likes.					
Task 41	Fail	Count	0	1	1
		% within Task 41	0.0%	100.0%	100.0%
	Pass	Count	11	10	21
		% within Task 41	52.4%	47.6%	100.0%
Total		Count	11	11	22
		% within Task 41	50.0%	50.0%	100.0%
Read out loud the movies John likes					
Task 42	Pass	Count	11	11	22
		% within Task 42	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 42	50.0%	50.0%	100.0%
Read out loud the TV shows does John likes.					
Task 43	Pass	Count	11	11	22
		% within Task 43	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 43	50.0%	50.0%	100.0%
Read out loud the books John likes.					
Task 44	Pass	Count	11	11	22
		% within Task 44	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 44	50.0%	50.0%	100.0%
Click where you would leave a comment on John Smith's family photo.					
Task 47	Fail	Count	1	1	2
		% within Task 47	50.0%	50.0%	100.0%
	Pass	Count	10	10	20
		% within Task 47	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 47	50.0%	50.0%	100.0%

Subtask Rates					
Demonstrate how you would tag John Smith in this family picture by clicking the appropriate links.					
Task 48	Fail	Count	2	3	5
		% within Task 48	40.0%	60.0%	100.0%
	Pass	Count	9	8	17
		% within Task 48	52.9%	47.1%	100.0%
Total		Count	11	11	22
		% within Task 48	50.0%	50.0%	100.0%
Click on the appropriate link to view your friends					
Task 49	Fail	Count	2	1	3
		% within Task 49	66.7%	33.3%	100.0%
	Pass	Count	9	10	19
		% within Task 49	47.4%	52.6%	100.0%
Total		Count	11	11	22
		% within Task 49	50.0%	50.0%	100.0%
Click on your friend Ann Jones to go to her profile page.					
Task 50	Fail	Count	2	0	2
		% within Task 50	100.0%	0.0%	100.0%
	Pass	Count	9	11	20
		% within Task 50	45.0%	55.0%	100.0%
Total		Count	11	11	22
		% within Task 50	50.0%	50.0%	100.0%
Click where you would leave a comment on Ann Jones' wall.					
Task 51	Fail	Count	2	0	2
		% within Task 51	100.0%	0.0%	100.0%
	Pass	Count	9	11	20
		% within Task 51	45.0%	55.0%	100.0%
Total		Count	11	11	22
		% within Task 51	50.0%	50.0%	100.0%

Subtask Results					
Click where you would learn about social media					
Task 53	Fail	Count	1	1	2
		% within Task 53	50.0%	50.0%	100.0%
	Pass	Count	10	10	20
		% within Task 53	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 53	50.0%	50.0%	100.0%
Click where you would search for a terminology 54					
Task 54	Pass	Count	11	11	22
		% within Task 54	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 54	50.0%	50.0%	100.0%
Click on the definition of tagging.					
Task 55	Fail	Count	2	0	2
		% within Task 55	100.0%	0.0%	100.0%
	Pass	Count	9	11	20
		% within Task 55	45.0%	55.0%	100.0%
Total		Count	11	11	22
		% within Task 55	50.0%	50.0%	100.0%
Click where you would view an example of tagging.					
Task 56	Fail	Count	1	0	1
		% within Task 56	100.0%	0.0%	100.0%
	Pass	Count	10	11	21
		% within Task 56	47.6%	52.4%	100.0%
Total		Count	11	11	22
		% within Task 56	50.0%	50.0%	100.0%

28. APPENDIX V

Success Rates Phase 3 Group 1 & 2 Version 2

Table 42: Success Rates Phase 3 Group 1 & 2 Version 2

Subtasks					
Click in the field where you would enter your username.					
			Group 1	Group 2	
Task 2	Pass	Count	11	11	22
		% within Task 2	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 2	50.0%	50.0%	100.0%
Click in the field where you would enter your password.					
Task 3	Pass	Count	11	11	22
		% within Task 3	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 3	50.0%	50.0%	100.0%
Click on Login to enter the site.					
Task 4	Pass	Count	11	11	22
		% within Task 4	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 4	50.0%	50.0%	100.0%
Read out loud the title of the latest post in your newsfeed.					
Task 6	Fail	Count	1	0	1
		% within Task 6	100.0%	0.0%	100.0%
	Pass	Count	10	11	21
		% within Task 6	47.6%	52.4%	100.0%
Total		Count	11	11	22
		% within Task 6	50.0%	50.0%	100.0%

Subtasks					
Click the appropriate link to read the next post					
Task 7	Fail	Count	3	0	3
		% within Task 7	100.0%	0.0%	100.0%
	Pass	Count	8	11	19
		% within Task 7	42.1%	57.9%	100.0%
Total		Count	11	11	22
		% within Task 7	50.0%	50.0%	100.0%
Read out loud the title of another post in your newsfeed.					
Task 9	Pass	Count	11	11	22
		% within Task 9	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 9	50.0%	50.0%	100.0%
Open this post by clicking on it					
Task 10	Fail	Count	1	1	2
		% within Task 10	50.0%	50.0%	100.0%
	Pass	Count	10	10	20
		% within Task 10	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 10	50.0%	50.0%	100.0%
Click where you would view deals and advertisements					
Task 14	Fail	Count	0	1	1
		% within Task 14	0.0%	100.0%	100.0%
	Pass	Count	11	10	21
		% within Task 14	52.4%	47.6%	100.0%
Total		Count	11	11	22
		% within Task 14	50.0%	50.0%	100.0%
Read out loud a title of an advertisement on the homepage					
Task 17	Pass	Count	11	11	22
		% within Task 17	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 17	50.0%	50.0%	100.0%

Subtasks					
Open an advertisement on the page by clicking on it					
Task 18	Fail	Count	1	2	3
		% within Task 18	33.3%	66.7%	100.0%
	Pass	Count	10	9	19
		% within Task 18	52.6%	47.4%	100.0%
Total		Count	11	11	22
		% within Task 18	50.0%	50.0%	100.0%
Click on the appropriate link to go to your Profile page					
Task 20	Fail	Count	0	1	1
		% within Task 20	0.0%	100.0%	100.0%
	Pass	Count	11	10	21
		% within Task 20	52.4%	47.6%	100.0%
Total		Count	11	11	22
		% within Task 20	50.0%	50.0%	100.0%
Click on an appropriate link to view your posts					
Task 21	Fail	Count	1	1	2
		% within Task 21	50.0%	50.0%	100.0%
	Pass	Count	10	10	20
		% within Task 21	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 21	50.0%	50.0%	100.0%
Read out loud your latest post.					
Task 22	Pass	Count	11	11	22
		% within Task 22	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 22	50.0%	50.0%	100.0%
Click on your latest post.					
Task 23	Fail	Count	1	0	1
		% within Task 23	100.0%	0.0%	100.0%
	Pass	Count	10	11	21
		% within Task 23	47.6%	52.4%	100.0%
Total		Count	11	11	22
		% within Task 23	50.0%	50.0%	100.0%

Subtasks					
Click on the area where you would view information about yourself.					
Task 24	Fail	Count	4	4	8
		% within Task 24	50.0%	50.0%	100.0%
	Pass	Count	7	7	14
		% within Task 24	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 24	50.0%	50.0%	100.0%
Click where you would view photos of yourself					
Task 26	Fail	Count	2	0	2
		% within Task 26	100.0%	0.0%	100.0%
	Pass	Count	9	11	20
		% within Task 26	45.0%	55.0%	100.0%
Total		Count	11	11	22
		% within Task 26	50.0%	50.0%	100.0%
Click where you would view your friend's list.					
Task 28	Fail	Count	1	1	2
		% within Task 28	50.0%	50.0%	100.0%
	Pass	Count	10	10	20
		% within Task 28	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 28	50.0%	50.0%	100.0%
Read out loud one of your friend's names.					
Task 29	Pass	Count	11	11	22
		% within Task 29	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 29	50.0%	50.0%	100.0%
Click the appropriate link to go to your homepage.					
Task 32	Pass	Count	11	11	22
		% within Task 32	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 32	50.0%	50.0%	100.0%

Subtasks					
Click the appropriate link to view notifications.					
Task 33	Fail	Count	1	0	1
		% within Task 33	100.0%	0.0%	100.0%
	Pass	Count	10	11	21
		% within Task 33	47.6%	52.4%	100.0%
Total		Count	11	11	22
		% within Task 33	50.0%	50.0%	100.0%
Identify where you would search for someone by name by clicking on this area					
Task 34	Pass	Count	11	11	22
		% within Task 32	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 32	50.0%	50.0%	100.0%
Click on John Smith (Redmond Washington) to visit his profile					
Task 35	Fail	Count	3	2	5
		% within Task 35	60.0%	40.0%	100.0%
	Pass	Count	8	9	17
		% within Task 35	47.1%	52.9%	100.0%
Total		Count	11	11	22
		% within Task 35	50.0%	50.0%	100.0%
Read out loud where John works.					
Task 37	Pass	Count	11	11	22
		% within Task 37	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 37	50.0%	50.0%	100.0%
Read out loud where John went to high school.					
Task 38	Pass	Count	11	11	22
		% within Task 38	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 38	50.0%	50.0%	100.0%
Read out loud where John went to college.					
Task 39	Pass	Count	11	11	22
		% within Task 39	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 39	50.0%	50.0%	100.0%

Subtasks					
Read out loud where John currently lives.					
Task 40	Fail	Count	0	1	1
		% within Task 40	0.0%	100.0%	100.0%
	Pass	Count	11	10	21
		% within Task 40	52.4%	47.6%	100.0%
Total		Count	11	11	22
		% within Task 40	50.0%	50.0%	100.0%
Read out loud the music John likes.					
Task 41	Fail	Count	1	1	2
		% within Task 41	50.0%	50.0%	100.0%
	Pass	Count	10	10	20
		% within Task 41	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 41	50.0%	50.0%	100.0%
Read out loud the movies John likes.					
Task 42	Pass	Count	11	11	22
		% within Task 42	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 42	50.0%	50.0%	100.0%
Read out loud the TV shows does John likes.					
Task 43	Pass	Count	11	11	22
		% within Task 43	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 43	50.0%	50.0%	100.0%
Read out loud the books John likes.					
Task 44	Pass	Count	11	11	22
		% within Task 44	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 44	50.0%	50.0%	100.0%

Subtasks					
Click where you would leave a comment on John Smith's family photo.					
Task 47	Fail	Count	2	0	2
		% within Task 47	100.0%	0.0%	100.0%
	Pass	Count	9	11	20
		% within Task 47	45.0%	55.0%	100.0%
Total		Count	11	11	22
		% within Task 47	50.0%	50.0%	100.0%
Demonstrate how you would tag John Smith in this family picture by clicking the appropriate links.					
Task 48	Fail	Count	4	3	7
		% within Task 48	57.1%	42.9%	100.0%
	Pass	Count	7	8	15
		% within Task 48	46.7%	53.3%	100.0%
Total		Count	11	11	22
		% within Task 48	50.0%	50.0%	100.0%
Click on the appropriate link to view John's friend's list.					
Task 49	Fail	Count	2	1	3
		% within Task 49	66.7%	33.3%	100.0%
	Pass	Count	9	10	19
		% within Task 49	47.4%	52.6%	100.0%
Total		Count	11	11	22
		% within Task 49	50.0%	50.0%	100.0%
Click on your friend Ann Jones to go to her profile page.					
Task 50	Fail	Count	1	0	1
		% within Task 50	100.0%	0.0%	100.0%
	Pass	Count	10	11	21
		% within Task 50	47.6%	52.4%	100.0%
Total		Count	11	11	22
		% within Task 50	50.0%	50.0%	100.0%

Subtasks					
Click where you would leave a comment on Ann Jones' wall.					
Task 51 Pass	Count	11	11	22	
	% within Task 51	50.0%	50.0%	100.0%	
Total	Count	11	11	22	
	% within Task 51	50.0%	50.0%	100.0%	
Click where you would learn about social media					
Task 53 Pass	Count	11	11	22	
	% within Task 53	50.0%	50.0%	100.0%	
Total	Count	11	11	22	
	% within Task 53	50.0%	50.0%	100.0%	

Subtasks					
Click where you would search for a terminology					
Task 54	Pass	Count	11	11	22
		% within Task 54	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 54	50.0%	50.0%	100.0%
Click on the definition of tagging.					
Task 55	Fail	Count	2	0	2
		% within Task 55	100.0%	0.0%	100.0%
	Pass	Count	9	11	20
		% within Task 55	45.0%	55.0%	100.0%
Total		Count	11	11	22
		% within Task 55	50.0%	50.0%	100.0%
Click where you would view an example of tagging.					
Task 56	Pass	Count	11	11	22
		% within Task 56	50.0%	50.0%	100.0%
Total		Count	11	11	22
		% within Task 56	50.0%	50.0%	100.0%

29.   APPENDIX W

Success Rates Chi Square Phase 1 Group 1 and 2

Table 43: Success Rates Chi Square Phase 1 Group 1 and 2

Tasks	Value	dF	Asymp. Sig. (2-sided)
Task 1: Logging into account			
Pearson Chi-Square	5.111	1	.276
Task 2: Updating Profile			
Pearson Chi-Square	3.986	1	.408
Task 3: Navigating			
Pearson Chi-Square	.291	1	.962
Task 4: Understanding the Homepage			
Pearson Chi-Square	3.000	1	.558
Task 5: Commenting on Profiles			
Pearson Chi-Square	2.533	1	.639

30.   APPENDIX X

Success Rates Chi Square Phase 3 Group 1 and 2 V1

Table 44: Success Rates Chi Square Phase 3 Group 1 and 2 V1

Group 1 & 2 V1 Chi N of Valid Cases = 22	Value	df	Asymp. Sig. (2-sided)
2 Click in the field where you would enter your username.			
Pearson Chi-Square	2.200	1	.333
3 Click in the field where you would enter your password.			
Pearson Chi-Square	2.200	1	.333
4 Click on Login to enter the site.			
Pearson Chi-Square	3.474	1	.324
6 Read out loud the title of the latest post in your newsfeed.			
Pearson Chi-Square	14.318	1	.074
7 Click the appropriate link to read the next post			
Pearson Chi-Square	12.496	1	.130
9 Read out loud the title of another post in your newsfeed.			
Pearson Chi-Square	7.143	1	.308
10 Open this post by clicking on it			
Pearson Chi-Square	4.505	1	.342
14 Click where you would view deals and advertisements			
Pearson Chi-Square	9.533	1	.299
17 Read out loud a title of an advertisement on the homepage			
Pearson Chi-Square	15.387	1	.031
18 Open an advertisement on the page by clicking on it			
Pearson Chi-Square	3.548	1	.471
20 Click on the appropriate link to go to your Profile page			
Pearson Chi-Square	9.927	1	.077
21 Click on an appropriate link to view your posts			
Pearson Chi-Square	10.000	1	.265
22 Read out loud your latest post.			
Pearson Chi-Square	8.371	1	.079
23 Click on your latest post.			
Pearson Chi-Square	8.572	1	.127

Group 1 & 2 V1 Chi N of Valid Cases = 22	Value	df	Asymp. Sig. (2-sided)
24 Click where you would view information about yourself.			
Pearson Chi-Square	9.644	1	.380
26 Click where you would view photos of yourself			
Pearson Chi-Square	11.478	1	.119
28 Click where you would view your friend's list.			
Pearson Chi-Square	13.074	1	.042
29 Read out loud one of your friend's names.			
Pearson Chi-Square	6.667	1	.036
32 Click the appropriate link to go to your homepage.			
Pearson Chi-Square	11.071	1	.086
33Click the appropriate link to view notifications.			
Pearson Chi-Square	12.733	1	.079
34 Identify where you would search for someone by name by clicking on this are			
Pearson Chi-Square	14.986	1	.020
35 Click on John Smith (Redmond Washington) to visit his profile			
Pearson Chi-Square	9.975	1	.041
37 Read out loud where John works.			
Pearson Chi-Square	5.000	1	.544
38 Read out loud where John went to high school.			
Pearson Chi-Square	2.294	1	.514
39 Read out loud where John went to college.			
Pearson Chi-Square	2.222	1	.329
40 Read out loud where John currently lives.			
Pearson Chi-Square	11.120	1	.049
41 Read out loud the music John likes.			
Pearson Chi-Square	12.982	1	.024
42 Read out loud the movies John likes			
Pearson Chi-Square	5.773	1	.123
43 Read out loud the TV shows does John likes.			
Pearson Chi-Square	7.400	1	.193
44 Read out loud the books John likes.			
Pearson Chi-Square	4.476	1	.345
47 Click where you would leave a comment on John Smith's family photo.			
Pearson Chi-Square	10.705	1	.152

Group 1 & 2 V1 Chi N of Valid Cases = 22	Value	df	Asymp. Sig. (2-sided)
48 Demonstrate how you would tag John Smith in this family picture by clicking the appropriate links.			
Pearson Chi-Square	10.310	1	.503
49 Click on the appropriate link to view John's friend's list.			
Pearson Chi-Square	11.178	1	.083
53 Click on your friend Ann Jones to go to her profile page.			
Pearson Chi-Square	2.828	1	.419
51 Click where you would leave a comment on Ann Jones' wall.			
Pearson Chi-Square	3.761	1	.288
53 Click where you would learn about social media			
Pearson Chi-Square	7.800	1	.168
54 Click where you would search for a terminology			
Pearson Chi-Square	13.600	1	.018
55 Click on the definition of tagging.			
Pearson Chi-Square	13.176	1	.022
56 Click where you would view an example of tagging.			
Pearson Chi-Square	8.741	1	.120

31. APPENDIX Y

Success Rates Chi Square Phase 3 Group 1 and 2 V2

Table 45: Success Rates Chi Square Phase 3 Group 1 and 2 V2

Phase 3 group 1 and 2 V2 N of Valid Cases = 22			
Subtask	**Value**	**df**	**Asymp. Sig. (2-sided)**
2 Click in the field where you would enter your username.			
Pearson Chi-Square	3.474	1	.324
3 Click in the field where you would enter your password.			
Pearson Chi-Square	3.474	1	.176
4 Click on Login to enter the site.			
Pearson Chi-Square	3.474	1	.324
6 Read out loud the title of the latest post in your newsfeed.			
Pearson Chi-Square	8.171	1	.517
7 Click the appropriate link to read the next post			
Pearson Chi-Square	7.149	1	.210
9 Read out loud the title of another post in your newsfeed.			
Pearson Chi-Square	5.600	1	.347
10 Open this post by clicking on it			
Pearson Chi-Square	7.000	1	.321
14 Click where you would view deals and advertisements			
Pearson Chi-Square	6.96	1	.728
17 Read out loud a title of an advertisement on the homepage			
Pearson Chi-Square	5.752	1	.451
18 Open an advertisement on the page by clicking on it			
Pearson Chi-Square	6.465	1	.373
20 Click on the appropriate link to go to your Profile page			
Pearson Chi-Square	4.052	1	.256
21 Click on an appropriate link to view your posts			
Pearson Chi-Square	6.000	1	.647
22 Read out loud your latest post.			
Pearson Chi-Square	7.067	1	.216
23 Click on your latest post.			

Subtask	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.448	1	.295
24 Click on the area where you would view information about yourself.			
Pearson Chi-Square	4.000	1	.677
26 Click where you would view photos of yourself (not your profile pictures).			
Pearson Chi-Square	9.192	1	.239
28 Click where you would view your friend's list.			
Pearson Chi-Square	7.571	1	.056
29 Read out loud one of your friend's names.			
Pearson Chi-Square	8.250	3	.041
32 Click the appropriate link to go to your homepage.			
Pearson Chi-Square	10.500	1	.105
33 Click the appropriate link to view notifications.			
Pearson Chi-Square	10.548	1	.103
34 Identify where you would search for someone by name by clicking on this area			
Pearson Chi-Square	13.200	1	.213
35 Click on John Smith (Redmond Washington) to visit his profile			
Pearson Chi-Square	1.370	1	.713
37 Read out loud where John works.			
Pearson Chi-Square	4.800	1	.308
38 Read out loud where John went to high school.			
Pearson Chi-Square	1.476	1	.688
39 Read out loud where John went to college.			
Pearson Chi-Square	4.222	1	.238
40 Read out loud where John currently lives.			
Pearson Chi-Square	1.289	1	.732
41 Read out loud the music John likes.			
Pearson Chi-Square	6.968	1	.324
42 Read out loud the movies John likes			
Pearson Chi-Square	2.600	1	.457
43 Read out loud the TV shows does John likes.			
Pearson Chi-Square	4.500	1	.480
44 Read out loud the books John likes.			
Pearson Chi-Square	2.226	1	.527
47 Click where you would leave a comment on John Smith's family photo.			

Subtask	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.071	1	.422
48 Demonstrate how you would tag John Smith in this family picture by clicking the appropriate links.			
Pearson Chi-Square	9.978	1	.352
49 Click on the appropriate link to view John's friend's list.			
Pearson Chi-Square	10.978	1	.203
50 Click on your friend Ann Jones to go to her profile page.			
Pearson Chi-Square	7.219	1	.027
51 Click where you would leave a comment on Ann Jones' wall.			
Pearson Chi-Square	12.026	1	.034
53 Click where you would learn about social media			
Pearson Chi-Square	6.500	1	.483
54 Click where you would search for a terminology			
Pearson Chi-Square	8.267	1	.142
55 Click on the definition of tagging.			
Pearson Chi-Square	6.532	1	.258
56 Click where you would view an example of tagging.			
Pearson Chi-Square	9.975	1	.076

32.   APPENDIX Z

Success Rates Chi Square Phase 1 and Phase 3 Chi Square Version 1

Table 46: Success Rates Chi Square Phase 1 and Phase 3 Chi Square Version 1

N of Valid Cases = 44	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
2 Click in the field where you would enter your username.					
Pearson Chi-Square	14.667	1	.000		
3 Click in the field where you would enter your password.					
Pearson Chi-Square	2.095	1	.148		
4 Click on Login to enter the site.					
Pearson Chi-Square	1.023	1	.312		
6 Read out loud the title of the latest post in your newsfeed.					
Pearson Chi-Square	5.500	1	.019		
7 Click the appropriate link to read the next post					
Pearson Chi-Square	5.939	1	.015		
9 Read out loud the title of another post in your newsfeed.					
Pearson Chi-Square	8.324	1	.004		
10 Open this post by clicking on it					
Pearson Chi-Square	6.844	1	.009		
14 Click where you would view deals and advertisements					
Pearson Chi-Square	6.947	1	.008		
17 Read out loud a title of an advertisement on the homepage					
Pearson Chi-Square	2.031	1	.154		
18 Open an advertisement on the page by clicking on it					
Pearson Chi-Square	.611	1	.434		
20 Click on the appropriate link to go to your Profile page					
Pearson Chi-Square	26.771	1	.000		
21 Click on an appropriate link to view your posts					
Pearson Chi-Square	1.529	1	.216		
22 Read out loud your latest post.					
Pearson Chi-Square	8.282[a]	1	.004		
23 Click on your latest post.					
Pearson Chi-Square	6.844	1	.009		

N of Valid Cases = 44	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Continuity Correction	5.029	1	.025		
24 Click on the area where you would view information about yourself. 24 x problems					
Pearson Chi-Square	.096[a]	1	.757		
26 Click where you would view photos of yourself					
Pearson Chi-Square	2.031	1	.154		
28 Click where you would view your friend's list.					
Pearson Chi-Square	2.095	1	.148		
29 Read out loud one of your friend's names.					
Pearson Chi-Square	2.095	1	.148		
32 Click the appropriate link to go to your homepage.					
Pearson Chi-Square	14.667	1	.000		
33 Click the appropriate link to view notifications.					
Pearson Chi-Square	30.462	1	.000		
34 Identify where you would search for someone by name by clicking on this area					
Pearson Chi-Square	3.088	1	.079		
35 Click on John Smith (Redmond Washington) to visit his profile					
Pearson Chi-Square	.000	1	1.000		
37 Read out loud where John works.					
Pearson Chi-Square	1.023	1	.312		
38 Read out loud where John went to high school.					
Pearson Chi-Square	9.778	1	.002		
39 Read out loud where John went to college.					
Pearson Chi-Square	1.023	1	.312		
40 Read out loud where John currently lives.					
Pearson Chi-Square	2.031	1	.154		
41 Read out loud the music John likes.					
Pearson Chi-Square	.000	1	1.000		
42 Read out loud the movies John likes					
Pearson Chi-Square	3.220	1	.073		
43 Read out loud the TV shows does John likes					
Pearson Chi-Square	3.220	1	.073		
44 Read out loud the books John likes.					
Pearson Chi-Square	4.400	1	.036		
47 Click where you would leave a comment on John Smith's family photo					

N of Valid Cases = 44	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	29.455	1	.000		
48 Demonstrate how you would tag John Smith in this family picture by clicking the appropriate links.					
Pearson Chi-Square	20.842	1	.000		
49 Click on the appropriate link to view John's friend's list.					
Pearson Chi-Square	.170	1	.680		
50 Click on your friend Ann Jones to go to her profile page.					
Pearson Chi-Square	.226	1	.635		
51 Click where you would leave a comment on Ann Jones' wall.					
Pearson Chi-Square	10.476	1	.001		

33.   APPENDIX AA

Success Rates Chi Square Phase 1 and Phase 3 Chi Square Version 2

Table 47: Success Rates Chi Square Phase 1 and Phase 3 Chi Square Version 2

Subtask	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
2 Click in the field where you would enter your username.					
Pearson Chi-Square	14.667	1	.000		
3 Click in the field where you would enter your password.					
Pearson Chi-Square	2.095	1	.148		
4 Click on Login to enter the site.					
Pearson Chi-Square	1.023	1	.312		
6 Read out loud the title of the latest post in your newsfeed.					
Pearson Chi-Square	5.500	1	.019		
7 Click the appropriate link to read the next post					
Pearson Chi-Square	4.125	1	.042		
9 Read out loud the title of another post in your newsfeed.					
Pearson Chi-Square	8.324	1	.004		
10 Open this post by clicking on it					
Pearson Chi-Square	4.659	1	.031		
14 Click where you would view deals and advertisements					
Pearson Chi-Square	4.247	1	.039		
17 Read out loud a title of an advertisement on the homepage					
Pearson Chi-Square	4.400	1	.036		
18 Open an advertisement on the page by clicking on it					
Pearson Chi-Square	.611	1	.434		
20 Click on the appropriate link to go to your Profile page					
Pearson Chi-Square	26.771	1	.000		
21 Click on an appropriate link to view your posts					
Pearson Chi-Square	1.529	1	.216		
22 Read out loud your latest post.					
Pearson Chi-Square	11.314	1	.001		
23 Click on your latest post.					
Pearson Chi-Square	6.844	1	.009		

Subtask	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
24 Click on the area where you would view information about yourself. 24 x problems					
Pearson Chi-Square	.096	1	.757		
26 Click where you would view photos of yourself					
Pearson Chi-Square	.772	1	.380		
28 Click where you would view your friend's list.					
Pearson Chi-Square	2.095	1	.148		
29 Read out loud one of your friend's names.					
Pearson Chi-Square	2.095	1	.148		
32 Click the appropriate link to go to your homepage.					
Pearson Chi-Square	14.667	1	.000		
33 Click the appropriate link to view notifications.					
Pearson Chi-Square	26.771	1	.000		
32 Identify where you would search for someone by name by clicking on this area					
Pearson Chi-Square	5.641	1	.018		
35 Click on John Smith (Redmond Washington) to visit his profile					
Pearson Chi-Square	.611	1	.434		
37 Read out loud where John works.					
Pearson Chi-Square	1.023	1	.312		
38 Read out loud where John went to high school.					
Pearson Chi-Square	9.778	1	.002		
39 Read out loud where John went to college.					
Pearson Chi-Square	1.023	1	.312		
40 Read out loud where John currently lives.					
Pearson Chi-Square	2.031	1	.154		
41 Read out loud the music John likes.					
Pearson Chi-Square	.358	1	.550		
42 Read out loud the movies John likes.					
Pearson Chi-Square	3.220	1	.073		
43 Read out loud the TV shows does John likes.					
Pearson Chi-Square	3.220	1	.073		
44 Read out loud the books John likes.					
Pearson Chi-Square	4.400	1	.036		
47 Click where you would leave a comment on John Smith's family photo.					
Pearson Chi-Square	29.455	1	.000		

Subtask	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
48 Demonstrate how you would tag John Smith in this family picture by clicking the appropriate links.					
Pearson Chi-Square	16.200	1	.000		
49 Click on the appropriate link to view John's friend's list.					
Pearson Chi-Square	.170	1	.680		
50 Click on your friend Ann Jones to go to her profile page.					
Pearson Chi-Square	1.100	1	.294		
51 Click where you would leave a comment on Ann Jones' wall.					
Pearson Chi-Square	16.500	1	.000		

34.   APPENDIX AB

Wilcoxon Completion Times Version 0, 1, 2

Table 48: Wilcoxon Completion Times Version 0, 1, 2

Test	Phase 1/ Phase 3 V1	Phase 3 V2/ Phase 3 V1	Phase 3 V2/ Phase 1
	2.1 - 2.0	2.2 - 2.1	2.2 - 2.0
Z	-2.402	.000	-2.402
Asymp. Sig. (2-tailed)	.016	1.000	.016
	3.1 - 3.0	3.2 - 3.1	3.2 - 3.0
Z	-2.699	-1.342	-2.699
Asymp. Sig. (2-tailed)	.007	.180	.007
	4.1 - 4.0	4.2 - 4.1	4.2 - 4.0
Z	-3.053	-1.000	-2.836
Asymp. Sig. (2-tailed)	.002	.317	.005
	6.1 - 6.0	6.2 - 6.1	6.2 - 6.0
Z	-.597	-.769	-1.134
Asymp. Sig. (2-tailed)	.551	.442	.257
	7.1 - 7.0	7.2 - 7.1	7.2 - 7.0
Z	-.677	-.209	-.862
Asymp. Sig. (2-tailed)	.498	.834	.389
	9.1 - 9.0	9.2 - 9.1	9.2 - 9.0
Z	-3.124	-.851	-3.317
Asymp. Sig. (2-tailed)	.002	.395	.001
	10.1 - 10.0	10.2 - 10.1	10.2 - 10.0
Z	-1.897	-1.494	-.513
Asymp. Sig. (2-tailed)	.058	.135	.608
	14.1 - 14.0	14.2 - 14.1	14.2 - 14.0
Z	-1.785	-.833	-2.000
Asymp. Sig. (2-tailed)	.074	.405	.046
Z	17.1 - 17.0	17.2 - 17.1	17.2 - 17.0
Asymp. Sig. (2-tailed)	-2.285	-.276	-.987
	.022	.783	.323

Test	Phase 1/ Phase 3 V1	Phase 3 V2/ Phase 3 V1	Phase 3 V2/ Phase 1
	18.1 - 18.0	18.2 - 18.1	18.2 - 18.0
Z	-.492	-.360	-.667
Asymp. Sig. (2-tailed)	.622	.719	.505
	20.1 - 20.0	20.2 - 20.1	20.2 - 20.0
Z	-1.826	-1.917	-1.826
Asymp. Sig. (2-tailed)	.068	.055	.068
	21.1 - 21.0	21.2 - 21.1	21.2 - 21.0
Z	-1.454	-.505	-.347
Asymp. Sig. (2-tailed)	.146	.613	.729
	22.1 - 22.0	22.2 - 22.1	22.2 - 22.0
Z	-2.857	-.119	-3.083
Asymp. Sig. (2-tailed)	.004	.905	.002
	23.1 - 23.0	23.2 - 23.1	23.2 - 23.0
Z	-1.983	-1.993	-1.077
Asymp. Sig. (2-tailed)	.047	.046	.282
	24.1 - 24.0	24.2 - 24.1	24.2 - 24.0
Z	-.775	-1.219	-1.249
Asymp. Sig. (2-tailed)	.438	.223	.212
	26.1 - 26.0	26.2 - 26.1	26.2 - 26.0
Z	-2.674	-.498	-2.506
Asymp. Sig. (2-tailed)	.007	.619	.012
Z	28.1 - 28.0	28.2 - 28.1	28.2 - 28.0
Asymp. Sig. (2-tailed)	-.879	-1.240	-2.296
	.379	.215	.022
	29.1 - 29.0	29.2 - 29.1	29.2 - 29.0
Z	-3.108	.000	-2.665
Asymp. Sig. (2-tailed)	.002	1.000	.008
	32.1 - 32.0	32.2 - 32.1	32.2 - 32.0
Z	-2.807	-.258	-2.952
Asymp. Sig. (2-tailed)	.005	.796	.003
	33.1 - 33.0	33.2 - 33.1	33.2 - 33.0
Z	-1.826	-.310	-1.841
Asymp. Sig. (2-tailed)	.068	.756	.066
	34.1 - 34.0	34.2 - 34.1	34.2 - 34.0
Z	-3.297	-1.295	-3.286
Asymp. Sig. (2-tailed)	.001	.195	.001

Test	Phase 1/ Phase 3 V1	Phase 3 V2/ Phase 3 V1	Phase 3 V2/ Phase 1
	35.1 - 35.0	35.2 - 35.1	35.2 - 35.0
Z	-2.668	-1.186	-2.502
Asymp. Sig. (2-tailed)	.008	.236	.012
	37.1 - 37.0	37.2 - 37.1	37.2 - 37.0
Z	-2.600	-1.486	-3.728
Asymp. Sig. (2-tailed)	.009	.137	.000
	38.1 - 38.0	38.2 - 38.1	38.2 - 38.0
Z	-2.809	-.504	-2.762
Asymp. Sig. (2-tailed)	.005	.614	.006
Z	40.1 - 40.0	40.2 - 40.1	40.2 - 40.0
Asymp. Sig. (2-tailed)	-.736	-.630	-1.720
	.462	.529	.085
	41.1 - 41.0	41.2 - 41.1	41.2 - 41.0
Z	-3.060	-.662	-3.141
Asymp. Sig. (2-tailed)	.002	.508	.002
	42.1 - 42.0	42.2 - 42.1	42.2 - 42.0
Z	-3.629	-.775	-3.646
Asymp. Sig. (2-tailed)	.000	.439	.000
	43.1 - 43.0	43.2 - 43.1	43.2 - 43.0
Z	-2.005	-.087	-1.869
Asymp. Sig. (2-tailed)	.045	.931	.062
	44.1 - 44.0	44.2 - 44.1	44.2 - 44.0
Z	-2.889	-.333	-2.864
Asymp. Sig. (2-tailed)	.004	.739	.004
	47.1 - 47.0	47.2 - 47.1	47.2 - 47.0
Z	-1.000	-1.143	-1.000
Asymp. Sig. (2-tailed)	.317	.253	.317
	49.1 - 49.0	49.2 - 49.1	49.2 - 49.0
Z	-2.772	-.996	-2.178
Asymp. Sig. (2-tailed)	.006	.319	.029
	50.1 - 50.0	50.2 - 50.1	50.2 - 50.0
Z	-2.825	.000[c]	-3.222
Asymp. Sig. (2-tailed)	.005	1.000	.001
	51.1 - 51.0	51.2 - 51.1	51.2 - 51.0
Z	-2.194	-.687	-2.505
Asymp. Sig. (2-tailed)	.028	.492	.012
		53.2 - 53.1	

Test	Phase 1/ Phase 3 V1	Phase 3 V2/ Phase 3 V1	Phase 3 V2/ Phase 1
Z Asymp. Sig. (2-tailed)		-.461 .645	
		54.2 - 54.1	
Z Asymp. Sig. (2-tailed)		-.144 .885	
		55.2 - 55.1	
Z Asymp. Sig. (2-tailed)		-.710 .478	
		56.2 - 56.1	
Z Asymp. Sig. (2-tailed)		-.850 .395	

35. APPENDIX AC

Screen Captures
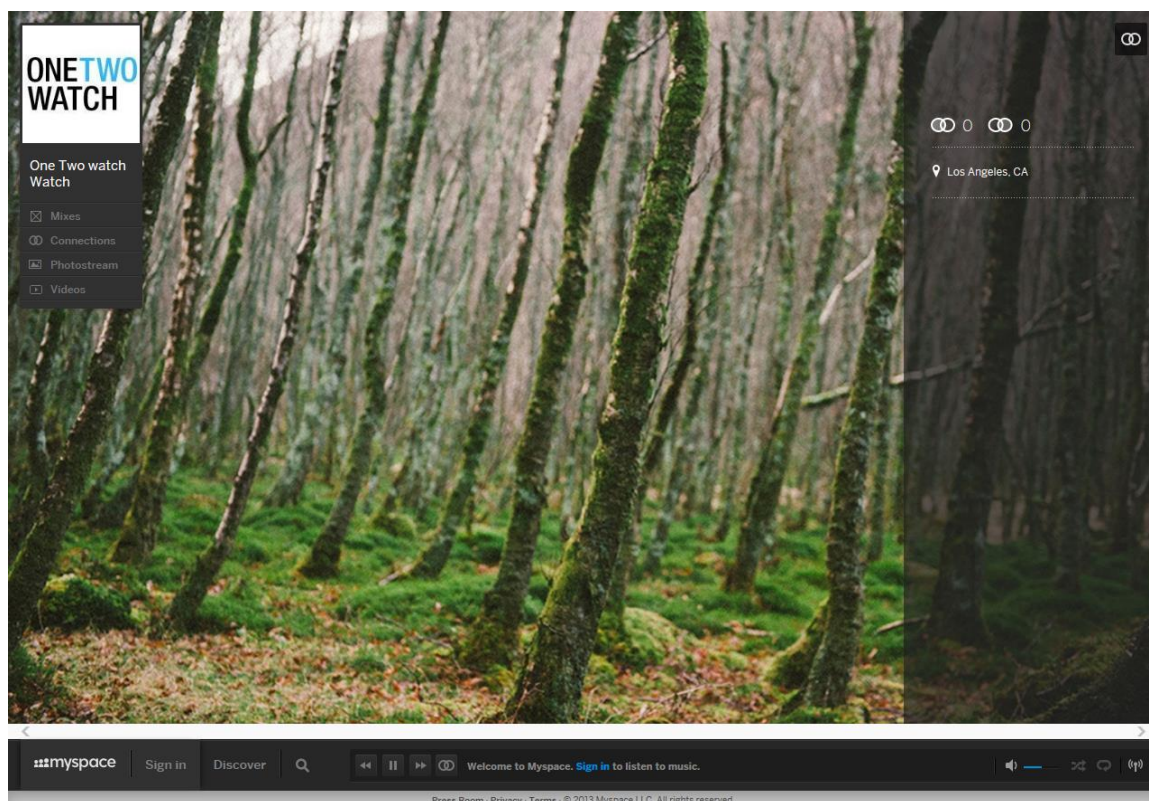
Figure 30: MySpace Violation
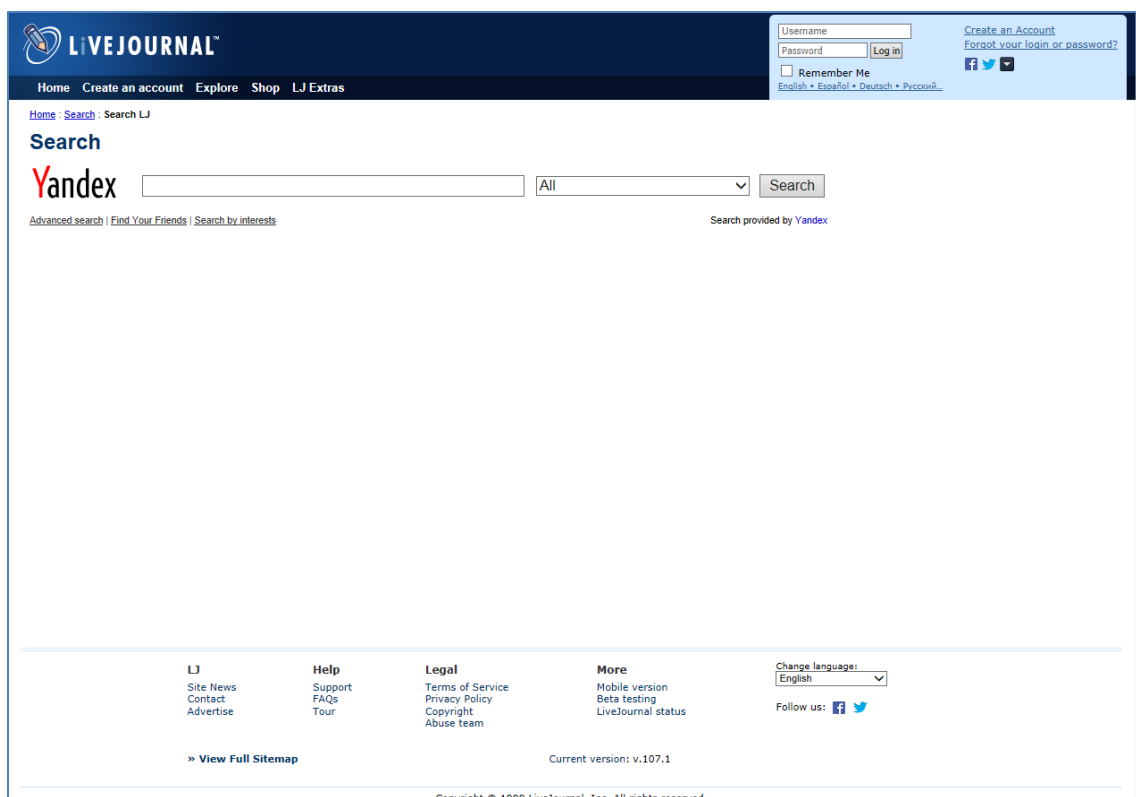
Figure 31: Screenshot of LiveJournal Violation
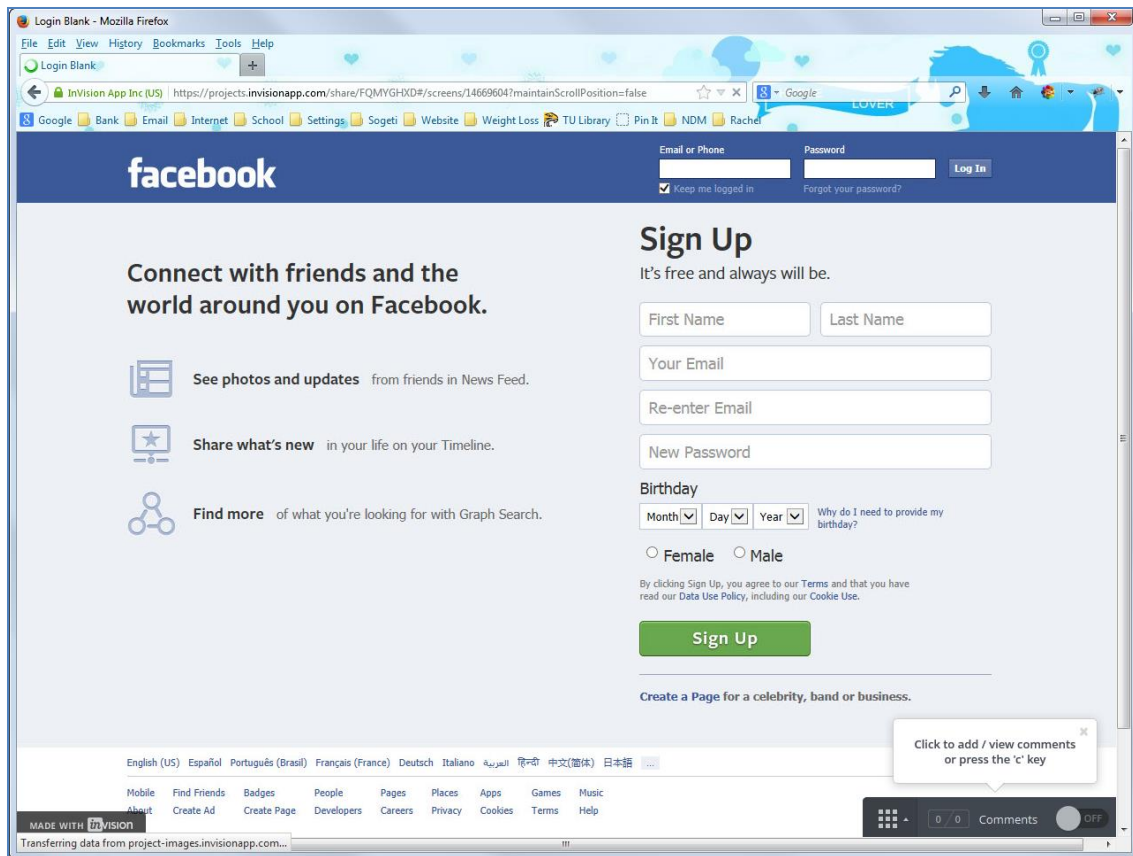
Figure 32: Phase 1 Login Screen
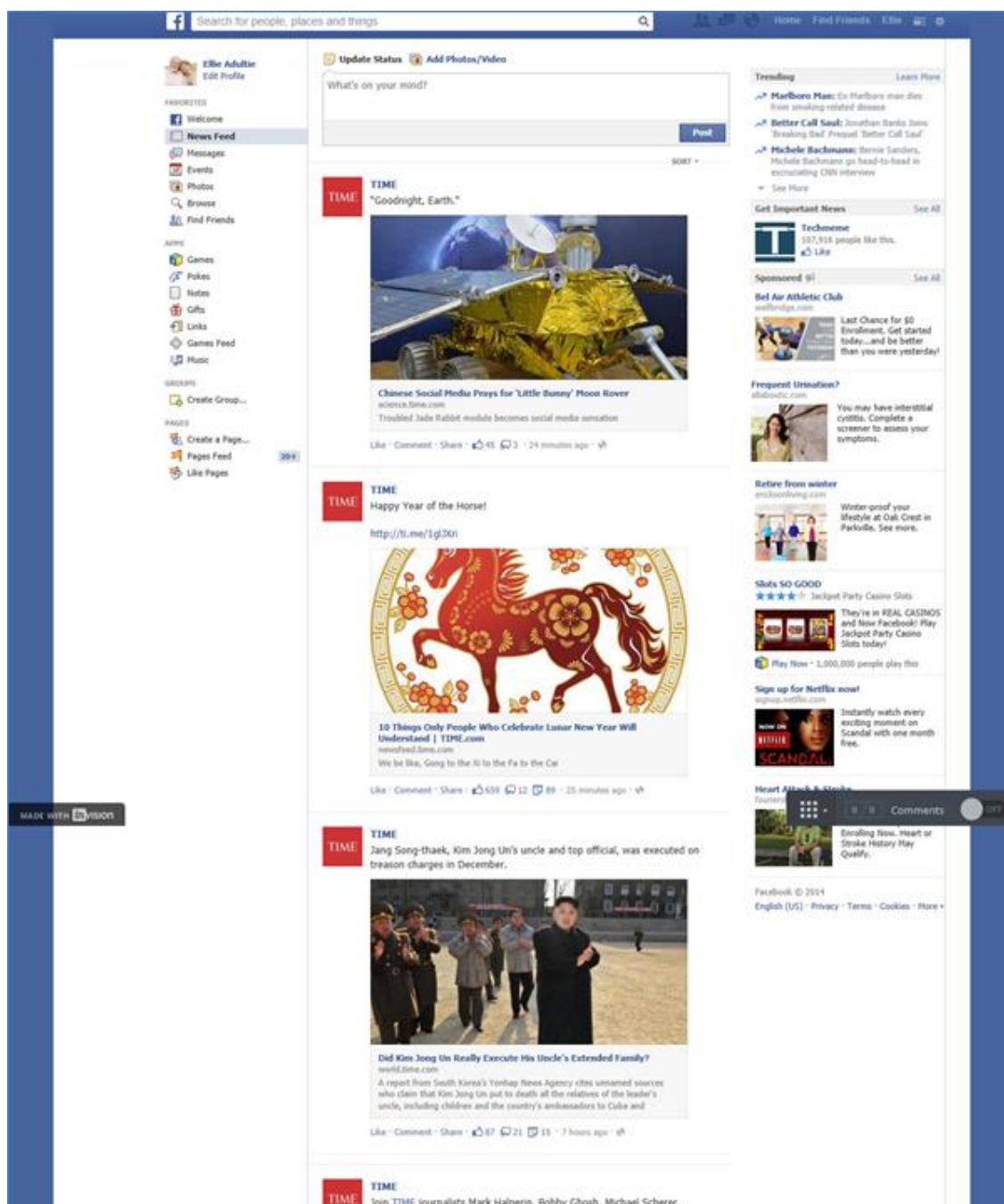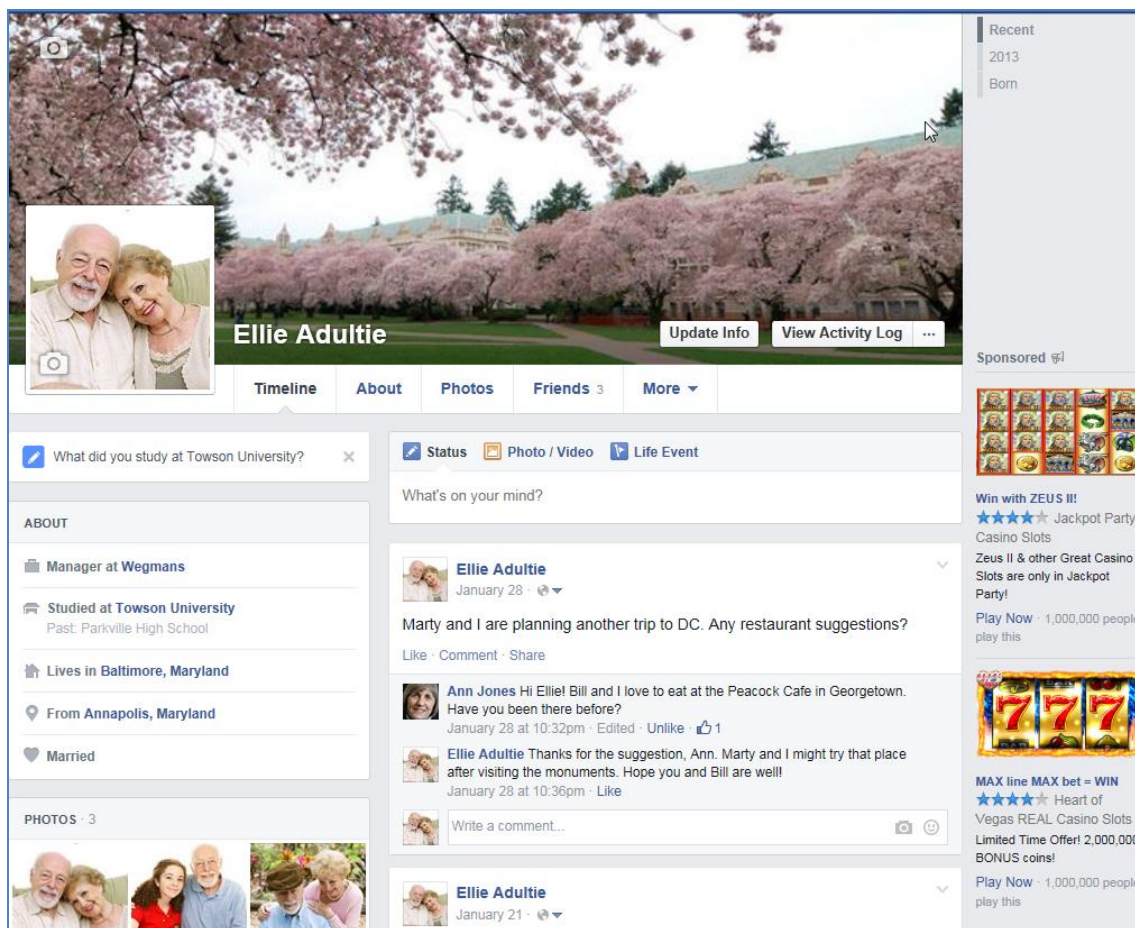
Figure 33: Phase 1 Homepage

Figure 34: Profile Page

Figure 35: Phase 1 Notifications

Figure 36: Phase 1 Eldie Adultie Profile

Figure 37: Phase 1 John Smith Profile
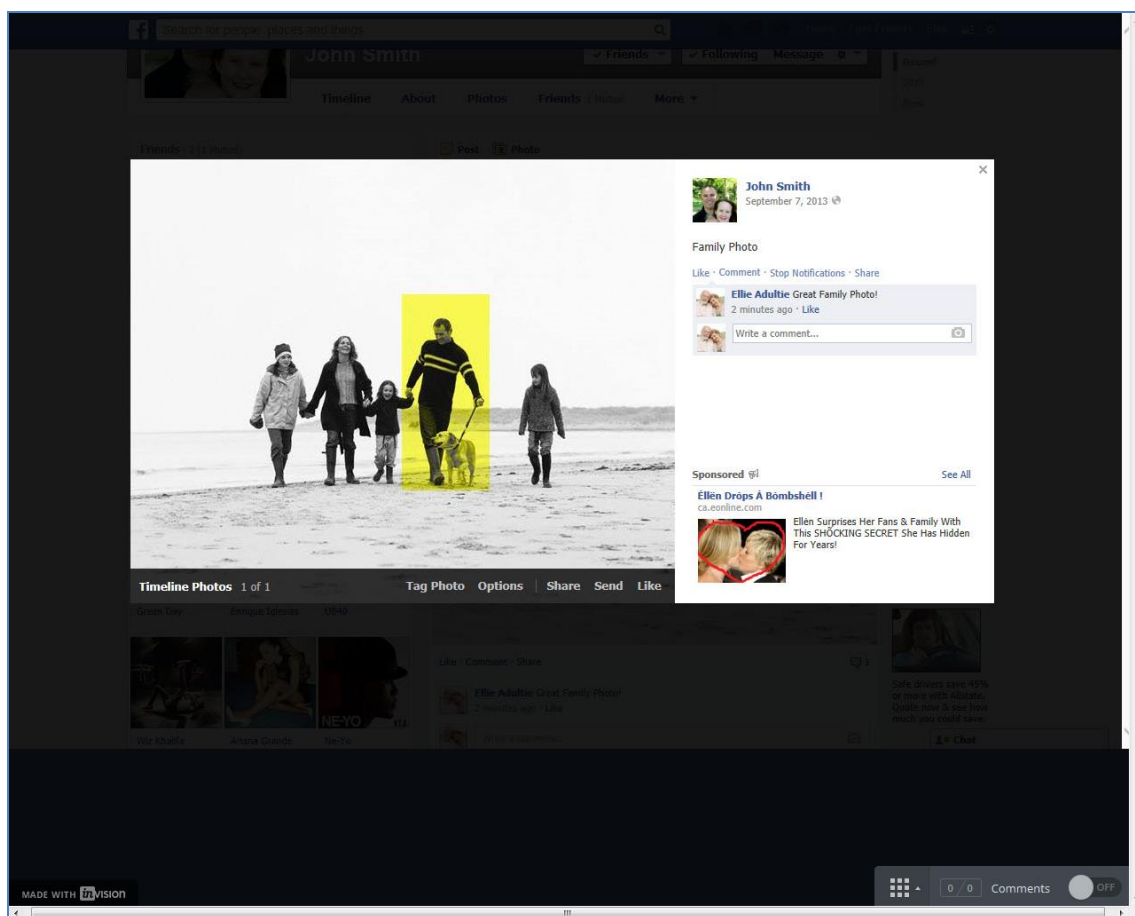
**Figure 38: Phase 1 Tagging**

Figure 39: Phase 1 Friends List

Figure 40: Login Page
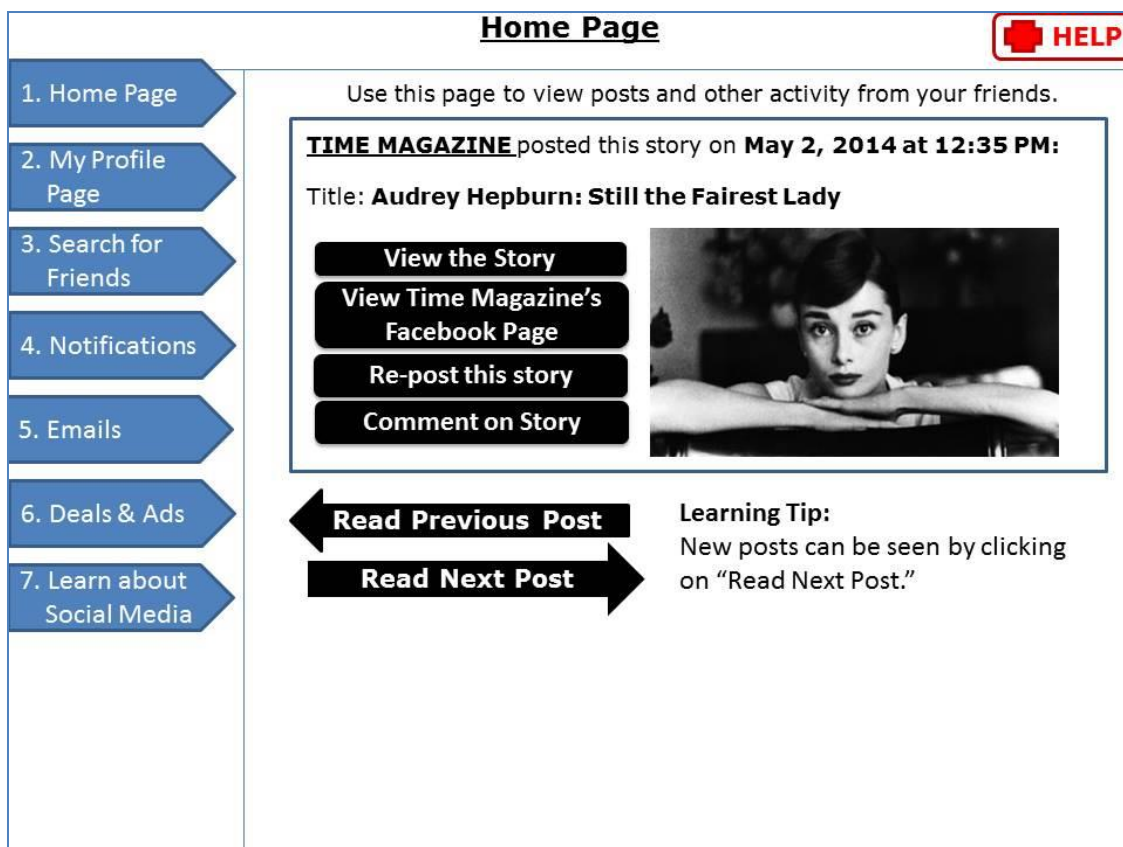
**Figure 41: Homepage with Sub links on Side**

Home Page

🔴 **HELP**

1. Home Page

2. My Profile Page

3. Search for Friends

4. Notifications

5. Emails

6. Deals & Ads

7. Learn about Social Media

Use this page to view posts and other activity from your friends.

◄ **Read Previous Post**   **Read Next Post** ►

TIME MAGAZINE posted this story on **May 2, 2014 at 12:35 PM:**

Title: **Audrey Hepburn: Still the Fairest Lady**

View the Story

View Time Magazine's Facebook Page

Re-post this story

Comment on Story

Learning Tip:
New posts can be seen by clicking on "Read Next Post."

Figure 42: Homepage with Sub links on Top

**Figure 43: Profile page with sublinks on side**

**Figure 44: Profile page with sublinks on side (Information about you)**

Figure 45: Profile page with sub-links at top

**Figure 46: Deals and Advertising page (image credit: Wes Peters Real Estate 2014; Facebook 2014)**

**Figure 47: Notifications page**

Figure 48: John Smith's Profile Page

Figure 49: Tagging (Step 1)

Figure 50: Tagging (Step 2)

**Figure 51: Tagging (Step 3)**

Figure 52: Help Button

**Figure 53: Learning About Social Media**

Figure 54: Main Navigation Links
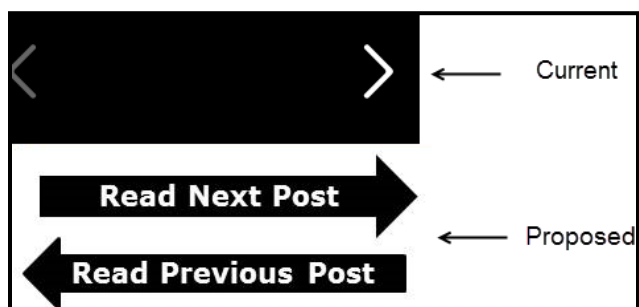
Figure 55: Comparison of Navigation Buttons

36. APPENDIX AD

Perception Frequencies Comparisons – Phase 1

Table 49: Perception Frequencies Comparisons – Phase 1

N of Valid Cases = 22		Group		Total
		1	2	
Logging into account	0	2	0	2
	1	3	3	6
	2	1	1	2
	3	5	4	9
	4	0	3	3
Total		11	11	22
Updating Profile	0	1	0	1
	1	5	2	7
	2	3	5	8
	3	2	3	5
	4	0	1	1
Total		11	11	22
Navigating	0	1	1	2
	1	5	6	11
	2	2	2	4
	3	3	2	5
Total		11	11	22
Understanding Homepage	0	1	1	2
	1	2	0	2
	2	1	1	2
	3	6	6	12
	4	1	3	4
Total		11	11	22
Commenting on Profiles	0	1	0	1
	1	6	6	12
	2	2	1	3
	3	2	3	5
	4	0	1	1
Total		11	11	22

N of Valid Cases = 22	Group		Total
	1	**2**	
Logging into account	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.111a	4	.276
Updating Profile	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.986a	4	.408
Navigating	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.291a	3	.962
Understanding Homepage	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.000a	4	.558
Commenting on Profiles	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.533a	4	.639
N of Valid Cases	22		

37.   APPENDIX AE

Perception Frequency Comparisons - Phase 1 and 3 Group 1

Table 50: Perception Frequency Comparisons - Phase 1 and 3 Group 1

Subtask 1		Phase		
		1	3	Total
Logging into account	0	2	0	2
	1	3	0	3
	2	1	1	2
	3	5	0	5
	4	0	10	10
Total		11	11	22
Subtask 2		Phase		
		1	3	Total
Updating Profile	0	1	0	1
	1	5	1	6
	2	3	0	3
	3	2	1	3
	4	0	9	9
Total		11	11	22
Subtask 3		Phase		
		1	3	Total
Navigating	0	1	0	1
	1	5	1	6
	2	2	2	4
	3	3	2	5
	4	0	6	6
Total		11	11	22

Subtask 4		Phase		
		1	3	Total
Understanding	0	1	0	1
Homepage	1	2	0	2
	2	1	0	1
	3	6	4	10
	4	1	7	8
Total		11	11	22

Subtask 5		Phase		
		1	3	Total
Commenting on	0	1	0	1
Profiles	1	6	1	7
	2	2	0	2
	3	2	5	7
	4	0	5	5
Total		11	11	22

Subtask 6		Phase	
		3	Total
Social Media	0	1	1
	2	1	1
	3	4	4
	4	5	5
Total		11	11

38.   APPENDIX AF

Perception Frequency Comparisons - Phase 1 and 3 Group 2

Table 51: Perception Frequency Comparisons - Phase 1 and 3 Group 2

Subtask 1		Phase		Total
		1	3	Total
Logging into account	1	3	0	3
	2	1	0	1
	3	4	0	4
	4	3	11	14
Total		11	11	22

Subtask 2		Phase		Total
		1	3	Total
Updating Profile	1	2	0	2
	2	5	0	5
	3	3	3	6
	4	1	8	9
Total		11	11	22

Subtask 3		Phase		Total
		1	3	Total
Navigating	0	1	0	1
	1	6	0	6
	2	2	0	2
	3	2	4	6
	4	0	7	7
Total		11	11	22

Subtask 4		Phase		Total
		1	3	Total
Understanding Homepage	0	1	0	1
	2	1	0	1
	3	6	3	9
	4	3	8	11
Total		11	11	22

Subtask 5		Phase		Total
		1	3	
Commenting on Profiles	1	6	0	6
	2	1	1	2
	3	3	3	6
	4	1	7	8
Total		11	11	22

Subtask 6	Phase	Total
	3	
Social Media 3	3	3
4	8	8
Total	11	11

39.   APPENDIX AG

Senior Center Support Letter

Subject:	Fw: Harford Senior Center - Usability Study Participants
From:	Streeter, Suzanne (sestreeter@harfordcountymd.gov)
To:	jessicaarfaa@yahoo.com;
Cc:	rjwalker@harfordcountymd.gov; lamyers@harfordcountymd.gov;
Date:	Sunday, February 9, 2014 10:17 AM

I thought the message below dated Feb 3 was sent to you--sorry about that. The manager at McFaul and Edgewood will expect to hear from you. Hope it all goes well!

From: Streeter, Suzanne
Sent: Monday, February 03, 2014 03:52 PM
To: Walker, Richard; Myers, Linda
Cc: Pomilla, Andrea; Jacobs, Susanne; rumsey, peggy
Subject: FW: Harford Senior Center - Usability Study Participants

Jessica:

Your questionnaire looks fine. Rick Walker at our McFaul Center 410-638-4040 and Linda Myers at our Edgewood Center 410-612-1622 are expecting to hear from you, so I would check in with each of them to determine the best days and times to interview seniors. We ended up closing the centers early today because of weather and it looks like we might have freezing rain Wednesday morning, so call ahead to make sure we are not closed.

Suzanne E. Streeter

Manager, Senior Center Division

Harford County, Office on Aging, Department of Community Services

Havre de Grace Activity Center

351 Lewis Lane, Havre de Grace, MD 21078

Ph: 410-638-3032 Cell: 443-752-0208 Fax: 410:-939-5125

E-mail: sestreeter@harfordcountymd.gov

40.   APPENDIX AH

IRB Approval for Preliminary Studies

TOWSON
UNIVERSITY

EXEMPTION NUMBER: 14-X022

To: Jessica   Arfaa

From: Institutional Review Board for the Proctection of Human
           Subjects Beth Merryman, Member

Date: Thursday, October 03, 2013

RE: Application for Approval of Research Involving the Use of
           Human Participants

Office of University
Research Services

Towson University
8000 York Road
Towson, MD 21252-0001

t. 410 704-2236
f. 410 704-4494

Thank you for submitting an application for approval of the research titled,
*Assessing social networking sites for the elderly: A study to improve
accessibility and usability of social networking sites for the elderly.*

to the Institutional Review Board for the Protection of Human
Participants (IRB) at Towson University.

Your research is exempt from general Human Participants requirements
according to 45 CFR 46.101(b)(3). No further review of this project is
required from year to year provided it does not deviate from the submitted
research design.

If you substantially change your research project or your survey
instrument, please notify the Board immediately.

We wish you every success in your research project.

CC: Y. Wang
         File

41.   APPENDIX AI

IRB Approval for Usability Studies

TOWSON
UNIVERSITY

EXEMPTION NUMBER: 14-X080

To: Jessica   Arfaa

From: Institutional Review Board for the Protection of Human
         Subjects Melissa Osborne Groves, Member

Date: Friday, January 31, 2014

RE: Application for Approval of Research Involving the Use of
         Human Participants

Office of University
Research Services

Towson University
8000 York Road
Towson, MD 21252-0001

t. 410 704-2236
f. 410 704-4494

Thank you for submitting an application for approval of the research titled,
A Usability Study of Edler Adults Utilizing Social Networking Sites

to the Institutional Review Board for the Protection of Human Participants
(IRB) at Towson University.

Your research is exempt from general Human Participants requirements
according to 45 CFR 46.101(b)(2). No further review of this project is
required from year to year provided it does not deviate from the submitted
research design.

If you substantially change your research project or your survey
instrument, please notify the Board immediately.

We wish you every success in your research project.

CC: K. Wang
      File

Message pane

42.   LIST OF REFERENCES

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