

Panel 4: Usability testing voting systems

3:00- 4:30 pm

Susan King Roth

I appreciate the opportunity to participate in this hearing to discuss an issue of such importance to the American people.

I am an Associate Dean and Associate Professor of Communications Design at Virginia Commonwealth University. I first conducted research on the usability and accessibility of voting ballots and systems in 1993 while a faculty member at Ohio State University. Two voting systems certified in Franklin County, Ohio were compared during use by a diverse group of subjects – a mechanical lever system and a full-face DRE system both displaying ballots from the 1992 presidential election. This preliminary study revealed problems related to ballot ambiguity and display height as well as questions that warranted further research. Findings were published in *Visible Language*, covered in the media, and shared with state and county election administrators.

In 1996 I was commissioned by the Franklin County Board of Elections to test alternative provisional voting processes involving a hybrid punch card/DRE system prior to the gubernatorial election. Findings in this study indicated voter dissatisfaction and a high error rate associated with punch cards. Research results from both studies were summarized and published in 1998 under the title “*Disenfranchised by Design: voting systems and the election process.*” This article was posted to the internet by the publisher following the November 2000 election because issues identified in the studies predicted problems that surfaced during the election. The article received widespread media attention at a time when the country was focused on problems surrounding the voting process.

I have testified before the National Commission on Federal Election Reform and participated in the Commission’s Taskforce on Accessibility. Research findings were presented to the Election Administration Advisory Panel to the FEC and I was invited to serve as lead consultant on a proposal to develop usability standards by the International Foundation on Election Systems (IFES). I presented ballot design guidelines to election officials in Virginia and currently serve as a member of the Project Advisory Board for NSF-funded research on voting technology and ballot design conducted by

the Center for American Politics and Citizenship at the University of MD/College Park. I recently participated in an expert review of six electronic voting machines at the Center.

Q. How should we conduct usability testing of voting systems, given their unique requirements?

This response includes the following issues: **when** usability testing should be conducted, **who** should conduct it, and **how** it should be conducted.

Usability testing should be performed by vendors *during development* (formative testing early in the process and summative testing near completion) before voting systems are placed on the market. Testing criteria should be tied to national usability standards and results provided to state and federal election officials.

It is important that independent usability testing be conducted at the national level. This could be implemented as an expansion of qualification tests conducted by ITAs (Independent Test Authorities) certified by NIST, after the transition to new procedures. Standardized criteria for testing and reporting should be developed and results made available to state election administrators, vendors and the public, with varying degrees of detail.

In order to produce relevant results usability testing of voting systems should be conducted in a simulated or naturalistic setting that approximates conditions at the polling place during an election. A diverse group of subjects should be tested under the pressure of time. A specified time limit of five minutes might be used based on the fact that some states mandate five minutes per voter when lines are long at the polling place, or alternately time needed to complete the task of voting could be recorded as one way to assess usability, although familiarity with the voting process and physical/cognitive capabilities also impact performance time. My research found that subjects over 65 required more time to vote.

Official ballots from current or recent elections should be used during testing. Simple demonstration ballots will not produce problems generated by actual ballots that are more complex. Criteria for usability and accessibility should be based on relevant human factors standards and ballot design guidelines, which ideally would be developed with the input of experts in information design, communications design, human factors

engineering, and computer science as well as experienced election administrators. To achieve more consistency in ballot format implemented on electronic voting systems would be desirable given the current lack of standardized approaches to ballot format and design that make developing general standards and criteria for testing difficult. The guidelines might be more specific about attributes such as type style, optimum (not minimum) size, organization of information and controls, feedback to the voter, etc. to provide more guidance to developers.

The issue of accuracy is related to usability as well as technical standards. The ability of a system to accurately reflect voter intentions and minimize unintentional error depends also on the organization of information on the ballot, clarity of instructions, and a product that communicates functionality. All electronic systems should prevent overvotes and provide a warning for undervotes to minimize disenfranchisement and increase the accuracy of results.

Field testing for usability has also been conducted during actual elections but the right to vote in secret limits test methods that can be used as well as the reliability of information generated. For example, voters cannot be visually recorded while voting so user interaction cannot be assessed. Conducting surveys after voting has limitations too since voters won't - by definition - be aware of unintentional errors (unless ballot scanning has been provided at the precinct). They also might not admit having difficulties with the system. Voter opinions can be polled, however.

Usability testing should employ multiple methods such as visual recording of voting activities, observation, collection of demographic data, post-activity interviews and questionnaires.

- *What role can usability testing play in the certification process, or to provide inputs to the certification process?*

Certification at the state level might be awarded only to systems meeting or exceeding national usability standards as determined by independent testing authorities, in addition to their ability to satisfy other testing criteria and requirements established by states.

- *How do we ensure that the participants in usability testing represent the full spectrum of voters?*

Usability test participants should represent the voting population. This includes all age groups about 18 years and those with various physical and cognitive capabilities and characteristics, levels of education, ethnic and racial backgrounds, first-time voters, and those for whom English is a second language. Testing that includes a diverse group of subjects, or multiple tests with separate groups identifies problems that can occur during actual elections, especially as new voter registration increases during close elections.

- *What research needs to be done to provide input to human factors and accessibility standards for voting systems?*

More research is needed to determine the most accessible and error-resistant ballot format including such factors as: the organization of information, type size and settings, clarity and conspicuity of ballot instructions, readability of ballot language, feedback and error messages, etc.

There are other questions that would benefit by research include the following. Do existing systems support independence and secrecy for disabled voters without stigmatizing them? Are electronic systems easy to use for voters who are not computer-literate? Are systems easy to use and difficult to mismanage by poll workers before, during and after elections? How can systems instill trust in the voting process? An examination of these issues and others would inform the development of comprehensive human factors and accessibility standards for voting systems, and could lead to the development of improved voting systems in the future.