



RICE

# Accessible Polling Places for the Visually Impaired



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- We would also like to thank the Texas chapter of the National Federation of the Blind for their participation.



# Overview

- Background
  - What do we know about blind voters?
  - Design of an accessible user interface
- Survey
  - Large survey of blind adults' voting habits
- Results & Discussion
  - Guidelines for accessible DRE (Direct-recording electronic voting system) design



# Prevalence of disabilities

- 20% of the US population lives with one or more disabilities
  - Over 8 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, 2007)

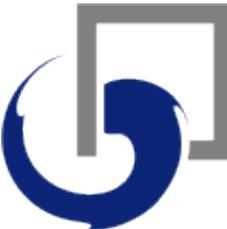
- 1.3 million persons reported legal blindness (0.5%)

(American Foundation of the Blind, 2007)



# Election Participation

- Visually impaired individuals are under-represented members of the voting population
  - In the 2008 election, 56.8% compared to 64.5% of the general population (Schur and Kruse, 2008)
- Those that do vote can't always do so independently or privately
  - In a 2008 survey by the NFB (National Federation of the Blind), only 51% were able to do so independently
  - Even with an accessible DRE, only 86% were able to do so privately



# Voting Method Used

	General Population, EAC 2008	Blind Voters, NFB 2008
In person, on Election Day	<b>60.2%</b>	45.9%
Early Voting	13.0%	<b>16.2%</b>
Absentee Ballot	17.3%	<b>38%</b>



# Designing an Accessible UI

- This research is designed to address both the usability issues and user-reported shortcomings when designing a new DRE user interface.
- Previous Research (Piner & Byrne, 2010) – What aspects of voting do people have problems with during a mock election?
- Current Survey– What do people say they are dissatisfied with? How would they like to see these issues addressed?



# Voter Survey

- 52 question survey of election experience and voting habits, administered to legally-blind adults
  - Included multiple choice, open-ended, and 5 or 10-point Likert scale questions
  - Subjects were given as much time as desired to respond
  - Wherever applicable, an open-ended “Other” option was provided



# Survey Questions

- 26 questions were identical to those used in previous voting studies with sighted individuals (such as Byrne, Greene, & Everett, 2007)
  - Demographic questions
  - Computer experience
  - Election participation
  - Voting preferences
  - Other difficulties



# Survey Questions

- 26 new questions, to address the unique situation of a blind voter
  - Vision
  - Voting experience
  - Audio interface
  - Input methods



# Survey Respondents

- Total of 202 subjects
  - 112 female, 78 male (12 did not answer)
  - Ranged in age from 19-86, with a mean age of 50.4 ( $SD=13.5$ )
  - Respondent pool was both highly Caucasian (92%) and highly educated (63% had a Bachelor's degree or higher)
- Levels of Vision
  - *Low Vision* – Can read large point/magnified text (**26.7%**)
  - *Light Perception* – Can tell dark from light (**13.3%**)
  - *No Vision* – No residual vision (**60.0%**)



# Discussion

- *What do people say they are dissatisfied with? How would they like to see these issues addressed?*
- **Guidelines for an Accessible DRE**
  1. Multi-modality audio and visual interface
  2. Adjustable visual interface (text size and screen contrast)
  3. Adjustable audio interface (speed and volume)
  4. Male text-to-speech voice
  5. Flexible navigation and replay ability
  6. Optional ballot review process



# Guidelines

## 1. An accessible DRE interface should include an audio mode that can be used in conjunction with the standard visual display.

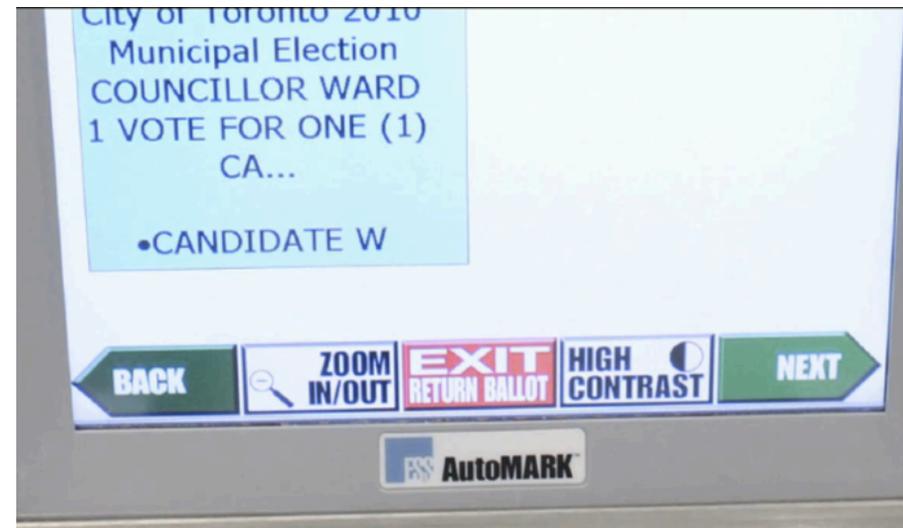
- Currently, 16.4% of respondents use both interfaces
- *“The problem for me with the visual mode is because of the novelty of blind people voting people tend to peak over my shoulder which compromises my privacy. These are voters or family members of voters not poll workers.”*



# Guidelines

## 2. The system should provide the ability to adjust text size and screen contrast

- 30.1% of those voters that don't currently use both modalities would be more likely to if one of these changes were available:
  - 9.5% increased font size
  - 7.5% ability to change contrast
  - 23.3% other changes



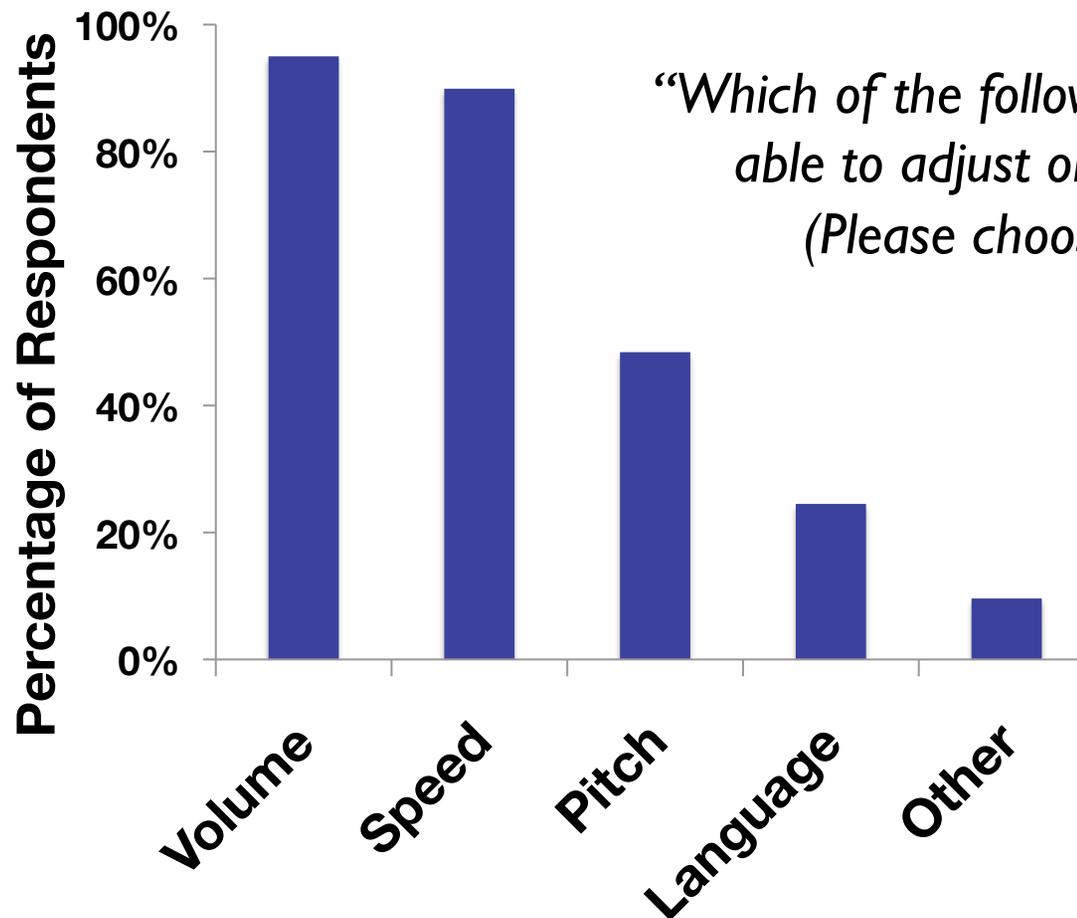
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- *“By Magnifying and using contract this could help low vision or elderly individuals vote more easily.”*
- *“The introduction of large print text format has certainly been an improvement and helpful in reading voting instructions and selections.”*



# Guidelines

## 3. The system should provide the ability to change audio properties (like volume and speed).



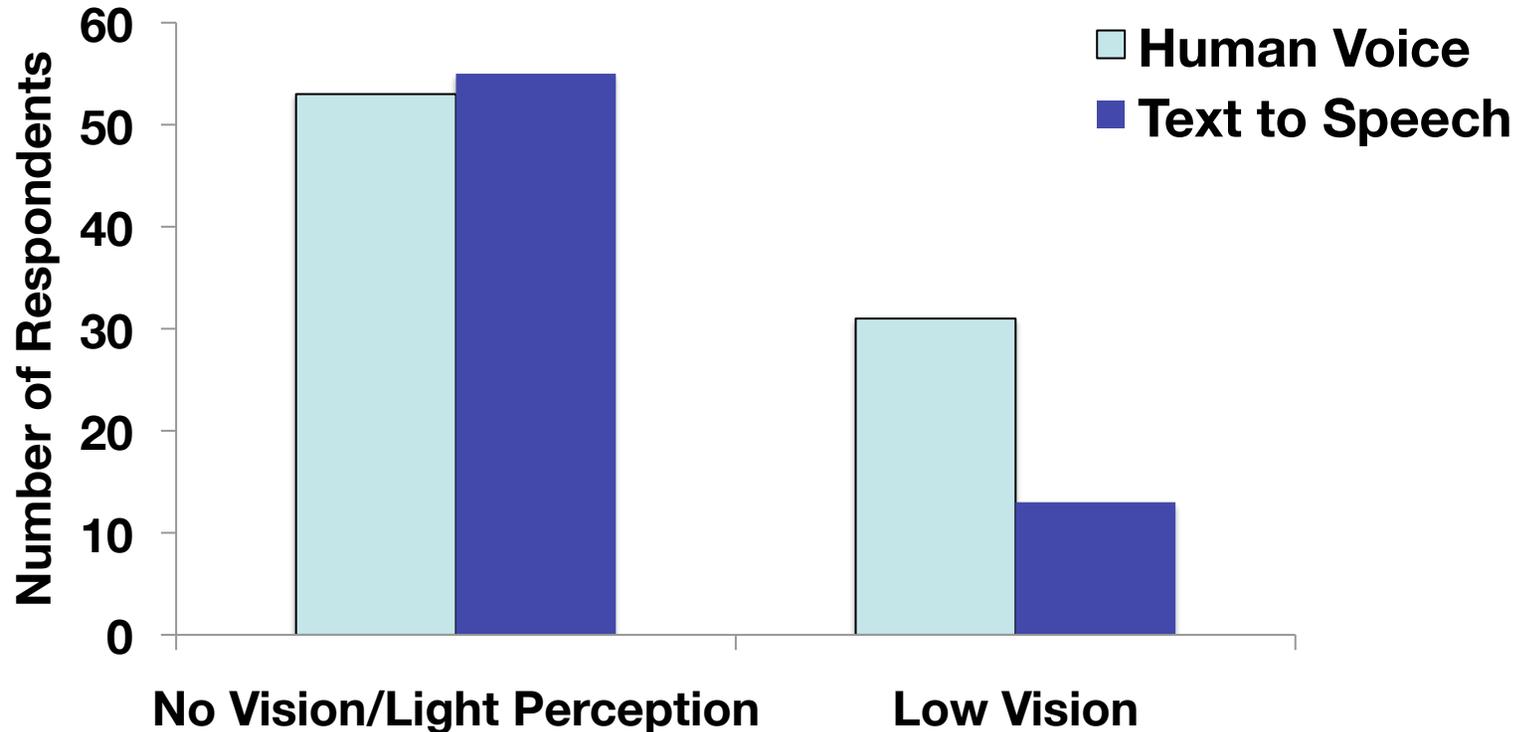
## 3. The system should provide the ability to change audio properties (like volume and speed).

- *“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.”*
- *“I have used the talking voting machines, but I was very unhappy with them. I was not able to adjust the volume of the voice, and it was too low to hear in the busy/loud area I was in, and I wasn't able to speed up the voice to suit my needs like I can on all of the other assistive technology I use.”*



# Guidelines

4. A male synthesized text-to-speech voice (chosen over the slightly preferred human voice due to the ability to speed up the audio, a highly desired option) should be used.



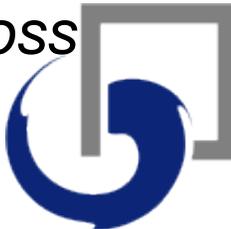
*“In general, would you prefer a voting machine's audio interface to use a recorded human voice or a synthesized voice from text-to-speech software?”*



# Guidelines

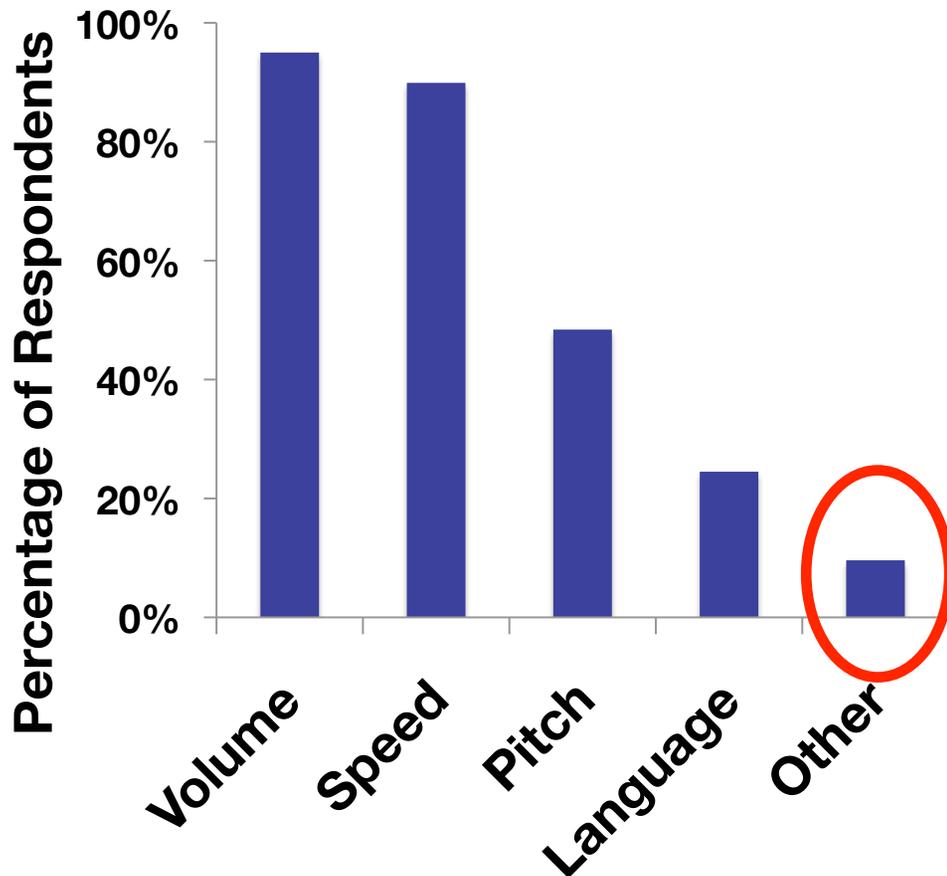
## 4. A male synthesized text-to-speech voice should be used.

- *“Choice is important in every aspect of the experience, and digital over analog any day. Talking ATMs seem to be much closer to how things should work than some of these human voice read systems. I think text to speech systems are good enough now that everyone should be able to be acomodated in this manner. They give the advantage and responsiveness of a pure synthesized voice without the robottic qualities that seem to bother many users. These are the voices that should be used.”*
- *“The reason I prefer a male voice is that I have a hearing loss and those voices are easier for me to hear.”*



# Guidelines

## 5. Flexible navigation should allow users to skip through sections of speech as well as replay any parts they may have missed.



### “Other” category (Verbatim)

- Ability to repeat last word, sentence or other chunk of text.
- Ability to hear the spelling of names which may be mispronounced.
- Navigation levels (characters, words, spelling, sentence, ballot descriptions/choices, ballot items)



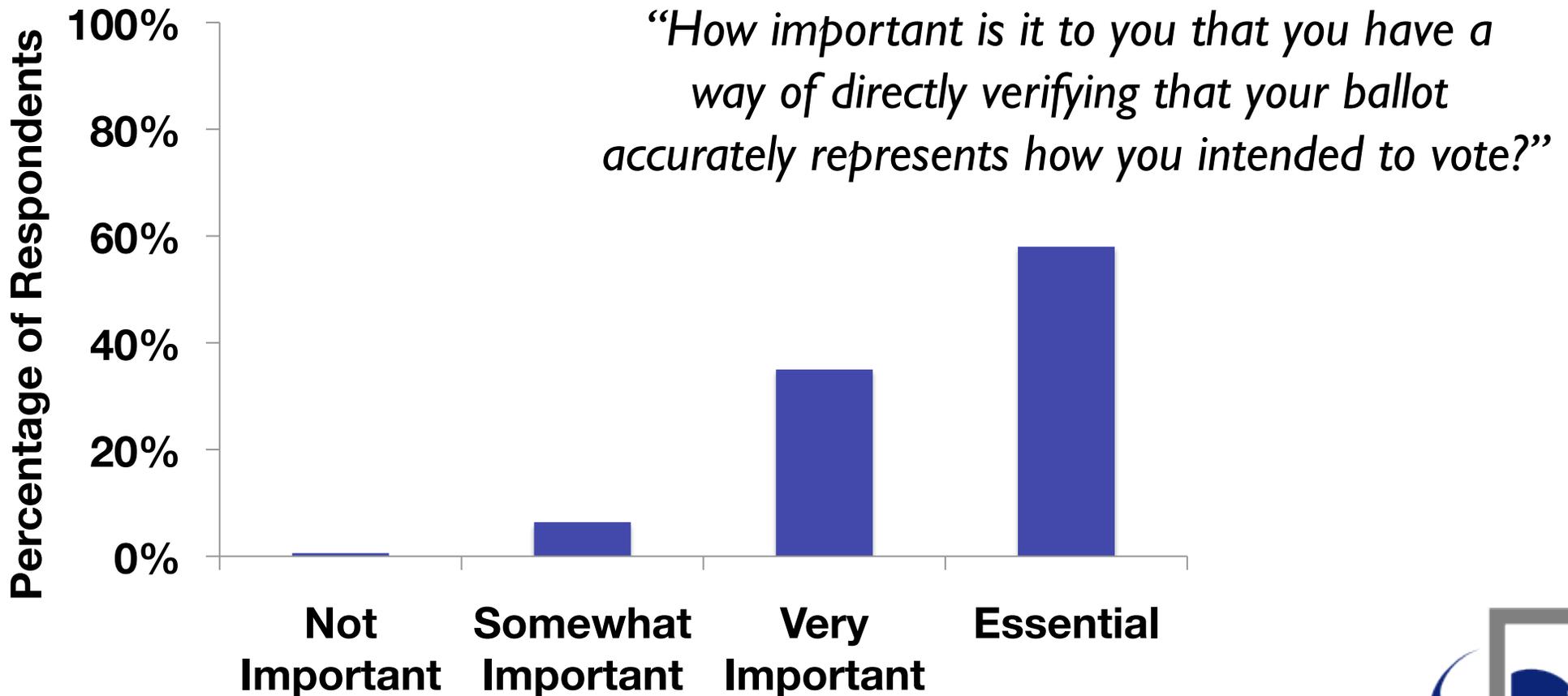
## 5. Flexible navigation should allow users to skip through sections of speech as well as replay any parts they may have missed.

- *“It [Computerize Voting] has been of some benefit, but it would be better if we could have some control over the speed of reading and be able to skip things when we want to.”*
- *“First, I'd like DRE voting equipment to allow the blind user to have more flexibility to change the speed of speech output and to skip unwanted text from being read. This would speed up my voting time considerably.”*



# Guidelines

**6. A way of reviewing the ballot must be included, but should not be required in order for a voter to cast their ballot.**



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- *“Any method requiring human reader(s) feels somewhat intimidating- I am more reluctant to 'pass' on an issue or race with which I am unfamiliar. The accessible machine still makes me a little nervous each time- wondering if I remember what to do- but it is wonderful. It is a great bonus to be able to review your selections before casting the ballot.”*
- *“In my experience, the machines I've used make you listen to the entire text of the issue. This is very annoying when I know in advance how I plan to vote. it also makes me review my votes, even if I am confident they were recorded correctly.”*



# Discussion

- Future Directions: The design of an accessible DRE
  - Adhere to these 6 core guidelines
  - Offer multi-modalities and adjustable options to accommodate the wide range of the voting population
  - Evaluate an audio DRE using the baseline data collected from previous studies with blind individuals using non-computerized technology



# Discussion

- The ability to vote independently and privately, although a legal right, is something many have not been able to experience themselves
  - *“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.”*



Thank you. Questions?

