Increasing the Use of Accessible Voting Systems

Background

ATAP is a membership organization that represents the federally funded network of State Assistive Technology (AT) Programs. There is one State AT Program in each state and territory, 56 total grantees. The Assistive Technology Act is the federal law that funds State AT Programs and it mandates a number of activities including device demonstrations. In a device demonstration, individuals are provided with guided exploration of the access features of a device by someone who has technical expertise in the device and its features. Hands-on use of the device by the participant with support from the expert is a critical part of any demonstration. This allows the person to become familiar and comfortable with the access features and provides structure to support independent device use.

State AT Programs have staff with tremendous experience and expertise in providing device demonstrations for a wide variety of devices that address different functional limitations, vision, motor, hearing, intellectual, etc. Demonstrations have proven to be an effective mechanism for increasing consumer familiarity with and use of assistive technology devices. Based on this positive experience with demonstrations of AT devices, the RAAV-ATAP project proposed providing demonstrations of accessible voting systems to support voters with disabilities using those systems to vote privately and independently.

Recent research suggests that voters with disabilities have significant difficulty using accessible voting systems (AVS). The 2012 National Council on Disability survey (N=900) shows 45% of those surveyed reporting barriers involving voting machines and 25% identified untrained poll personnel as a barrier. The Rutgers 2012 survey (N=2000 with disabilities and 1022 without disabilities) found statistically significant differences between voters with and without disabilities who reported difficulty understanding how to vote or use the voting equipment (10% voters with disabilities versus 1% voters without disabilities.) And last the National Federation of the Blind survey (N=537) found 25% of blind voters reported being unable to use the AVS (it was not set-up, poor instructions, no assistance from poll workers, etc.)

The ATAP-RAAV project implemented and gathered data on voting system demonstration activities in six states, Illinois, Missouri, Montana, North Dakota, Oklahoma and New Jersey. In three states (Illinois, Missouri, and New Jersey) a local jurisdiction was identified in which to provide voting system demonstrations as these states use different voting equipment at a county level. In North Dakota, Montana and Oklahoma, the demonstrations were done statewide as those states use the same voting system in all counties.

The voting system demonstrations were provided by experienced AT Program staff and were designed to familiarize voters with all types of disabilities with the accessible voting system used by their voting jurisdiction. A pre and post test was administered to each person participating in the demonstration asking them to rate their level of comfort using the accessible voting system on a scale of 1 to 10 and indicate how they typically vote (at polling place, absentee, etc.). Basic demographic data (e.g. age range, type of disability, prior AT use) was also reported on each individual participating in the demonstration. Observations by the person providing the demonstration were used to report the type of access feature(s) used, the amount of time it took for the voter to become comfortable and independent using these access feature(s), and what could have been done to improve the access features to better meet the voter's needs. Each demonstration participant was also asked to complete a relatively short standard ballot at the conclusion of the demonstration with data collected on the time it took to complete that ballot. This ballot included six candidate races with five to 15 choices. In five races, the voter was to vote for one candidate and in one race, the voter was to select three candidates. The ballot also included one proposition and one amendment.

The initial hypothesis for this project was -- *voters who participate in a quality demonstration/training of the accessible voting system will be more confident and able to use the access features of the voting equipment and will be more likely to go to a polling place and use the accessible voting system (if they do not currently do so).* It was also postulated that there would be differences in the amount of time it took for individuals to become comfortable with and independent in using different access features and it seemed logical that more complex features would require more extensive demonstration/training time. If the results were positive, we hoped that the data collected along with informal feedback and discussion with those providing the demonstrations/trainings would provide insight into how to best implement more comprehensive demonstration/training activities at a local or state level to obtain the desired outcome of more voters with disabilities being able to use accessible voting systems to vote privately and independently (as was the vision of HAVA).

Demonstration Data Summary

A total of 506 demonstrations were done with complete data reported in the period of March 2012 through April 2014. The largest disability represented was vision limitations (64%). The next largest group was motor limitations (27%) then intellectual disability (16%). The remaining disability groups (hearing, speech, and other) were much smaller (from 8% to 4%). The category of "other" was primarily used when a participant refused to disclose their disability, or no accurate classification could be made based on observation, or the person had a combination of limitations that made it difficult to identify each individually.

The age of the demonstration participants included a majority of seniors (47%) and middle aged individuals (36%) with the remainder young adults (17%). Exact ages were not collected as it was anticipated that some participants would be reluctant or would even outright refuse to provide their age.

A little over half of the participants reported that they used assistive technology. However, when the list of AT used was analyzed, most of the devices used were rather "low tech" items in terms of consumer expertise in using them (e.g. canes, glasses, walkers, manual wheelchairs and similar items.) Less than 10% of the participants were using computer adaptations or similar AT devices which would provide some transferable experience to the access features of a voting system. The most common AT devices used by this group were screen reader software, screen enlargement software or both which is consistent with the large number of participants with vision disabilities.

Table 1 summarizes the data on access features demonstrated and used by participants; observations about how long it took for participants to become independent in using these access features; and how long it took to complete a standard sample ballot.

TABLE 1

Access Feature	% of Demos	Minutes to Independent		% Never Independent	Minutes to Complete Ballot	
		Mean	Max		Mean	Max
Large Visual Display Output	44%	4.77	25	4.46%	10.49	35
Speech Output & Tactile Keypad Input	44%	4.50	25	16.12%	12.02	45
Synchronized Speech & Visual Display Output	11%	4.51	25	8.20%	11.61	45
Switch Input	1%	2.00	4	33.33%	16.33	35

Large Visual Display Output was used in 44% of the demonstrations. This access feature provides a larger text display on the screen of the accessible voting system. On most systems the size of the text in the large display mode is 6.3 to 9 mm or roughly equivalent to 18 point size font in hard copy print.

On average it took a little less than 5 minutes of demonstration/training for a participant to become independent using the large visual display output. However, for some participants it took 25 minutes of demonstration/training for the person to become independent and 4% of these participants never became independent even after extensive demonstration/training. On average, it took 10½ minutes for individuals to complete the sample ballot using the large visual display output; but took some individuals 35 minutes to do so.

Speech Output with Tactile Input (Audio Ballot) was used in another 44% of the demonstrations. This access feature provides a keypad or buttons that the voter can "feel" to control, navigate through and mark the ballot and provides speech output so the voter can listen to the ballot contents. Typically a voter uses a headset to listen to the speech output.

On average it took 4½ minutes of demonstration/training for a participant to become independent using the audio ballot. However, for some participants it took 25 minutes of demonstration/training for the person to become independent and 16% of these

participants never became independent even after extensive demonstration/training. It took an average of 12 minutes for individuals to complete the sample ballot using the tactile/audio interface; but took some individuals 45 minutes to do so.

Synchronized Speech & Visual Display was used in 12% of the demonstrations. This access feature delivers speech output in real-time with the text and images displayed on the screen. In some systems, only the regular size text can be seen when the audio output is active. In other systems, a voter can use the large size text with speech output so the voter is learning to use a combination of access features.

On average it took 4½ minutes of demonstration/training for a participant to become independent using synchronized speech and visual display. For some participants it took 25 minutes of demonstration/training for the person to become independent and 8% of these participants did not become independent even after extensive demonstration/training. It took an average of almost 12 minutes for individuals to complete the sample ballot using synchronized speech and visual display; but took some individuals 45 minutes to do so.

Switch Input was used in a very small number (1%) of the demonstrations. This access feature allows an individual to use a dual switch (such as a pneumatic air switch or "sip and puff") to control, navigate and mark the ballot. Most accessible voting systems will allow a voter to plug in their own dual switch if they already have/use one. The output used with switch input is typically the regular text visual display.

All but two participants who used switch input for the demonstration was an experienced switch user which makes this data impossible to compare to the other access features. On average it took 2 minutes of demonstration/training for the experienced switch users to become independent with a maximum time of 4 minutes required. On average it took a little over 16 minutes (35 minute max) to complete the sample ballot using switch input. The two individuals who were not already switch users were unable to become independent using the switch input.

Table 2 provides a summary of this same data categorized by voter age. Overall, there are no major differences between the three age groups on any of these measures. Based on this data, it appears that indeed the complexity of the access feature is a greater influence on the amount of demonstration/training time that will be required than does age.

TABLE 2

Age Group	N	Minutes to Independent		# Never Independent	Minutes to Complete Ballot	
		Mean	Max		Mean	Max
Senior	238	4.93	25	9%	11.18	45
Middle Age	182	5.45	25	9%	10.47	35
Young Adult	86	4.25	25	10%	10.80	30

Table 3 provides aggregate data on the minutes of demonstration/training required to reach independent use of any/all of the access features. And Table 4 provides that same data broken down into age groups.

TABLE 3						
Minutes to Independent Use	**1 to 2 minutes**	**3 to 4 minutes**	**5 to 9 minutes**	**10 to 14 minutes**	**15 to 25 minutes**	**25+ never reached**
N	168	89	117	53	31	48
Percent	33%	18%	23%	11%	6%	9%
Percent	51%		34%		15%	

TABLE 4						
Minutes to Independent Use	**1 to 2 minutes**	**3 to 4 minutes**	**5 to 9 minutes**	**10 to 14 minutes**	**15 to 25 minutes**	**25+ never reached**
Senior	27%	24%	26%	9%	5%	9%
	51%		35%		14%	
Middle Age	34%	11%	24%	14%	8%	9%
	45%		38%		17%	
Young Adult	47%	14%	15%	8%	6%	10%
	61%		23%		16%	

This data indicates that the majority of voters, regardless of age, will be able to become independent using an AVS with less than 5 minutes of demonstration/training time. In addition, the data shows that vast majority of voters with disabilities can become independent with less than 15 minutes of demonstration/training time. Less than 10% of voters were unable to become independent in this study.

Pre/Post Participant Self-Rating Results

Each demonstration participant was asked to respond to the following question prior to and after the demonstration/training.

On a scale of 1–10, how comfortable are you using the accessible voting system?

1 2 3 4 5 6 7 8 9 10

Not at all comfortable Somewhat comfortable Very comfortable

Since this data is self-reported by the participant, it is a subjective perception and could be influenced by any number of extraneous factors. For example, a participant might feel they should affirm the quality of the demonstration by reporting an increased comfort level. Or a participant that never achieved independence or one that struggled a long time to complete the sample ballot might be so frustrated by the time they complete the post survey that they report a decreased comfort level.

However, even with these potential external influences, the data was relatively consistent in showing an increase in comfort level. The mean comfort rating provided by participants prior to the demonstration/training was 4.47 and the post comfort rating was 8.02. This represents almost a 4 point increase in self-rating of comfort level after participating in a demonstration/training activity. Almost 20% increased their comfort rating by 8 or 9 points (moving from not at all comfortable to very comfortable) suggesting a large improvement in their confidence in using the AVS.

Prior to participating in the demonstration, 80.04% of participants reported they voted at a polling place, 8.5% indicated they voted absentee, another 4.15% reported they vote both ways and 7.31% indicated they did not typically vote. Post-demonstration, 85.97% of participants (an almost 6% increase) reported they would vote at their polling place. Correspondingly, the numbers for voting absentee and especially not voting at all dropped significantly. This suggests that the demonstration/training does increase voter comfort level sufficient to improve use of accessible voting systems. Table 5 below summarizes this pre and post demonstration data.

	Polling Place	Absentee	Both	Do Not Vote
Pre-Demo	80.04%	8.50%	4.15%	7.31%
Post-Demo	85.97%	7.71%	3.75%	2.57%
Change	+5.93%	-.79%	-.40%	-4.74%

Access Feature Comments

For each demonstration/training, the participant and/or staff provider was asked to report any recommendations they would make to improve the access feature(s) to better meet the needs of the voter with a disability.

1. By far the most frequent suggestion was that the voting system needed to provide larger text size display. Most systems currently have only two text sizes, regular and large, with the large at about standard large print size. For many individuals with vision loss, there is no doubt that this “large” size is simply not large enough to be functional.

2. Another frequent recommendation was for the touchscreen and/or tactile keypad to have larger strike areas and adjustable sensitivity so that less or more pressure could be used to activate. This is a typical access feature for most assistive technology products that have a touchscreen interface. The highly variable range of motor skills and limitations makes it almost impossible to establish a “norm” to use for strike area size and sensitivity. Thus if the touchscreen could be adjusted, it would be usable by many more individuals with disabilities. One participant commented “the boxes need to be larger since I have to use my whole hand to tap the screen”.

3. Another suggestion frequently made was to improve the audio navigation and general instructions. For many voters who had experience with speech output systems, they found the voting system “unsophisticated” when compared to the technology they routinely use. Conversely, voters who had no technology background found the audio

navigation bewildering and overly complex. Obviously there is much room for improvement in these features, but it may be a challenge to meet the diverse needs of voters based on their differing levels of technology experience. Again, adjustability would seem extremely helpful.

4. Even with the limited number of demonstrations that used the switch input, a similar recommendation was made about the need to improve the navigation programming of the dual switch input. Since that is frequently simply a modification of the core software as the audio navigation, this concern was not unexpected.

Based on voter comments about the need for larger text display, additional research was implemented in May of 2013. When a voter participating in a demonstration reported the text size displayed on the AVS was not large enough, the voter was moved to an electronic enlarging system that would enlarge text to the voters preferred size. That size was recorded in millimeters since that is how the large visual display of an AVS is standardized.

A total of 94 voters with visual impairments who indicated the AVS text size was not large enough participated in this expanded research. The mean preferred text size for these individuals was 17.46 mm. The standard large text display as specified in the Voluntary Voting System Guidelines (VVSG) is 6.3 mm-9 mm and this finding suggests that the standard may be inadequate in meeting the needs of voters with visual impairments.

These voters were asked to use the electronic enlarging system to mark a ballot to gather information about the viability of using such equipment for that purpose. While 65% of these voters were able to use the electronic enlarging system to mark a ballot, only 12% preferred using the electronic enlarging system to the AVS. Most reported the visual-motor coordination needed to use the electronic enlarging system to be extremely challenging which made using the electronic enlarging AT an undesirable method for marking a ballot.

While these recommendations suggest there is plenty of room for improvement in the access features of currently deployed AVS, it is important to remember that the vast majority of the participants were able to become independent users after a short demonstration and training of about 5 minutes. This indicates that the current equipment does provide a solid array of access features that enable voters with different needs to vote independently provided they have the opportunity to interact with a system before hitting the door of the polling place.

Analysis / Discussion

The overall data findings support the hypothesized (and hoped for) increase in the rating of comfort level with the accessible voting system after participation in the demonstration/training. There was also an increase in voters reporting they would go to their polling place to vote post demonstration and a decrease in individuals not voting at all. When viewed in total, this data supports the use of demonstration/training activities as a

viable mechanism to increase effective use of accessible voting systems by the vast majority of individuals with disabilities.

The fact that less than 10% of the individuals who participated in a demonstration had background experience with assistive technology that would generalize to learning to use the access features of a voting system is assumed to be a major factor in the need for demonstration/training and how much time was required to become independent. An individual with no transferable skill set will certainly need demonstration/training time to become effective in using the AVS.

This assumption was supported by the perceptions of the AT experts providing the demonstration/trainings. They reported that the speech output/tactile input and switch input were the more complex features to demonstrate and challenging to ensure that voters were able to use them independently. However, more participants who needed these access features had "high tech" AT experience and were able to master the access features fairly quickly.

One somewhat unexpected result was found in the data comparisons of the access features. While the data did not show significantly more demonstration time required for voters to become independent using the complex access features, other interesting differences emerged. The more complex access features of speech output/tactile input and switch input did have a much larger percentage of individuals who were unable to become independent using those access features. This probably reflects not only the relative complexity of those access features but also limited voter background experience with AT.

Switch input seems clearly to be an access feature that a voter must have prior experience in using to become effective utilizing that access feature on a voting system. This certainly seems to support the concept of ensuring that AVS have a universal switch coupling system to allow voters with disabilities to use their own switches.

It is interesting to note that the data shows a mixed age impact on the time required to become independent. While younger voters are able to become independent with a 1 to 2 minute demonstration, seniors and middle age voters "catch-up" when the demonstration time is expanded to 4 minutes of demonstration time. And this trend continues through up to 9 minutes of demonstration time and for even longer demonstration times there are no real age differences. The number of individuals who did not become independent is relatively equal for all three age groups suggesting little age impact in that area.

The fact that some individuals never became independent using the access features even after extensive demonstration/training confirms that a few voters with disabilities will continue to need alternatives available to using the AVS, most likely voting with human assistance using a procedure approved by the jurisdiction.

Overall lack of experience with an electronic "computer-like" interface also seems to be a contributing factor to the need for extensive demonstration/training time for many participants. In the few jurisdictions where ALL voters use the same electronic interface to

vote (and voters with disabilities simply "add-on" the access features) there appears to be a higher baseline level of comfort in using the voting system electronic interface. As a result, it takes less time for a voter with a disability to become comfortable using the access features as they are simply learning the access feature, not an overall new voting interface (as compared to hand marking a paper ballot.) This research did not have a sufficient number of demonstrations in a jurisdiction where all voters use an electronic interface to make a definitive statement about the different this makes, but it does appear to have an impact. Similarly, survey research conducted in Tennessee (where all voters use an electronic interface) as compared to Missouri where that is not the case found a significant difference in voters self-perception of their ability to use the AVS along with a difference in poll worker ability to support the AVS. All of this research suggests an accessibility benefit by having all voters use an electronic interface.

What is very clear from the demonstration research to date is that the vast majority of voters can become independent through hands-on demonstration/training support. It is also quite clear that these demonstrations will require far more time and expertise than typical poll workers will be able to provide on an election day in a busy polling place. The data indicate that it is unreasonable to expect voters with disabilities to show up at a polling place and "intuitively" be able to use the access features of a voting system without any prior demonstration and training. The data also suggest that demonstration/training should be provided for voters with disabilities before they go to the polling place and attempt to use an AVS -- or those systems will continue to be poorly utilized.

Recommendations

The overall data results support the use of demonstrations as a viable mechanism for increasing the effective use of AVS. Rather than the old idiom "familiarity breeds contempt" – in this case the data supports the supposition that familiarity through demonstration and training produces a greater level of comfort with AVS and a greater number of individuals who will go to their polling place and use the AVS. Comments from those doing the demonstrations included stories of voters who were now well versed enough with the accessible voting system to not only go to the polling place and vote independently but also to help their local poll workers better understand how to use the accessible equipment.

Election officials are encouraged to consider implementing a system of AVS demonstration/ training in a tiered approach.

- Community organizations (e.g. senior centers, libraries, etc.) could be used to provide demonstrations/trainings after appropriate training. The data would suggest that the needs of about half of voters with disabilities could be met this way since they require less than 5 minutes of demonstration/training.
- Disability organizations such as independent living centers, developmental disability organizations, etc. could be used to provide demonstration/training to those individuals who need 5 to 15 minutes (34%)
- Assistive technology centers could be used to provide the intensive demonstration /training needed by the 15% who need more than 15 minutes.

Since voters with disabilities will take longer to complete a ballot using the access features of an AVS, access to early voting is highly desirable. Voters with disabilities should be able to use the AVS without feeling pressured by a busy polling place. No matter how efficient a voter is using the access features, they will take longer to vote their ballot and early voting can ensure they are able to vote privately and independently using the AVS.

Another idea election officials might consider is using a roving assistive technology expert on election day to support those voters with disabilities who do come to the polling place without any experience in using the AVS. This person could be "on call" to deliver the kind of intensive demonstration/training that a poll worker could not be expected to provide. An interesting suggestion is to utilize graduate students in an area such as occupational therapy as these "roving AT specialists" since these students have extensive assistive technology background as part of their academic training.

Equipment Access Challenge

Obtaining voting equipment to use for demonstration/training was more problematic than anticipated. Local voting jurisdictions place legitimate restrictions on "lending" out equipment because it will have to be returned for an election; there are liability fears; and other concerns that make it difficult to use jurisdiction owned equipment for demonstration/training purposes. Doing demonstration/training activities on a wide scale basis in states that use different voting systems increases these challenges as multiple AVS must be obtained to demonstrate.

To complicate this issue further, vendors are extremely reluctant to allow anyone other than election officials to purchase an AVS. Again while there are legitimate reasons for their reluctance, it makes it very difficult to obtain an AVS to do demonstrations/trainings. For purposes of this research, we were able to borrow an AVS from a number of election officials for limited time periods and in one state the AVS was rented from the vendor. In all cases the vendors were paid to program the ballot we used for this research.

One possible solution to this problem would be for manufacturers to create machines that were specifically designed to be used only for demonstration/training purposes (ones that did not tabulate or have other features that create security concerns by being widely available). If these devices could be obtained by State AT Programs or other disability organizations that were willing and had the expertise to do demonstrations, the challenge of borrowing equipment from election officials would be greatly reduced. (This would be especially true when the device borrowed is part of the pool of equipment that will actually be used in an election).

Further Research Thoughts

Three overarching needs for further research and/or accessibility initiatives emerged as a result of the ATAP-RAAV experience. This experience included the research data

summarized in this report along with extensive feedback collected from election officials during numerous workshops, seminars, and collaborative events with the Election Center.

1. Research to Improve AVS Access Features

Large Visual Display

As noted by the ATAP research, the current large text visual display does not meet the needs of many or even most individuals with visual impairments. Unless the large visual display is improved, many individuals who have low vision will be forced to use an audio output which is fraught with problems, especially for seniors. (Seniors will be the majority of low vision voters who need the larger text size and yet they are also highly likely to have age related hearing loss in addition to their visual impairment which makes asking them to use an audio output unrealistic.)

Future research should be done to identify an optimal large text display size or range that will still allow appropriate ballot layout to be used. This research will also need to identify an appropriate screen size that is required to display the large text. These research results should be used to update the VVSG to better meet the needs of individuals with visual impairments.

Touchscreen Strike Area Size

Similar to the large visual display issue, research is also needed to identify an optimal "strike area" to activate items on the touchscreen of an AVS. Many of the ATAP research participants indicated that the strike area was not large enough for their motor limitations. If text size is increased significantly on a display screen that also functions as the input touchscreen for a voting system, it seems logical to assume the strike area would increase correspondingly. Research should be done to determine if this size increase is sufficient to meet the needs of individuals with a range of fine motor limitations.

Audio-Tactile Interface

Future research is needed to identify mechanisms that can be added to the audio-tactile interface to improve efficiency of the navigation and control. Researchers should explore techniques already shown to be successful in creating effective and efficient audio navigation and control in existing assistive technology products (e.g. screen readers such as JAWS and Window-Eyes) and identify if/how those could be utilized in an AVS. While simple linear and proactive navigation may need to remain (i.e. the voter must perform an action to move linearly through the ballot), there should be options for AVS to also include shortcuts and other features that will increase the efficiency of the AVS by those voters who have AT experience.

Switch Input Interface

Parallel to the audio-tactile interface, future research is also needed to identify mechanisms that will improve the efficiency of using a switch for navigation and control of an AVS. A current, typical AVS provides simple dual switch software that requires the voter to take an affirmative motor action (e.g. striking the A part of the

switch) to move through each selection on the ballot, each race, each candidate, each referenda, etc. It then requires the voter to take another affirmative motor action to activate the B part of the switch to select the item when they reach it – making the overall process extremely slow and laborious.

Individuals who use switches in their everyday life have scanning built into the switch software which is set up to automatically move through selections once activated. So the individual only uses a motor action to activate the scan, then uses another or same motor action to select. They can also provide other commands such as go back so they are not locked into a one-way linear sequence of navigation and control.

Again similar to the audio-tactile interface, researchers should explore techniques already shown to be successful in creating effective and efficient switch navigation and control in existing assistive technology products that are used for computers as that would provide the most direct relevance for an AVS. Strategies used by switch AT should be identified that might be used in an AVS to improve efficiency and options for software that would support switch types beyond just a dual switch should be explored, e.g. single switch and those with 3, 4, 5 or more switch activation options.

2. Research to Support Accessibility of Absentee or Remote Paper-Based Voting

A massive unmet accessibility need was identified via discussion with voting jurisdictions who primarily or exclusively utilize mail-in or similar non-polling place mechanisms with hand-marked paper ballots. The totality of the voting process in these situations is inaccessible – marking the ballot, verifying the vote selections, and casting the ballot.

A few jurisdictions have experimented with providing a mailed or downloadable digital file that includes the content of the voter's ballot allowing that voter to use the digital file with their own computer and assistive technology to mark the ballot. While this strategy can provide access to marking the ballot, it does nothing to address accessible verification or casting of the ballot. It also is dependent on individuals with disabilities having their own computer with robust AT that will support this kind of activity. The vast majority of people with disabilities do not have that kind of technology access. It also requires a reasonable level of understanding in how to construct an accessible file format for the digital ballot or it will not be compatible with voter used AT. And lastly it is likely that the ballot that is printed by the voter with a disability will have to be "hand copied" by election officials onto a ballot format that can be machine read and counted which is certainly not desirable and adds one more opportunity for human error to occur. This area is ripe for research that will improve the almost complete lack of accessibility that is currently available.

3. Research to Support Accessibility of Supportive Voting Functions

Another critical research need illuminated in discussion with election jurisdictions was for policy guidance and technical support to ensure accessibility of web sites, web-based voter registration systems, and other voter educational materials provided on the web and in hard copy format. While web based information can be made readily accessible, just because it is in electronic form on the web does not ensure that the content is accessible. Voting jurisdictions identified a significant need for resource materials that would help them understand their legal obligations for web and educational material accessibility along with technical support resources to help their web developers build accessibility into their web sites. With growing use of the web as a primary voter registration and education tool, the need for accessibility will increase over time. While this may not be a "pure research" area, it is certainly one that election officials identified as a critical need for additional resources and supports.

Resource Guide

The ATAP-RAAV project also produced a resource guide, *Guide to Disabilities and Voting System Access Features*, which describes the range of functional limitations that individuals with disabilities have that impede voting privately and independently along with descriptions of the access features of current accessible voting systems that can be used to address those limitations. The Guide also includes appendices with national disability organizations with state affiliates who could be helpful resources to state and local election officials. The goal is for this Guide to help election officials along with voting system developers and others better understand the relationship between access features and functional limitations and how to best reach a broad spectrum of individuals with disabilities. This Guide can be downloaded from http://ataporg.org/docs/RAAV%206.27.13%20publish.pdf.

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For more information about the ATAP-RAAV activities see http://ataporg.org/voting.html

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