Application of Election Technology: Considerations for Election Administrators, Practitioners and Policy Makers

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Introduction

When election administration practitioners and policy makers examine the practical interests of improving election processes and administrative procedures, invariably the issue of technological enhancements must be considered. The introduction of various technological systems has been widely adopted by most election bodies throughout the world. Indeed election processes have benefited greatly from the widespread adoption of technological platforms to enhance election administration in areas such as voter registry management, electoral district demarcation, results and tabulation transmission and reporting and electronic voting systems.

Much of the adaptation of technologies into electoral processes and management mirrors a general trend in the workplace. Where technology may simplify a process or make it more user friendly it will be adopted and integrated into business, industry and public institutions alike. The end result for election administration will generally be an improved and more easily managed process for election commissions and their management bodies as well as a system, if properly designed, that is more accessible and user friendly to the voters' needs. The integration of technology into election administration, therefore, is a natural evolutionary adaptation of technology at hand that seeks to increase accuracy, accessibility, security and verifiability. Ultimately the objective for the election administration remains the same, however; to manage a process that produces credible and legitimate results that voters and political contestants alike will view as reflecting the will of the voters.

Technological innovations will continue to present opportunities to enhance the capacity of election administration. How far an election body wishes to reach with these technological innovations or solutions depends largely on the will of the voters and a consensus among policy makers to support the introduction of new technological platforms. This is clearly contextually dependent and will vary from democratic state to

state. Some societies will have greater risk tolerance for the introduction of election related technologies such as Internet voting and others will have less tolerance for these new possibilities. What is imperative, however, from an election practitioner perspective is that elections technology must be harnessed in a positive and transparent manner that safeguards public confidence and assurance that an individual's vote will be cast in secrecy and counted uniquely.

II. Election Voting Technology – US Recent Experience

In what is likely the most well noted case of recent widespread election administration malfunction, the 2000 US presidential election debacle resulted in a national policy consensus for the universal introduction of improved voting systems technologies and the strengthening of other key election administration processes. Problems experienced in the 2000 US elections included malfunctioning and inaccessible machines, spoiled ballots that could not be counted, inaccurate voting lists, and barriers to the polling place. The passage of the Help America Vote Act (HAVA)[1] was the key legislative mandate that directed the states to quickly improve their respective election administrative practice and to select and purchase with federal support, advanced electronic voting systems. HAVA specified that states had a narrow four-year window for the review of voting system technologies and then to transition to new voting systems technology if necessary. Failure to perform this assessment, would risk for a state to loose the federal subsidies for the procurement of new electronic voting equipment.

What this did, in effect, is force many states to quickly make decisions on future election processes without the appropriate knowledge on technology performance or independent capacities to evaluate new technologies. The rapid or premature introduction of technologies driven by HAVA mandates, in particular voting systems technology, has resulted in considerable levels of controversy. The Association for Computing Machinery

[1] The Help America Vote Act (HAVA) of 2002 was passed by the United States Congress to enact mandatory minimum standards for states to follow in several key areas of election administration. The law provided funding to help states meet these new standards, replace voting systems and improve election administration. HAVA also established the Election Assistance Commission (EAC) to assist the states regarding HAVA compliance and to distribute HAVA funds to the states. EAC is also responsible for creating voting system guidelines and operating the federal government's voluntary voting system guidelines program.

in a 2004 analysis stated that, "many electronic voting systems have been evaluated by independent, generally-recognized experts and have been found to be poorly designed; developed using inferior software engineering processes; designed without (or with very limited) external audit capabilities; intended for operation without obvious protective measures; and deployed without rigorous, scientifically-designed testing."[2] These early findings taken together with the technology providers' proprietary control over the software or source code running the respective electronic voting systems combined to raise concerns among election administrators and voters alike regarding the integrity of certain electronic voting systems. When technology is not well understood by both those who must administer the systems and the voters who will use the systems on election day then it is likely that real or perceived insecurities about the implementation and use of the systems will be apparent and may unnecessarily discredit the integrity of the elections.

Further raising concern among practitioners, observers and voters alike was the introduction of highly opaque voting technologies that do not provide a paper trail of voter intent. These are direct recording electronic (DRE) voting systems that are neither paper based nor enabled to provide a paper audit trail in the case of problems, disputes or the need for a recount.[3] The introduction of these systems proved highly contentious in some jurisdictions which has eventually led to DRE system refinements through the inclusion of a voter verifiable audit trail (VVAT). Many election jurisdictions have subsequently taken measures to fully phase out the DRE systems in favor of voting systems that provide some form of paper audit trail.

In response to the integrity challenges presented by faulty election voting technology and a poorly understood process, constructive strides have been made in the United States context to develop national advisory standards through a recent updating of the Electoral

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[2] US Public Policy Committee Association for Computing Machinery; Recommendations on Electronic Voting Systems, 2004

[3] Frequently Asked Questions about DRE Voting Systems, VerifiedVoting.Org

Assistance Commission's Voluntary Voting Systems Guidelines (VVSG)[4]. The VVSG provides voluntary regulatory guidance for the next generation of voting technology equipment, which will impact how the industry develops into the future. This combined with industry and various association efforts to self regulate, evaluate and certify technologies reflects an important effort to ensure that voting systems technologies are accepted with the highest confidence by both election administrators and voters alike.

III. International Voting Technology Standards

The development of modern computerized voting technology, while empowering voters by making the process more accessible and user friendly, also introduces vulnerabilities due to the possibility of accidental or malicious interference with the voting processes. Election administrators and practitioners alike would benefit greatly from the development of international guidelines and standards for the application of elections technology. This trend has of yet, not been as broadly applied to the international context where the highest likely market growth opportunities for this technology resides in the future. Of particular concern will be attempts to apply sophisticated voting technology solutions in countries where the human skill capacity to operate, evaluate and audit the technology does not exist widely coupled with infrastructure constraints that may inhibit proper operation and maintenance of the voting systems.

Decisions taken on the selection, procurement and introduction of voting systems technologies will likely have far ranging consequences for how elections are adminstered and perceived throughout the world. A well planned and publicly discussed evaluation and adoption of voting systems technology that is both transparent in its operations and auditable will go far in assuring public confidence in the electoral process. A well managed evaluation and introduction of voting systems technology has the opportunity to enhance the integrity in the democratic electoral process.

[4] 2008 EAC VVSG update expands material in many areas, including reliability, quality, usability and accessibility, security, and testing. Requirements are more structured and meant to provide guidance to voting system manufacturers and test laboratories.

IV. Case Study Analysis – State of Connecticut

The following examines the implementation of HAVA mandated electronic voting technology improvements in the State of Connecticut. Examination of this case study will provide lessons learned about how a consensus decision to adopt certain voting technology was made and the creative methodologies that were introduced to ensure confidence in the newly introduced voting systems.

Prior to transitioning out its machine lever voting systems, Connecticut over the course of multiple elections cycles, engaged vendors in simulations of different technologies in various jurisdictions to assess voting system performance and gauge public reaction and confidence in the systems being tested. These simulations included the testing of both DRE technologies as well as optical scan technologies and provided state election authorities a good understanding of the performance of the technologies on voting day.

However, civic groups and other concerned citizens actively pressed the Secretary of State to perform a more thorough analysis of the technology rather than to rely solely on the simulations and technical presentations provided by the vendors. This was an important factor in Connecticut's decision to independently evaluate the infrastructure of the voting machines through a series of information technology based diagnostic tests.

Establishment of Third Party Independent Technical Consulting Resource: With the HAVA decision to upgrade voting technologies Connecticut created a Voting Technology Standards Board in 2005 to review the state's evaluation and potential procurement of the voting technology. The Secretary of State's Office (SOTS) – the chief election administration body in the state - recognizing an internal technical capacity deficit was granted legislative approval to outsource the technical evaluation of the voting system technologies. In response, the University of Connecticut Information Technology Department established a Voting Technology Research (VoTeR) Center to advise state government in the use of voting technologies, to research, investigate and evaluate voting

technology and voting equipment, and to develop and recommend safe use procedures for the computerized voting technology in elections.[5]

The UCONN VoTER Center was granted the authority to perform the following independent evaluation of voting systems technologies:

(1) Technical review, testing or research associated with the certification of voting equipment;
(2) Technical review, testing or research associated with the de-certification of voting equipment,
(3) Development of standards for the use of voting equipment during any election, primary or referenda;
(4) Development of standards to ensure the accuracy of voting equipment;
(5) Development of standards and procedures for the security, set-up and storage of voting equipment;
(6) Development of standards, procedures and oversight of post-election audits;
(7) Development of standards for re-canvass procedures to ensure the accuracy and reliability of any such re-canvass;
(8) Development of standards and procedures for the programming of ballots and voting equipment;
(9) Research and analysis of data formats for ballot programming and election-related electronic data.[6]

The VoTeR Center offers the State an independent, objective analysis of the voting technologies offered by several vendors, and advised the State on selecting and administering the voting equipment for its election needs. Very importantly, there is no association or affiliation with the VoTeR Center and any voting technology vendors. The evaluations of the voting technology are performed at the VoTeR Center Lab located at the University of Connecticut campus. As the VoTeR Center relates, "this includes

[5] http://voter.engr.uconn.edu
[6] Public Act No. 07-194, Concerning the Integrity and Security of the Voting Process

comprehensive hands-on evaluations, exploration of possible attack vectors, physical integrity checks of the terminals and memory cards, and mitigation strategies."[7]

Strict Audit Authority: The Center's authority, as written in law, to randomly perform pre and post election auditing of the voting machines (optical - voter-verified paper trail) and the memory cards is critical to ensure the reliability and accuracy of the elections. Ten percent of all election district equipment will be audited pre-election and twenty percent post-election, according to Connecticut law. The audits serve to increase the integrity of the election process by validating the infrastructure being used for the elections and the end results. Such audits can reveal not only incorrect (or malicious) programming of the customizable software components, but also mistakes or oversights that can occur in preparing voting machines by district or by polling station personnel running the elections.

For example, in a 2008 primary election pre-election audit, one memory card was incorrectly set for election with non-zero counters. If the incorrectly set memory card was used in an election, the results would reflect the extra votes already on the card. Although this would have likely been detected by the failure to produce a zero total report on election day, it still is a mistake that could have implications on vote totals. Additionally, several cards were not set properly at the start of polling and although not likely to compromise the integrity of the process, this was contrary to the proper procedures highlighting the importance of developing clear and precise procedures with a requisite training program for poll workers.

Through the 2008 pre-election primary audit the UCONN experts also found a substantial number of spoiled or "junk" cards (3.5% in pre-election audit and 8% in post-election audit). Whether or not these cards were the result of software or hardware failures, or lack of testing at the vendor site, such rates of failure are inadequate for modern electronic systems. Most importantly, however, for the overall integrity of the process the UCONN VoTeR examination of audited memory cards revealed no incorrect ballot data

[7] http://voter.engr.uconn.edu/voter/Reports.html

or malicious code and no interference with the tamper-evident (serial coded plastic seals) protection of the voting machines, strict chain of custody and post-election random audits.

Chain of Custody: The development of effective chain of custody procedures also ensures high public confidence in the safety of the voting systems. The opportunities for maniputlation of the machines or memory cards therefore become almost a non-issue if procedures are properly followed. Intensive training of election officials will ensure that procedures are followed.

Certification / De-certification of Equipment: Through its review and analysis of the performance of the electronic voting systems the independent technical VoTeR's Center may advise to the Chief Election Administrator or Secretary of State to either to de-certify poorly functioning systems or maintain certification of existing electronic voting systems.

This is advantageous for the election administration in maintaining, reviewing or ending its service agreements with the respective vendor providing the electronic voting technology.

Conclusion: There are a range of areas where lessons can be learned from the State of Connecticut example. Of particular interest for election bodies considering procurement of electronic voting systems would be the following:

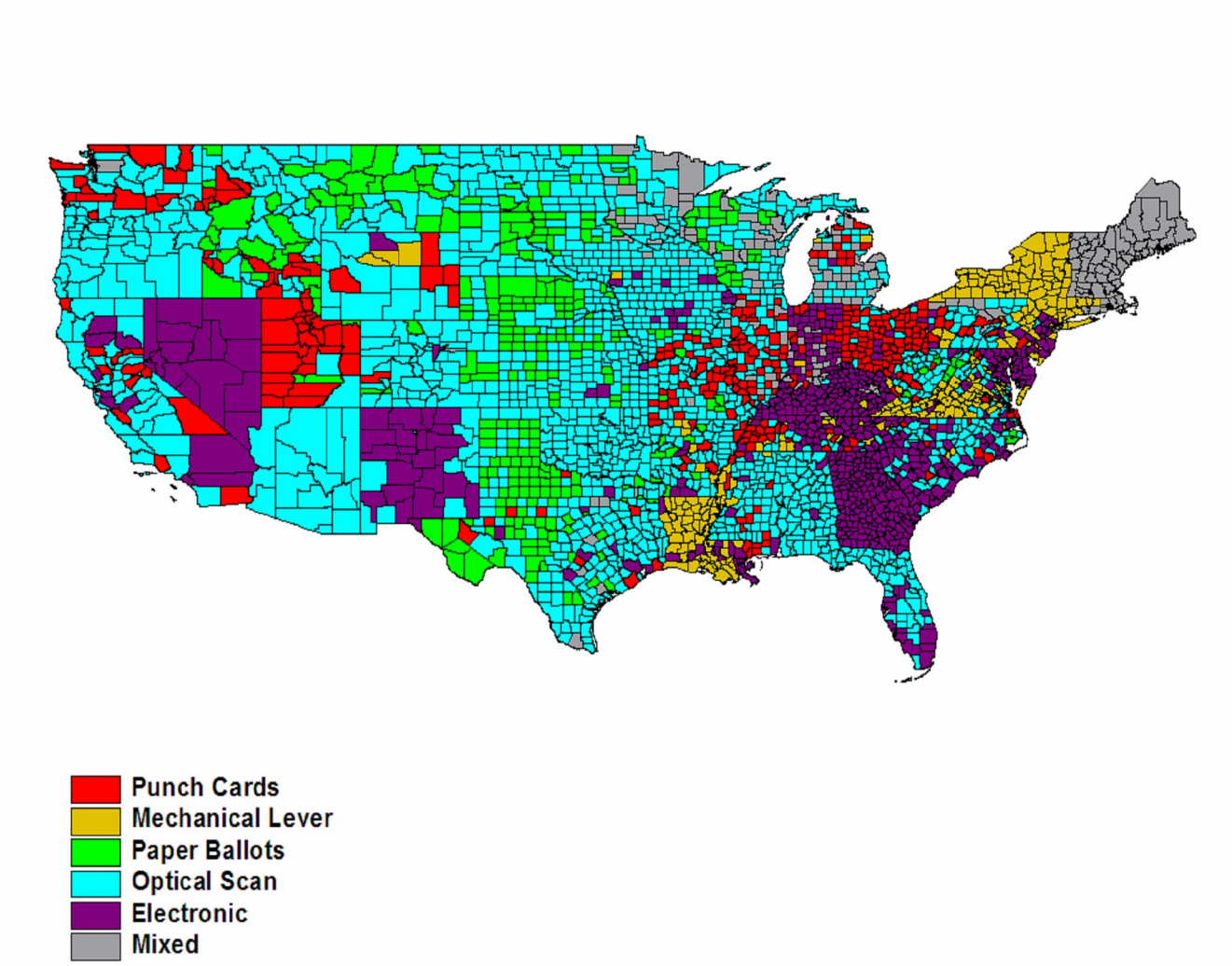
- Outsourcing the information technology systems evaluation to a counterpart institution. This institution, unlike the election administration, would have the necessary capacity to perform complex diagnostics and tests on the voting systems technology and make objective recommendations about systems procurement or potential systems modification.
- Integrating independent pre-election and post-election auditing systems to ensure the proper performance of the voting systems technology. Public disclosure of the

audit results will perform an important confidence building measure that the system is performing as designed or will be fixed if not functioning appropriately.

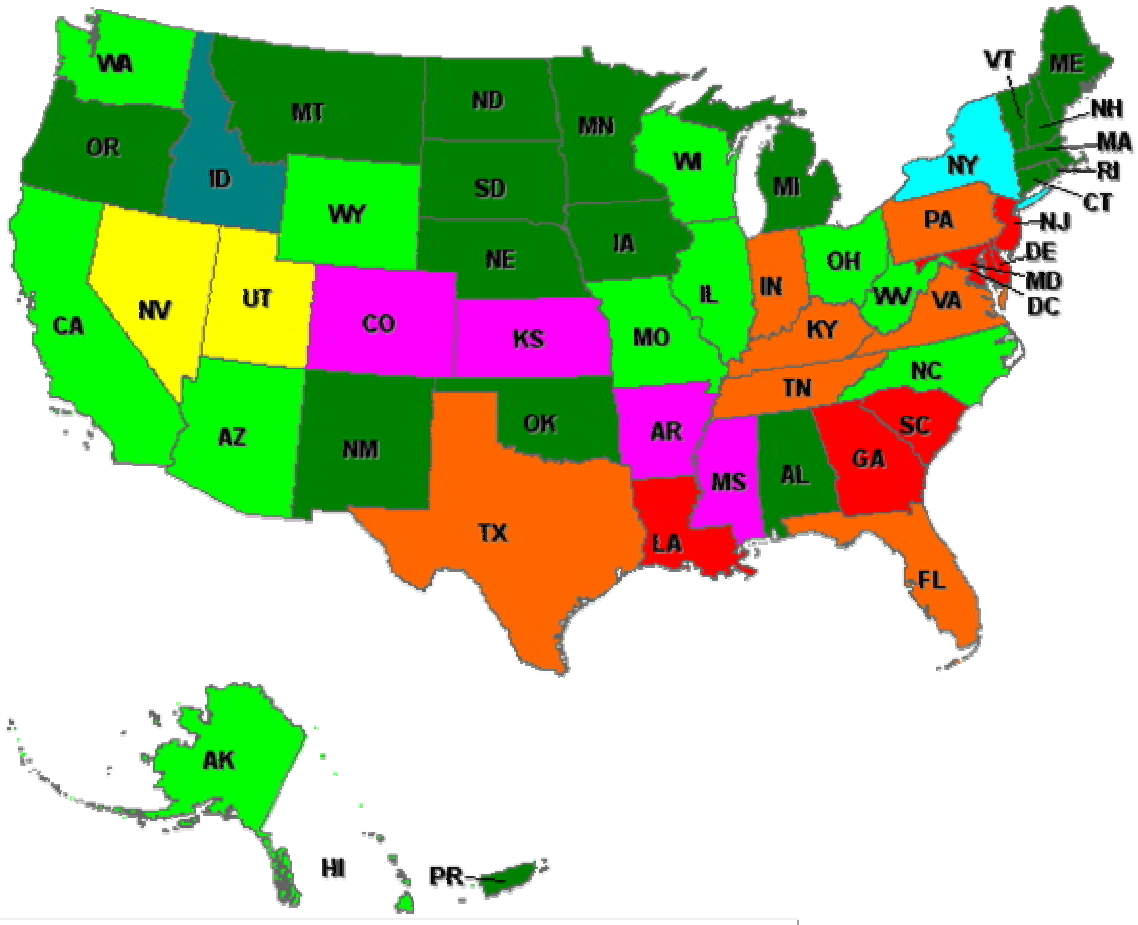
Finally, Connecticut benefited greatly through an interactive dialogue with the public and interested civic groups as it sought to select new voting technologies. This most assuredly built public confidence in and support for the eventual voting technology procured by the state. In November 2008, the state implemented its first statewide schedule of federal, state and municipal elections using the new voting system in all polling stations. No voting systems performance complaints were reported and in large part the system was accepted without question.

Annex: The following illustrations present a dramatic picture of the decentralized nature of US election administration and the individual states varied selection and integration of new voting systems in response to HAVA obligations from 2004 to the most recent 2008 elections.

2004 US Election Voting Systems by County



2008 US Election Voting Systems by State



Legend - Standard and Accessible Equipment 2004

- Paper Ballot – Optical Scan Systems
- Paper Ballot and Punch Card
- Mixed Paper Ballot and DREs with VVPAT
- DREs with VVPAT
- Mixed Paper Ballot and DREs with and without VVPAT
- Mixed Paper Ballot and DREs without VVPAT
- DREs without VVPAT
- Mechanical Lever Machines and Accessible Ballot Marking Devices

VVPAT = Voter Verified Paper Audit Trail Printers

DRE = Direct-recording Electronic

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[8] VerifiedVoting.org; Since 2006, 131 counties across 9 states -- California, Colorado, Florida, Iowa, Kentucky, North Carolina, Ohio, Pennsylvania and Virginia -- removed DRE machines in favor of paper ballot voting systems.[8]