This Executive Summary presents the principal findings of two studies of vote verification technologies that were commissioned in 2005 by the Maryland State Board of Elections (SBE). The first, or the technical study, was conducted by researchers at the University of Maryland, Baltimore County (UMBC). The second, or the usability study, was conducted by researchers at the University of Maryland, College Park.

We note that while these studies were commissioned by the SBE, they were conducted independently of the SBE and, indeed, independently of one another. This should provide the citizens and decision-makers in the State of Maryland with a high degree of confidence that the studies are impartial and scientifically sound.

Part I: Technical Study Executive Summary

Scholars at UMBC, working through the Maryland Institute for Policy Analysis and Research, conducted a technical review of vote verification systems. Initially, the review was supposed to include up to seven systems from the following organizations and individuals: VoteHere (Sentinel); SCYTL (Pnyx.DRE); Prof. Ted Selker, MIT (VVAATT); Diebold’s VVPAT; Democracy Systems, Inc. (VoteGuard); IP.Com; and Avante. We determined that IP.Com did not represent a true vote verification technology, and Avante and Democracy Systems, Inc., declined to participate in the study. We also examined the SBE’s procedures for “parallel testing” of the Diebold AccuVote-TS voting system and used this as a baseline against which to evaluate the vote verification systems.

In conducting our analysis, we received demonstrations from the vendors, and we examined the vendors’ hardware, software, documentation – to determine if their products did what their vendors claim that they do. That is, do they enable voters who use the touch screen voting systems in use in the State of Maryland (Diebold AccuvoteTS system) to verify that their votes were cast as intended, recorded as cast, and reported as recorded, and do they permit post-election auditing? We examined such issues as:

- implementation
- impact on current state voting processes and procedures
- impact on voting
In addition to the technical analysis against the criteria mentioned above, we also compared these systems against one another and against the state’s current voting system and procedures, which includes the SBE’s use of parallel testing around that system.

Our principal findings are, first, that each of the systems that we examined – only one of which by the way provides for a pure paper solution – may have something to offer the State of Maryland in terms of vote verification. But this is true only if the system were fully developed, fully integrated with the Diebold DREs and effectively implemented. If this were the case, then each system in its own way could provide a degree of vote verification beyond what is available through the Diebold Accuvote TS and associated policies and procedures as currently implemented.

However, and importantly – and this is our second principal finding – none of these systems is yet a fully developed, commercially ready product. None of these products had been used in an election in the U.S., although SCYTL has been used outside the U.S. and a different version of the Diebold VVPAT has been used in the U.S.

Were the State of Maryland to decide to acquire any of these products, anywhere from a relatively small to a considerably large amount of money and effort would be required on the part of the vendor to produce an actual product and make the product ready for use in actual elections. Indeed, nearly all of these vendors are looking for someone to pay them to fully develop and commercialize their products.

In our expert opinion, it is a bad idea for governments to buy products that are not functionally complete and that either do not have positive records in the market place or that cannot be fully and effectively tested in simulated elections to ascertain their performance characteristics.

We also note several specific concerns about these products. The introduction of any vote verification product creates trade-offs for the State and its voters -- trade-offs in the sense that were these products fully developed and thus able to provide some of their promised benefits to the state, these benefits would not arrive without costs, sometimes substantial costs. These costs include at least the following:

1. All of these products would impose significant one-time implementation and on-going management burdens (cost, effort, security, etc.) on the SBE and the Local Boards of Elections.
2. All would increase the complexity of the act of voting.
3. All would increase the amount of time required to vote.
4. All would at least double the amount of effort required to administer elections.
5. All would adversely affect voter privacy.
6. These products would have both potentially positive and potentially negative impacts on security and election integrity.
7. None can be considered as fully accessible to persons with disabilities and none of them fully meets the accessibility standards of Section 508 of the Rehabilitation Act.
8. Integration of these systems will require the cooperation of Diebold to develop and/or ensure the viability of a working interface between the vendors’ products and the Diebold system. It is unclear whether this would be in Diebold (or any other DRE system vendor’s) self-interests. As such, there is the clear potential here for added difficulties when implementing any of these solutions.

Therefore, based on the evidence from this study, we cannot recommend that the State of Maryland adopt any of the vote verification products that we examined at this time.

We note that no election system – regardless of the technology involved -- is foolproof nor is any election system completely immune or secure from fraud and attack. Indeed, there is a long and inglorious history of election fraud in the U.S. that involves nearly all methods and technologies of voting, especially paper voting systems. Moreover, it would be prohibitively costly to make any election totally secure.

Finally, regardless of what the State of Maryland does in the near term with regard to vote verification and vote verification systems, it should tighten security procedures around the current election system and, in future elections, it should expand the use of parallel testing. We say this even with the knowledge that current security procedures are reasonable and prudent and that the SBE’s system of parallel testing reduces considerably the possibility of fraud and attack on the system.

**Part II: Usability Study Executive Summary**

The University of Maryland’s Center for American Politics and Citizenship, along with the Human-Computer Interaction Lab, conducted a usability study of four vote verification systems and a voting system with no verification unit for the Maryland State Board of Elections.

The major findings from the expert review by human-computer interaction experts are:

- There was a perceived trade-off between usability and security. In all cases, the verification system appeared to reduce the usability of the voting process compared to the Diebold AccuVote-TS, which had no verification unit.

- The Diebold AccuVote-TSx with the AccuView Printer Module (paper printout, referred to as AccuView Printer) was rated most favorably. However,
suggestions were made for improvement and questions were raised about the paper record’s utility when used for a long ballot.

- Privacy concerns were raised about each of the four vote verification systems.

The major findings from the field test involving more than 800 Marylanders are:

- All of the systems were viewed favorably, including the Diebold AccuVote-TS with no verification unit.

- The Diebold with AccuView Printer was rated the most favorably in terms of voter satisfaction, but not substantially better than the AccuVote-TS with no verification unit or the VoteHere Sentinel.

- The MIT (audio) system was found to be distracting and it failed to generate as much confidence as other systems. It also was criticized by some users because of sanitary concerns related to the repeated use of the same headset.

- Participants needed the least amount of help when using the Diebold AccuVote-TS system (no verification unit). The Diebold with AccuView Printer system (paper trail) came next. Voters received more help using the VoteHere (internet or telephone), MIT (audio), and Scytl (monitor) systems.

The major findings concerned with election administration are:

- Adding any of the four verification systems greatly increased the complexity of administering an election.

- The paper spool in the Diebold AccuView Printer had to be changed frequently, and changing it was fairly complex.

- It was difficult and time consuming to set up the Scytl system.

- The Scytl, MIT, and Diebold AccuVote-TS with no verification unit were out of commission for some portions of the study (but not enough to affect the results).

- Diebold provided outstanding response to service calls. Scytl (based in Spain) provided poor service. No service calls were made to MIT or VoteHere.

Recommendations

- On the basis of usability and some administrative considerations, we cannot recommend that the State of Maryland purchase any one of the vote verification systems (or system prototypes) that were tested. There are some important tradeoffs between usability and other considerations, including the security of the vote.
• We recommend that the voter interface of AccuVote-TS (with no printer unit) be modified to incorporate some of the improvements made to the interface of the AccuVote-TSx with the AccuView Printer system.

• The AccuVote-TS with no verification unit became inoperative while an individual was voting under normal circumstances. This had a direct impact on the usability of the system and caused concern among voters. An explanation was provided but it was beyond the scope of this study to confirm it. We recommend this situation be addressed.