

Voting Systems in the US: Standards and Testing for Usability and Accessibility

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NIST

National Institute of Standards and Technology
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NIST
National Institute of Standards and Technology

...working with industry to develop and apply technology, measurements and standards

- NIST is part of the Department of Commerce
- We facilitate the development of measurements, evaluation methods and metrics, and standards, with
 - Research in the NIST Laboratories, such as the Information Technology Lab
 - Partnerships such as
 - Consortia and standards development organizations
 - Voluntary consensus standards and guidelines
 - Cooperative research agreements with other agencies, universities, and industry
 - Laboratory accreditation

NIST HAVA Mandates

- In general, provide leadership, measurements, standards, data, and expert guidance needed to support the Election Assistance Commission
- Chair Technical Guidelines Development Committee (TGDC)
- Serve as TGDC Secretariat
- In consultation with EAC, write and submit a Human Factors Report to Congress
- Laboratory Accreditation: “NIST shall conduct an evaluation of Independent Testing Authorities and shall submit a list to the EAC that NIST proposes be accredited” (not later than 6 months after EAC adopts voluntary voting system guidelines)

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NIST HAVA Mandates (cont.)

- Monitor and review on an on-going basis accredited laboratory performance. (EAC is accrediting body)
- Ensure initial set of recommendations to EAC for voluntary voting system guidelines (9 months)
- Provide technical guidance for TGDC to operate. Including :
 - Intramural research and development to support the development of voluntary voting system guidelines for
 - security of computers, networks, storage
 - protection of voter privacy
 - role of Human Factors in voting system design
 - remote access voting including internet

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Current Status

- EAC is up and running
 - <http://www.eac.gov>
- Standards Board and Board of Advisors have been appointed
- TGDC nominated
- Human factors report submitted to Congress by the EAC on April 30
- Testimony concerning report in EAC Public Hearing on May 5 by Sharon Laskowski

What is this “Human Factors Report”?

- Mandated in the Help America Vote Act (HAVA) of 2002, Public Law 107-252
- “...the Commission, in consultation with the Director of the National Institute of Standards and Technology, shall submit a report to Congress which assesses the areas of human factor research, including usability engineering and human-computer and human-machine interaction, which feasibly could be applied to voting products and systems design to ensure the usability and accuracy of voting products and systems, including methods to improve access for individuals with disabilities (including blindness) and individuals with limited proficiency in the English language and to reduce voter error and the number of spoiled ballots in elections.”

Human Factors Report

- “Improving the Usability and Accessibility of Voting Systems and Products”, Sharon J. Laskowski, Marguerite Autry, John Cugini, William Killam, James Yen
- NIST Special Publication 500-256, May 2004
- <http://vote.nist.gov>
- <http://eac.nist.gov>

State of Usability of US Voting Systems

- In general, voting systems have not been measured for usability nor have they been developed using a user-centered design process
- we do not know the degree to which voters cast their vote NOT as they intended due to confusion with the user interface
- [Note observations by Herrnson et.al. and others such as Doug Jones]

Current Voting System Standards

- Developed by the FEC, issued in 1990, 2002
- The standards call for three levels of tests to be performed on voting systems to ensure that the end product works accurately, reliably, and appropriately:
 - Qualification tests to be performed by independent testing authorities (ITAs) designated by the National Association of State Election Directors;
 - Certification tests to be performed by the State; and
 - Acceptance tests to be performed by the jurisdiction acquiring the system.
- 2002 revisions paid some attention to design for accessibility and added a usability appendix

Usability in the Process: who – user – what – standard – method

- Vendor
 - Voters -- Voting Product -- Performance and design heuristics, VSS
 - UCD, formative (diagnostic) testing, summative testing
- ITA's
 - Voters -- Voting Product -- VSS, test ballots, conformance tests for qualification
 - Inspection, expert examination, summative testing
- State
 - Voters -- Voting Product, ballots -- Certification against state laws
 - Inspection, user testing with actual ballots
- State (and others)
 - Voters, election officials -- Ballots and ballot design software -- Ballot design guidelines
 - Inspection, user testing with actual ballots
- Vendors, ITA's, State
 - Election officials, poll workers -- Equipment documentation, training materials, facilities and equipment layout documentation -- guidelines
 - Inspection and user testing

10 Recommendations

- Develop voting system standards for usability that are performance-based, high-level (i.e., relatively independent of the technology), and specific (i.e., precise).
- Specify the complete set of user-related functional requirements for voting products in the voting system standards.
- Avoid low-level design specifications and very general specifications for usability. Only those product design requirements that have been validated as necessary to ensure usability should be included as “shall” statements in standards.
- Build a foundation of applied research for voting systems and products to support the development of usability and accessibility standards.

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10 Recommendations

- Review the requirements developed by the Access Board, the current VSS, and the draft IEEE standards and consider for adoption as updated VSS standards.
- Develop ballot design guidelines based on the most recent research and experience of the visual design communities, specifically for use by election officials and in ballot design software.
- Develop a set of guidelines for facility and equipment layout; develop a set of design and usability testing guidelines for vendor- and state-supplied documentation and training materials.

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10 Recommendations

- Encourage vendors to incorporate a user-centered design approach into their product design and development cycles including formative (diagnostic) usability testing as part of product development.
- Develop a uniform set of procedures for testing the conformance of voting products against the applicable accessibility requirements.
- Develop a valid, reliable, repeatable, and reproducible process for usability conformance testing of voting products against the standards described in recommendation 1) with agreed upon usability pass/fail requirements.

Most Critical Need

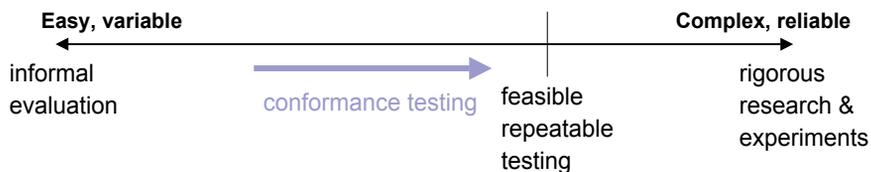
- A set of usability standards for voting systems that are performance-based, with
 - Objective measures
 - Conformance test procedures
- Then voting products and systems can be certified that they meet the usability standards
- This is the only way to guarantee high levels of usability

Major Issue: Design and Performance Standards

- Design Standards—how the product is designed
 - For example, font size, ballot instructions
- Performance Standards—how the product functions
 - No overvoting, test by demonstration
 - Time to cast vote, failures in casting vote as intended
 - Requires: measuring with users against benchmarks,
 - Sample ballots of different complexity, and
 - Well-defined test protocols and user groups

Major Issue: Measurement

- We currently cannot measure usability of voting systems
 - E.g., select/deselect
 - Need high degree of usability
 - Following design guidelines does not necessarily insure usability
 - Usability engineering provides measurement methods, but not necessarily to the degree we need specifically for voting



- We need standards and conformance tests that do measure degree of usability and accessibility, if systems are going to be qualified and certified for usability and accessibility

RoadMap (Details in Report)

- Short term: encourage usability and user-centered design
- Long term:
 - Use best of IEEE and other standards
 - Develop user test procedures
 - Collect user data to define performance baselines
 - Develop performance standards and conformance tests

Next Steps

- Funding for NIST?
- Usability Community: Use the report!