

# Only 58 percent of votes cast on tamper-resistant systems counted

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A Rice University study of tamper-resistant voting methods revealed that only 58 percent of ballots were successfully cast across three voting systems. The researchers concluded additional work is needed to make voting both secure and user-friendly.

The study, "Usability of Voter Verifiable, End-to-End Voting Systems: Baseline Data for Helios, Prêt à Voter and Scantegrity II," examined three new end-to-end voting systems – systems that give voters the option to both verify the system is working properly and to check that their votes have been recorded after leaving the polling place.

Claudia Acemyan, a postdoctoral fellow at Rice and the study's lead author, said voting concerns such as accuracy, privacy and bribery/coercion have prompted research and development of ways to make voting tamper-resistant and verifiable by voters. She said that while the three systems evaluated solved many of the security problems surrounding voting with traditional methods – such as voters being able to independently confirm that a vote was counted correctly – the systems' added complexity appeared to negatively impact their usability.

"Overall, the tested systems were exceptionally difficult to use," Acemyan said. "Our data revealed that success rates of voters casting ballots on these systems were extraordinarily low – specifically, only 58 percent of ballots were successfully cast across all three systems."

The research also revealed that using the three voting systems took twice as long as traditional voting systems. The three systems studied were Helios, a Web-based voting system; Prêt à Voter, a system that allows voting with paper forms that are scanned after they are filled out by voters; and Scantegrity II, an optical scan voting system that enables someone to vote with a specially designed paper bubble ballot. Challenges ranged from voters having to complete new, confusing voting procedures that deviated from what they currently do to cast a vote, to voters having to use equipment with which they are unfamiliar.

"If voting is more time-consuming, then it might mean more people will have to wait in longer lines and election officials might need to purchase more equipment," Acemyan said. "And if individuals are unable to complete the voting process, it can impact the outcome of elections."

Acemyan said that [voting-system](#) developers must be mindful of different types of voters and their level of comfort with technology and unfamiliar procedures.

"When designing voting systems, you must keep the diverse population in mind – otherwise you have the potential to disenfranchise [voters](#) and change election outcomes," Acemyan said. "Voting security is important, but there needs to be a way for it to happen behind the scenes. It should not require additional effort on the voter's behalf."

The study of the three voting systems included 37 participants (22 male, 15 female) who were U.S. citizens at least 18 years of age. Thirty-eight percent of the participants were African-American, 27 percent Caucasian, 11 percent Mexican-American/Chicano, 11 percent Hispanic/Latino and 13 percent other ethnicities. The majority of participants – 62 percent – completed some college or had an associate's degree, 5 percent had a high school diploma or GED, 22 percent had a bachelor's degree or equivalent and 11 percent held a postgraduate degree. Participants had normal or corrected-to-normal vision and had, on average, voted in 5.1 state and local elections. Volunteers rated their computer expertise on a scale from one to 10, with one being novice and 10 being expert; the average was 8.2.

Acemyan said that she hopes the research will encourage further improvements in end-to-end voting systems.

**More information:** The study is available online:  
[www.usenix.org/system/files/co ... ets\\_0203-acemyan.pdf](http://www.usenix.org/system/files/co...ets_0203-acemyan.pdf)

Provided by Rice University

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