

Voting Technology: The Way Forward

Daniel Tokaji
Assistant Professor, The Ohio State University, Moritz College of Law
Associate Director, Election Law @ Moritz

Prepared for American University, Center for Democracy and Election Management
“Are U.S. Elections Getting Better or Worse? Is HAVA Working?”
March 29, 2006

2006 is turning out to be an important year in the area of voting technology. That's largely because of some key deadlines in the Help America Vote Act of 2002 ("HAVA"), requiring disability-accessible voting equipment in every polling place and the replacement of punch-card and lever machines in some states. Some states failed to prepare adequately for these deadlines, forcing a rush to get new technology in place in time for this year's elections. In other states, the fierce debate over the security of electronic machines – particularly the push to require contemporaneous paper records of electronically-cast votes – has slowed conversion to new technology. The end result is that, contrary to what Congress intended in 2002, the transformation of the United States' voting equipment is nowhere near complete as of early 2006. The big question is how to move forward, given this unsettled state of affairs.

This paper sketches a path toward further improvement of voting technology. It starts with a brief review of developments in voting technology since the 2000 election, and then describes the major issues that jurisdictions are currently facing. It suggests that, before moving forward, we must first take a step back. Rather than arguing over the best technological “fix,” we should first endeavor to reach agreement on the underlying values that we expect voting technology – and our election system generally – to serve. Once there is some basic agreement on these values, the next step is to evaluate how existing technologies measure up, where necessary conducting new research to assess their performance. As it turns out, there is an enormous need for research in this area, particularly

with respect to the usability and administrability of different voting technologies. A prerequisite to recommending further voting technology reforms is a thoroughly interdisciplinary research approach, one that draws on the combined insights of computer science, political science, law, and election administration.

How We Got Here

In order to chart a course forward, it is first necessary to review how we got to where we are now.¹ Attention to voting equipment began in earnest with the November 2000 election, in which most voters in the pivotal state of Florida used unreliable paper-based voting systems – specifically, central-count optical scan and punch card ballots – that do not allow voters to “check their work” before casting their votes. The result was that many voters mistakenly cast “overvotes” (marking more than allowed number of candidates) or “undervotes” (not marking any candidates), collectively known as “residual votes.” It's likely that the equipment used affected the result of the 2000 presidential election. Social science research has also shown that punch-card voting equipment has an especially negative impact on certain groups of voters, including people of color.²

As a result of the documented problems with certain types of paper-based voting systems, voters in several states – including Florida, Georgia, Illinois, California, and Ohio – brought lawsuits

¹The developments in voting technology since 2000 are more exhaustively discussed in my article *The Paperless Chase: Electronic Voting and Democratic Values*, 73 *FORDHAM L. REV.* 1711, 1724-41 (2005).

²See Justin Buchler, et al, *Punch Card Technology and the Racial Gap in Residual Votes*, 2 *PERSPS. ON POL.* 517 (2004); Michael Tomz & Robert P. Van Houweling, *How Does Voting Equipment Affect the Racial Gap in Voided Ballots*, 47 *AM. J. POL. SCI.* 46 (2003).

to compel the replacement of this equipment. Most of these lawsuits were settled or otherwise resolved, with states agreeing to replace the challenged voting systems.

Eventually, Congress took action on election reform by enacting HAVA in 2002. There are two important provisions of HAVA having to do with voting equipment. Title I provided \$325 million in federal funds for the replacement of punch-card and lever voting machines.³ States accepting this money were originally to have their new technology in place by November 2004, but most states obtained an extension. HAVA allowed such extensions to be granted for “good cause,” but set an outer limit by requiring that the transition to new voting technology be complete in time for the first federal elections in 2006 – in other words, for this year's primary elections. States that fail to meet this deadline are required to pay back the federal funds they took, in proportion to the number of precincts that have failed to get rid of the old equipment.⁴

³42 U.S.C. §§ 15302, 15303.

⁴42 U.S.C. § 15302(d).

The other key provision of HAVA relating to voting equipment is contained in Title III of the Act, which sets requirements applicable to all states. Among those requirements is that each state have in place at least one voting unit that is accessible to people with disabilities, including those with visual impairments.⁵ Contemporary touchscreen machines provide this capacity, through an audio component that reads the ballot to voters who are blind or otherwise visually impaired. Some electronic systems also have accessibility features for those with manual dexterity or mobility impairments, allowing them to vote independently.⁶ Voting equipment must also have alternative language capacity,⁷ something that electronic machines can also do.⁸ Finally, HAVA requires that voting machines have a manual audit capacity. That includes a “permanent paper record,” that is supposed to be available for use in the event of a recount.⁹ The deadline for compliance with these requirements was January 1, 2006.¹⁰

Between HAVA's enactment in and the 2004 election, many but not all states took action to replace unreliable voting equipment. This, in fact, is one aspect of HAVA which yielded positive results. Nationwide, the percentage of voters using punch-card voting equipment declined substantially, going from 31 percent to 13 percent between the 2000 and 2004 presidential elections.¹¹ This shift was accompanied by a significant decrease in the number of lost votes, which political

⁵42 U.S.C. § 15481(a)(3).

⁶See Tokaji, *The Paperless Chase*, at 1768-71.

⁷42 U.S.C. § 154381(a)(4).

⁸See Tokaji, *The Paperless Chase*, at 1771-72.

⁹42 U.S.C. § 15481(a)(2).

¹⁰42 U.S.C. § 15481(d).

¹¹Daniel P. Tokaji, *Early Returns on Election Reform*, 73 GEO. WASH. L. REV. 1206, 1242 (2005).

scientists have documented. Charles Stewart of MIT estimates that there were approximately one million votes saved in 2004, due to new voting equipment and administrative improvements.¹² In addition, David Kimball and Martha Kropf find that touchscreen electronic voting machines performed better than other voting systems, in reducing residual vote rates on ballot initiatives.¹³

Still, the transition to new voting equipment was not complete by the 2004 presidential election. The pivotal state of Ohio was among those that continued to use unreliable punch-card voting equipment in that election, even though the state had received over \$30 million in federal funds to replace this equipment.¹⁴ Over 70 percent of the state's voters used punch cards in 2004 and, had the margin of victory been closer, the tens of thousands of votes lost due to the continuing use of punch cards might well have been determinative – as they probably were in Florida's 2000 election.

The Present State of Affairs

With HAVA's deadlines now upon us, many states are behind the eight-ball when it comes to compliance with federal voting system requirements. Although the reasons for states' noncompliance are complex, concerns over the security of contemporary electronic voting machines are a major factor. Prominent among the concerns has been the possibility that software could be tampered with,

¹²Charles Stewart III, *Residual Votes in the 2004 Election*, Feb. 2005, available at http://www.vote.caltech.edu/media/documents/vtp_wp21v2.3.pdf.

¹³David C. Kimball & Martha Kropf, *Ballot Initiatives and Residual Ballots in the 2004 Presidential Election*, presented at Annual Meeting of the Southern Political Science Ass'n, Jan. 2006.

¹⁴Tokaji, *Early Returns on Election Reform*, at 1221-22.

resulting in elections being stolen. In fact, some advocates made this very allegation about Ohio's 2004 election – despite the fact that paper-based punch card voting systems were used by most voters.

The focal point of the debate over electronic voting security has been proposals to require these machines to generate a contemporaneous paper record of the electronic ballot, or “voter-verified paper audit trail” (“VVPAT”). Although HAVA already requires a permanent paper record, that can be used in the event of a recount, laws passed or proposed in several states go further. They require that the paper record be produced for viewing by the voter, before it is actually cast. The most commonly discussed way of doing this is to print out the voter's choices on a strip of paper adjacent to the viewing screen of the electronic voting machine. Several Nevada counties experimented with such a system in the 2004 election. Although several states have now enacted laws requiring a VVPAT, there has been remarkably little research on whether this device (or other vote verification methods) provide a workable and effective solution to the security concerns surrounding electronic voting. What little evidence is available from Nevada’s experiment suggests that very few voters actually check all of their choices on the paper printouts.¹⁵ A recent study prepared for the Maryland Board of Elections compared a VVPAT system with other vote verification technologies, including an audio audit trail and an electronic verification module.¹⁶ It concluded that adoption of any of these vote verification systems, including the VVPAT “*will at least double the complexity of the act of voting and the administration of elections.*”¹⁷ Given the problems found to exist with all the vote verification

¹⁵Ted Selker, *Processes Can Improve Electronic Voting: A Case Study of an Election*, VTP Working Paper #19, October 2004, at 3 (reporting that few people checked VVPAT printouts); Conny B. McCormack, U.S. Senate Committee on Rules and Administration Hearing on Voter Verification in the Federal Electoral Process, June 21, 2005, at 3 (same).

¹⁶National Center for the Study of Elections of the Maryland Institute for Policy Analysis and Research, University of Maryland, Baltimore County, *A Study of Vote Verification Technologies, Part I: Technical Study*, Feb. 2006.

¹⁷*Id.* at 10 (original emphasis).

methods examined, it could not recommend adoption of any of them.¹⁸ This research should give pause to anyone who believes that the VVPAT is a panacea to the security concerns surrounding electronic voting.

Paper ballots, moreover, have security concerns of their own – like electronic records, paper records can be tampered with if proper procedures are not prescribed and rigorously followed. In addition, the paper records will only serve as an effective check on cheating, if a sufficient number of paper records are actually recounted by hand. That's a laborious process, and state and local election officials have shown little enthusiasm for counting a sufficient percentage of paper ballots to provide an acceptable level of confidence in the accuracy of election results.¹⁹ In Nevada, for example, the Clark County registrar of voters estimated that it took about four hours to count a single strip of paper, 318 feet long, containing just 64 votes. That amounts to four minutes for each ballot. As *electionline.org* points out in a recent report, a full manual recount would take weeks to complete at that rate. And this is aside from mechanical problems, such as paper jams, which have emerged in tests of some VVPAT equipment.²⁰

¹⁸*Id.* at 59.

¹⁹See C. Andrew Neff, *Election Confidence: A Comparison of Methodologies and Their Relative Effectiveness at Achieving It* 6 (2003)(finding that California's 1% manual recount provides only a 40% confidence level that a congressional race has not been changed by 10%).

²⁰*electionline.org, Election Reform: What's Changed, What Hasn't, and Why 2000-2006*, available at <http://www.electionline.org/Portals/1/Publications/2006.annual.report.final.pdf>.

Largely due to the controversy over electronic voting, a number of states are either not compliant with HAVA's voting equipment requirements, or at risk of being noncompliant once the primary election rolls around. That's primarily because electronic voting equipment that complies with both HAVA's disability-access requirements and with state VVPAT requirements wasn't certified in time for local jurisdictions to make an orderly transition to new technology by 2006. A case in point is California, one of the first states to enact a VVPAT requirement into state law, where printers failed during the pre-certification testing process. New York is in even worse shape, compliance with HAVA's voting system requirements having been slowed by the controversy over electronic voting security. Both these states have already been targeted by the U.S. Department of Justice for failure to comply with HAVA. Most recently, the Maryland House voted to put its Diebold touchscreen machines on hold, because they don't produce a VVPAT.²¹ Even though Maryland's voting machines have an excellent record, in terms of reducing the number of lost votes, legislators in that state have succumbed to the mass panic surrounding electronic voting – and given in to the seductive assumption that paper ballots would provide a simple answer.

The Way Forward

It now appears that a number of states will be out of compliance with HAVA this year, because they won't have disability-accessible voting equipment in place or because they have failed to replace their punch-card or lever voting machines. As I have discussed at greater length elsewhere,²² it is doubtful that the VVPAT will provide a workable and effective solution to the concerns raised by

²¹Marc L. Songini, *Maryland House Votes to Oust Diebold Machines*, COMPUTERWORLD, Mar. 13, 2006.

²²Tokaji, *The Paperless Chase*, at 1780-91.

electronic voting critics.

That is *not* to say that all of the concerns that have been raised about electronic voting are illegitimate. The point is that the myopic focus on paper as the one and only solution has had a deleterious effect on the larger discourse over the improvement of voting technology. It is necessary to get beyond this tired debate, and instead pursue agreement on commonly shared ends. A more constructive approach is to step back and consider the underlying democratic values that we want our voting technology to promote. At least four values are especially worth considering.

One of those values is *equality*, meaning equal access to the voting process for all people, including people with disabilities and non-English proficient voters. It also means providing a feedback mechanism for voters to check their work, in order to minimize disparities in lost votes based on race, education level, poverty, or other characteristics. The conversion to electronic voting machines tends to promote equality, by reducing the number of lost votes and providing greater access to disabled and non-English proficient voters. Equality is not, however, the only value that must be taken into consideration in the voting process. Two values that have rightly been prominent in the debate over electronic voting are *security* (resistance to fraud and other forms of manipulation) and *transparency* (the capacity to produce auditable results in which voters may have confidence). Another value that should be taken into consideration is *administrability* – having a voting system in place that will actually work as intended, given the limited funds and human resources available to the local jurisdictions that must implement the technology. This list of values – equality, security, transparency, and administrability – is not meant to be exclusive. There are other ways of defining and categorizing core values that we expect our technology, and our election administration system generally, to serve. This list is instead meant to suggest a different approach to voting technology than that which has been predominant. Rather than starting with the proposed solution, whether it's paper or some other proposed fix, we should start by defining the values that ought to guide the search for

better technology. Once we have some general agreement on those values, we should then examine the available evidence – and where necessary, conduct additional research – to assess how well different systems measure up.

Two recent commentaries are helpful in developing a more constructive approach to election administration. One is by one of the foremost critics of contemporary electronic voting technology, David Dill of Stanford University.²³ Dill suggests that the debate over voting technology has been miscast. "Theories of widespread election fraud are highly debatable," he explains, "encourag[ing] a sense of hopelessness and consum[ing] energy that could instead be focused on long-term changes that could give us elections we can trust." I agree. Dill is also correct to argue that *transparency* should be recognized as an integral democratic value, and that better procedures are needed to promote this value. Where Professor Dill errs, in my opinion, is in concluding that VVPAT requirements may be justified as a means to promote transparency. While the VVPAT may result in a marginal increase in transparency, that enhancement should be tempered by recognition of the practical difficulties in implementing this suggested fix – including the lingering questions about whether voters will actually check the paper records. This makes is questionable as to whether this device will actually promote the value of security. Moreover, it fails to take into consideration other values such as equality and administrability, which are likely to be impaired by the VVPAT requirement.

²³David L. Dill, *Making Democracy Transparent*, TOMPAINE.COM, Mar. 7, 2006.

This point is effectively made in another recent commentary on the voting technology controversy by Roy Saltman, who was among the first to point out the problems with punch-card voting systems and has just published a book tracing the history of voting technology.²⁴ In a Q&A with the Nieman Foundation for Journalism at Harvard University²⁵, Saltman highlights the questions of administrability relating to paper trails, observing that: “It has been a hallmark of the members of the many groups that have formed in the past four years to be activists on use of paper trails, or on election fraud in general, that they have made no effort to know the history and literature of their subject and to read the arguments that have been made on all sides.” Saltman properly focuses on the *procedures* and *people* responsible for running elections. The failure to have adequate procedural mechanisms and to appoint trustworthy election officials will inevitably taint election results, regardless of what type of voting equipment is used.

At this stage, the existing research doesn't support the conclusion that the VVPAT experiment should be extended on a nationwide basis – much less to lock such requirements in place through a federal legislative mandate – particularly when democratic values other than transparency are taken into consideration. Whether or not one agrees that contemporaneous paper records are *necessary* to promote secure and transparent voting, it is clear that they are not *sufficient* to achieve the multiple values that we expect our voting systems to serve. On the other hand, the multiplicity of voting equipment being used in different states provides an opportunity to carefully examine what works and what doesn't. Given that many states will be using new technology, including VVPAT systems, in the 2006 elections, now is the perfect time to study and assess the performance of these different

²⁴ROY G. SALTMAN, *THE HISTORY AND POLITICS OF VOTING TECHNOLOGY: IN QUEST OF INTEGRITY AND PUBLIC CONFIDENCE* (2006).

²⁵Roy G. Saltman, *Think Paper Trails Will Make Elections Secure? It's Not That Simple*, Feb. 1, 2006, available at http://www.niemanwatchdog.org/index.cfm?fuseaction=ask_this.view&askthisid=166&stoplayout=true&print=true.

technologies.

It is clear that HAVA resulted in some significant improvements in voting technology, most notably in the elimination of punch-card voting and the provision of technology that is accessible to people with disabilities. But it is also clear that the transition to better voting technology is nowhere near complete. Nor can this process be completed, until we have much better information than is available today on what technological solutions work and don't work. Fortunately, there are some worthy research efforts that may ultimately lead us in a productive direction. They include:

- The work of a team of researchers, including Paul Herrnson of the University of Maryland and Richard Niemi of the University of Rochester on the usability of different voting systems.²⁶ This includes VVPAT systems, as well as other types of electronic voting equipment. This research should give us valuable insights into how user-friendly different types of equipment really are.
- The National Institute of Standards and Technology's work on threats to different types of voting systems, which started with a workshop in the fall.²⁷ This research is vital to assessing what security risks really exist with different types of equipment, and how they might best be remedied.
- The National Research Council of the National Academy of Sciences' attempt to develop a framework for understanding electronic voting which has recommended that “more resources [be] dedicated to understanding how these systems work and to educating election officials and the public on their use.”²⁸
- The ongoing work of a team of researchers, including Professor Dill, called ACCURATE (A Center for Correct, Usable, Reliable, Auditable, and Transparent Elections), which is funded by the National Science Foundation.²⁹ ACCURATE has properly highlighted the need to consider the values of transparency and security along side other values – such as equality and functionality – and then to assess different voting systems' performance in each of these parameters.

These exemplify the type of research that will be absolutely essential to the continuing

²⁶Paul S. Herrnson, et al., *Early Appraisals of Electronic Voting* (2005).

²⁷<http://vote.nist.gov/threats>.

²⁸NATIONAL RESEARCH COUNCIL, *ASKING THE RIGHT QUESTIONS ABOUT ELECTRONIC VOTING* (2005).

²⁹<http://accurate-voting.org>.

improvement of voting technology. We must also take into consideration the experience and wisdom of the dedicated public servants who run our elections, particularly *local* election officials who will ultimately be the ones to administer any new rules given our decentralized system. Too often, reforms have been recommended and adopted without adequate consultation with the state and local election officials to whom their implementation is entrusted.

Conclusion

The challenges that we confront in the ongoing effort to improve our voting technology are complex and formidable. While there is an understandable desire for simple solutions, there is a pressing need for additional research before new federal mandates are imposed. As the recent Maryland report put it: “[I]t is a very bad idea for governments to buy products that are not functionally complete and that either do not have positive records in the marketplace or that cannot be fully and effectively tested in simulated elections to ascertain their performance characteristics.” An even worse idea is to pass federal laws that would require the purchase of products that have not proven workable and effective in real-world elections. It would thus be a mistake to press forward with new federal legislative mandates, such as VVPAT requirement, at least until the changes mandated by HAVA have become effective and the impact of these changes can be evaluated. Careful study of state and local election officials' experience with their new technology in the 2006 is an essential prerequisite to recommending further reforms. Rather than throwing good money after bad by requiring technology that may or may not function as intended, the more prudent course is to await the results of this election, and the research that should follow it, before making new investments.