Perceptions of Accessibility and Usability by Blind or Visually Impaired Persons: A Pilot Study

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ABSTRACT
This pilot study utilizes qualitative interviews to explore perceptions of accessibility and usability from the perspective of blind or visually impaired (BVI) persons. Using the frameworks of everyday life information seeking (ELIS) and the sense-making approach, this research addresses a gap in the literature; most studies with this population are either quantitative, outdated, or task-based observations. Through five in-depth interviews, this study provides a more nuanced understanding of the perceptions, experiences, and opinions of BVI persons who use screen readers with a voice synthesizer as a primary modality of interaction with web content. Understanding the information needs and information behavior of BVI persons is important for proper web design, since technical accessibility does not ensure usability. In particular, it is the perception of accessibility and usability that affects information behavior. Design must be informed by empirical research in order for it to be effective in assisting a variety of users to accomplish their information goals.

Keywords
Visual impairment, accessibility, usability, user-centered design.

INTRODUCTION
The Internet and the World Wide Web have significantly increased the ease of access to information resources for people with disabilities due to the flexibility of use and the provision of assistive technologies such as screen readers for people who are BVI. (Booth, 2012). However, web content is only useful if it is accessible and usable. The concepts of accessibility, usability, and usefulness are part of a growing field that focuses on user experience (UX) and user-centered design (Datig, 2015). Tempelman-Kluit and Pearce (2014) define user-centered design as “…both a design philosophy and a process focused on optimizing interfaces in response to how people work, rather than expecting people to alter their work habits to accommodate the demands of the interface” (p. 617). This requires learning about users, which is particularly important for BVI persons who interact with interfaces and content in alternative ways.

Although involving actual end-users is a critical aspect of user-centered design, very little qualitative research has explored the perceptions and experiences of access to web content by BVI persons. According to Hill (2013) “…there appears to be a lot of discussion about people with disabilities, but little direct involvement of these people in research…” and “…in many cases, the literature is attempting to assess accessibility without talking to or involving people with disabilities, which can lead to some significant deficiencies in the research” (p. 141). True user-centered design “…requires learning about as much as possible about users, including their culture, capabilities, and common tasks” (Schulze, 2001, p. 117). Thus the goal of this exploratory, qualitative pilot study is to learn about the perceptions of accessibility and usability of web content by BVI persons and thereby aims to inform user-centered design practices.

RELEVANT LITERATURE
Two key concepts are central to the information behavior of BVI persons on the web: accessibility and usability. The most common mode of interaction with web content for BVI persons is a screen reader with a voice synthesizer that converts text to speech (Lazar, Allen, Kleinman, & Malarkey, 2007). Web accessibility in the context of this modality requires that content be structured in a way that a screen reader can interpret it; e.g. images need to include alternative text and links need to have clear, meaningful labels.

Usability is a related but distinct concept: “…usability aims to enable users and to make access to content possible for everyone, regardless of disability or the type of device that may be used. Usability focuses on improving the user experience…” (Kleynhans & Fourie, 2014, p. 370). Thus, accessibility is more technology-oriented and usability is more user-centered. Conflicts often exist between these two
A growing number of research studies have been published about the information needs and behavior of BVI persons; however, the methods used have largely been quantitative. For example, Chandrashekar and Caidi (2010) studied the online information practices of BVI adults living in Ontario. The study used a questionnaire survey, semi-structured interviews, and observations of online behavior during interview sessions with think-aloud protocols. The reported results, however, do not provide sufficient context as to why participants engaged with specific online resources.

Chang and Chang (2010) used micro-moment time-line interviews to understand library use among BVI patrons of the National Taiwan Library. While they gathered qualitative data, the results were specific to that particular institution and focused more on source preferences rather than issues of perceived usability and accessibility.

Berry (1999) wrote that research should “…discover the perceptions of visually impaired users…” and that: “There is currently little information available regarding how the Web has affected the lives of visually impaired users. There is no real data on how visually impaired users who use the Web for practical purposes perceive and experience this valuable information tool” (n.p.).

Reviewing the literature that has been published in the years since Berry (1999), the situation seems about the same concerning rich, qualitative data. The data that this pilot study gathered compliments and updates previous research.

**Conceptual Framework**

Two conceptual frameworks informed this study. First is *everyday life information seeking* (ELIS) wherein: “The key word is *everyday life*, which refers to a set of attributes characterizing relatively stable and recurrent qualities of both work and free time activities” (Savolainen, 2009). In this study, ELIS is used as a way to contextualize the access to and use of web resources; the attributes that characterize these processes include the participants’ visual impairment and use of screen readers with a voice synthesizer. These attributes are relatively stable over time and influence which information resources are used and how they are obtained. The interview questions were designed to allow the participants to discuss the information seeking activities that they felt were relevant to their everyday lives, without restricting the focus to either work-related or leisure-related tasks.

The second conceptual framework that informed this study is a sub-set of ELIS: the sense-making approach developed by Dervin (1992). In particular, the sense-making approach led to the decision to use qualitative interviews as a research method and provided guidance on how to frame the interview questions. Of particular importance is the assumption “…that human use of information and information systems needs to be studied from the perspective of the actor, not from the perspective of the observer” (Dervin, 1992, p. 64). Kuhlthau (1991), in her application of sense-making to the information search process, states that: “…the basic research questions of why information seekers behave the way they do…produce findings that also have practical application for professional practice of intervention and system design” (p. 369). The long-term goal of this research is to provide empirical evidence to support accessible system design.

**Research Questions**

Based on the stated purpose of this research study, the literature review, and the conceptual frameworks used as structure, the research questions are as follows:

**RQ1:** How do people who are blind or visually impaired and use screen readers conceptualize accessibility as related to web content?

**RQ2:** How do people who are blind or visually impaired and use screen readers conceptualize usability as related to web content?

**RQ3:** What are the factors, from the perspective of people who are blind or visually impaired and use screen readers, for choosing to use the web as a resource for information?

**METHOD**

Qualitative research methods were used for both data collection and analysis. Semi-structured interviews were conducted with five BVI persons. Informed consent was gathered orally and an accessible copy of the consent form was emailed to each participant after the interview.

The sample was gathered using the snowball technique and referrals. The sample is theoretical and criteria-based. The inclusion criteria were: (a) that the participant be 18 years or older; (b) that the participant accesses web content primarily through a screen reader with a voice synthesizer; and (c) that the participant has at least 1 year of experience using a screen reader. The second criterion was to limit the sample to a particular mode of interaction whereby accessing web content is a listening activity. The third criterion was to help control for inexperience as an intervening variable.

**FINDINGS**

The 5 interviews were audio recorded and transcribed. The transcriptions are verbatim with the exception that any identifiable information was removed or changed. The transcripts were then coded using the constant comparative method (Glaser & Strauss, 1967). Demographic information for each of the participants is displayed in Table 1.
The idea of designing for accessibility was brought up by three of the five participants. There was an understanding that some of the inaccessible features on websites were fixable and that some of the usability issues could be improved if web designers were more aware of the impact that design has for BVI persons. Some of the accessibility issues mentioned included:

- Images without alt text
- Text on images
- Inaccessible PDFs
- Information in tables
- Auto play videos
- Pop-up windows
- CAPTCHA without an audio alternative
- Inaccessible closed captioning
- Difficulties with form fields
- Video control buttons

Usability, for these participants, was closely tied to accessibility. If a web resource had inaccessible elements, then it was generally not usable. Usability was seen as an issue with the individual websites, not the screen reader technology or the individual trying to use a particular web resource. Experience, practice, and familiarity all contributed to perceptions of accessibility and usability; a Web resource was perceived as more usable if it was familiar.

**Autonomy and empowerment**
All of the participants mentioned something relating to autonomy, such as not wanting to rely on others, that it was faster and more convenient to be able to search for information independently, or that they were frustrated when they couldn’t do something autonomously. Two participants mentioned accessible work-arounds, which in this context is a method of bypassing inaccessible content by creatively utilizing multiple types of assistive technology or specialized apps that allow the BVI person to independently complete a task. Although time-consuming, work-arounds were preferred over asking for help.

The sense of empowerment that assistive technology afforded was evident in all five interviews. There was some normalizing language, phrases such as “just like anybody else would” and “I wouldn’t say that I make more mistakes than anybody else” that was used to minimize differences between BVI and sighted persons. Thus, when a web resource was perceived to be inaccessible or not usable, these participants indicated frustration about having to rely on others to help.

**CONCLUSION**
This pilot study was exploratory; it revealed some important themes related to perceptions of accessibility and usability. In particular, the context of web access for BVI persons is complex and includes factors such as training and education, experience, motivation for use, and many other factors that are present in the literature but not in this data. Notably, accessibility and usability were interrelated concepts from the point of view of these participants and were not talked about separately. The desire for autonomy

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**Table 1. Participant Demographics**

<table>
<thead>
<tr>
<th>Pseudonym</th>
<th>Age/Gender</th>
<th>Education</th>
<th>Occupation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Darren</td>
<td>22/male</td>
<td>In graduate school</td>
<td>Student</td>
</tr>
<tr>
<td>Paul</td>
<td>69/male</td>
<td>Graduate degree</td>
<td>Retired</td>
</tr>
<tr>
<td>Nicole</td>
<td>31/female</td>
<td>In graduate school</td>
<td>Student</td>
</tr>
<tr>
<td>Rebecca</td>
<td>29/female</td>
<td>In graduate school</td>
<td>Student</td>
</tr>
<tr>
<td>Lisa</td>
<td>30/female</td>
<td>Bachelor's degree</td>
<td>Unemployed</td>
</tr>
</tbody>
</table>

**Table 2. Online activities**

<table>
<thead>
<tr>
<th>Category</th>
<th>Types of Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>Email, IM, social media</td>
</tr>
<tr>
<td>Entertainment</td>
<td>Music; TV &amp; movies; YouTube; eBooks</td>
</tr>
<tr>
<td>Consumer behavior</td>
<td>Travel or concert tickets; shopping</td>
</tr>
<tr>
<td>Research/ Education</td>
<td>Academic &amp; library sites; Google Scholar</td>
</tr>
<tr>
<td>Information for personal use</td>
<td>News sites; tutorials; search engines</td>
</tr>
</tbody>
</table>
and a sense of empowerment was clear. A poignant example of these concepts was expressed by Paul; he talked about how assistive technology allowed him to remain competitive in his career and that he did not want his impairment to affect his work or reputation. He said: “I’ve struggled very hard to be a doctor who happens to be blind rather than being referred to as the blind doctor.”

**Limitations**

This was a pilot study, so the small sample size was appropriate; however, it limits the transferability of this findings to other BVI persons. The method of sampling may also have skewed the data, such as the high level of education among participants. Another limitation is that the interview protocol asks participants to recall information, such as instances of accessibility issues. The participants had some difficulty in recalling specific examples. Some other methods cited in the literature, such as think-aloud protocols, help to capture issues of accessibility and usability as they are happening, while qualitative interviewing is entirely retrospective. However, interviews are better at exploring general perceptions related to past experiences, which was the rationale behind the choice of method for this study.

**Future Research**

The sample of participants will need to expand significantly, which would require a new sampling method, such as posting notices on web forums. A stratified sample could be useful and increase participant diversity; potential participants could be grouped by education level, age, or experience using a screen reader. The interview questions should also be modified to separate the nuanced differences between accessibility and usability in a way that the participants may be able to differentiate between the two concepts, or further validate the intimate connection between the two. For example, asking participants more direct questions such as “What does accessibility mean to you?” might be a better approach than trying to make inferences on perceptions of accessibility based solely on the use of web resources and trying to elicit examples of frustrating or unsuccessful instances of information seeking. Future research should include additional data collection methods to strengthen the validity of the findings and to fill in the gaps from any one method. BVI users are a complex and heterogeneous group that requires rigorous and robust methods of research to increase understanding of their information behavior and the ways in which web resources can be changed to improve accessibility and usability.

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