

# The Experience of Accessible Voting: Results of a Survey among Legally-Blind Users

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The Help America Vote Act (2002) mandated that all polling places have an accessible method of voting available for those wishing to vote in federal elections. Unfortunately, there is presently little voting-specific data available to help guide the design of accessible voting systems for special segments of the population, such as visually impaired voters. We hope to fill this gap, and report on results from a questionnaire survey of 180 legally blind Americans of voting age to understand voting experiences and desired changes to improve voting technology. We found that most respondents vote in person at a polling location, and prefer audio voting systems with a recorded human male voice to other methods or options, including Braille. Important issues were identified. For example, lack of poll worker training with accessible technology was reported to be a problem by 24% of respondents, and was significantly more likely to be reported by those who had been assisted by a poll worker in the past. These results can help inform the design of future accessible voting interfaces.

## INTRODUCTION

The act of voting in an election can be a complicated and time-consuming process for anyone. It involves getting to the polling place, signing in, understanding and responding to any directions given by a poll worker, comprehending the voting technology and how to use it (be it paper ballot, lever machine, computerized voting machine, etc), making selections on a ballot, possibly verifying those selections, and casting the ballot. For blind and sight-impaired members of the community, the complications that may arise during the voting process are magnified and new obstacles are often introduced. While there are many sources of guidelines for the design of accessible systems, there is scant empirical literature that specifically addresses the needs of visually impaired voters. Field observations can be a useful source of data in this regard, but we also wanted to get a clearer sense of what the broader experiences are for the visually impaired as they vote.

Our research aims to provide a better understanding of the voting process and its environment by inquiring about voter experiences, success, and confidence. This is an exploratory study to provide both answers to specific questions regarding design decisions and a broader understanding of the context for the implementation of an improved accessible direct-recording electronic (DRE) voting machine interface.

The ability to vote must generalize to the extremely diverse population of all Americans over eighteen years of age. This is a much broader target

population than virtually any other human-machine system. In particular, voters with disabilities make up a sizable portion of this population. The Americans with Disabilities Act (United States Government, 1990) defines a disability as “a physical or mental impairment that substantially limits one or more major life activities.” According to the U.S. Census Bureau Americans with Disabilities report (2005), 19% of the US population lives with one or more disabilities. 1.3 million persons (0.5%) reported legal blindness. A fifth of Americans with disabilities (more than eight million people) have been unable to vote in presidential or congressional elections due to barriers at or getting to the polls (National Organization on Disability, 2004).

The Help America Vote Act (HAVA) was the federal government’s response to this situation, and mandated that all polling places have an accessible method of voting available for those wishing to vote in federal elections (United States Government, 2002). These rights extend to two crucial aspects of voting: privacy and independence. It is clear that this legislation has already made an impact on the voting experience for many. One emphasis of this end-user survey is to document experiences such as this one, from one of our respondents: “I would like to say that the first time I voted completely on my own with an accessible voting machine, it was such a liberating experience that I cried. I was so elated that everyone in the polling place applauded.” It is our hope that by better understanding the needs and preferences of this population, we can

provide this experience to even more visually impaired voters.

It has been difficult for blind voters to participate in elections privately and independently because very little information exists on the best way to provide these. A systematic survey of the blind voting population is one way to obtain a better understanding. The National Federation of the Blind (NFB) Jernigan Institute conducted a telephone survey of 557 blind individuals of voting age, representing all 50 states, following the November 2008 national election (Hollander Cohen & McBride Marketing Research, 2008). They found that 90% of the households surveyed had voted in the 2008 election, but only 51% were able to do so independently. Out of those that voted in a location that offered an accessible voting machine, 86% were able to vote secretly. This largely successful percentage indicates that accessible DREs are good, and are probably the best option currently available for providing universal access to voting. It is clear from the missing 14% and other studies on potential issues with DREs (see Runyan, 2007 and Cross et al., 2009) that these systems are by no means perfect. Extant commercial systems are an important first step, but there is still a great deal that can be done to improve the user interface and voting experience as a whole.

In addition to the aspects of voting surveyed by the NFB (2008), our survey included questions regarding polling locations, transportation, potential obstacles, and poll worker interactions. Some of the items from the NFB's work overlap with the our inquiries, including what types of machines were used, voter success, and voter confidence in those voting methods. By integrating the results found by the NFB with survey data from this paper, a clearer picture of the needs of blind users can be obtained. Taking lessons from real-world interactions with voting machines and other accessible technology and integrating the feedback will inform a better, more usable design for a DRE user interface.

## METHODS

### Subjects

Subjects were recruited and interviewed both in person and online. Twenty-one individuals were recruited in person at the National Federation of the Blind's Texas state convention, and were compensated with \$15 for their participation. One hundred and fifty-nine people were recruited online through Internet correspondence sent to email lists, blogs, and message boards that serve the visually impaired community. Subjects completing the survey online were given a chance to express their thoughts and opinions, but were not compensated monetarily for their time.

The total one hundred and eighty subjects (100 female, 66 male) ranged in age from 21-86, with a mean age of 51.8 ( $SD=12.8$ ). Table 1 shows the frequency of the subjects' education levels; nine subjects did not report their level of education.

Table 1: Level of Education

High school or less	14 (7.8%)
Some college	42 (23.3%)
Bachelor's degree or higher	115 (63.9%)

The subjects' previous voting experience and number of elections voted is shown in Table 2. Only 5 subjects had never voted in any type of election.

Table 2: Election Participation (number of subjects)

	0	1-8	9-15	15+
National-Level Elections	6	52	39	64
Governmental Elections	15	61	36	56
Local/Other Elections	36	63	39	33

### Procedure

All materials were read to the subjects that were interviewed in person. Subjects that completed the survey online read the materials themselves by any method they chose, such as increasing the font size, a screen reader, having a friend read it to them, etc. Those being interviewed in person were seated across from the experimenter, with a microphone in the middle to record their answers. Those who received the survey online were given a link to SurveyGizmo, a survey tool that collected and reported their answers.

Subjects were first given a consent form and agreed that they were both over the age of 18 and considered legally blind. Following that, they received 50 questions including demographic questions, questions related to their previous voting experiences and questions about desired changes and future directions for the voting industry. Question formats included multiple choice, open-ended, and 5 or 10-point Likert scale questions. Whenever applicable, an "other" option along with the direction to "please specify" and a text box were provided in an attempt to account for a wide range of experiences and preferences. Subjects were given as much time as desired to respond. After completing the survey, they were debriefed to the nature of the experiment and given contact information if they desired to follow up on anything with the experimenters.

## RESULTS

The results of some of the general response questions are summarized in Table 3.

Table 3: Respondent Characteristics

- A majority of respondents (73.3%) have no vision or only light perception. The remainder reported some kind of low vision (visual acuity less than 20/200 or a reduced visual field). 16.4% of respondents would choose to use a visual display in addition to an audio interface while voting, if provided.
- Eleven percent of respondents have never used Braille and 40% are completely proficient Braille readers. If a Braille interface were offered, only 34.4% would choose to use Braille over an audio interface.
- When reporting computer skill (on a 10-point Likert scale with 1 being a novice and 10 being an expert) no one reported being lower than a 3 (2.2%) and 7.8% reported to be experts. The majority of respondents were experienced computer users, ranging between 7-9 (55%). 78.9% of respondents use a computer more than 20 hours a week.
- When asked about using an automated teller machine (ATM) to get money or complete a transaction, 23.9% of respondents never use one, 28.0% use one occasionally (several times a year), and 39.4% use on often (at least once a month).
- During an election, 27.2% of respondents have worried about figuring out how to use the technology to cast their vote and 19.4% felt that time pressure caused them to rush or make a mistake.

### Audio Interface

There was a slight preference among our respondents for a voting machine's audio to use a recorded human voice (55.3%) rather than a synthesized text-to-speech program. However, 85.4% of respondents were familiar and comfortable with using and understanding synthesized voices (by responding 8 or higher on a 10-point Likert scale). While the majority of respondents had no preference about the gender of the audio voice (59.4%), there was a significant preference for male (28.9%) over female (6.1%) voices in the remaining subjects  $\chi^2(1, N = 63) = 26.68, p < .001$ .

The ability for the user to be able to change audio volume and speed were both highly desired aspects of a computerized audio interface (83.9% and 79.4%, respectively). Other desired audio controls included ability to change pitch (42.8%) and language (21.7%).

### Input Devices

Respondents were asked to think about how comfortable they would be with using different methods to control their interactions with a voting machine. A substantial majority of respondents (88.5%) said they would be comfortable with a directional keypad (arrow keys) and even more—90.4%—said they would be comfortable with a telephone keypad. 95.6% of respondents were very proficient (8 or higher on a 10-point Likert scale) with using a telephone keypad to enter numbers.

There was a significant relationship between a respondent's computer skill and their comfort using directional arrows, with more experienced computer users being more comfortable with using arrow key inputs,  $r(151) = .17, p = .04$ . No relationship between a respondent's computer skill and their comfort using a telephone keypad was found. 90.9% of responders reported keyboards to be their preferred method of input when using a computer (followed by a mouse, 4.9%, a touch screen, 1.8%, and a joystick, 0.6%).

### Voting Experiences

It is often the case that multiple options for voting exist; absentee ballots in alternative formats such as regular, large print, Braille, or tactile are not unusual. However, a majority of respondents chose to vote in person; only 12.3% typically voted using an absentee ballot. The similar NFB (2008) survey found that 62% of blind voters chose to vote at the polls.

When asked about their participation in early voting, 48.4% of respondents never early vote, 25.8% sometimes early vote, 14.5% usually early vote, and 11.3% never early vote. Again, this is similar to the NFB survey, which found that early voting was taken advantage of by over half (52%) of respondents. This is a substantial proportion, considering only 32 states (plus the District of Columbia) offer in-person early voting as an option (National Conference of State Legislatures, 2010).

Only 9.3% of respondents always chose to vote a straight-party ticket. 23% usually voted straight-party, 37.9% sometimes voted straight-party, and 29.8% never voted straight-party. Out of those that have voted straight-party, 80.2% did so by voting in each race

individually and 19.8% used the single straight-party option on the ballot.

Most respondents (92.2%) have received assistance during the actual process of voting, from family, friends, a poll worker, or someone else.

### **Poll Worker Relations**

Out of the respondents that have used assistance during voting, 58.4% have received help from a poll worker. A quarter of respondents (24.4%) said that poll worker attitude is an obstacle that they feel makes it difficult for them to vote. The majority of respondents (84.3%) trusted the poll workers to provide them with accurate information.

Respondents that have been helped by a poll worker previously are significantly more likely to report the attitude of poll workers as a problem,  $\chi^2(1, N = 166) = 5.04, p = .025$ . No relationship between receiving assistance from a poll worker and trust in a poll worker was found.

This is certainly consistent with the results from the NFB (2008) survey: of the 191 individuals that were offered/asked for an accessible machine, 19% experienced problems obtaining one. About 1 in 5 voters overall said poll workers had trouble setting up or activating an accessible voting machine – most often indicating the individual did not know how to activate the audio ballot or did not know how to operate the machine. On average, voters had to wait 15-16 minutes for an accessible machine if one was not up and running prior to their arrival.

### **Qualitative Responses**

Numerous respondents provided free-response comments that were particularly interesting or insightful. For example, issues involving multiple disabilities were raised: “The reason I prefer a male voice is that I have a hearing loss and those voices are easier for me to hear.”

A key area of dissatisfaction among blind voters was the lack of appropriate audio controls on the DRE. In particular, control of speech rate was a common complaint. For example: “The most cumbersome was not being able to adjust the rate of the synthetic speech. It was at a very slow rate of speech and I customarily use a higher rate.” One respondent elaborated “I’d like it better if audio machines demonstrated to beginning users how to change the speed right away; it took forever for this slow talker of a man to get to it and I had an to rush out of there without reviewing the ballot because of it.”

Poll workers were another common source of complaint: “Generally speaking, I have found the poll workers to be poorly trained, and resistant to my use of the adaptive technology, encouraging me to be assisted

as I had in the past.” Another mentioned “It wouldn't hurt to put polling workers through some disability awareness/sensitivity training to make it a better experience for those of us with disabilities.”

## **DISCUSSION**

The use of an audio interface either by itself or conjunction with another modality (such as visual or Braille) is fundamental to providing an accessible DRE interface. Allowing multiple options to be tailored by voters to suit their own needs is critical. Most of our respondents have experience with screen readers (pieces of software that are used to convert computer and web content into audio navigation). Experienced users set the speech rate upwards of 300 words per minute, a speed far faster than an inexperienced listener could comprehend (WebAIM, n.d.). DRE interfaces should allow voters to capitalize on this expertise, as it is not unusual for auditory interfaces to have extremely steep time costs relative to visual interfaces (e.g., Piner & Byrne, 2010).

The relationship between a respondent's computer skills and their level of comfort with using directional arrow keys can be understood in terms of the keyboard, the preferred input device. Arrows keys are an integral part of navigation a webpage or document using a screen reader. This level of familiarity and comfort could be taken advantage of and designed into a voting machine's input device.

With almost two-thirds of the blind population choosing to vote in person, it is essential that accessible voting machines be provided that allow people to cast a secret ballot. This is one of many obstacles to overcome at the polls. The most evident in the open-ended survey results was the interaction between the voters and the poll workers. The expressed problems included a desire for more training of the poll workers on how to use the technology, how to assist people with disabilities, and a general acceptance of accessible technology. Accessible voting options (like large print, audio, or even Braille interfaces) need to be integrated with all voting machines so the process is no different, or need to provide a simple setup that poll workers with limited technological experience can successfully complete.

Large surveys of blind respondents provide us with a better understanding of voter abilities, needs, and desires. Thorough analysis and observation will help lead to an end goal of providing highly usable multimodal ballot technology for the blind and visually impaired population. Parts of this survey were used as an exploratory forum for respondents to voice their opinions, describe detailed experiences, and to fill in any

aspects of voting they felt had been neglected in the survey. These responses provided valuable insight and put a personal voice behind the main findings of this survey, as well as providing details about aspects of voting that need to be addressed in future inquiries.

These results will inform upcoming research and directly impact how the input devices and user interface are designed in a future accessible DRE.

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