Web Accessibility for the Blind and Visually Impaired: Strengths and Weaknesses

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Abstract

Web usability and digital accessibility are continuously evolving. For the blind and visually impaired (BVI), user-friendly options are few and far between. Unfortunately, the type of resources that the BVI community desperately needs aren't generally prioritized for development, and existing studies are limited in scope as well as sample size. This paper examines recent qualitative studies about the information seeking behaviors of the BVI community and proposes potential solutions to common challenges. Most of the studies chosen for this research are from the last 12 years, with over half of this content being produced in only the last three years. This is largely due to a prior lack of awareness regarding the struggles that the visually impaired face, as well as a series of stereotypes and assumptions about what the visually impaired are capable of. The results indicate that while rapid progress is being made, the general lack of prior research makes it difficult to propose a meaningful or immediate solution to common problems. It is therefore vital to return to basics when it comes to the visually impaired—braille expansion and digitization, the continued overhaul and enforcement of web standards (with care taken that these updates are inclusive to the BVI community), and additional qualitative studies with expanded sample sizes.

Introduction

The information community of the blind and visually impaired is frequently misunderstood. Visual impairments have historically been ignored by the sighted, and concerns about the visually impaired tend to be an afterthought (Tomlinson, 2016). There are a variety of stereotypes that persist within the public's perception of this diverse group. The BVI community is a particularly vulnerable population, with about 90% of the world's visually impaired living in low-income settings. (World Health Organization, 2014). All peoples, regardless of background, would benefit from increased public awareness regarding daily BVI challenges and struggles (Alajarmeh, 2021) (Xie et al., 2020).

Even within the library and information science environment—and frustratingly, academia as well— frequent issues persist (Maatta Smith, 2014) (Mune and Agee, 2016) (Rysavy and Michalak, 2020) (Seyama et al., 2014). Many of these problems are resolvable, so long as care is taken to pay closer attention to the BVI community and related groups (Yang et al., 2020).

For the reasons stated above, conditions of blindness or limited sight can be extremely isolating to those enduring such issues (Whitney and Kolar, 2019) (Seo and Jung 2020). Therefore, many visually impaired people turn to social media to connect with others and spread awareness. Despite missing large chunks of information when browsing a digital landscape, the BVI community is persistent and steadfast in its resolution to be seen and heard on the internet (Seo and Jung, 2020).

According to Moreno et al., (2021) "The web is far less accessible for people with vision impairments than it is for sighted people." There are many additional statistics to confirm this

fact. (Alajarmeh, 2021) (Waecker et al., 2019) (Xie et al., 2021) (Yang et al., 2020). Even within completed studies, sample sizes of qualitative data are often limited (Xie et al., 2021). There is a sense of, metaphorically speaking, throwing the existing qualitative data to the wall to see what sticks (Xie et al., 2022).

While many members of this unique community rely on everyday life information seeking behaviors (ELIS), including asking their peers for help and information, a high value is placed on being able to find information independently wherever possible (Savolainen and Thomson, 2021). This community's members employ a variety of coping mechanisms when struggling to navigate a digital landscape, such as repeatedly refreshing a page when browsing a digital library (Xie et al., 2021). Surprisingly, the BVI community is incredibly patient when it comes to navigating the web. Some are unexpectedly cheerful, such as Lucy Edwards, a young blind woman who learned to do her own makeup and posts her tutorials online (Edwards, n.d.).

Social media relies heavily on embedded text within visuals, and thus can be confusing— or even impossible— for many in the BVI community to navigate. Despite this, blind and visually impaired users use social media in much the same way that sighted users do, but with considerably more effort and a higher rate of missing information (Whitney and Kolar, 2019). Making the process of finding everyday information easier would benefit a wide range of library users beyond just the BVI community (Xie et al., 2021).

The general population tends to accept information that is fast, convenient, and easy to access, regardless of the validity of the subject material (Hirsh, 2022). Worse, lies tend to spread faster than truth on the internet, particularly on social media. (Cooke, 2017). As misinformation and disinformation run rampant across information seeking communities, huge emphasis must be

placed on standardization and vetting of information, not just for the BVI community, but for all (Cooke, 2017).

This paper will discuss several key points: social media use in the BVI community, web standards for BVI accessibility, and trends in the information seeking behavior of the visually impaired.

Literature Review

Overview

Research of the BVI community did not begin in a qualitative sense until at least 2014, with 2016 marking one of the first pilot studies on BVI accessibility (Tomlinson, 2016). More recently, Xie et al., (2021) began multiple deep dive studies related to coping mechanisms of the blind and visually impaired (Xie et al., 2020). (Xie et al., 2022).

Most modern apps, operating systems, and websites are not equipped to handle assistive devices (such as screen readers) without significant workarounds (Nengroo and Kuppusamy, 2017). Implementation of accessibility features tends to be non-standard and spotty across the web (Gies et al., 2022) (Bonacin, 2021). Often, members of the BVI community lament that they are not sure what they are missing in terms of information. It has been determined that even the highest quality screen readers are incompatible with certain types of information, particularly embedded text within images (Whitney and Kolar, 2019).

Academic study is particularly difficult for those in the BVI community, and the blind and visually impaired often have a lower level of education than the sighted as a result (Mune and Agee, 2016), (Waecker et al., 2019). It is incredibly unfortunate that the academic community does not put more emphasis on fixing accessibility issues for those with visual impairments. This technological gap acts as a barrier between those with visual deficiencies and access to higher education (Yang et al., 2020).

Themes and Trends

Some work has been done to attempt to standardize alt tags as well as create artificial intelligence for image identification, but algorithms need more work to become fully automated (Nengroo and Kuppusamy, 2017). Other studies focused on the need for alternate accessibility options with certain types of dynamic websites (Moreno et al., 2020). In many cases, the studies that have been done so far are not sufficient to meet the needs of BVI information seekers. This issue has unfortunately persisted over the last decade and little progress has been made (Tomlinson, 2016) (Moreno et al., 2020).

While braille is an important tool for the visually impaired and is frequently used among the BVI community, screen readers are usually the go-to for navigating the web, even when they are not considered the most appropriate tool available (Shimomura et al., 2010). There is no standardized format for e-books. Finding an accessible version of an e-book can also be prohibitively expensive, particularly for students, who tend to have limited budgetary capabilities. Additionally, many academic e-book resources are poor quality scans of original textbooks and lack metadata. Browsing e-books as a member of the BVI community is not facilitated by screen readers, nor do many platforms offer high contrast options for low vision users (Mune and Agee, 2016). EPUBs and PDFs are inconsistent in their ability to process

certain types of information, and screen readers can often get hung up on titles, page numbers, and hyphenation (Mulliken and Falloon, 2018) (Mulliken 2019) (Waecker et al., 2019).

Some common themes have been identified in terms of challenges that the visually impaired face when navigating the web. These include issues with navigating multiple columns on a page, difficulty with horizontal scrolling, redundant or repetitive information, and a general lack of contrast between assets. In addition, drop-down menus can create extra— and confusing— navigational steps. Ultimately, without an expanded and enforced standard as guidance, such as the WCAG 2.1, difficulties will continue (Moreno et al., 2020).

Gaps and Shortcomings

Recent studies have attempted to apply a one-size-fits all approach to solving the issues of the BVI community. However, the needs of the blind versus that of the partially sighted are entirely different, and the two groups use different techniques when navigating a digital environment. Further, these two groups can be split into a third subgroup of partially sighted individuals who use both screen readers as well as magnification (Moreno et al., 2020). This is the group that I found myself personally belonging to during the course of my research, as referenced in the methodology section of this paper.

Many subgroups of the BVI community are severely underrepresented. For example, the deafblind community has little option in the way of emotional communication, as braille is a binary language and emotions are often expressed using numbers (Daniels, 1996). Finger braille, a technique where emotions are expressed through the squeezing of hands and other subtle forms of touch, has had limited and inconsistent use (Matsuda et al., 2010).

Disappointingly, existing studies do not generally focus on the elderly, though some balanced studies do exist (van der Geest, 2019). Although the elderly community makes up a large portion of the blind and visually impaired overall (Yuan et al, 2020), a mere handful of studies have been done involving this group. (Engelbrektsson et al., 2004).

A lack of implementation of web accessibility standards, such as WCAG 2.1, creates an environment where solutions for the BVI community are inconsistently applied to a digital landscape. This creates unreasonable barriers that prevent the BVI community from accessing the internet. In addition, finding and sharing relevant information within this community tends to be tedious and time consuming (Alajarmeh, 2021).

Methodology

For this research, I enlisted the use of the LISS (Library and Information Science Source) database, and primarily used EBSCOhost to search within the database for appropriate information. I began with a general search of the habits and needs of the BVI community, and then narrowed down my search to more recent studies involving the digital realm. I soon discovered that the latter is the bulk of existing literature on the subject.

I organized my chosen articles (primarily PDF files) in Zotero and used highlighting within digital files. I further utilized printed files to take paper notes, and organized these printed articles into folders, with author names and keywords written on the outside. I then inserted these folders into a larger expanding file folder. The rationale behind this behavior is that I ran into some technical issues, being a partially sighted person myself, such as a lack of standardized color inversion options in both ProQuest and Zotero.

I am in the group of partially sighted users that employ the use of a screen reader in addition to magnification and large-size font features. I can personally confirm that it is fussy and difficult to navigate. This was one of the key reasons for my interest in studying this topic, as I was having trouble studying digital coursework as well as finding relevant information. It is simpler, particularly during a time of eye strain or increased astigmatism, to print the relevant articles instead. In this way, it is possible to read, highlight, and take notes directly on paper without worry of technical error.

For the information that was not peer-reviewed or was social media-based, I tended to employ the use of YouTube and Facebook primarily, as these seem to be the platforms that the BVI community favor, although Twitter and Instagram are also frequently used. I also employed the use of textbooks, and thus combined this research with that of peer reviewed articles.

As an additional note, I invested a great deal of time in attempting to tweak contrast settings—namely, inverted black-on-white text, and still struggled frequently with issues regarding accessibility and usability. Many academic textbook servers, particularly ProQuest, do not have an option for color inversion, leading to the necessity of downloading additional extensions (such as Invert!) and other tools.

One would assume that related technological devices, such as an iPhone or Macbook, would have similar capabilities for accessibility, but this is not entirely the case. Screen reading capabilities, for example, work slightly differently depending on the device being used.

Discussion

Key Findings

An overwhelming amount of evidence points to the fact that while web standards for the BVI community have recently been overhauled, implementation has lagged. (Nengroo and Kuppusamy, 2017) (Bonacin, 2021). While there are many recent qualitative studies, the researchers involved largely come from the same circles (Xie et al., 2021) (Babu and Xie, 2017) (Mulliken 2019) (Mulliken and Falloon, 2018).

Context

Qualitative data gathering did not really begin until Tomlinson's (2016) work regarding accessibility in the BVI community. Much of the initial research was developed around this time (Mune and Agee, 2016) (Babu and Xie, 2017) (Mulliken and Falloon, 2018) (Nengroo and Kuppusamy, 2017). All data points to one primary concept: not enough is being done for the BVI community when it comes to the digital landscape. Additionally, there is no one-size-fits-all approach to solving the problem (Moreno et al., 2020).

Unexpected Results

To be perfectly honest, I did not expect that the BVI community would be so thoroughly neglected. When I began this research project at the beginning of the semester, it was my hope that more genuine attempts at a universal standard would exist. Sadly, this is not the case. In retrospect, this information is not surprising news, given the overwhelming evidence that navigating an academic or library environment is prohibitively time consuming for BVI learners (Tomlinson, 2016) (Xie et al., 2020).

Despite known coping mechanisms, these behaviors are not sufficient when it comes to the digital landscape (Xie et al., 2021). While WCAG 2.1 standards were recently invented and/or expanded to include members of the BVI community, this so-called universal standard is

hardly a requirement to publish any web page and is not required of any digital resource. This is shocking to say the least, as the extensive standards listed are generally not difficult to implement, though they can be tedious for designers to program into their webpages and applications. (Alajarmeh, 2022).

Limitations and Weaknesses

As noted above, there are not enough seasoned studies on BVI accessibility, and sample sizes are small. There also are not a lot of recent studies about overlapping information communities, such as the deafblind and the elderly. According to Yuan et al. (2020), about 62 percent of visually impaired and 82 percent of blind people are 50 years and older. This is a powerful statistic, as many of the studies involved youth technology use, and did not pay much concern to the elderly. (Shimomura et al., 2010) (Seo and Jung, 2020). We must learn as a society to include all of the people who are struggling with a lack of sight instead of merely the young and tech savvy.

Implications for Future Study

Because screen readers and dynamic braille keyboards can be prohibitively expensive (Special Needs Computers, n.d.). finding a way to standardize these items and make them universally available would be highly beneficial. Continued studies with larger sample sizes are essential to furthering innovation surrounding usability for the BVI community. Useful as recent web standards may be, it is crucial to ensure that proper legislation enforces these concepts. (Alajarmeh, 2021). Furthermore, libraries and academic institutions must make space for the blind and visually impaired and invest time and patience into furthering BVI goals.

Summary

While recent limited studies exist, there is still a great deal of work to be done. Much of the information that the BVI community is lacking about digital accessibility can only come with time and increased study. However, if care is not invested into this vulnerable group, BVI individuals will continue to suffer for the foreseeable future.

Though there are numerous limitations to current research, one might argue that the concept of usability is new, and therefore is by nature a developing concept. (Hirsh, 2022). Additionally, while it's easy to say that libraries and academic institutions should be given a complete overhaul, bureaucratic and financial limitations will realistically exist.

According to the Pew Research Center (2013), there are a variety of concepts that could cultivate interest from all groups in a library environment, including ideas such as a "digital petting zoo," where people from all walks of life are allowed to test out various types of technology, such as tablets. This kind of event could be easily tailored to the BVI community, with seminars about the various types of screen readers and dynamic braille devices available for use. If funding cannot be secured for these types of projects, however, BVI research will continue to stagnate.

Conclusion

The BVI community faces countless hurdles when it comes to seeking information but manages to remain innovative when it comes to developing workarounds (Xie et al., 2021). While challenges remain, there is much reason to hope that for the sake of all users, existing web standards will be expanded, and that digital features tailored to the BVI community will become more widely adopted (Alajarmeh, 2021). Further, artificial intelligence could help the process along. Caution must be taken, however, to not rely on algorithms alone to attend to the needs of

the BVI community (Nengroo and Kuppusamy, 2017). The blind and visually impaired successfully use social media to connect with their peers, though with significantly more difficulty than the sighted (Seo and Jung, 2020) (Whitney and Kolar, 2019).

For this reason, care must be taken to assist this vulnerable community, and if developing web accessibility standards are not enforced, the digital environment will remain difficult for the BVI community to navigate (Alajarmeh, 2021). Prohibitively expensive assistive tools, such as external screen readers and braille synthesizers, are also a barrier to access (Special Needs Computers, n.d.). and should be developed in much the same way that one might develop a toothbrush—as an everyday object for an everyday need. Perhaps this could still be considered a niche set of items.

However, for the BVI community, these tools are essential, and should be treated as such. It is possible that the implementation of expanded screen reading and braille synthesizing software or hardware to the general public would spark interest in the sighted community when it comes to learning about the visually impaired, as society as a whole would then be able to pick up a new skill and a new tool somewhat easily compared to the former circumstances.

This is something that already seems to be true for the deaf community, as learning sign language tends to be a popular pastime, and an activity reserved for hobbyists, at least for those that are not hearing impaired. By contrast, learning Braille or making use of a screen reader is considered a prohibitively expensive chore for the reasons listed prior. Why isn't learning braille the same as learning ASL in terms of ease-of-use? It seems that a hobbyist should be able to pick up Braille transcription as easily as one might learn the ASL alphabet.

With luck, the BVI community will develop increased awareness among the larger community of the sighted. Visually impaired individuals can only remain resilient, hopeful, and patient as the world catches up.

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