Successful voting systems must be accurate, usable, accessible and secure

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Voting systems must be accurate, usable, accessible and secure to be successful, according to a new paper from a voting behavior expert at Rice University.

"Improving Voting Systems' User-Friendliness, Reliability and Security" will appear in *Behavioral Science and Policy* and summarizes voting systems in the United States used throughout the past decade and outlines lessons about how to improve them. In the paper, author Mike Byrne, a professor of psychology and computer science at Rice, summarizes previous voting research that supports his argument that the following four factors are critical to the success of voting systems.

Accuracy

In his previous research on voting accuracy, Byrne found that voting machines fail to capture voter intent up to 4 percent of the time. He found a 1-2 percent error rate for paper ballots, a 1.5 percent error rate for direct recording electronic – DRE – machines and a 3-4 percent error rate for punch cards and lever machines. He said this is clear evidence that this issue must be addressed. Voting error rates were measured by comparing each voter's intent with the actual vote that was cast.

"The most critical measure of a voting system's usability is the system's ability to accurately capture voter intent," Byrne said. "In several

elections throughout history – including the 2016 presidential election – a few percentage points made all the difference. And there have been situations – such as the 2000 presidential election – where individuals thought they were casting a vote for their desired candidate, when it fact a confusing ballot made it harder to cast the right vote."

Byrne noted that studies from other voting researchers revealed even more troubling findings about voting accuracy, which he said further underscores the importance of voting accuracy.

"The scariest thing about these numbers is that we know from other research that the DRE we measured is almost certainly better than most of the ones out there in real polling places," he said.

Usability and accessibility

Electronic voting systems have become widespread in recent years, Byrne said. While they offer many features that improve usability and accessibility, such as faster voting, push-button voting and visual and audio aids, research showed that they did not improve the voting error rate.

Approximately a half-dozen previous studies of DREs revealed an average voter error rate of 1.5 percent; this indicates that they were no better than paper ballots, which have an error rate of 1-2 percent. Byrne noted that other studies not referenced in his paper have revealed even higher rates of voting errors.

Byrne said that although participants were up to 30 percent more satisfied with DREs than they were with traditional systems, the DRE system did not generate lower error rates.

"This research made it clear that there is more work to be done to both

improve voting usability and accessibility while preventing errors," he said.

Security

Security must also be considered early in the design of voting systems, but Byrne said it is important to take great care not to compromise the other important factors (usability, accessibility and accuracy) for this. Byrne said that although this is a difficult balance, getting it right is critical.

"Security is a complex problem on its own, particularly now that it involves computers; computer security is a whole branch of computer science," Byrne said. "We wanted to look at the human side of that problem."

In the paper, Byrne references a specific study of voters' ability to help thwart tampering. In the study, the researchers tested whether or not voters detected malfunctioning or maliciously altered voting machine software. The purpose was to detect whether voters would notice the altered votes on the review screen. Two-thirds of voters in the study failed to notice such changes.

"Security is obviously critical—we don't want hackers or ballot-box stuffers deciding election outcomes," Byrne said. "But if what's actually on the ballots doesn't accurately reflect the will of the voters, it doesn't matter how secure the system is; the election outcome can still be wrong."

Byrne said that much of the research on voting began following the 2002 Help America Vote Act, which was passed to improve voter access and voting systems. While well-intentioned, Byrne said, it inadvertently led to the purchase of systems that may have actually increased the vote

error rate. He said that research on voting systems has been conducted throughout the past decade and has demonstrated that many systems are less usable and secure than they should be.

Byrne said behavioral scientists are best equipped to design voting systems because the factors that contribute to human error tend not to be well-understood by software engineers, and behavioral scientists have the necessary expertise in conducting usability tests. He noted that two collaborative efforts to build better voting machines are currently underway—the Los Angeles County California Voting Systems Assessment Project and the Travis County STAR-Vote project.

"These two jurisdictions have different constraints in terms of election law, demographics and resources," Byrne said. "However, both have brought election and voting system experts together to share their expertise, and the systems they are building share some major design features. Both will have a DRE user interface similar to the Center for Civic Design's Anywhere Ballot to support usability and accessibility, and both will produce a paper record to ensure the system is secure and auditable. Both projects are also committed to usability testing."

More information: behavioralpolicy.org/wp-conten … 8/v3i1-web-Byrne.pdf

Provided by Rice University