A Blind-first Approach to Site Design

by

Dennis W. Lagman

Submitted to OCAD University
in partial fulfillment of the requirements for the degree of

Master of Design
in
Inclusive Design

Toronto, Ontario, Canada, April 2016

Copyright Notice

Author's Declaration

I hereby declare that I am the sole author of this MRP. This is a true copy of the MRP, including any required final revisions, as accepted by my examiners.

I authorize OCAD University to lend this MRP to other institutions or individuals for the purpose of scholarly research.

I understand that my MRP may be made electronically available to the public.

I further authorize OCAD University to reproduce this MRP by other means, in total or in part, at the request of other institutions or individuals for the purpose of scholarly research.

Dennis W. Lagman

Abstract

When designing a website, designers have to consider the needs of potential users. This is often difficult when designers have to design for different senses or for devices that they are not accustomed to using. In this case, most designers will then rely on creating websites that are targeted to users that are just like them, for example, a sighted designer creating a website for sighted users. In this body of work, I explore how I, as a sighted designer with limited knowledge and experience in web accessibility, learn how to create an accessible website by involving users who are blind in the design process. I achieve this in two ways: firstly, by involving five users with knowledge of assistive technologies in one-on-one user sessions and secondly, by creating design-related scenarios as the basis of a dialogue between myself and these users who are blind to simulate interaction with the proposed website. I conclude this work by critically reflecting on what I've learned through this process and discuss practical considerations in its application.

Keywords: Accessible User Experience Design, Inclusive Design, User Interviews, Accessibility, Screen Reader, Blind

Acknowledgment

Thank you to Sambhavi Chandrashekar who helped facilitate this research project by identifying potential participants that I could involve in my study.

Thank you to my five wonderful participants who gave up their time and provided me with so much great insight and knowledge.

Thank you to my classmates, the "Delta Cohort", who I spent the last two years living and breathing Inclusive Design with. We did it!

Table of Contents

List of Figures

Introduction

Today, more than half a million Canadians are estimated to be living with significant vision loss that impacts their quality of life, and every year more than 50,000 Canadians will lose their sight (Fast Facts about Vision Loss, n.d.). For these individuals, accessing content on the Internet is extremely difficult, as many websites are not designed to accommodate their unique disability. What may be considered extremely user-friendly for sighted individuals may be the opposite for users who are blind, who have to rely on screen readers or other assistive devices to access the same content and information.

Therefore, when designing accessible websites for users who are blind, it is crucial for designers to make sure that their understanding of the problem is aligned to that of the users' interaction and experience with a website or interface. This can be a problem, however, as many designers find it difficult to imagine the needs of users who are blind, and to conceptualize the users' interactions with the system.

Throughout this body of work, I will be proposing a dialogue-based scenario and task method that will help me, as a web designer, better understand how to create accessible websites for screen reader users.

1.1 Research context and problem

User experience designers and front-end web designers are tasked with creating and designing enjoyable websites and applications for users of a website or application (Hassenzahl & Tractinsky, 2006). According to the International Standards Organization (ISO), User Experience is defined as "a person's perceptions and responses that result from the use and/or anticipated use of a product, system or service."

An essential aspect of a web designer's job is to determine how online information can be presented when combining multiple media such as text, graphics, audio and video. Visual objects such as images, visual elements such as scrolling text, visual attributes such as colour, and visual/spatial arrangements such as appealing layout of content are some of the features used in designing web pages to enhance content and presentation (Andronico, 2006). Unfortunately, these visual aspects of the Web are not available to Web users who are blind. For these users, web content is usually spoken to them through the use of a screen reader.

There are roughly 314 million people who are visually impaired worldwide, of whom 45 million are blind (Visual impairment and blindness, 2014). Of this number, it is not known how many use

screen readers. However, according to a published report by the Government of Canada, the percentage of Canadians with disabilities that use the computer and Internet at school and work is comparable with the percentage of those without disabilities (Advancing the Inclusion of People with Disabilities, n.d.).

Although the Web Accessibility Initiative (WAI) of the World Wide Web Consortium ("World Wide Web Consortium [W3C]", 2014) provides guidance on improving the accessibility of websites and apps, many user experience designers and front-end web designers ignore making websites accessible for screen reader users because they think it's either too difficult to implement or refer to roadblocks such as a lack of time, lack of training, lack of managerial support, lack of client support, inadequate software tools, and confusing accessibility guidelines. This has a negative impact on how screen reader users experience a website, as their screen reader software cannot properly "read" the structure of content displayed on a page.

In order to improve the user experience design for screen reader users, it is essential that designers understand how screen readers work and what challenges and frustrations these screen reader users have when navigating web pages. Not understanding the device that is used and the users who are affected will undermine the

importance of the Web Content Accessibility Guidelines and will result in these guidelines not properly being implemented.

Today, screen readers read out the text content of web pages displayed on the screen. It can also indicate to the user the presence of interactive elements such as buttons, forms, links and menus. The user can then interact with these elements through a keyboard. Thus, screen reader users typically do not use a mouse. In terms of limitations, Treviranus (1997) points out the significant limitations that screen reader users face online, which continue to exist even today:

- Information is presented only in text form
- Information access is usually sequential, unless the web page is designed to facilitate navigation with a screen reader
- Visual objects are inaccessible except through text alternatives, if provided.
- Users hear only small portions of text at a time, leading to a loss of context.
- Information overload occurs when users are forced to hear repeating portions of common text, such as website headers on every page, that visual users can easily avoid.

- Users interact with the computer only through the keyboard, which makes mouse-only interactions impossible for them to negotiate.

These many drawbacks slow down navigation for screen reader users and make it difficult for these users to locate the information they want, which sometimes can lead to frustration (Lazar, Allen, Kleinman, & Malarkey, 2007). This frustration is compounded by the fact that the visual cues on a web page that aid sighted users are not directly available to screen reader users. The way screen reader users interact with a web page is also limited to how well these users can use their screen reader, which means that it's often difficult to create a consistent user experience across screen reader users.

Although there is research focusing on accessibility for people with disabilities, those studies focus on users being able to interact with the system and *not* on how users with a severe visual impairment can be involved in the design process in order to assist designers in creating accessible websites and apps. The few studies that involved these users in the web design process typically focus on one specific component of a website, but do not go into detail on how these users were recruited, how their feedback was incorporated and what the overall benefit of involving users that are blind is to the designer.

1.2 Design Challenge

The objective of this body of work is to create a process in which participants that primarily use a screen reader are involved in the design and development of a new website called blindfirstdesign.com.

To this end, this body of work ultimately explores what I've learned throughout the process of involving screen reader users when designing the new website, and if a dialogue based approach to site design assisted me in creating a more usable and accessible website for users that are blind.

These learnings will then be applied to the development of the blindfirstdesign.com website, and the process in which screen reader users were involved in the design and development of the site will be publicly posted on it. The goal of this website will to assist other designers in implementing a blind-first approach to design within their own organizations, and to potentially use the website as a way to recruit screen reader users in the design and development of new websites.

1.2.1 Research Questions

My research explores the following questions:

- RQ1: What are the benefits of a blind-first approach to site design?
- RQ2: Can a blind-first approach to site design help me, a designer who has limited knowledge of the WCAG, create a more accessible website for users who must use a screen reader to navigate websites?

To find answers to the above questions, I designed a dialogue-based task scenario protocol to engage screen reader users in the design of a new website. To ensure that there was no bias in my understanding of their existing challenges and frustrations with website design, I also refrained from learning about the web content accessibility guidelines and the role it has on web design.

1.3 Approach and Methods

My research was to ultimately explore how screen reader users would navigate a proposed website and how they would perceive and interact with site elements such as navigation menus, images, text, links and forms. An exploratory approach was employed since there is

a lack of information available from the literature concerning the area being studied. A dialogue-based design protocol was developed and used to uncover what issues screen reader users have with respect to different site elements.

The three components that made up this dialogue-based design protocol include:

- User interviews to learn more about the study participant, what type of screen reader software they are using and how long they have been using it for.
- Dialogue-based task scenarios where the study participant had to imagine that they were navigating a website, in order to describe how they would use their screen reader to navigate the site.
- Usability testing on existing websites in order for the study participant to further articulate what they like or what they don't like about current site design practices.

These methods are further explained in Section 3. Using the three multiple methods provided a degree of convergent validity to the data collected.

The data collected was sought from adult residents of Ontario who are blind or severely visually impaired and who have been using a screen reader to interact with the Web for at least 1 year. Based on

the requirements of my study, five participants who fit this profile were purposively selected for their diversity of vision loss and their level of experience navigating websites through their screen reader software.

The data gathered from these five research participants was then analyzed to identify the main issues around the various site components and how these site components could be designed in such a way that they were accessible by screen reader users.

1.4 Significance of the Research

My research is based on the mobile-first approach to site design, in that a full, standard website should be able to scale back and gradually remove content and features as the "viewport" becomes smaller and the system simpler (Mobile First Design: Why It's Great and Why It Sucks, n.d.). One way to properly achieve this is to consider how the site content will be displayed on a mobile viewport first, and then gradually enhance the experience for larger platforms where there are fewer constraints. Therefore, through the "mobile-first" approach, designers first consider how they could provide users with minimal screen real estate, processing power and third party plugins, an amazing experience that both looks great and functions perfectly (Mobile First Design: Why It's Great and Why It Sucks, n.d.).

Once this is figured out, the full desktop experience is designed, which often is easier to do since there is less limitations and constraints.

The significance of my research is to explore what would happen if the mobile-first design approach was taken even further, where a website is first designed for users who use screen readers. Would designing first for screen reader software prove to be beneficial for screen reader users? How does this approach benefit or impact the design of the mobile and desktop experience? By involving users that are blind in the process, does the blind-first approach to design lead to increased implementation of web content accessibility guidelines, which ultimately benefits everyone?

This thinking is based on the "curb-cut phenomenon" (Helander, Landauer & Prabhu, 1997, p. 817). When sidewalks were redesigned with curb cuts to accommodate wheelchair users, it also proved beneficial for people using skateboards, rollerblades, bicycles, shopping carts, and baby strollers. Benefits that occur when developing information products with accessibility in mind are likewise referred to as the "electronic curb-cut effect" (Jacobs, n.d.).

Insights drawn from this study about how screen reader users that are blind or visually impaired perceive the information architecture of a webpage or website might prove useful in understanding how sighted users may interact with websites when

engaged in eyes-free type situations such while driving or using smaller content devices like Apple Watch.

1.5 Outcomes

This project was for me to determine if a blind-first approach to site design could help me better understand if by involving users that are blind in the design of a new website, could I incorporate site accessibility without actually knowing anything about it? Indirectly, the project aim was to also consider the following:

- How does a dialogue-based approach to site design lead to the involvement of users that are blind in the design process?
- How does involving users that are blind in the design process help designers with limited knowledge of accessibility create accessible websites for these users?
- How could the blindfirstdesign.com website that I am designing be used to inform other designers on how to involve users that are blind in the design process?

Therefore, based on the interactions with participants that are blind, future work includes developing a website informing other designers on how to implement a blind-first approach to design within their own organizations.

1.6 Summary and Report Outline

This body of work reports the results of an exploration into the non-visual online interactions of individuals that are blind or visually impaired using a screen reader during their everyday information practices. This exploration is then used to create a website that is accessible towards this group of users.

Following this introductory section, a review of related literature is presented in the next chapter. The process of the research is presented in Chapter 3, followed by Chapter 4 that describes the results in terms of participant description. Chapter 5 discusses the key themes emerging from the results while Chapter 6 summarizes how the key themes were used to design a new website and what my overall learning was throughout this entire process. Chapter 7 presents the research contributions and implications for future research.

2 Literature Review

2.1 Introduction

This section presents a review of past research from which a conceptual framework was constructed to guide this exploratory study of a blind-first approach to site design. Sub-section 2.2 presents three themes relevant to this research with a summary of key literature under each theme. The literature review first begins with an examination of previous work done to involve users that are blind in a site design process and the outcomes from it. The next review is on previous research done on what screen reader users find frustrating when navigating websites, which is then followed by an examination of literature that reports on aspects of human-computer interaction (HCI), such as web accessibility, that come into play during online interactions using a screen reader.

2.2 Themes Explored

2.2.1 Involving Users that are Blind in the Site Design Process

Sahib, Stockman, Tombros and Metatla utilized a participatory approach to design with users that are blind as a way to inform the

development of a web-search interface. They accomplished this by using scenarios and dialogue-simulated interactions with the proposed search interface as a way to involve screen reader users who had knowledge of assistive technologies, as members of the design team. Through this approach, they were able to verify requirements for the proposed search interface and users that are blind were able to provide formative feedback, critique design plans and propose new designs based on their experience and expertise with assistive technologies.

Through their research, Sahib, Stockman, Tombros and Metatla provide an approach to design with screen reader users and outline the benefits, challenges and practical experiences gained from applying it. This includes:

- Benefits: Scenarios are flexible and adaptable and thus can be customized according to the needs and abilities of the user group. The value of using scenarios with screen reader users is that it allows this user group to envision the proposed interface and form a mental model of how they would interact with it. Therefore, scenarios, especially when expressed as narratives, have an inherent ability to support participatory design (Luck, 2003).

- Challenges: As visual aids are unable to be used, designers using this textual narrative approach need to ensure that descriptions of interface features are detailed and communicated properly, as this plays a significant role in shaping the mental model that screen reader users created of the interface.

2.2.2 Screen Reader Online Interactions

Assistive technologies help people with disabilities to enhance or substitute their physical and cognitive functions in order to be able to perform activities such as using a computer (Cook & Hussey, 2002). Through the use of personal computers, people with special needs have been able to enhance their autonomy, social inclusion, and communication capacity (Taipale & Pereira, 1995). Thus, HCI plays an important role in the provision of information and social opportunities to people with disabilities (Abascal & Civit, 2002).

A common assistive technology that assists users that are blind in accessing computer applications is a screen reader. A screen reader is a software program that enables the user to interact with various computer applications such as a web browser, non-visually. The screen reader works by reading out the contents displayed on the screen and informs the users about the navigational options and

operational controls on the screen, which the user than operates via a keyboard (Chandrashekar, 2010).

When a user navigates to a website, the screen reader software will attempt to interpret the code that is used to construct the displayed webpage. Although the screen reader can automatically convert any text into sound, it cannot automatically decipher non-text objects unless text alternatives are provided along with the object.

Screen readers are not capable of conveying visual/spatial information such as content layout on web pages to the user unless relevant meta-information is provided by the web page code through "markups" (Chandrashekar, 2010). This meta-information should be used when web content is presented through pictures, graphics, audio and video. Doing this would help screen reader users find "the metaphoric 'sing posts' within an information space, and from those signposts to easily understand their current position in that information space, their possible interaction alternatives and the usefulness and appropriateness to their task of the various navigation paths on offer from that point" (Paay, 1998, p. 539).

In summary, screen reader users must deal with several challenges when accessing online information. In order to fully understand these challenges, designers should consider involving

users that are blind in the design of their websites to determine how screen readers will decipher the content and potential layout of a site.

2.2.3 Accessibility of Websites

The ISO definition of accessibility implies that to ensure accessibility is to ensure usability across the maximum possible user diversity (Chandrashekar, 2010). A view of accessibility that is more focused on how users with disabilities access the web is put forth by the World Wide Web Consortium (W3C) through their Web Accessibility Initiative: "Web accessibility means that people with disabilities can perceive, understand, navigate, and interact with the Web, and that they can contribute to the Web" (Introduction to Web Accessibility, n.d.)

Guidelines, such as the W3C's Web Content Accessibility Guidelines (WCAG) (Web Accessibility Guidelines 1.0., N.D.), have been published to guide designers on creating websites with accessibility in mind. In Ontario, the government released the Accessible Information and Communication Standard under the government of Ontario's Accessibility for Ontarians with Disabilities (AODA) Act, 2005. This standard includes requirements for compliance with the WCAG 2.0 standards for web accessibility.

Today, many websites include features that mimic desktop applications such as drag-and-drop of elements. These interactions

are not possible for users who require assistive technologies such as a screen reader to interact with websites. Therefore, in order to make dynamic web content accessible for people with disabilities, the Web Accessibility Initiative (WAI) group of the W3C has laid down specification for Accessible Rich Internet Application (ARIA).

The challenge, however, with these standards and guidelines is that many designers are not effectively implementing them on their websites. By not including users that are blind through the design process, designers will find it difficult to perceive the accessibility of their sites from the perspective of a screen reader user.

2.3 Summary

This section focused on situating the research in practical and theoretical work around user experience design, site accessibility and screen reader online interactions. Each literature review section ended with a summary on how a blind-first approach to site design can alleviate some of the issues outlined, and in the next section, more information will be provided on the research methodology behind this approach.

3 Research Methodology

3.1 Introduction

The research consisted of an exploratory study with five individuals that are blind to better understand how they navigate and interact with websites. The goal was to develop a testable approach to site design with users that are blind, in order to identify if involving these users can help designers such as myself build an accessible website when very little is known about site accessibility.

The website I involved users that are blind in co-designing is blindfirstdesign.com. This is a website that will be used to inform other designers on how to involve users that are blind and use screen readers in the web design process, and to also act as a marketplace for designers and these users to come together to collaborate on design-related website projects.

The primary method used for data collection was a series of semi-structured interviews supported by dialogue-based task scenarios and hands-on online information activities. Participants arrived with their own laptops to access websites during the session. During this time, the audio was being recorded as well as the participant's on-screen interactions.

This section will further describe the design and implementation of the study and provide details on how data was collected and analyzed. Sub-section 3.2 describes the design of the research in terms of the methods that were selected. Sub-section 3.3 describes the approach to participant recruitment and what criterion was used to screen for study participation.

3.2 Research Design

A review of literature in the areas of user experience design revealed that there is limited studies with respect to involving users that are blind upfront in the website design process. The only relatable study was the involvement of users that are blind in the design of a search engine interface (Andronico, 2006). Other studies identify what frustrates screen reader users on the web (Lazar, 2007) but fail to describe the process in which designers can organically come to this information themselves through the involvement of users that are blind in the design process. Therefore, the research design was adapted from traditional talk-aloud protocol methods to allow the participant to describe how they would interact with certain site elements and what aspects of these site elements they typically find frustrating or confusing.

The following studies were drawn upon to develop the research process:

- Participatory Design with Blind Users: A Scenario-based Approach (Sahib, Stockman, Tombros, & Metatla, 2013)
- Improving search engine interfaces for blind users: A case study (Andronico, Buzzi, Castillo, & Leporini, 2006)
- What Frustrates Screen Reader Users on the Web: A Study of 100 Blind Users (Lazar, Allen, Kleinman, & Malarkey, 2007)
- Usability studies conducted with screen reader users in the fields of HCI (Lazar et al., 2007; Strain, Shaikh, & Boardman, 2007**;** Theofenos & Redish, 2003; Watanabe, 2007)
- UX studies conducted with sighted users (Bevan, 2008; Hassenzahl & Tractinsky, Porat & Tractinsky, 2012).

The following techniques were used:

- Semi-structured interviews
- Dialogue-based task scenarios
- Hands-on online information activities

3.2.1 Semi-structured Interview

In order to better understand how the participants interact with a website, a semi-structured or semi-standardized (Berg, 2007) format of interviewing was followed (Appendix A). This was done to keep the interview flexible enough to allow for participant flexibility with the opportunity to maximize participant insights. Questions were asked around the following themes:

- Nature of vision loss and whether user was able to previously experienced a website visually.
- Type of screen reader that is used to interact with a website and overall reasons for selecting this screen reader.
- Duration in which participant has been using their preferred screen reader for and whether the participant considers himself or herself an expert or novice screen reader user.

3.2.2 Dialogue-Based Task Scenarios

Dialogue-based task scenarios were used during the research session to externalize participant's thought processes and interpret their actions. The design of these task scenarios were done in such a way where the participants were not actually interacting with a website

(Appendix B). Instead, they were instructed to imagine that they were exploring blindfirstdesign.com, a website that does not exist today, and by doing so, to describe how they would interact with specific site elements of this new site. For each site element they were asked to further elaborate on what makes those site elements accessible for their screen reader and what aspects of those elements typically cause issues or frustration. The dialogue based task scenarios included the following:

- How the user would typically explore a new page to identify and determine what the new page is about
- How the user would interact with menus and other navigation-type elements
- How the user would interact with images and image-related assets such as hero banners, image carousels, etc.
- How the user would interact with page links and input fields

Notes were recorded based on how the participant would see themselves interacting with these elements and if given the opportunity, what would they change about those elements in order for it to be more accessible and inclusive for users who are blind. In

order to better demonstrate the issues and challenges they have with specific site elements, the participants were then asked to perform specific online activities, which is discussed in further detail in the next sub-section.

3.2.3 Hands-on Online Information Activities

Hands-on online information activities were used as part of the research study, where participants were asked to perform specific online activities to demonstrate their answers provided during the dialogue-based task scenarios. These online information activities provided an opportunity to observe how participants navigate websites that allowed several key insights to be made. More importantly, these online activities provided a clear understanding of how the participants felt when using their screen reader to interact with different websites which helped me, as a designer, understand the importance of making the information architecture accessible and inclusive.

These online information activities differ from traditional usability testing, where participants are asked to perform benchmark tasks in a laboratory setting in order for their performance to be measured and recorded. The number of usability issues encountered during my research was not measured, as I was more concerned with

exploring qualitative experiences and how this type of data can help inform the design of accessible and inclusive websites.

3.3 Research Implementation

3.3.1 Sampling and Recruitment

According to the International Classification of Impairments, Disabilities and Handicaps (ICIDH) manual by the World Health Organization, visual impairment is "the consequence of a certain degree of vision loss such as low vision/partially sightedness, legal blindness, complete blindness or colour blindness." Using this classification as a guideline, I had to consider the type of visually impaired user to involve in my research, and how their specific vision impairment could be addressed through a blind-first approach to web design.

Users with visual impairments experience the web in different ways. For those that have low-vision, partial sightedness or colour blindness, screen magnification programs or features built into the operating system or browser can enhance the accessibility of a website. For these users, the choice of colour and web page layout can make an enormous difference on how they experience a website.

However, for users who are completely blind, webpage layouts and site colours are meaningless. These users rely on screen readers or special browsers to interact with and understand what is being displayed on the page. This is typically done by the screen reader software or special browser "reading" what is displayed on the page and then sending this information via text-to-speech technology. However, if a webpage is not coded properly to support the screen reader or special browser, the experience of the page becomes severely degraded for screen reader users.

For the purposes of my research, I made the decision to only include users that are blind and that interact with web pages via screen reader software. The intention, by only including these types of vision impaired users in my research, was to see if a "blind first" approach to design would help me, as a web designer, develop a website that not only benefits these users but also other users that have less extreme forms of vision impairment. This approach is commonly referred to as the curb cut effect where things intended to benefit people with disabilities wind up benefiting everyone (Jacobs, n.d.).

Now that my target group was identified, I had to consider various selection criteria to ensure that I had a good distribution of

research participants that would help me develop a blind-first approach to web design.

3.3.2 Defining Selection Criteria

After identifying the target audience that would be involved in my research, selection criteria was created and used to effectively evaluate and select participants for my study.

The selection criterion was to help me determine if potential participants are eligible for the research based on set factors such as their age, location, gender and mobility. The criteria went further to also identify their level of experience browsing websites, the type of technologies they use to browse these websites and if they was born blind or if it came later in life. The importance of setting selection criteria is to ultimately ensure that there isn't any conflict between participants and the overall objective of the proposed research study.

3.3.3 Facilitating Inclusive Recruitment

Since users with a vision impairment do not simply fall into homogeneous groups (Buultjens, 1998), it was a challenge to reach out to individuals with a specific 'type' of vision impairment without the assistance of external groups and professional organizations such as the CNIB, or medical professionals such as Ophthalmologists,

Optometrists, and vision rehabilitation practitioners (Ritter, 2013). It was my assumption that these organizations and medical professionals would have referrals or have access to membership or patient lists that could be used to identify potential participants.

Working with other organizations to identify participants can also provide other important benefits, such as access to experts and assistive technologies (Ritter, 2013). Additionally, because these organizations are familiar working with the target audience, there is a greater chance of inclusiveness, as they would know how best to engage potential participants into the recruitment of the research study through the use of appropriate platforms, such as braille or large text. Therefore, the main benefit with partnering with external groups is that the responsibility of inclusive recruitment falls into their hands (Ritter, 2013).

Ultimately, my recruitment of participants that are blind was facilitated through my social network. I was able to reach out to colleagues and faculty that have previously done studies with my target audience, and have them identify if any of their participants fit my selection criteria. For those that did, I had my connections send an invitation for research, which I drafted, on my behalf. Five English-speaking adults (three women and two men) who are blind and use a

screen reader to interact with websites were recruited through my network. Once these participants agreed to participate, I formally sent an email introduction about the research along with an electronic consent form.

3.3.4 Barriers to Selected Recruitment

Although I was able to successfully recruit for my study, there are many potential logistical, interpersonal and ethical challenges associated with external group collaboration (Ritter, 2013). For example, institutional partners may require printed forms or other materials with braille annotations (Lazar, Allen, Kleinman & Malarkey, 2007) or the study itself may need to be approved by internal review boards or other bodies of governance. Other hurdles may include establishing process, procedures and policies as mandated by the partnering external groups to ensure the protection of their members' health and wellbeing (Ritter, 2013). Because of these hurdles, consideration into timing of the study needs to be a high priority as the inability to meet varying organizational requirements may lead to the inclusive study being abandoned altogether.

Ultimately, piloting and preliminary consultations with outside groups will prove crucial in developing an experimental plan and

procedure, as achieving a representative sample size will depend on the cooperation of external groups (Ritter, 2013).

3.3.5 Consent Process

Consent documents were provided to participants in an electronic format via email prior to each participant arriving for the research study (Appendix C). The form contained various affirmations about having read and understood the purpose of the research and what is expected from them. To indicate their consent, participants were asked to type in their name and the current date on the form followed by typing "I agree". The consent document was created in an accessible format and in the situation that a participant was unable to provide their consent prior to the research; a paper copy was made available during the research session where the information about the session was read aloud to the participant. Upon agreeing to the research the participant had to sign their name to show they consent to participating in the study. A paper sticky was added just below the signature field to inform the participant of the area that needed to be signed.

To ensure a successful and ethically appropriate test session, it is important to create a climate of trust and comfort for the participants. This was achieved by providing the participants with the

option of doing the interview virtually or in an environment that was able to accommodate their loss of vision. Of the five participants, four chose to do the research in-person with their own laptop and one requested to do it virtually via screen-sharing software.

3.3.6 Preparing the Physical Research Environment

Prior to the research starting, all test materials, consent forms, and documentation were reviewed for readiness and the research environment was set-up in advance to ensure that there would not be any technological issues during the study.

The research environment was set-up one day in advance to ensure that the room and technology would suffice. During this set-up it was clear that the room did not offer a wired Internet connection and so participants had to be informed that only wireless Internet could be used during the research and to ask if this would be an issue for them. Once the participants informed me that they were able to connect to wireless Internet further details of the meeting room location was sent out along with specific travel instructions.

Prior to the session Participants were also informed to bring their own devices and assistive technologies to ensure that they were working with a system they were most comfortable with. Having participants use a system that is foreign to them could have a negative

effect on the research results and could lead to unintended user frustration during the interactive aspects of the study.

The research environment itself was in a large, quiet meeting room that was chosen for the amount of space around the meeting table as well as the size of the table itself. Having a large working area was a consideration as adaptive technology users may require extra space for their computing device and any output readers.

3.3.7 Participant Arrival

During the day of the research, I met with the participant at the closest transit station in order to accompany them to the test venue. I ensured that an elbow was offered for guidance only when a guide dog was not present (What do you do when you meet a blind person? n.d.) to respect the participant's dignity and autonomy. As the participants were blind, I was sensitive to the participant's comfort level and was conscientious about initiating physical touch, as it may be an infringement on their personal space.

The participant was guided through the building elevator and up to the floor where the research was going to be taking place. Upon arriving on the floor, great care was taken to ensure participants knew what barriers were in front of them. For example, there were multiple doors that participants had to go through before arriving in the

research room, and so they were informed each time that they were nearing a door and I communicated whether the door would be opening away or towards them. Once we arrived to the research room the layout was described to the participant with further instruction on where in the room they will be sitting.

Prior to starting the research, participants were asked if they had any questions and the research protocols was explained to them (Appendix D). This included informing the participant when they would be requiring their computing device, how recording devices were going to be used and how long the session was going to be running for.

Participants were paid the compensation amount and after asking if they had any questions, the recording of the sessions began.

3.3.8 During the Research Session

Prior to starting the research session an audio recorder was turned on and the participant was informed that the research has started. The session itself was limited to an hour, as any longer could have lead to mental and physical fatigue for the participant. During this time they were also offered to take any breaks if they wished.

Before beginning the dialogue-based scenario approach with the participants, I asked various semi-structured interview questions to get a baseline understanding on how each participant interacts with their screen reader and how experienced they are navigating websites. This information was then used to create personas for each participant, which is discussed in section 4.3 of this report.

3.3.9 After the Research Session Ended

Once the research session was completed I announced that the session has ended and that all recording devices will now be turned off. I thanked the participant for their time and asked if they had any questions they would like to ask now that the recording has stopped. The participant was then accompanied back to the transit station.

3.4 Data Analysis and Validity

The audio recordings of each participant research session was then transcribed into text-format and transferred into a spreadsheet. Once entered into the spreadsheet, the data was further broken up and consolidated into related units in order to be further analysed and to identify if there were any repetition in the feedback received.

3.5 Summary

This section discussed the research methodology used, described the research design, the multiple methods used for data collection, and how this data was analysed and validated. The next section provides the results of the research, which is then followed by a discussion and conclusion in Section 5 and Section 6 of this report.

4 Participant Description

4.1 Introduction

This section presents demographics on the five participants that were involved in the research. Any identifying characteristics on the participants are masked and pseudonyms are assigned to ensure complete privacy. Information on each participant is presented as a persona. More information on the use of personas is given in section 4.3.

Following the personas, results gathered from the dialogue-based scenario approach is presented. This section will break down the results by component and will summarize how each participant would interact with the specific component along with what I've learned regarding accessibility and usability for that component.

4.2 Demographics

Three women and two men with ages ranging from 25 to 65 participated in the research. These participants are considered legally blind with two having congenital blindness and the remaining four having acquired blindness within their teenage years. All of the participants use a screen reader to navigate and interact with websites

and none of them have had any exposure to a visual layout of a website prior to losing their sight. Each of the participants identify themselves as experts within the field of digital accessibility or usability and are, or have been, gainfully employed with organizations that have leveraged their ability to recognize usability issues on their websites or apps.

The level of experience using screen readers as well as their professional experience as usability or digital accessibility experts was the primary consideration when screening for participants. The reason for this was to learn as much as I could from a group of screen reader users that could properly articulate what usability issues they encounter when interacting with specific site elements.

For this research project, personas were created based on the data and key characteristics of each of the five participants to illustrate their diversity and to enhance communication during the research outcomes outlined in the section below.

4.3 Personas

Personas are a method for enhancing engagement and reality (Grudin & Pruitt, 2002), which emerged first in the fields of interaction

design and marketing. Web designers can use personas for a variety of purposes such as to aid in design, identify site usability issues towards a specific audience and to illustrate results. For this research project, personas were created based on the data received from each of the five participants to clearly articulate their diversity and to illustrate how their level of experience using screen readers to navigate websites impacts what usability issues they encounter.

Based on these personas, five user states and contexts maps (Figures 1-5) were developed to communicate the different ways users that are blind interact with a web page. The user states and context map is a way for conceptualizing, designing, and evaluating the ability of a design to be consumed and operated by users in a wide range of states and contexts (Treviranus, n.d.).

The user states and contexts map (Appendix E) used in my design research covers the following paradigms:

- Sight: Severity of visual impairment
- Sensory: Ability to comprehend non-text elements
- Content Readability: Ability to read webpage content
- Dexterity: Preference of input device
- Device usage: Preference of web-browsing device
- Screen Reader: Preference of screen reader type

Focusing on the above paradigms will result in a website that is more accommodating of extreme users, as the design of the site will be "stretched" to accommodate more than one user and their use case.

4.3.1 Ryan

Ryan is in his late twenties and has congenital blindness. He currently works as a digital accessibility consultant and primarily uses JAWS while at work and at home.

Ryan considers himself an expert screen reader user, and within the last 10 years, he has tried a variety of different screen readers such as Window-Eyes, Orca, Blindows and NVDA. The reason for using JAWS as his primary screen reader is due to having professional training in the past.

When confronted with site usability issues, Ryan will try a secondary screen reader, such as NVDA, to determine which screen reader gives him better access to information.

In his free time, Ryan teaches people who have recently gone blind how to use a screen reader to navigate and access site content.

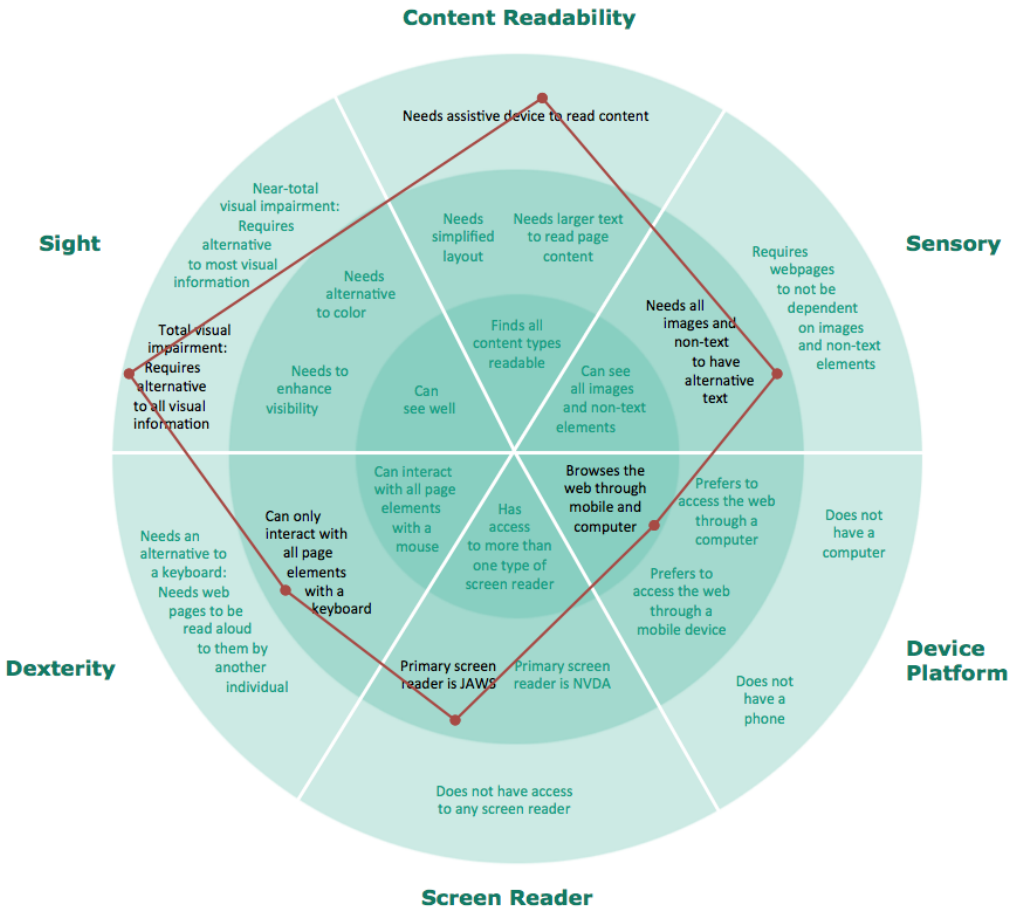


Figure 1: Web Browsing Use Case - Ryan

4.3.2 Jenna

Jenna is in her mid-thirties and acquired blindness in her early teens. She currently works as a usability expert and web designer for the Government and primarily uses Jaws for work and when at home, her preference is to use her Apple iPhone with VoiceOver.

In terms of screen readers, Jenna prefers to use Jaws as this is the screen reader that most professionals use and that it's better supported within a corporate environment. Because Jenna's background is in web design, she often will do testing with JAWS and will then validate the testing with NVDA.

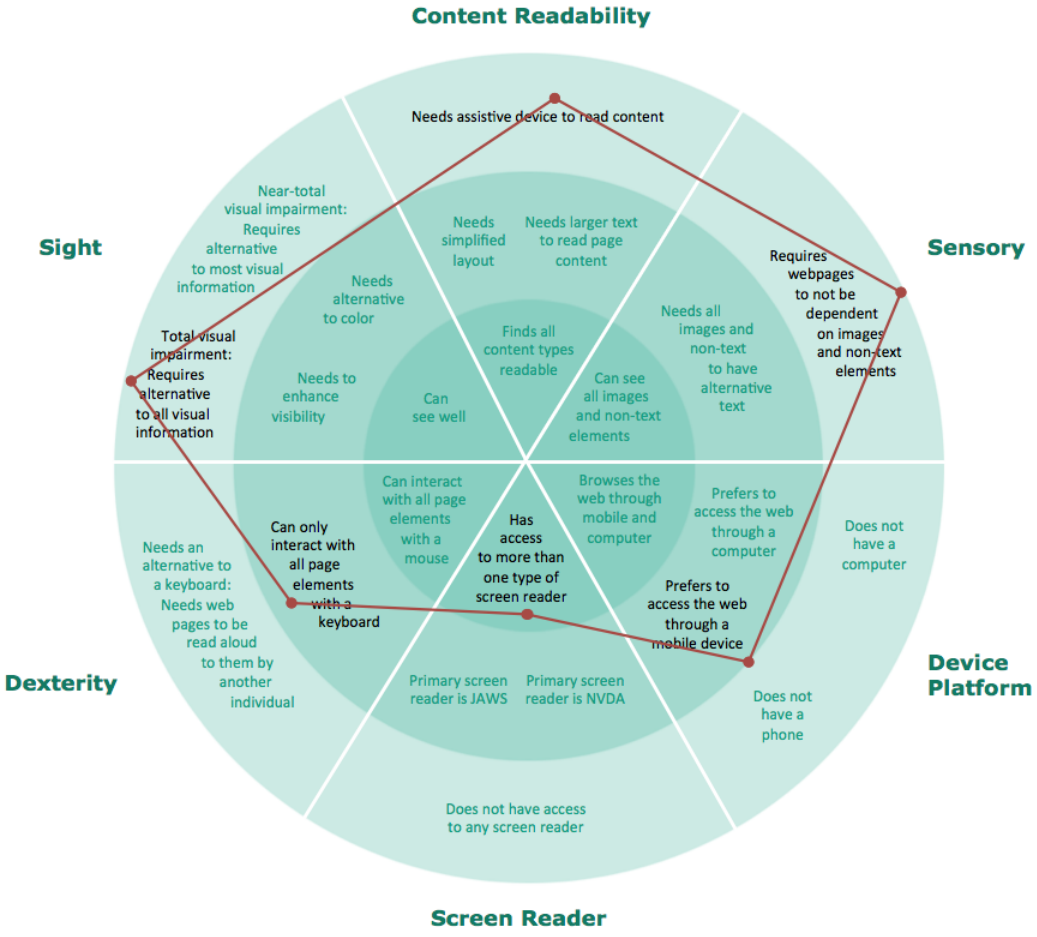


Figure 2: Web Browsing Use Case - Jenna

4.3.3 Darryl

Darryl is in his early sixties and acquired blindness in his late teens. He is currently retired however will consult in his free time as a digital accessibility expert.

Prior to retiring, Darryl worked for two large organizations as an IT Specialist where he was responsible for developing system applications.

Darryl considers himself an expert screen reader user his primary screen reader software is JAWS. He prefers to use JAWS over other screen reader users due to the variety of built-in options provided by JAWS and that it is better supported within corporate environments.

Very rarely will Darryl use a secondary screen reader and if he can’t easily access a website, he’ll just navigate to a new one that is more accessible.

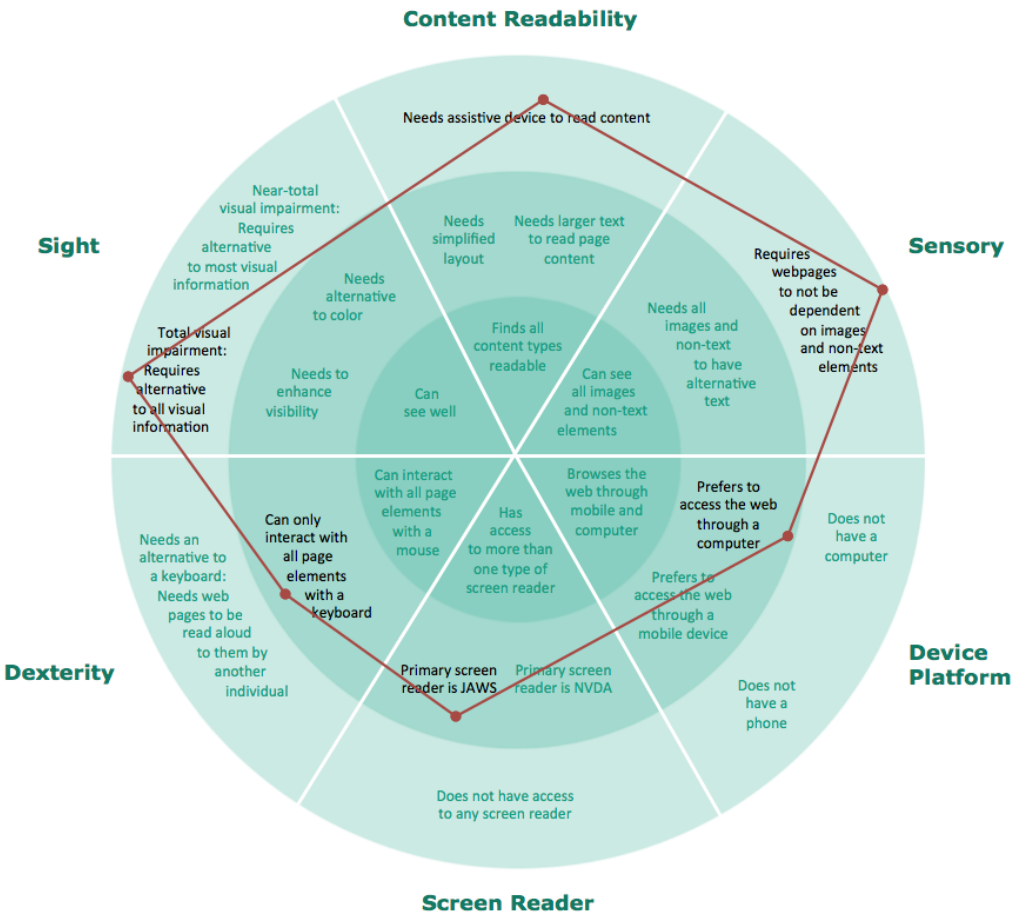


Figure 3: Web Browsing Use Case - Darryl

4.3.4 Pamela

Pamela is in her late forties and acquired blindness as a young adult. Prior to losing her sight, Pamela was using computers as a sighted person but did not have any experience with websites. Her experience at the time was with DOS and non-visual graphical interfaces.

Today, Pamela is employed with a major financial institution where she is responsible over contract management. Prior to this work, Pamela led an accessibility team that was focused on creating policies for accessibility.

In her workplace and at home Pamela uses JAWS. Although she considers herself as an expert with this screen reader, Pamela finds that increases in web technology has made it more difficult to interact with and absorb site content.

Because there isn't a lot of training to help people use assistive technologies, there is a lot of trial-and-error in how someone interacts with a website.

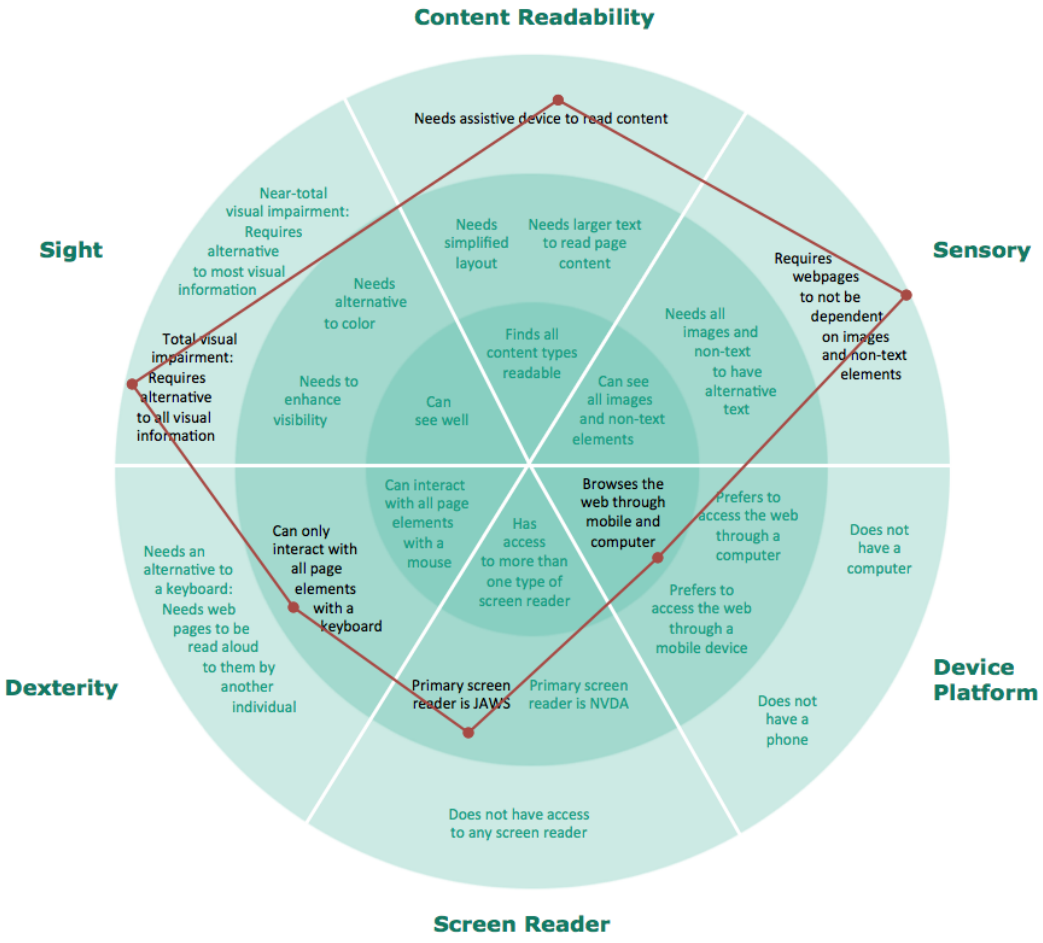


Figure 4: Web Browsing Use Case - Pamela

4.3.5 Martha

Martha is in her late thirties and has congenital blindness. She does, however, have an extremely narrow visual field in her right eye that allows her to make out certain parts of shape but not any details contained within the shape. She described this visual field as having to use a small pin light to shine on an object - you may not be able to see the entire thing, but the more you move the pin light around the object, the more you're able to recognize what the object is.

Although Martha has a narrow visual field, she relies completely on a screen reader to access and navigate websites. Her screen reader of choice is NVDA and this is what she uses on a regular basis at home and at work, where she is employed as a accessibility and usability expert.

Prior to current employment, Martha free-lanced as a web designer, where she would code websites from scratch. Therefore, she has extensive knowledge of web accessibility and how site components can be made to be more accessible.

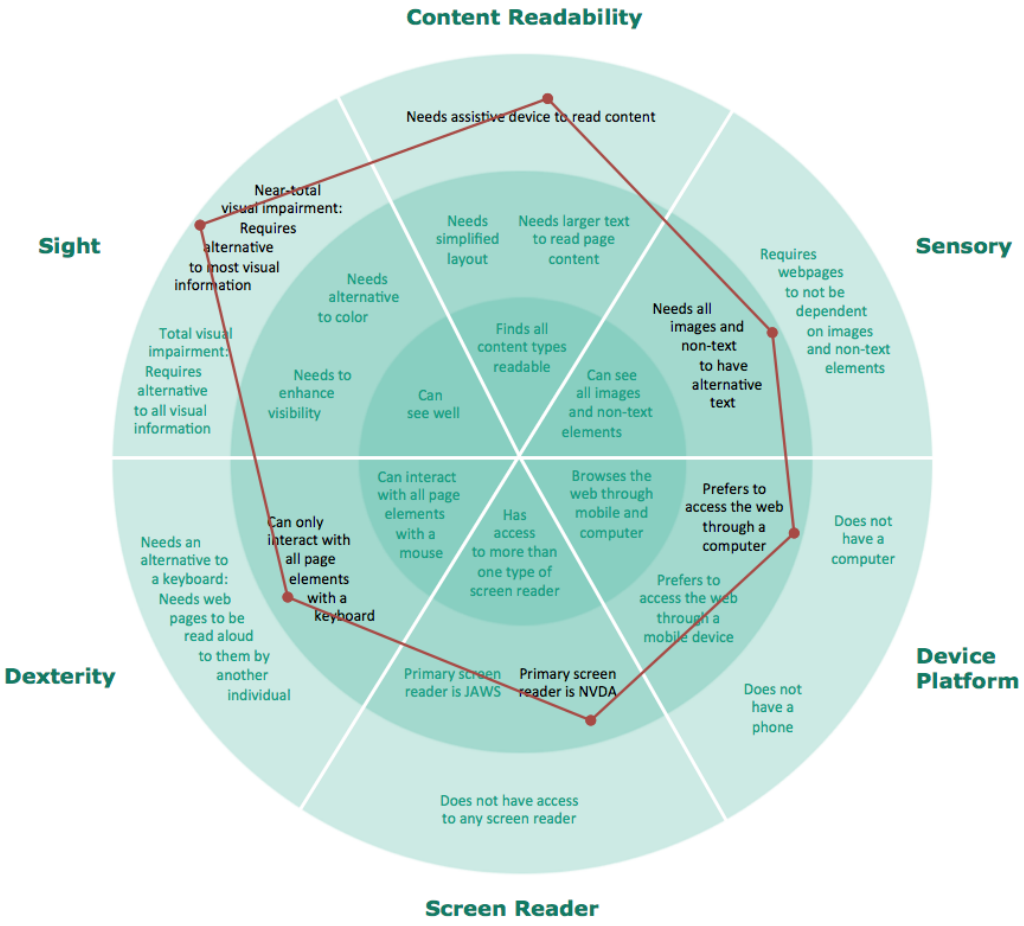


Figure 5: Web Browsing Use Case - Martha

4.4 Summary

As the purpose of my research was to test if a blind-first approach to site design could lead to a better understanding of site accessibility, the results that I was looking to gain were qualitative in nature. Therefore, the use of personas in interaction design serves two purposes. Firstly, personas were used to humanize the data and to allow readers to understand the human effects of accessible user experience issues (Graham, 2015). Secondly, personas were created and used to demonstrate the wide diversity of experiences amongst screen reader users. This was then plotted on individual use case and context diagrams to visually represent the diversity amongst participants.

5 Results from Design Research

5.1 Introduction

This section discusses what I've learned through the implementation of a dialogue-based approach to site design with users that are blind. Prior to this research, I had extremely limited knowledge of site accessibility and never designed a site with screen reader users in mind. Therefore, the purpose of this research was to see what I could learn from applying a blind-first approach to site design and the results discussed in the following subsections report on what I've learned.

5.2 Role of the Screen Reader

For people who are blind or severely visually impaired, the screen reader is one of the only software tools capable of extracting and delivering information published on a website. It provides and enhances independent access to online information that these users are otherwise unable to see. Therefore, for most blind people, it is a very critical tool in helping them compete in a sighted world.

Unfortunately, the ability to extract and deliver relevant information published on a website is only as good as the accessibility

of a site. Prior to this research, I had extremely limited experience and knowledge on how screen reader users access websites through their screen reader, and how a site can be rendered unusable when accessibility is not considered in the code. Although I knew about the Web Content Accessibility Guidelines, I was unable to fully understand the impact it would have for users who are blind and that use screen readers to navigate the web until I involved five of these users in the design of a new website.

Through a dialogue-based approach to site design, I was able to have five screen reader users help me understand how I should be approaching various elements of a website by asking them how they interact with these elements today, and what I should consider when adding them to my own website. Based on this learning, this section of my work I will examine the effectiveness of the blind-first approach to site design along the following dimensions:

1. Interpretation of relevant page content
2. Navigating within a website
3. Interacting with images and links
4. Completing forms

Each of these is considered in greater detail in the next four subsections.

5.3 Interpretation of Relevant Page Content

5.3.1.1 Ryan

Ryan considers himself an expert screen reader user, and so when first approaching a new website for the first time, he will tab through all the page-level headings to learn more about what the main homepage has to offer. He considers page headings as the main dividers of a website that makes it easier to then figure out what part of the website he wants to focus on. After identifying the page headings on the page, Ryan will then check for blocks of text on the page to see what page text is present that is not affiliated to any links. Because of this, very rarely will he learn about a site by using his arrow keys to go left-to-right and top-to-bottom.

What frustrates Ryan is navigating a page that has an improper page structure. When asked to elaborate on this, I learned that page headings cascade from page heading level 1 to page heading level 6. However, many sites do not properly follow this hierarchy and so screen readers are not able to communicate if page content is top level, secondary level, etc - which is something that a sighted person can easily make out when looking at a page.

5.3.1.2 Jenna

Jenna considers herself an expert screen reader user, however unlike Ryan, she will first approach a new website by reading from top-to-bottom by using her arrow keys to go left-to-right, top-to-bottom. She does this because she often feels that sites are not properly accessible and she fears that she will miss out on reading something. In order to feel she is on a relevant page, she will look at the page title first. If there's something specific that she's trying to find on a page she will then do a keyboard command to search for a specific term or will do a scan of the page headings.

Like Ryan, Jenna feels that website would be easier to navigate if the heading structure was done properly. She feels that each topic on a page should have a heading above it that accurately describes the content underneath. However, in order for a page to be easier to navigate for screen reader users, Jenna feels that the most important information should be near the top of the page with the least important at the bottom.

Jenna believes that the information architecture is what designers should focus on first. When designing a page visually, you are able to easily emphasize the page content by using different font colours and sizes, images and other attributes. However, when a blind

user interacts with the same site all they are only able to grasp is the content that's on the page. Therefore, Jenna would like designers to make content visually stand out but from just the basic text level.

5.3.1.3 Darryl

Darryl considers himself an expert screen reader user, and so when first approaching a new website for the first time, he will look for specific page landmarks to get a sense of what the page is about. Darryl describes these landmarks as regions, and that the three main regions are page banners, menus and then page headings. Exploring these regions allows Darryl to better understand the overall structure of a page. Alternatively, if the regions are not properly defined, the next thing Darryl will do is explore the page headers. Therefore, very rarely will Darryl explore a website from top-to-bottom.

The main challenge for Darryl when exploring a web page is not marked up properly, as it makes skipping through page elements difficult. Because he is unable to visually see what's on a page, Darryl has to rely on proper coding to help him locate things on a page. When page elements are not properly coded to be accessible, it's difficult for him to know where he is on a page or to figure out where to go next.

5.3.1.4 Pamela

Pamela considers herself an expert screen reader user, and so when first approaching a new website for the first time, she will look for an "orientation tab" or navigation panel that explains the structure of the website and the best way to navigate through it. Pamela feels that an orientation tab or navigation panel is rarely added to a website but that it would help a lot of screen reader users by letting them decide how they want to navigate a website.

When Pamela is unable to locate an orientation tab, she will then look for what links and buttons are on the page to better understand what the page is about. If she's unable to learn more about the page based on the links and buttons, she will then go from top-to-bottom, left-to-right to get a better understanding of the page structure and to see what information is displayed on the page.

5.3.1.5 Martha

Martha considers herself an expert screen reader user, however, when browsing a new website for the first time, she will opt to use her arrow keys since she's never quite sure if the site is designed to be accessible or if it was put together haphazardly. Using the arrows ensures that she's not missing anything on the page. Once Maria is more familiar with the site or if she knows that it's accessible, she'll

start using specific keyboard commands to search for page headings or links.

5.3.1.6 Summary

By having the participants imagine that they are exploring a web page for the first time, I was able to have them think about their current browsing behaviour and from that, I was able to learn a lot about site accessibility when it comes to the way information is organized.

Prior to this research I was under the impression that users that are blind navigate web pages by using a screen reader to communicate what's on the page line-by-line. However, during this research I was able to empathize with the participants and better understand that going line-by-line actually leads to frustration as screen readers will read everything on the page and unlike sighted people, users that are blind aren't able to quickly scan through a page and stop in areas that interest them unless the content infrastructure is well thought-out and made to be accessible.

The two major learnings that I arrived to from this part of the research was that the proper use of page headings is extremely important as it's one of the only ways that screen reader are able to quickly understand what a web page is about. It also resonated with

me that the most important content should be located near the top of the page as even if users that are blind opt to use a screen reader to read the page line-by-line, at least the most important information is being read first.

Other areas that I would like to further explore is how using an orientation tab or navigation panel can assist screen reader users to better navigate a website.

5.4 Navigating Within a Website

5.4.1.1 Ryan

For Ryan, most website navigation menus are not very usable for screen reader users. Typically, he will know that he's interacting with a menu as the individual elements in a menu are identified as links through his screen reader. However, because many navigation menus are designed as drop-downs containing various levels of menu items, it's difficult for Ryan to acknowledge which menu items are top-level categories, which are sub-categories, etc.

Through this component of the research, I had Ryan navigate to various websites that use different approaches to site menus. One of the more popular types, Mega Menus, was completely unusable. It

was difficult for Ryan to acknowledge that there were multiple columns of menu links contained within the mega menu drop-down and if there was a hierarchy of links.

His preference would be for menus to adopt a "table" structure as this structure will communicate a more visual layout to the screen reader. He also likes how with tables you can choose how you want to read the information. For example, with a table he can choose to read the content as a list or to read it as it is displayed in the columns and rows.

5.4.1.2 Jenna

When visiting a website, Jenna will take a few seconds to determine what the navigation structure of the page is and how she thinks she will need to interact with it. If her screen reader identifies a long list of links, Jenna will assume that this is a navigation menu and from this she will use her keyboard to see if she is able to tab between the links or if pressing on the down arrow key reveals another set of links. This would represent a drop-down menu. Once she's on this menu, she will use her keyboard to tab between the links, or press her arrow keys to either expand a drop-down list menu item, or move between menu links. She often finds drop-down menus annoying, as you aren't able to see all the links contained within the navigation

menu at the same time. You would need to close the active menu drop-down and then tab to the next one to explore what's contained within that menu item drop-down.

In addition to this, Jenna would like for drop-down menus to be coded in such a way that informs the user that a category has been expanded or collapsed. In order for screen reader users to understand order and hierarchy, a suggestion would also be to include a numbering system in the alternative text so that it's easier to know what the order of the items are and what category these items fall under.

5.4.1.3 Darryl

From Darryl's perspective, web designers need to develop websites that are dynamic, and therefore navigation menus is a powerful site element since they are easy to interact with visually. However, for screen reader users, all links contained in a menu are often presented in a sequential list so it's difficult to connect what link belongs with what menu category. In addition to how the navigation menu is coded, Darryl believes that it's also the user of the screen reader that needs to know how to use the reader. If the navigation menu is coded properly, the screen reader user will need to

know that using arrow keys will take them through links in a menu and that the tab key will go between top-level menu items.

Darryl's biggest frustration with navigation menus is that the experience of interacting with one on a particular site will always be different from how it's coded on another site. Therefore, it makes it really difficult for a user to really learn how to navigate a menu bar effectively. Unlike being able to visually see a menu bar, for screen reader users it's difficult to tell if the menu bar is functioning the way it is or if in fact it's broken. Therefore, the main challenge with navigating through menu bars is that it's a learn by doing approach since every site will use a different approach to menus.

5.4.1.4 Pamela

Pamela prefers menus to be located near the top of the page. She's aware that there are menus that expand from the side of the browser, which she feels is not very intuitive, and gets getting used to. The type of menu experience she finds extremely frustrating is the 'hamburger menu' approach where the menu itself is hidden within a small icon at the top of the page. For her, it's often difficult to locate this menu and there's not enough context to what's contained within this menu icon.

5.4.1.5 Martha

Martha looks for a list of links in order to determine if she's interacting with a menu bar. She will then use the arrow keys to see what links the menu has, and if she's able to tell the menu is accessible she'll use the tab key to jump between menu items.

5.4.1.6 Summary

Through this task, I was able to determine that for some screen reader users, they use the tab key to go between top-level menu items and the arrow keys to see what links are contained within each menu item.

In terms of usability, mega menus don't appear to work as it's difficult for screen reader users to imagine the way the information is laid out as items contained within this menu type is outputted as a list. Therefore, there is no hierarchy of information and it's difficult to acknowledge which items pertain to which category.

When creating a navigation menu for a site, I've learned that it's important to keep the menu near the top of the page and to ensure that it's not hidden within a button. There are a few suggestions that should be considered further, such as including a numbering system or using special characters to associate main categories and subcategories.

5.5 Interacting with Images and Links

5.5.1.1 Ryan

Unless an image has an alternative text tag associated to it a screen reader will read out the filename of the image. This is a challenge for all screen reader users as often times the image filename does not provide any context to what the image actually is. Typically, it's defined as a random string of letters and numbers. Therefore, Ryan wishes that all images including an ALT text that was descriptive in order to provide context to what the image is about.

In terms of how images are displayed on the page, Ryan finds that he has many issues interacting with image carousels. These are a challenge for him as the screen reader is unable to properly read the image descriptions or text before a new image is shown on the screen. He also feels that it's difficult to leave the image carousel element once you're interacting with it.

For links, what bothers Ryan the most is when designers only hyperlink "click here" as the screen reader will not be able to acknowledge what the "click here" is for. Often times, Ryan will refer to his links list and by doing this, all he'll be able to interact with are a list of links that say "click here". Therefore, it's extremely important to include a description as to where the link will be going.

5.5.1.2 Jenna

It's extremely important that images and links have a description that informs the screen reader user of what they will be interacting with. For Jenna, often times there's not enough direction to what a link or image will do. For example, often times a link won't inform the user if it's opening a new page or if it's expanding or compressing content on the existing page. If designers were to include this direction within the alternative text it would help other screen reader users to navigate around a website more efficiently.

5.5.1.3 Darryl

Properly using alternative text with an image is the only way screen reader users can learn more about what the image is about. With that being said, the alternative text needs to be contextualized so that it serves to inform the user of the most important aspects of the image.

5.5.1.4 Pamela

When interacting with images, it's important that the alternative text is contextualized to the site or the page the image is on. For example, if the image is displaying a product that you can buy online, then the alternative text should be as descriptive as possible. Pamela's analogy is to think of the alternative text as the audio descriptions to a movie. For an action movie with fast-moving

scenes, it's unrealistic to describe in detail what's happening on screen. Alternative text should be considered in the same way.

5.5.1.5 Martha

Martha feels that most images don't have enough descriptive text, and therefore it's a page element that she rarely will try to interact with. What her screen reader can do, however, is tell her if it's an image, a button, or some other visual component. She feels that many designers don't include proper alternative text as there's conflicting information as to what should actually be included in this tag. For her, the text just needs to provide enough context to what the image element is about.

5.5.1.6 Summary

Through this task, I was able to learn that images need to have proper alternative text in order to provide context to those users who cannot see the image. The challenge, however, is that the alternative text needs to be contextualized to the page. For example, if the page is selling a product then the images should be extremely descriptive and informative.

A challenge for many screen reader users is the use of image carousels on many sites. Often times these image carousels are not accessible and cause the screen reader user to be stuck within page

component. One way around this is to provide a way for screen readers to escape the image carousel.

For text, the context as to what the link is for is extremely important. All participants involved in the research expressed their frustration with links that only say, "click here" without providing further context as to what they are clicking on. This is an easy issue to overcome and being able to hear users that are blind speak about it has made a huge impact on how I will be designing websites in the future.

5.6 Forms

5.6.1.1 Ryan

Ryan believes that forms are not difficult to make accessible. The most important requirement for him, as a screen reader user, is that the tab order of a form is correct. Additionally, designers must ensure that any required information makes sense contextually. For example, if a required field is visually displayed with an asterisk or as a different colour, the alternative text for this field should specify that an input is required since non-textual queues are not deciphered properly.

The biggest challenge with forms is the security measures that are embedded to ensure that the person submitting the form is not a robot. One of these measures is the use of a Captcha, which is a program that protects websites against bots by generating and grading tests that humans can pass but current computer programs cannot. Captcha's are often difficult to interact with and leads to frustration when submitting forms (Earl, 2014).

5.6.1.2 Darryl

In terms of registration forms, sites that also provide a 'social login' option makes it easier for users like Darryl as it's less work to sign-up for a new account. Sites that allow a social login essentially bypass a new registration by allowing the user to use the same login credentials for sites such as Facebook, Twitter or LinkedIn.

An important criterion for Darryl is that any errors in a registration form be properly described after the form is submitted. For example, Darryl would prefer to see a list of all form errors at the top of the page after submitting the form in order to know what parts of the form need to be changed.

Like Ryan, Captcha's usually cause frustration when submitting a form. It is especially frustrating when previously entered

information in a form has to be entered again because the page reloaded due to the captcha being entered incorrectly.

5.6.1.3 Summary

Through this task, it was clear that there were very little accessibility issues when it came to forms. The biggest learning from this task was to ensure that any required information is properly labeled and that it's not just visually different from the other form fields.

Additionally, in order to create a more use-friendly experience with forms, Captcha is not an appropriate program to use when trying to protect the site from bots. As part of this blind-first approach to design, my next step would be to identify a program that screen reader users find more usable.

5.7 Overall Insights from the Blind-First Approach to Site Design

Through the dialogue-based approach to site design, I was able to involve users that are blind into the ideation and design of a new website. From the feedback I received, I was able to better

understand how to make various site components accessible and inclusive of screen reader use.

A major insight that has come from the user sessions was that the content infrastructure should be what designers focus on first. From my observation, it was clear that the information that was being deciphered through a screen reader did not match how content was being emphasized or displayed on the screen. Therefore, when interacting with components such as menus, the participants were unable to determine which menu items were sub-categories and which were the main category headings.

For one of the participants, in order to understand how content is emphasized on a page, she often will ask the designer of the site to take her hand and run it across the screen and describe how the information is being displayed. From this, she will gauge whether the information architecture as deciphered by the screen reader matches the visual architecture on the screen.

Therefore, what I've learned through this process is that the information architecture is extremely important when designing a website, and involving users that are blind in this stage can ensure that the IA is accessible and inclusive for screen reader access and use. Doing this can help designers empathize with these users, as

they are able to hear and see for themselves what parts of a website work and don't work. It's only through the involvement of users that are blind through the design process that I began to better understand web accessibility and how it affects users that are blind or users who are severely visually impaired.

5.8 Summary

Results from the research were presented in this section. Five personas were constructed from the data gathered on each participant and was presented in sub-section 4.3. From the requirements of each persona, the design of the blindfirstdesign.com website began to take shape, as the components of the site were designed to encompass the needs and requirements of each of the five participants.

These five participants represent a small subset of end users that require the use of a screen reader to navigate a website. Having these participants as the main stakeholders of the usability and user experience of the website has helped me in two ways:

1. Helped me anticipate the gaps in my website early in the process.

2. Helped me better understand the scope, uses and success criteria with respect to screen reader use.

At the same time, I was able to work with users that were blind to design a website that will also be inclusive to a wider range of people, as the process of stretching the site design to be more accessible for users who are blind covers many other needs, challenges and desires.

6 Discussion

6.1 Introduction

Prior to starting this research, I designed websites without considering accessibility. As a sighted designer, my main goal was to ensure that the websites I was designing was usable by other sighted users. Therefore, when thinking about site accessibility I had no idea where to begin. I was aware that the web content accessibility guidelines existed, but I wasn't sure how those guidelines led to accessibility and usability. Because I wasn't able to see the effect of including alternative text and other accessible code, I failed to see how it affected the users who need it the most.

So, instead of designing a new website and having users that are blind tell me what parts of the site are accessible and which parts aren't, I thought that I would approach the new site design by involving these types of users upfront.

This body of work therefore presents an exploration of a blind-first approach to site design by using dialogue-based scenarios. It is not work that validates whether this approach leads to more accessible design; rather, it is a summary of what I've learned about site accessibility by involving users that are blind in my site design.

6.2 Designing a Website through a Blind-First Design Approach

6.2.1 Why involve users that are blind in the site design process?

This research explores the benefits of involving users that are blind in the initial site design process. Although a similar approach has been undertaken by Sahib, Stockman, Tombros and Metatla, my research extends their findings by examining what learnings can arise from involving 5 users in the design phase versus 1. In addition to this, I go beyond the scope of their research by exploring the challenges and opportunities within each step of the blind-first design process, from recruitment, protocol development and finally, data analysis and validation.

As a designer with limited knowledge and experience with site accessibility, involving users that are blind enabled me to understand what aspects of a site need to be accessible and why. A guideline on how to effectively involve users that are blind in the ideation and design stages of a website would assist other designers in implementing a blind-first approach within their own organizations. This research is a step in that direction as I've outlined the recruitment

process and how to effectively involve users that are blind in design research.

6.2.2 Evaluation of a blind-first approach to site design

UX design, as a field, is concerned with the design of enjoyable websites and apps for users (Hassanzhal & Tractinksy, 2006). As seen previously in Section 2, previous design research has been done with users that are blind but these studies are either very focused on a specific component (search engine) or too broad (what frustrates screen reader users).

The dialogue-based approach to site design developed through my research provides readers with the information needed to do their own research with users that are blind. It contains information on how to recruit for a blind-first research study and the overall methodology to implement this approach within their own organizations. This is radically different from traditional participatory design practices, which is typically very visual. Therefore, through this approach, I was able to modify participatory and co-design methods to fit a specific target audience, which can ultimately apply to other user groups where an alternative to visual participation is required.

This dialogue-based approach to site design is worth considering as it allows individuals who are not responsible over the site design to

listen and observe screen reader users describe what they want in a website and why. This will help create alignment within organizations and help designers who have limited experience with web accessibility, implement web accessibility.

6.3 Summary

In summary, this section examined the findings around the blind-first approach to site design. Overall, this research is a positive step in the direction of supporting web accessibility and diversity as it encourages designers to incorporate accessible design by involving the users who are most impacted by it. This can be done even when the designer lacks knowledge in web accessibility as this approach to site design results in the designer learning about accessibility through conversation and observation.

7 Conclusion

7.1 Contributions to Inclusive Design

The goal and motivation of this body of work was to make several key contributions to the field of Inclusive Design. Inclusive Design looks at the needs of extreme users on the spectrum of individual abilities who are commonly ignored when designing products or solutions for user groups (Graham, 2015). The blind-first approach to site design as discussed throughout my body of work follows a similar approach, as I was able to create a design protocol that addresses a gap within my existing web design process. Through this, I was able to stretch my understanding of inclusive design and find ways to proactively include accessibility in a standard design workflow that can be adopted in both waterfall and agile methodologies. This approach therefore will be a benefit to many designers who work within web development teams as it ensures that accessibility is not looked at as an afterthought and eliminates the gatekeeping that usually happens in standard design workflows.

As a designer, I found that co-creating the website with screen reader users extremely gratifying, as I was able to find a way to really understand why these users need accessible websites and how they are impacted when websites are not properly coded to be accessible.

So, although I was able to develop design protocols to help designers introduce accessibility in their designs, what I truly learned is that this process will help designers have greater empathy and understanding for the users that are most impacted; since they won't be reading about web accessibility issues – they'll actually be seeing it happen right in front of them. This helped me better empathize with screen reader users and will ultimately have me implement a blind-first approach to web design with every new website project.

Although this approach to design could have also benefited other extreme groups of users, blind screen reader users were selected for this research as this user group is often ignored and perceived to be an insignificant user population of outliers. Learning from the involvement of this group of users will enable me to evolve the approach to site design and test it with other extreme user groups in the future. Therefore, a curb cut effect exists where the approach to site design can be used by other people on other groups.

An inclusive approach was also taken when collecting data from participants as well. The consent documentation was inclusively designed and offered to participants electronically prior to them arriving in the research facility. The participants were also able to use

whichever adaptive technologies they wanted to ensure the validity of the research.

Although this body of work was to demonstrate what I've learned by involving users that are blind in a blind-first approach to site design, the overall process that I've documented can be used by others to carry out similar research. Therefore, through my research I have been able to demonstrate that I've captured the following three dimensions of Inclusive Design (Treviranus, 2014):

1. Recognizing diversity and uniqueness: Blind screen reader users are often presented with unusable websites due to the lack of web accessibility. My research was to focus on this extreme group of users and create a process in which their involvement can lead to greater web accessibility.
2. Developing an inclusive process and tool: The blind-first approach to site design aims to be inclusive by involving those users who are most affected by the lack of web accessibility. The process and methodology is inclusive of all types of people, and leads to a positive cross-collaboration of opposite experiences (e.g. sighted versus non-sighted).
3. Creating broader beneficial impact: Although the research was to determine if a blind-first approach to site design could

help me better understand web accessibility, the overall methodology and process can be used with other extreme users.

As a result, this is a process that will continue to exemplify the principles of Inclusive Design and assist designers in meeting the needs of extreme users when designing for the web.

7.2 Future Work

Future work that could be developed from this body of work could be in the following three areas:

1. Sharing the process online: I have registered a website, blindfirstdesign.com that will be used to share the process I have undertaken through this research, online. This website will ultimately be designed to provide other designers with a toolkit that they can use to effectively manage their own blind-first approach to site design.
2. Creating a marketplace for blind usability testing and design: The website mentioned above will also include a component where visually impaired users can

register to be involved in future web design studies. Therefore, not only will users that are blind be able to be involved in projects, but also other users who have different forms of vision impairment. Designers will then be able to reach out to these users for any design-related studies. Creating a marketplace where designers and visually impaired can connect and collaborate on design projects will only further the goal of inclusive design.

3. Usability testing of designed site: Through this research I documented my process in involving users that are blind in the design of a new website. My next step is to build the website and involve a new set of screen reader users for usability testing, to determine if I've been successful with implementing web accessibility.

4. Carrying out this design process with other extreme user groups: As this body of work was to develop an inclusive design process with users that are blind, I would like to see what the learnings would be if the same process and protocols were used with other extreme user groups.

7.3 Parting Thoughts

Screen reader users continue to face many challenges and usability issues when it comes to accessing and enjoying content online. Although barriers are actively being reduced by those in the web accessibility community through the development of guidelines and requirements, more can be done to actually involve users that are blind in the design of websites.

Through this blind-first approach to site design, I was able to recognize that web design is ever-changing, and that with the right understanding sites can be made to responsively accommodate a variety of requirements. I was able to do this by taking what is considered typical in web design and stretching it out so that the design is able to accommodate users who are typically considered as edge-cases or extreme. So, by focusing on edge-case or extreme users, the design has the potential to accommodate more users who fall within the typical to extreme use-cases.

As a participant in my research noted, you would not design a website for children without first asking a child what their thoughts are on the site. Designing a site where some of the users are blind is not any different. Since screen reader users are only capable of interacting with the information infrastructure of a website, it only

makes sense that they should be involved in designing this information infrastructure. Doing this will help inform the visual design of a site and will ensure that site accessibility is not looked at as an afterthought.

It is with hope that the blind-first approach to site design as described in this work will advance the concept of involving users that are blind in designing the information architecture of a site. Not only will their involvement ensure that accessibility is not taken for granted, but it will also help designers better understand what accessibility is and why it matters.

8 References

Abascal, J., Civit, A. (2002). Opportunities and Risks of the Information and Communication Technologies for Users with Special Needs. Paper presented at the *2nd IEEE International Conference on Systems, Man and Cybernetics.* Hammamet, Tunisia.

Advancing the Inclusion of People with Disabilities. (n.d.). Retrieved April 4, 2016, from http://publications.gc.ca/collections/collection_2015/rhdcc/hrsdc/HS61-1-2007-eng.pdf

Andronico, P., Buzzi, M., Castillo, C., & Leporini, B. (2006). Improving search engine interfaces for blind users: A case study. *Universal Access in the Information Society Univ Access Inf Soc*, 5(1), 23-40.

Buultjens, M. (1998). Webster, A. & Roe, J; Children with Visual Impairments: Social interaction, language and learning; 1998; *published by Routledge*, London; pp.238.

Chandrashekar, S. (2010). Is Hearing Believing? Perception of Online Information Credibility by Screen Reader Users Who Are Blind or Visually Impaired. Retrieved April 4, 2016, from https://tspace.library.utoronto.ca/handle/1807/26157

Cook, A.M. & Hussey, S.M. (2002). *Assistive Technologies: Principles and Practice*. 2nd ed. Mosby.

Department of Human Services - Commission for the Blind and Visually Impaired | What do you do when you meet a blind person? (n.d.). Retrieved April 04, 2016, from http://www.state.nj.us/humanservices/cbvi/faq/etiquette/blind/.

Earl, C. (2014). "Can CAPTCHAs Be Made Accessible?" *American Foundation for the Blind*. Retrieved April 17, 2016, from: http://www.afb.org/blog/afb-blog/can-captchas-be-made-accessible/12

Fast Facts about Vision Loss. (n.d.). Retrieved April 04, 2016, from http://www.cnib.ca/en/about/media/vision-loss/pages/default.aspx

Graham, G. (2015) A Process and Tool for Evaluation of Accessible User Experience with Websites and Apps for Screen Reader Users who are Blind. Print.

Hassenzahl, M., & Tractinsky, N. (2006). User experience - a research agenda. *Behaviour & information technology*, *25*(2), 91-97.

Helander, M.G., Landauer, T.K., & Prabhu, P.V. (1997). *Handbook of Human-Computer Interaction* (2nd ed.). Amsterdam, Netherlands: Elsevier Science Ltd.

Introduction to Web Accessibility. (n.d.). Retrieved April 04, 2016, from http://www.w3.org/WAI/intro/accessibility.php

ISO 9241. Standard on Ergonomics of Human System Interaction (Part 11 1998).

ISO DIS 9241-210:2010. Ergonomics of human system interaction – Part 210: Human-centred design for interactive systems (formerly known as 13407). *International Standardization Organization (ISO)*. Switzerland.

Jacobs, S. (n.d.). The Electronic Curb-Cut Effect. Retrieved March 14, 2016, from http://www.icdri.org/technology/ecceff.htm

Lazar, J., Allen, A., Kleinman, J., & Malarkey, C. (2007). What Frustrates Screen Reader Users on the Web: A Study of 100 Blind Users. *International Journal of Human-Computer Interaction*, 22(3), 247-269.

Luck, R.: Dialogue in participatory design. Design Studies 24(6) (2003) 523–535

Mobile First Design: Why It's Great and Why It Sucks. (n.d.). Retrieved March 14, 2016, from https://codemyviews.com/blog/mobilefirst

Paay, J. (1998). Effective Visual Cues for Web Assisted Learning. *Proceedings of the ASCILITE Conference, 1998*, (pp. 539–548) Wollongong. Australia.

Ritter, F. (2013). Preparing to Run the Low Vision HCI Study. In *Running behavioral studies with human participants: A practical guide*. Los Angeles: SAGE.

Sahib, N., Stockman, T., Tombros, A. & Metatla, O. (n.d.). Participatory Design with Blind Users: A Scenario-based ... Retrieved April 4, 2016, from http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.397.5802

The Electronic Curb Cut. (n.d.). Retrieved April 04, 2016, from http://www.accessiblesociety.org/topics/technology/eleccurbcut.htm

Taipale, V. & Pereira, L. (1995). The social aspects of telematics, disabled and elderly people and the future challenges. In: Roe, P. (Ed.), *Telecommunications for All*. ECSC-EC- EAEC, Brussels Luxemburg, pp. 55–61.

Treviranus, J. (1997, April). Nimble Document Navigation Using Alternative Access Tools, *Sixth International World Wide Web Conference*, Santa Clara, CA.

Treviranus, J. (n.d.). Requirement Mapping (Petals & Flowers): User States and Contexts. Retrieved April 27, 2016, from https://wiki.fluidproject.org/pages/viewpage.action?pageId=80674818

Treviranus, J. (2014). Leveraging the Web as a Platform for Economic Inclusion. *Behavioral Sciences & the Law Behav. Sci. Law, 32*(1), 94-103.

Visual impairment and blindness. (2014, August). Retrieved March 15, 2016, from http://www.who.int/mediacentre/factsheets/fs282/en

Web Content Accessibility Guidelines 1.0. (n.d.). Retrieved April 04, 2016, from http://www.w3.org/TR/WAI-WEBCONTENT

Web Accessibility Initiative (WAI). (2014). World Wide Web Consortium (W3C) http://w3c.org/wai/

Appendix A – Semi-Structured Interview Questions

1. Can you please tell me how old you are?
2. Can you please tell me more about your vision loss?
    a. If lost vision later in life:
        i. How old were you when you lost your vision?
        ii. Prior to losing your vision, did you have any experience browsing websites for content?
            1. If yes: What do you remember about this experience versus how you experience websites now?
                a. What are some of the main challenges you have browsing a site now that you have to use a screen reader?
                b. When did you start using a screen reader?
    b. If always been blind:
        i. How long have you been using a screen reader?
        ii. How long have you been using a screen reader to browsing websites?
3. Are you currently working?
    a. If yes:
        i. What do you do for work?
        ii. As part of your job, do you have to access information online?
            1. How are you currently locating this information? For example, are you using any special software or hardware?

2. How long have you been using this type of screen reader for? What do you like or dislike about it?

    a. How did you first become aware of this screen reader?

    b. Is this any different from when you are accessing information in your personal time, such as when you are at home?

    c. Have you tried other screen readers? What did you like or dislike about them?

b. If no:

    i. On a daily basis, how frequently would you say you are online browsing websites for content or information?

        1. How are you currently locating this information? For example, are you using any special software or hardware?

        2. How long have you been using this type of screen reader for? What do you like or dislike about it?

        3. How did you first become aware of this screen reader?

        4. Have you tried other screen readers? What did you like or dislike about them?

4. What are some of the main challenges you have browsing a site through a screen reader?

5. Do you access the Internet in other ways?

Appendix B – Dialogue-Based Design Protocols

Protocol:

Determine how screen reader users interact with the following, through dialogue-based scenarios and tasks:

1) Identify relevance of a specific webpage
2) Locating specific content on a webpage
3) Identifying images and what the image is about on a page
4) Locating links and identifying link relevance
5) Identifying site navigation structure
6) Working with forms
7) Dynamic content

Once feedback is received, the participant will be asked to display a website that either has the above areas working well or not.

Introduction:

I am looking to design a new website called blindfirstdesign.com. The purpose of the site is to educate web designers with a new and different approach to site design, which is to involve blind users first in order to ensure that sites are accessible and inclusive.

I have not started building the website and I also do not have a strong background when it comes to web accessibility. I'd like to see if by involving blind users in the design process, if I could make this blindfirstdesign.com website accessible without actually knowing what the accessibility is about.

The way I'm going to try and do this is by asking you a series of dialogue-based scenarios to uncover what parts of a website work and don't work for you. Through this, I hope to have a better understanding of the usability issues you are facing, which will help inform how I should be designing my blindfirstdesign.com.

Task One - How do you determine the relevance of a specific webpage?

Imagine that you landed on the main page of the blindfirstdesign.com website or any site for that matter.

Questions:

1) Can you describe how you would go about exploring the website, through your screen reader, to better understand what the site is about? Why?

2) Can you show me a website or webpage where you're able to successfully experience the site in the way you just described?

    a. Why does this experience work for you?

3) Can you show me a website or webpage where you're unable to successfully experience the site in the way you just described?

    a. How could this page be improved?

Task Two – How do you locate specific content on a webpage?

Let's imagine that the reason for visiting the blindfirstdesign.com website is because there is specific content that you want to read, which you believe is located right on the homepage.

Questions:

1) Can you describe how you would go about locating this specific content through your screen reader?

2) How do you know you've found the content you're looking for?

3) How do you know that you've finished reading the content you were looking for? For example, that there is nothing left to read on the page about that specific topic?

4) Can you show me a website or webpage where you're able to successfully locate content on the page?

    a. Why does this experience work well for you?

5) Can you show me a website or webpage where you're unable to successfully locate content on the page?

    a. How could this page be improved?

6) If you could describe the ultimate experience, whether or not exists today, what would that be? For example, how would you like content on the page to be described to you in order for you to quickly and easily find this content?

Task Four – Images on a site

Imagine that the page you are looking at has numerous images.

Questions:

1) Can you describe how you would go about identifying what those images are about when having to use your screen reader?

2) How do you know you've come across an image and how do you know what the image is about?

3) Does having scrolling images on the page affect your ability to identify an image or what the images are about?

4) Can you show me a website or webpage where you're able to successfully identify when you've come across a site image?

    a. How do you know what it's about?

    b. Why does this experience work well for you?

- Can you show me a website or webpage where you're unable to successfully identify site images?

    - How could this page be improved?

- If you could describe the ultimate experience, whether or not exists today, what would that be? For example, how could images be better experienced through your screen reader?

Task Five – Links

You are done reading the content on this page and would like to learn more about a specific section you read about earlier on the page by clicking on the associated link.

Questions:

1) Can you describe how you would proceed to identify the appropriate link or links that would take you to more information on a different page on the site?

2) How do you know that you've been located the right links?

3) Can you show me a website or webpage where you're able to successfully identify what pages the links on a page will take you to?

    a. Why does this experience work well for you?

4) Can you show me a website or webpage where you're unable to successfully identify what the links are going to take you to?

5) How could this page be improved?

6) If you could describe the ultimate experience, whether or not exists today, what would that be?

Task Six – Navigation

You are done reading the content on this page and would like to see what other pages are on this website.

Questions:

1) Can you describe how you would proceed to identify what other pages or sections are on this website?

2) How do you know that you've been presented with a list of all the pages or sections on the site?

3) How easy is it for you to navigate mega menus? Mega menus are menus that have multiple columns containing links or various levels of menus that dig deeper and deeper into the pages are on the site.

4) Is there a maximum number of menu items that a menu should adhere to?

    a. Why?

5) Can you show me a website or webpage where you're able to successfully navigate to different site sections or pages?

    a. Why does this experience work well for you?

6) Can you show me a website or webpage where you're unable to successfully navigate to different site sections or pages?

    a. How could this page be improved?

7) If you could describe the ultimate experience, whether or not exists today, what would that be? For example, how could a website be made easier for you to navigate to different sections or pages on the site?

Task Seven - Forms

Now that you are done reading the website, you want to register and become a member of the site.

Questions:

1) Can you describe how you would proceed to filling out a registration form online?

2) Are you able to interact with form drop-downs? Why or why not?

3) Are you able to interact with radio buttons? Why or why not?

4) How do you interact with input fields?

5) How do you interact with password fields?

6) How do you deal with sites that use captcha as a security measure?

7) Can you show me a website or webpage where you're a form is done well?

    a. Why does this experience work well for you?

8) Can you show me a website or webpage where a form is not done well?

Appendix C – Information Consent Letter

Date:

Project Title: A Blind-First Approach to Site Design

Principal Student Investigator:
Dennis Lagman, Student, OCAD University
dl14li@student.ocadu.ca

Faculty Supervisor:
Jutta Treviranus, Faculty of Inclusive Design, OCAD University
jtraviranus@ocadu.ca

INVITATION

You are invited to participate in a study that involves the development of a new website. The purpose of this study is to design a process in which individuals who are blind and use screen readers, are involved in the design and development of new websites.

For your participation, you will be rewarded with 250 AIR MILES or a $20 cash incentive if you are not a member of the AIR MILES program.

WHAT'S INVOLVED

As a participant, you will be asked to attend an in-person session at 438 University Avenue, Suite 600. This building is located at the southwest corner of University and Dundas.

During this in-person session, we will have a conversation around the design of a website. With your consent, I will audio record the session to be able to accurately transcribe and analyse the data subsequently.

Please bring your laptop with you so that you could be most comfortable during the hands-on part of the session. I will arrange for Internet connection to your laptop.

I will be asking you questions relating to, among other things, your preferred ways of navigating and exploring websites. You could show me examples on your laptop. I will set up a video camera to record the screen of your laptop. No part of your person, except fingers on the keyboard, will be recorded.

Participation will take approximately 1 to 1 1/2 hours of your time, with appropriate breaks in-between, and will only require one visit. Please fill in the consent form on page 3, and email this document back to me. Please retain a copy for yourself.

POTENTIAL BENEFITS AND RISKS

There may not be any direct benefit to you from your participation, except for the satisfaction of having contributed to a new process and approach to designing websites. There are no known or anticipated risks associated with participation in this study.

CONFIDENTIALITY

All information you provide will be kept confidential; your name will not be included or, in any other way, associated with the data collected in the study. Furthermore, because our interest is in the average responses of the entire group of participants, you will not be identified individually in any way in written reports of this research.

Data collected during this study will be stored privately and securely on a local hard drive and will be kept for a maximum period of one month, after which time the data will be destroyed. Access to this data will be restricted to Dennis Lagman.

VOLUNTARY PARTICIPATION

Participation in this study is voluntary. If you wish, you may decline to answer any of the questions or participate in any component of the test. Further, you may decide to withdraw from this research, or to request withdrawal of your data at any time up to April 1, 2016. Even upon withdrawal from the study, the AIR MILES bonus reward miles or the $20 cash incentive paid to you will remain with you.

PUBLICATION OF RESULTS

Results of this study will be used to inform the design and development of a new website and will be presented in aggregated form in oral presentations and written reports/papers. All information you provide will be considered confidential and grouped with responses from other participants. Quotations from interviews or surveys will not

be attributed to you without your permission. Please indicate your preference in the consent form on page 3.

A summary of the study results will be prepared by May 1, 2016. If you wish to receive a copy of it, please send an email request to me after that date.

CONTACT INFORMATION AND ETHICS CLEARANCE

If you have any questions about this study or require further information, please contact me, the Principal Student Investigator (Dennis Lagman), or my Faculty Supervisor (Jutta Treviranus), using the contact information provided above.

This study has been reviewed and received ethics clearance through the Research Ethics Board at OCAD University [2015-47]. If you have any comments or concerns, please contact the Research Ethics Office through cpineda@ocadu.ca.

CONSENT FORM

I agree to participate in this study described above. I have made this decision based on the information I have read in the Information-Consent Letter. I have had the opportunity to receive any additional details I wanted about the study and understand that I may ask questions in the future. I understand that I may withdraw this consent at any time. I am signing below to show my consent for those activities.

- I consent to our session being audio recorded.
- I consent to the screen of my laptop being video recorded.
- I wish to receive a copy of the study feedback summary by email.
- I would like to be attributed for my contribution to this research study. You may use my name alongside quotations that I have made as part of my responses.

To indicate my consent to participate in this study, I am providing my signature followed by my Name and Date below.

Signature: _____

Name:

Date:

Thank you for your assistance in this project. Please keep a copy of this form for your records

Appendix D – Information for Participants

Thank you for coming in today and for completing the information consent form ahead of time. Here is your $20 as a reward for your participation.

You've been invited to help me design a process in which individuals who are blind and use screen readers, are involved in the design and development of new websites.

So, for the next hour I will be breaking up this session in two parts.

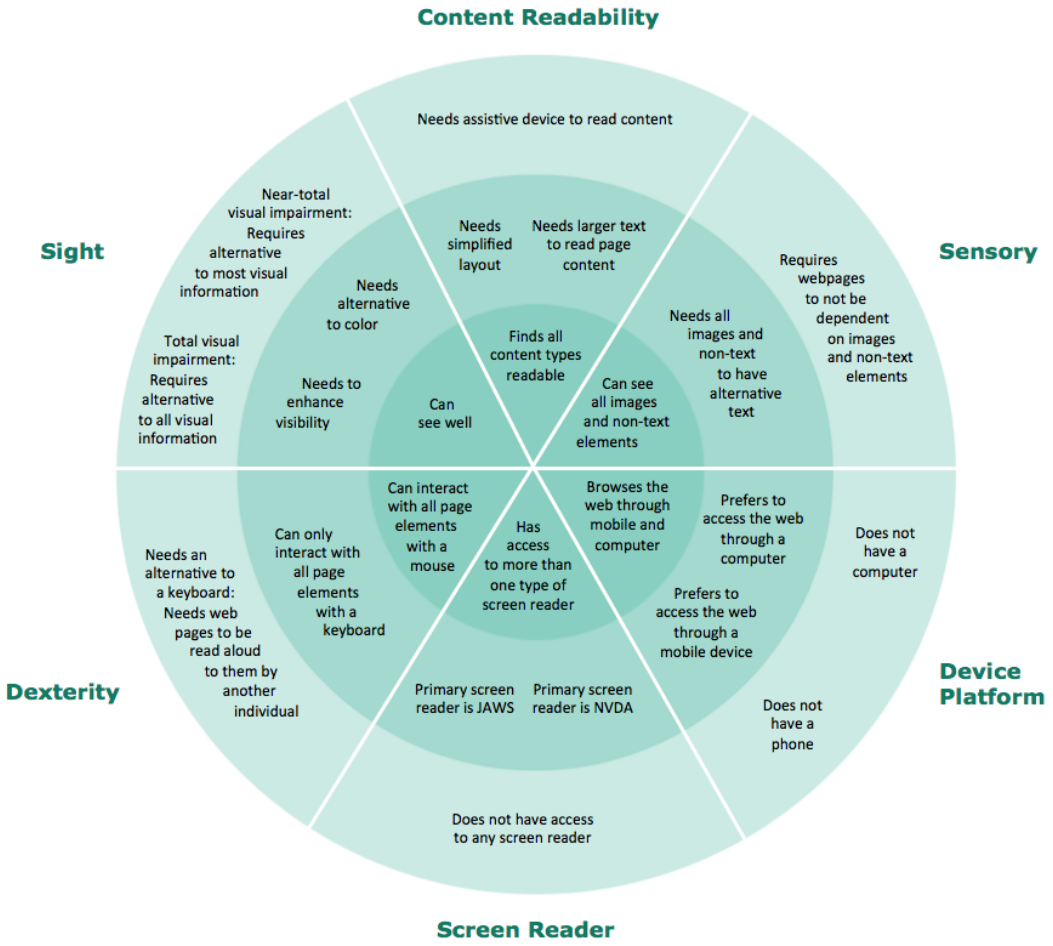
- For the first part, I will be asking you a few questions to learn more about you and how you access and browse websites.
- For the second part of the session, I will then be asking you a series of dialogue base scenarios to uncover how best to design a website that is accessible and inclusive for blind screen reader users.

Based on the feedback I receive, I may then ask you to show me existing websites that best demonstrates what you like or don't like about certain site features.

Please note that there is nothing you can say or do that will be wrong throughout this study. All I ask is that you speak all of your thoughts out loud.

I also want you to be aware that, during today's study, your opinions and interactions with websites will be recorded. This will allow me to better understand how you use your screen reader to interact with a site and what you like or don't' like about the experience.

Appendix E – User States & Contexts Map Template



Adapted from: "Requirement Mapping (Petals & Flowers): User States and Contexts" by Jutta Treviranus, from

https://wiki.fluidproject.org/pages/viewpage.action?pageId=80674818