Any device, anywhere, anytime: a bibliography on voting, accessibility and mobile

The primary outcome of our ITIF-AVT grant was a ballot interface prototype that can be used on any device, including tablets, smartphones, or desktops. This ballot interface is available at http://anywhereballot.com.

In the tradition of universal design, our ballot interface leverages the robust assistive technologies available for desktops and other devices, while making the ballot instructions and ballot marking interaction usable for both expert users and users who don't read well or who have mild cognitive impairment.

The ballot interface was tested on a tablet, with a range of participants including

- participants with measured low literacy levels
- seniors with high literacy but unfamiliar with tablets
- seniors with low literacy and unfamiliar with tablets
- participants with mild cognitive impairment.

We found that the combination of plain language and plain interaction made the ballot interface accessible for most participants—even those unfamiliar with tablets.

This annotated bibliography supported our ballot interface design work, and primarily includes sources about ballot design and about designing for audiences with low literacy skills and mild cognitive impairment. It also includes some sources about barriers to voting, voting trends, and voting technologies, including voting on mobile devices. The bibliography grew and expanded over the course of the project, as we encountered questions and sought to integrate our research findings with the work of prior researchers. The bibliography was also shaped by the needs of our project team, who had varying degrees of familiarity with the voting space and with the range of assistive technologies currently available.

Prior work on ballot design and accessibility

Our goal was to start with best practices in ballot design. Most of the seminal sources in this area will be found below.

General principles of ballot design are well understood. The baseline was set in work commissioned by the Election Assistance Commission (EAC) and researched by AIGA's Design For Democracy, which became *Effective Designs for the Administration of Federal Elections* (http://www.eac.gov/assets/1/workflow_staging/Page/70.PDF). This set of best practices for ballot design includes design specifications for many types of printed materials used on Election Day, from signs to ballots. It also proposes a basic framework for a digital user interface. NIST created their internal "calibration machine" based on this proposed UI, which runs on a commercially available touch screen tablet.

The National Institute of Standards and Technology (NIST) and the EAC have worked since the Help America Vote Act (HAVA) became law in 2002 to establish standards for voting systems. The current version of the standard, Voluntary Voting System Guidelines (VVSG) 2.5, covers usability and accessibility in Chapter 3 -- addressing hundreds of accessibility issues mainly for people with low vision or who are blind. The VVSG also addresses accessibility for people with cognitive disabilities through standards on usability and plain language.

Designing for voters with lower literacy skills and cognitive disabilities

We also include many sources about designing Web and mobile interfaces for people who don't read well or who are older.

The primary challenges in designing for lower-literacy audiences, readers with cognitive disabilities, and other at-risk audiences such as the elderly are to accommodate their need for sequential processing, to guide interaction effectively, to provide clear feedback, and to help users avoid, discover, and recover from errors. Supporting sequential rather than concurrent demands for cognitive processing improves both understanding and performance. However, understanding and performance also improve when users can see the structure of the information or task they are performing.

In the context of voting, a ballot that showed all the races at once in an overview led to fewer errors in voting choices; a comparison ballot that showed a single race at a time led to reduced undervoting but led to a somewhat higher error rate. Our challenge was to provide the specificity and clarity of a "single race at a time" interaction and also provide an effective "review" experience that allowed users to review and confirm their votes successfully.

References

[1] Assistive technology for access to computers. (2009). Wisconsin Assistive Technology Initiative.

This article describes the different types of assistive technology needed in classrooms. It also discusses the factors to consider when assigning computer tasks for individuals with cognitive disabilities, such as vision, motor skills, fatigue/strength, attention and computer skills.

Tags: Assistive Technology, cognitive impairment

[2] Alvarez, R., Levin, I., & Sinclair, J. (2012). Making voting easier: Convenience voting in the 2008 Presidential election. Political Research Quarterly, 65(2), 248-262.

The authors analyze the choice of voting mode (in-person, early voting, and mail-in) in the 2008 presidential election using a large-sample survey. Convenience voting was defined as those voters who opted to either vote early or mail-in their votes. The research found that over the past decade convenience voting has gone from being a novelty to being quite common. It was determined that convenience voting does not have anything to do with partisan voting; the Republican Party does not do better with convenience voting. Elderly voters and those with disabilities are more likely to vote by mail.

Tags: Voting standards, seniors, cognitive impairments

[3] Astrauskas, M. J., John A. Black, J., & Panchanathan, S. (2008). A demonstration of phototacs: A simple image-based phone dialing interface for people with cognitive or visual impairments. Paper presented at the Proceedings of the 10th international ACM SIGACCESS conference on Computers and accessibility. doi:10.1145/1414471.1414547

New technology and software can be difficult for users with cognitive disabilities to use. This article discusses the relation of a simplified, image based phone dialer for disabled users that would rely on visual cues and images of contacts rather than names or phone numbers.

Phototacs can be used on any smartphone and consists of two screens. The primary interface, the dialer screen, allows a user to scroll through the images of contacts. The user places a call by tapping the handset icon or the image of the selected person. The configuration screen allows users to add, remove or edit

the contacts in the phone book. The user can take a picture or use a picture already stored in their phone.

Tags: Assistive Technology, cognitive impairment

[4] Baker, P. M. A., Roy, R. G. B., & Moon, N. W. (2005). Getting out the vote: Assessing technological, social and process barriers to (e)voting for people with disabilities. Paper presented at The Twenty-Seventh Annual APPAM Research Conference.

Results of a voter survey to assess voter satisfaction and issues with the current ballot system. While e-voting tools have improved access, voting systems are not yet completely accessible. Researchers focused on the voting experiences of people with disabilities in a telephone survey of 1,240 following the November 1998 elections and found that voter turnout was 20 percent lower among people with disabilities than among those without who had otherwise similar demographic characteristics. The study also found that the implications of disabilities extended beyond resource constraints to include social and psychological effects that decrease voter turnout due to decreased social capital and decreased identification with mainstream society.

Tags: Ballot design, cognitive impairment, remote voting

[5] Bederson, B. B., Lee, B., Sherman, R. M., Herrnson, P. S., & Niemi, R. G. (2003). Electronic voting system usability issues. In Human Factors in Computing Systems: Proceedings of CHI 2003, (pp. 145–152). New York: ACM. doi:10.1145/642611.642638

Usability reports on electronic voting machines finding 10% of users unsatisfied or confused with the technology. This article chronicles the challenges of voting and how many voters are afraid to ask for help. There is not training for voters and the first time most voters see the voting technology, they are already in the booth ready to cast their ballot.

Aside from voter troubles, this article explains the problems with voting machines as well. State or county purchasers are usually more concerned with the cost than the usability of machines and once the systems are purchased, the public has no access to the machines for evaluations. In addition, election workers who design the ballot tend not to have usability experience and pill workers who deploy the voting system have minimal training or support to cope with problems.

Tags: Barriers to voting

[6] Berkeley, S., & Lindstrom, J. H. (2011). Technology for the struggling reader: Free and easily accessible resources. TEACHING Exceptional Children, 43(4), 48-55.

The article highlights several assistive technologies available for teachers in reading practice and instruction to use with students who are struggling readers, including text to speech features and text modification tools that can be used to summarize information and to reformat screen views in word processors such as Microsoft Word.

Tools available in Microsoft Office include the Readability Statistics tool (generates a grade level score for content) and the AutoSummarize tool (highlights key points in the reading). The Internet browser, Firefox has a "readability" add-on that strips away extraneous page elements for the user. This add-on gives the user the ability to change the way they view the page (newspaper, novel, e-book, etc); the font size (small to extra large); and margin settings.

Tags: Assistive technology, low literacy

[7] Bodine, C., & Scherer, M. J. (2006). Technology for improving cognitive function. A workshop sponsored by the U.S. Interagency Committee on Disability Research (ICDR): Reports from working groups. Disability & Rehabilitation, 28(24), 1567-1571. doi:10.1080/09638280601071151

This paper discusses the results of a two-day conference on Technology to Improve Cognitive Function, sponsored by the Interagency Committee on Disability Research in 2006. The committee agreed that there is little technology for people with cognitive disabilities, despite the growing need. Since Alzheimer's/Dementia is recognized as a large problem and better defined than cognitive disability in general, it may be the place to start in determining cognitive impairment or decline and appropriate assistive technology.

This article also includes guidelines created by the committee to address cognitive issues and aging, education, and technology.

Tags: Assistive technology, cognitive impairment

[8] Brown, V. (2010). Digital media learning supports individuals with cognitive disabilities. Childhood Education, 87(1), 68.

Students with different cognitive disabilities often have reading difficulties caused by visual discrimination, audio processing problems, attention span difficulties, or short-term memory impairments. The advantage of using websites is the ability to integrate different types of digital media. This integration of

media allows interaction with content in ways a static textbook cannot offer, since media may use animation, hypertext, and clickable diagrams.

Tags: Cognitive impairment, universal design

[9] Campbell, B., Tossell, C., Byrne, M., & Kortum, P. (2011). Voting on a smartphone. Proceedings Of The Human Factors And Ergonomics Society Annual Meeting, 55(1), 1100.

Researchers developed a mobile voting system for the iPhone and compared its usability with traditional voting platforms.

Smartphones offer remote participation in elections through the use of pervasive technology, potentially increasing voter participation while allowing voters to use familiar technology. Results showed that the mobile voting system was not as efficient as the other voting methods in total interaction time. However, smartphone owners committed fewer errors on the mobile voting system than on the traditional voting systems.

Tags: Ballot design, voting trends, remote voting

[10] Chaudry, B. M., Connelly, K. H., Siek, K. A., & Welch, J. L. (2012). Mobile interface design for low-literacy populations. In Proceedings of the 2nd ACM SIGHIT International Health Informatics Symposium (pp. 91–100). doi:10.1145/2110363.2110377

This paper presents two different research studies; the first study tested four graphical user interface widgets, the second study tested three cross-page navigation styles. The four tested widgets were interactive icons, check boxes, radio buttons, and scrollbars. Participants performed best with radio buttons and preferred them to the other widget options.

In the second study, three different navigation paths were tested; namely, linear, hierarchical, and cross-linked modes of navigation. Participants performed better with linear navigation because low-literacy users tend to want to start each new task in the same place and start over whenever they want.

Tags: Low literacy, plain language, plain interaction, remote voting

[11] Chisnell, D., & Redish, J. (2005). Designing web sites for older adults: Expert review of usability for older adults at 50 web sites (Vol. 1, pp. 1-60). AARP.

This report outlines heuristics for the older users, age 50 and up, compiled from an expert review of 50 websites. Researchers found a wide variance in the

population's abilities and skills. The study covered various types of websites from travel and shopping sites to health insurance and financial planning sites.

Tags: Older voters

[12] Chisnell, D. E., Redish, J., & Lee, A. (2006). New heuristics for understanding older adults as web users. Technical Communication, 53(1), 39-59.

Outlines a set of 20 heuristics for evaluating websites for older users and describes a step-by-step methodology of persona-based and task-based heuristic review.

Tags: Older voters

[13] Chisnell, D., Becker, S., Laskowski, S., & Lowry, S. (2009). Style guide for voting system documentation: Why user-centered documentation matters to voting security. In Proceedings of the 2009 conference on Electronic voting technology/workshop on trustworthy elections (pp. 2-2). USENIX Association

This document outlines best practices in style, formatting and language guidelines for voting documentation for poll workers and election staff. At the very least, these guidelines form a basis for voting system test laboratories to evaluate documentation.

Tags: Voting statistics, ballot design, plain language

[14] Chisnell, D. (2010). Looking at accessibility as a design problem. Interactions: New Visions Of Human-Computer Interaction, 17(5), 43. doi:10.1145/1836216.1836227

Many voting systems were retrofitted for accessibility rather than designed that way. The standard approach to aiding disability has been to make the disability unvisible. But this paper asks, what if design could be used to destigmaztize disability?

Tags: Accessibility, cognitive impairment

[15] Coyne, K.P. and Nielsen, J. (2002). Web usability for senior citizens - Design guidelines based on usability studies with people age 65 and older. Nielsen Norman Group, April 2002, pp.126.

This paper emphasizes overlap between good design practices for a general population and Web usability for senior citizens, including limiting graphics and links on a page, and avoiding pop-up windows, rollover text, new windows, and

cascading menus. Other guidelines include avoiding small buttons, tables and splash pages, choosing text colors for good contrast, limiting required form information, and making a search tool forgiving of spelling errors.

Tags: Older voters, plain interaction

[16] Crow, K. L. (2008). Four types of disabilities: Their impact on online learning. Techtrends: Linking Research & Practice To Improve Learning, 52(1), 51-55. doi:10.1007/s11528-008-0112-6

Looks at visual impairment, hearing impairment, motor impairment and cognitive impairment and discusses how assistive technology and universal design can make online learning more accessible.

Tags: Cognitive impairment, assistive technology

[17] Dawe, M. (2006). Desperately seeking simplicity: how young adults with cognitive disabilities and their families adopt assistive technologies. Paper presented at the Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. doi:10.1145/1124772.1124943

Discusses reasons and context behind user abandonment of assistive technology in the home, emphasizing the need for ease of installation, use and upgrade both by the disabled user and a caregiver who may have to maintain, set up or otherwise use the equipment. Research was collected through interviews with parents and teacher of students with cognitive disabilities. Core research questions included, "What role does technology play today in the lives of families who have a child with cognitive disabilities?" - "How do families find, acquire and use these technologies?" and "What key factors increase or decrease the adoption of technology?"

Tags: Cognitive impairment, assistive technology

[18] de Joode, E., van Heugten, C., Verhey, F., & van Boxtel, M. (2010). Efficacy and usability of assistive technology for patients with cognitive deficits: A systematic review. Clinical Rehabilitation, 24(8), 701-714. doi:10.1177/0269215510367551

Comprehensive review of 28 papers representing 25 studies and 423 patients. Reviewers concluded the efficacy of assistive technology in general is not yet sufficiently studied in randomized controlled trials, although promising results have been reported. Several studies established that both potential users and clinicians have optimistic expectations about the usability of assistive

technology. Patients who did not use assistive technology were also surveyed about their desire and barriers to use.

Tags: Assistive technology, cognitive impairment

[19] Dill, D., Schneier, B., & Simons, B. (2003). Voting and technology: Who gets to count your vote?. Communications Of The ACM, 46(8), 29-31.

The ideal voting technology would have five attributes: anonymity, scalability, speed, audit and accuracy. But, in the rush to improving the first four, accuracy is being sacrificed.

Tags: Voting standards

[20] Disabled web use. (2012). Retrieved from http://www.w3.org/WAI/intro/people-use-web/Overview.html

W3C guidelines on how users with disabilities navigate the web, including people with age-related impairments. It also describes tools and approaches that people with different kinds of disabilities use to browse the Web and the design barriers they encounter. It includes principles for creating accessible websites, web applications, browsers, and other web tools.

Tags: Cognitive impairment, older voters, universal design

[21] Everett, S. P., Greene, K. K., Byrne, M. D., Wallach, D. S., Derr, K., Sandler, D., & Torous, T. (2008). Electronic voting machines versus traditional methods: Improved preference, similar performance. Paper presented at the CHI '08 Proceedings of the twenty-sixth annual SIGCHI conference on Human factors in computing systems. doi:10.1145/1357054.1357195

SUS survey of paper and e-voting methods finding similar error rates but much higher SUS scores on e-voting machine between both novice and expert computer users.

In addition to individual ballot preferences, survey responses also revealed that in previous voting experiences in real elections, 12% of participants had been unsure whether their vote was cast correctly or would be counted. A larger 26% had previously worried about figuring out how to use a ballot or voting technology to cast their vote.

Tags: Barriers to voting, voter statistics

[22] Friedman, M. G., & Bryen, D. (2007). Web accessibility design recommendations for people with cognitive disabilities. Technology & Disability, 19(4), 205-212.

Offers 22 design recommendations for people with cognitive impairments. Findings came from a 2003 NIH conference on cognitive disabilities and the web. Recommendations included using picture and symbols along with text, simple text, consistent navigation, headings/titles, screen -reader support, large font, uncluttered layout, maintain white space, allow customizations, numbered lists instead of bullets, large navigation buttons on every page, color contrast, appropriate reading level, no right justification, voice captions, and feedback.

Tags: Universal design, cognitive impairment

[23] Fuglerud, K., & Rossvoll, T. (2012). An evaluation of web-based voting usability and accessibility. Universal Access in The Information Society, 11(4), 359-373.

In a 2011 study of web-based voting in Norway, researchers found that universal design principles were not fully understood or not prioritized for implementation by the solution providers. Researchers designed several e-voting prototypes and asked participants to rank them after use. One prototype was preferred by the majority of participants, including those with impairments, confirming that it is possible to avoid conflicting designs for users with different disabilities.

Tags: Voting standards, accessibility

[24] Gallo, R., Kawakami, H., Dahab, R., Azevedo, R., Lima, S., & Araujo, G. (2010, Dec). T-dre: A hardware trusted computing base for direct recording electronic vote machines. Proceedings of the 26th annual computer security applications conference, Austin, Texas. doi:10.1145/1920261.1920291

Provides overview of considerations needed when developing new e-voting systems. Goals include one voter/one vote, cast-as-intended, counted-as-cast, verifiability, privacy, and coercion resistance.

Tags: Voting trends, ballot design, barriers to voting

[25] Gilbert, J., McMillian, Y., Rouse, K., Williams, P., Rogers, G., McClendon, J., & Mitchell, W., Gupta, P. Mkpong-Ruffin, I., & Cross, E. (2010). Universal access in e-voting for the blind. Universal Access in The Information Society, 9(4), 357-365.

Electronic voting systems have made attempts to include disabled voters but have fallen short. Using recent developments in technology a secure, user centered, multimodal electronic voting system has been developed to study a multimodal approach for providing equity in access, privacy and security in electronic voting. The findings suggest that the proposed multimodal approach to voting is easy to use and trustworthy for all populations, including the blind and deaf.

Tags: Assistive technology, voting trends, barriers to voting

[26] Gilbert, J., Ekandem, J., Darnell, S., Alnizami, H., Martin, A., & Johnson, W. (2011). Accessible voting: One machine, one vote for everyone. 2011 Annual Conference Extended Abstracts on Human Factors in Computing Systems, Vancouver, BC.

Prime III is an open-source multi-modal electronic voting system. It allows users to hear or see candidate names while they cast their vote using their voice or touch. Candidates are randomly assigned to numbers and the voters speak numbers allowing for additional privacy. Voters can also sip/puff their vote and all voters receive a printed voting record.

Tags: Assistive technology, voting trends, cognitive impairment

[27] Gillespie, A., Best, C., & O'Neill, B. (2012). Cognitive function and assistive technology for cognition: A systematic review. Journal Of The International Neuropsychological Society, 18(1), 1-19. doi:10.1017/S1355617711001548

The review makes three contributions: (1) It reviews existing Assistive Technology for Cognition (ATC) in terms of cognitive function, thus providing a framework for ATC prescription on the basis of a profile of cognitive deficits, (2) it introduces a new classification of ATC based on cognitive function, and (3) it identifies areas for future ATC research and development.

Tags: Cognitive impairment, assistive technology

[28] Grabinger, S. (2010). A framework for supporting postsecondary learners with psychiatric disabilities in online environments. Electronic Journal Of E-Learning, 8(2), 101-110.

This article talks about cognitive disabilities and online learning. Many times when online tools are constructed they do not take into account people with cognitive disabilities, but the Center of Applied Special Technology has created a framework for online education and tools.

Tags: Cognitive impairment, assistive technology, universal design

[29] Grabinger, R., Aplin, C., & Ponnappa-Brenner, G. (2008). Supporting learners with cognitive impairments in online environments. Techtrends: Linking Research & Practice To Improve Learning, 52(1), 63-69. doi:10.1007/s11528-008-0114-4

Describes the lack of support to make education accessible to students who have suffered from disabilities and discusses the Center for Applied Technology and its educational framework, "Universal Design for Learning" which addresses the need to design curricula for all types of individuals.

Tags: Assistive technology, universal design

[30] Hall, T. E., & Alvarez, R. M. (2012). Defining the barriers to political participation for individuals with disabilities - Working paper. Washington D.C.: The Information Technology and Innovation Foundation - Accessible Voting Technology Initiative.

This working paper, a part of the Accessible Voting Initiative, provides an overview of disabilities in the U.S. as they relate to enabling voting. It includes a discussion of focus group results from disabled users and their voting preferences, discusses registration and voter rate by disability, income and education, and explains barriers to voting

Tags: Barriers to voting, voting statistics

[31] Hällgren, M. A. (2011). Technology and everyday functioning in people with intellectual disabilities: a Rasch analysis of the Everyday Technology Use Questionnaire (ETUQ). Journal Of Intellectual Disability Research, 55(6), 610-620. doi:10.1111/j.1365-2788.2011.01419.x

The purpose of this study was to explore and evaluate evidence of the validity of ETUQ among adult persons with intellectual disabilities, contributing to the awareness of what technologies are most often used by people with disabilities.

Tags: Cognitive impairment, assistive technology

[32] Huenerfauth, M. P. (2002). Design approaches for developing user-interfaces accessible to illiterate users. Proceedings of the 18th National conference on Artificial intelligence. Retrieved from http://www.aaai.org/Papers/Workshops/2002/WS-02-08/WS02-08-005.pdf

This paper presents "User-Interface Recommendations in Support of Universal Literacy Accessibility (URSULA)" to create a set of guidelines for developers to make systems accessible to illiterate users. It examines both technological literacy and written language literacy. Some of the guidelines presented in the article include highlighting important information, adapting for user's geographic location, adapting medical information based on user needs, communicating sequence, facilitating information use (printing, storing, bookmarking, adding notes), detecting and adapting to user literacy level, supporting speech-to-text, and providing "focus tracking" to show users what element of the system the content is referring to.

Tags: Universal design, low literacy, plain language, plain interaction

[33] Hurst, A., & Tobias, J. (2011). Empowering individuals with do-it-yourself assistive technology. Paper presented at The proceedings of the 13th international ACM SIGACCESS Conference on Computers and Accessibility. doi:10.1145/2049536.2049541

Looks at involving disabled users in development and modification of assistive technology to create products that suit their specific needs, and points to a lack of user-centered design in the overall assistive technology marketplace.

Tags: Assistive technology, cognitive impairment

[34] Jantz, C., Anderson, J., & Gould, S. M. (2002). Using computer-based assessments to evaluate interactive multimedia nutrition education among low-income predominantly Hispanic participants. Journal of Nutrition Education and Behavior, 34(5). 254-260.

This research was conducted to measure the effectiveness of interactive multimedia (IMM) with low-income Hispanic persons. Computer evaluations decrease both participant completion time and researcher analysis time. Additionally, participants may feel less intimidated by completing a questionnaire on the touch-screen computer.

Tags: New language learners

[35] Kantner, L. and Rosenbaum, S. (2003). Usable computers for the elderly: Applying coaching experience. IPCC 2003 Proceedings (Annual Conference IEEE Professional Communication Society). doi:10.1109/IPCC.2003.1245476

Explains the computer usage problems found among elderly populations from a 2003 study. Older users had trouble with dexterity, vision and typing. They were afraid of making mistakes, had trouble using folders and downloading attachments and found it difficult to create a search query. When asked, older users suggested simpler pages with less buttons, clearer back and forward buttons, fewer pop-ups or moving ads and search results that display associated groupings.

Tags: Older voters, plain interaction

[36] Kennedy, H., Evans, S., & Thomas, S. (2011). Can the web be made accessible for people with intellectual disabilities?. Information Society, 27(1), 29-39. doi:10.1080/01972243.2011.534365

This paper chronicles the Inclusive New Media Design (INMD) project, which brought together 31 designers and developers and 29 people with intellectual disabilities to explore best practices. It highlights simple steps for accessibility among people with mild impairments and discusses barriers that exist for accessibility. The paper defines a difference between cognitive disabilities and intellectual disabilities. It says, "cognitive disability can be acquired at any age, whereas learning disabilities are lifelong; cognitive disability usually refers to a specific condition, whereas intellectual disability is often characterized by a complex of cognitive impairments."

Tags: Cognitive impairment, universal design

[37] Koppell, J. G. S. & Steen, J. A. (2004). The effects of ballot position on election outcomes. The Journal of Politics, 66(1), 267-281. doi:10.1046/j.1468-2508.2004.00151.x

Article looks at the effect of name position on voting from a study of the 1998 Democratic primary in NYC. Each precinct rotated the position of the candidate names, showing that position of name on ballot does influence voting preference - the first name listed is statistically chosen more frequently.

Tags: Ballot design

[38] Laskowski, S. J., & Redish, J. (2006). Making ballot language understandable to voters. Proceedings of the USENIX/Accurate Electronic Voting Technology Workshop 2006 on Electronic Voting Technology Workshop (pp. 1–1). Retrieved from http://static.usenix.org/event/evt06/tech/full_papers/laskowski/laskowski.pdf

The paper discusses "the gap between best practices and typical ballot instructions." It reviews more than 100 paper ballots from all 50 states and the District of Columbia, sample ballots on three Direct Recording Electronic voting machines (DREs), and the online demonstration of voting on the web site of a fourth DRE. Recommended best practices include: "Best Practice 1. Tell people about consequences before they are likely to act. Best Practice 2. Put the context before the action in each instruction. Best Practice 3. Use familiar, common words. Avoid technical or specialized words that users are not likely to understand. Best Practice 4. Put instructions in logical order: First task, first; last task, last."

Tags: Ballot design, voting trends

[39] Lee, B., Chen, Y., & Hewitt, L. (2011). Age differences in constraints encountered by seniors in their use of computers and the internet. Computers in Human Behavior, 27. 1231-1237 doi:10.1016/j.chb.2011.01.003

This article looked at perceived barriers that older adults encounter when using computer-mediated information technology, including intrapersonal, interpersonal, structural, and functional constraints.

Tags: Older voters

[40] López-Guerra, C. (2012). Enfranchising minors and the mentally impaired. Social Theory & Practice, 38(1), 115.

Fairness in voting requires the inclusion of all members of the polity who have what the author calls the *franchise capacity*: the minimum necessary cognitive and moral powers to experience the benefits of having the franchise or the harms of disenfranchisement. The article argues that current age and sanity prerequisites for voting in most places fail to meet the demands of fairness and ought to be revised.

Tags: Cognitive impairment

[41] Making voting more accessible for veterans with disabilities. (2012, 0724). Retrieved from http://www.itif.org/publications/making-voting-more-accessible-veterans-disabilities

More than 40,000 American military personnel have been injured in Iraq and Afghanistan, and many of these Americans are undergoing lengthy recovery and rehabilitation treatments at hospitals far from home. Many barriers exist that may prevent these Americans from registering and voting in elections. Fortunately, improvements in technology and support services can make voting more accessible for these Americans and others who face barriers to participating in the electoral process.

Tags: Barriers to voting

[42] McGrew, G. (2012). Assistive technology for the voting process - working paper. Washington D.C.: The Information Technology and Innovation Foundation - Accessible Voting Technology Initiative.

Based on the 2010 American Community Survey from the US Census Bureau, there are an estimated 33.4 million people with disabilities in this country who are of voting age. While much progress has been made in voting accessibility over the past 30 years with the help of federal legislation (e.g., Voting Accessibility for the Elderly and Handicapped Act – 1984, Americans with Disabilities Act – 1990, Help America Vote Act – 2002) as well as many state initiatives, many barriers exist that can hinder or prevent people with disabilities from independently participating in the voting process. This report discusses the nature of that process, what functional abilities one needs to carry out tasks associated with the process, and what assistive technology (AT) products are used by people with disabilities that provide them the functional ability to perform these tasks independently. Additionally, this report tries to provide the reader a sense of the context of life with a disability through which the voter must navigate to successfully carry out voting. For some, effective AT products may not be enough to smooth the path to voting success.

Tags: Voting statistics, assistive technology

[43] Niemi, R.G., & Herrnoson, P.S. (2003). Ballot design: How to improve life at the ballot box. Spectrum: The Journal of State Government. 35-39

Discusses issues with current ballot designs and offers suggestions for future designs to help voters at the voting booth. Principles for a well designed ballot include: simplicity, instructional clarity, consistency, and equity. Flaws will cause problems for new and non-habitual voters; some might vote for wrong

candidates, while others might not vote for races they intended to solely because of bad design decisions. More knowledgeable voters (those who vote with regularity) will not be as tripped up by bad design.

Tags: Ballot design, plain interaction, plain language

[44] Nussbaum, M. (2009). The capabilities of people with cognitive disabilities. Metaphilosophy, 40(3/4), 331-351. doi:10.1111/j.1467-9973.2009.01606.x

Argues the law must go further in protecting people with cognitive disabilities by offering them equal access to education. Laws should treat people with cognitive disabilities as equal citizens and should show respect for them as equals. Which the article states means that the law must provide equal entitlement to medical care, housing, and other economic needs. Though, the author states the central theme is not about medical needs, but political needs.

Tags: Cognitive impairment

[45] Olson, K., Nordhaug, H.F. Internet elections: Unsafe in any home?. (2012). Communications of the ACM, 55(8), 36. doi:10.1145/2240236.22040251

Explores online voting systems and countries with internet voting election options, such as Norway, which launched a $40 million project in 2009 to design an electronic voting system for its 2011 elections. The system allowed repeated voting and only counted a voter's last vote. They also used a coding system to prevent tampering, by giving each voter a code on the back of the card mailed to them.

Tags: Voting trends, ballot design, remote voting

[46] Runyan, N. (2007). Improving access to voting: A report on the technology for accessible voting systems. Retrieved March 1, 2007 from http://www.demos.org/publication/improving-access-voting-report-technology-accessible-voting-systems

This document details the need for accessible voting systems for all voters. It states that the technology already exists and is a cheap fix that can be applied to many voting systems. Direct-recording electronic systems should only be used if they incorporate an accessible and truly verifiable paper ballot printer-scanner-verifier that converts them into more reliable ballot-marking devices, or their accessibility is substantially improved to fully comply with all the new VVSG accessibility requirements.

Tags: Ballot design, cognitive impairment

[47] Redish, J., & Chisnell, D. (2004). Designing Web sites for older adults: A review of recent research. *Retrieved June, 9*, 2008.

This article reviews web site design for older adult user and outlines common usability and design issues for that population. Researchers discuss various types of web sites, while focusing on interaction and navigation, information architecture, visual design and information design.

Tags: Older voters, plain interaction

[48] Redish, J. G., Chisnell, D. E., Newby, E., Laskowski, S. J., & Lowry, S. (2009). Report of Findings: Use of Language in Ballot Instructions. Retrieved from http://www.nist.gov/itl/vote/upload/NISTIR-7556.pdf

This report details the finding of research conducted on plain language in voting instructions; forty-five participants were asked to vote using a plain language version and a standard language version. The report found that participants were able to vote more accurately when using the plain language version ballot. Participants who first used the plain language version were able to better perform on the standard language version, as well.

Tags: Plain language, ballot design

[49] Redish, J. G., Chisnell, D. E., Laskowski, S. J., & Lowry, S. (2010). Plain language makes a difference when people vote. *Journal of Usability Studies*, *5*(3), 81-103.

This document discusses plain language guidelines created from an empirical study comparing a ballot with traditional language instructions) to a ballot with plain language instructions. Voters were more accurate when using the plain language ballot and 82 percent of voters said they preferred the plain language ballot.

Tags: Plain language, ballot design

[50] Selker, T., Goler, J. A., & Wilde, L. F. (2008). Who does better with a big interface? Improving Voting Performance of Reading Disabled Voters. MIT/Caltech.

Discusses the effect of ballot interface on user performance. Finds fault with current methods and suggests a hybrid solution that orients users and guides them through the ballot selection process. Results showed that voters with a diagnosed reading disability were able to perform much better on full-faced voting machines than those who seemed to have similar disabilities but were undiagnosed.

It was suggested that the diagnosis allowed voters to develop methods to compensate for their disability. However, even the best voters made at least two mistakes--an unacceptable error rate in light of the high stakes of voting.

Tags: Ballot design, low literacy

[51] Selker, T. (2007). Technology of access: Allowing people of age to vote for themselves. The McGeorge Law Review, 38, 1113. Retrieved from http://www.americanbar.org/content/dam/aba/migrated/aging/voting/pdfs/selker.authcheckdam.pdf

This article examines how new technology should make voting accessible to all users without relying on help from another person for assistance. It describes that many challenges can be addressed by better interface design: good viewability, redundancy of cues, clear and simple onscreen training materials, and the reduced cognitive complexity of onscreen environments. Simple interfaces with fewer buttons help voters have less to learn and tend to make fewer mistakes.

Tags: Ballot design, universal design, plain interaction

[52] Scherer, M. J. (2005). Assessing the benefits of using assistive technologies and other supports for thinking, remembering and learning. Disability & Rehabilitation, 27(13), 731-739. doi:10.1080/09638280400014816

Planning assistive technologies and other supports for individuals with cognitive disabilities requires a comprehensive and individualized assessment of current goals, past experiences with the use of technologies and other supports, and the person's predisposition to the use of alternative or additional supports. This paper discusses a foundation for the refinement of an existing assessment process to match technologies to individuals with cognitive disabilities.

Tags: Assistive technology, cognitive disability

[53] Shneiderman, B. (2000). Universal usability. Communications of the ACM, 43(5), 84-91.

The article focuses on the need of encouraging research on universal usability of computers to empower every citizen. Universal usability can be defined as having more than 90% of all households as successful users of information and communications services at least once a week. The goals include 1) to cope with the technology variety by supporting the 100-to-1 range of hardware, software and network access speeds, 2) the accommodation of enormous diversity of users and 3) bridging the gap between what users know and need to know.

Tags: Universal Design

[54] Shurkin, J. (2011). Call up the vote. *New Scientist*, 211(2831), 28.

Bryan Campbell and his colleagues at Rice University in Houston, Texas, designed an iPhone app for casting votes. They tested 55 people between ages 18 and 69, with and without smartphone experience, on their app and on paper. On average, users took 90 seconds longer to cast their vote on the smartphone system; however, the app did reduce the number of mistakes made in voting, among people familiar with smartphones. The researchers think they will be able to reduce the time taken by making adjustments to their app.

Tags: Ballot design

[55] Snyder, P. J., Jackson, C. E., Peterson, R. C., Khachaturian, A. S., Kaye, J., Albert, M. S., & Weintraub, S. (2011). Review article: Assessment of cognition in mild cognitive impairment: A comparative study. Alzheimer's & Dementia: The Journal Of The Alzheimer's Association, 7338-355. doi:10.1016/j.jalz.2011.03.009

Provides understanding for what older patients with cognitive disabilities can be expected to do.

Tags: Older voters, cognitive impairment

[56] Smith, B., Laskowski, S., & Lowry, S. (2009). Implications of graphics on usability and accessibility for the voter. E-Voting and Identity, 54–74. doi:10.1007/978-3-642-04135-8_4

This paper explores using graphics on ballots; their implications for usability and accessibility, and their impact voters, specifically those with cognitive disabilities. For the purposes of the paper, graphical elements are photographs, party logos, or informational icons. The paper examines the usability issues for graphics on ballots and provides arguments both for and against their usage. It further explores designing to accommodate cognitive disabilities including reading ability, verbal comprehension, memory and attention, visual comprehension, mathematics comprehension, and problem-solving ability.

Tags: Ballot design, cognitive impairment

[57] Stock, S. E., Davies, D. K., Wehmeyer, M. L., & Lachapelle, Y. (2011). Emerging new practices in technology to support independent community access for people with intellectual and cognitive disabilities. Neurorehabilitation, 28(3), 261-269.

This paper discusses historical and emerging practices related to physical access to community based information for individuals with cognitive disabilities such as intellectual disability, autism, or traumatic brain injury.

Tags: Cognitive impairment

[58] Summers, K., & Summers, M. (2004). Making the web friendlier for lower-literacy users. *Intercom*, 51(6), 19-21.

[59] Summers, K., & Summers, M. (2005). Reading and navigational strategies of web users with lower literacy skills. Proceedings of the American Society for Information Science and Technology, 42(1), NA.

More than half of adults in the U.S. read below an eighth grade level, yet most web sites are written at a tenth-grade level. The goal of this two-year study, sponsored by Pfizer, was twofold: 1) to understand the differences between the reading and navigational strategies of users with medium to high literacy skills and those with lower literacy skills; 2) to learn how to make web-based medical content usable and accessible for lower-literacy adults, and to develop design principles that could be used to design websites that would meet the needs of both higher and lower literacy users.

Tags: Low literacy

[60] Summers, K., Langford, J., Wu, J., Abela, C. and Souza, R. (2006), Designing web-based forms for users with lower literacy skills. Proceedings of the American Society for Information Science and Technology, 43: 1–12. doi: 10.1002/meet.14504301174

Previous research (Summers & Summers, 2003) has identified patterns of behavior and effective practices related to how lower literacy users interact with health-related Internet sites. But, earlier research has not addressed how users react to interactive medical forms on health sites. The goal of this study was to learn how low-literacy users react to web-based medical forms and develop design principles for creating these forms.

Tags: Low literacy

[61] Takagi, H., Saito, S., Fukuda, K., & Asakawa, C. (2007). Analysis of navigability of web applications for improving blind usability. ACM Transactions Computer-Human Interaction, 14(3), 13. doi:10.1145/1279700.1279703

This research proposes new, landmark based navigation structure to assist blind users with orienting and navigating a site. It discusses difficulty non-visual users have with current site structure despite using their assistive tools. One difference is that sighted users navigate hypertext navigation by selecting hyperlinks. For blind users, navigation means hypertext navigation and scanning navigation, which corresponds to eye-movements for the sighted. One of the goals for this study was to discover the various scanning methods, and measure their frequencies. Findings included the need to increase the numbers of useful landmarks is important, improve HTML specification, and improve voice browsers to support users to learn appropriate navigation methods for each page they access.

Tags: Universal design

[62] Underhill, W. (2012). Elections in the digital world. State Legislatures, 38(2), 20.

Through the Voting Information Project — collaboration between the Pew Center on the States and Google — election officials, advocacy groups, candidates, and others can use free tools to provide voters with personalized information on voting day. Thirty-four states have provided data to the voting project. The project team then created a code that programmers can use to build local apps.

Tags: Voting trends

[63] United States Election Assistance Commission. (2007). Effective Designs for the Administration of Federal Elections. Retrieved from http://www.eac.gov/election_management_resources/designing_polling_place_materials.aspx

This document outlines the guidelines created by the US Election Assistance Commission for the design of ballots and polling place materials. The report includes legislative guidelines and design principles; similarly, the report outlines the whole ballot design process which can be complex and difficult to navigate.

Tags: ballot design, universal design

[64] United States Election Assistance Commission. (2009). Voluntary Voting Systems Guidelines (v 1.1). Retrieved from http://www.eac.gov/testing_and_certification/voluntary_voting_system_guidelines.aspx

This document outlines the set of specification and requirements created by the US Election Assistance Commission to be used when testing voting systems for basic functionality, accessibility, and security capabilities. This current version updates the prior documents to be in line with the most recent advancements in election technology and practices. States may choose to follow these requirements.

Tags: ballot design, universal design

[65] Ward, A., Baker, P. M. A., & Moon, N. W. (2009). Ensuring the enfranchisement of people with disabilities. Journal of Disability Policy Studies, 20(2), 79-92.

This article asserts that how a person with disabilities vote is just as important as the physical barriers they face when casting their votes. For this reason, attention has begun to turn to the sorts of problems people with disabilities encounter in their interactions with poll workers and other local election officials. New voting technologies have only augmented the arguments around voting for people with disabilities. In the end, the article's discussion is more on voting policies than voting practices.

Tags: Cognitive disabilities, voting trends

[66] Wattenberg, T. (2004). Beyond standards: Reaching usability goals through user participation. SIGACCESS Accessibility and Computing (79), 10-20.

The passing of the Americans with Disabilities Act (ADA) was meant to increase inclusion of those with disabilities in the mainstream; however, unemployment rates have remained pretty much the same since the ADA's passing. This paper argues for inclusion of users in assistive technology development as a way of developing more useful assistive tools and reducing drop-off amongst disabled users.

Tags: Cognitive impairment, assistive technology

[67] Wise, P. H. (2012). Emerging technologies and their impact on disability. Future Of Children, 22(1), 169-191.

New technologies can mean great things for able-bodied people; however, for those with learning disabilities new technologies often push them further out of the mainstream. For example, telephones increased the ease of oral communication, but this further limited the deaf community's ability to communicate with each other and those outside their community. Adaptive systems had to be created to overcome this barrier. The paper focuses on mostly therapeutic technology and not adapting technology to those with disabilities.

Tags: Assistive technology

[68] Yao, D., Qiu, Y., Huang, H., Du, Z., & Ma, J. (2011). A survey of technology accessibility problems faced by older users in china. Universal Access in the Information Society, 10(4). 373-390. doi:10.1007/s10209-011-0222-3

Older generations need the Internet to have more parent-child interaction, make friends, learn about society, and gain knowledge. Problems with current design include: flashing screens, loud colors, unreadable fonts, text walls, and small images. All these things are obstacles for the older adult. Most designers are not currently addressing these design problems. This paper enumerates feedback from older adult users on design choices that need to be relooked at when designing for the older adults.

Tags: Older voters, plain interaction, universal design