Electronic Voting
A Strategy for Managing the Voting Process

Synopsis

The Grand Jury investigated Santa Cruz County's response to the requirements of the "Help America Vote Act" and the county's effectiveness in implementing so-called "electronic" or "computerized" voting machines. The investigation revealed that the county's strategy in deploying new voting machines was effective. The overall security, reliability and accuracy of the voting and counting process were found to have met reasonable expectations. In general, the suitability of polling stations and worker training was also found to have been adequate. Public reaction to electronic voting was measured in an exit poll on the day of the November 2006 election. There were areas that could be further improved from the standpoint of efficiency and public confidence and understanding of the process. These areas are identified in this report.

"This is the biggest change we've seen in the elections process in the history of the nation."   Bruce McPherson, former California Secretary of State

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Background

"The Help America Vote Act" (HAVA or the Act) was passed by Congress in 2002 to provide assistance with the establishment of minimum election administration standards for federal elections. HAVA provides the states with funds, which in part are to be disseminated to the counties to meet the various provisions of the Act. The Act requires:

- Nationwide implementation of provisional voting.

- Voter ID requirements for new voters in federal elections.

- Replacement of punch card and lever voting machines.

- Voting system accessibility for voters with specific needs.

- A centralized statewide voter registration database in each state and territory.

- Specialized handling of absentee ballot applications for military and overseas voters.

- Each state and territory to define what constitutes a valid vote.

As the result of both federal and state legislation, HAVA and California's Proposition 41 (the Voting Modernization Act), major changes are occurring in the processes by which state and Santa Cruz County voters cast their ballots, as well as in the way votes are tabulated. Regarding the move to electronic voting machines, the former California Secretary of State, Bruce McPherson, said: "This is the biggest change we've seen in the elections process in the history of the nation."

With this change, specialized computers are used directly by voters in casting their ballots and provide for automation of the tabulation of the votes.

Early attempts to use such machines around the country have led to a number of problems — from power outages that made machines unusable, to machines rebooting for unknown reasons mid-day during an election, to difficulties experienced by precinct staff in starting the machines and properly capturing totals.

There are several vendors of voting machines, including: Sequoia Systems (the system used by Santa Cruz County in the November 2006 election), Diebold Machine, and ES&S Machine. To date, there have not been any reports of significant Sequoia failures, but serious concerns have been raised about the reliability of other systems. In North Carolina, it was reported that 16,000 votes were lost (Diebold Machine). Also, there were 18,000 missing votes in Florida, which have not been resolved (ES&S Machine).

Reliability concerns arise both from questions about the workings of the generally privately owned and proprietary software and the vulnerability of the machines to fraud. According to an expert, fraud results from manipulations of the operating software (hacking) or of physical manipulations, such as swapping out memory cards containing the machine software and/or the vote totals. The new California Secretary of State, Debra Bowen, has recently commissioned a study of the matter. She has formed a team of highly technical members. They will be doing a "top to bottom" review of the various voting systems. This study will include:

- Reviewing the source code. It is proposed to maintain the source code at the state level.

- Performing "attack" testing to ensure that the system cannot be hacked.

- Conducting a voting system documentation study.

This will be the first time that Sequoia Voting Systems has been reviewed by the State of California.

Santa Cruz County evaluated several options before selecting Sequoia Systems as the vendor for new voting equipment. Santa Cruz County has been notably cautious in their approach to changing the voting processes, both because of concerns regarding the reliability of the new systems and because of cost issues. Our county has opted to implement the minimum legally required system — which is to have a single touch screen machine in each precinct polling location and to allow voters to choose between paper ballots capable of being optically scanned or the touch screen machine. Although optical scanning had been used in earlier elections, voters began using touch screen machines in the last election (November 2006).

Scope

The Grand Jury has chosen to review the following issues as they relate to the new voting process:

- Adequacy of security in the election process.
- Performance of the voting machines.
- Reliability and accuracy of the vote tallies.
- Adequacy of poll worker training.
- Suitability of polling place physical arrangements.
- Adequacy of election staffing.
- Adequacy of public education of the voting process.
- Suitability of the current strategy to comply with the Help America Vote Act.
- Poll worker and voter opinions of the new process.
  - Poll worker and voter surveys.
  - Grand Jury observations.

Definitions

400C Ballot Counter
Machine that counts the paper absentee ballots.

Electronic Voting
Using computers to capture, record and tally votes.

HAVA
Help American Vote Act — act passed by Congress in 2002 which specifies that all federal elections must meet certain minimum standards.

Memory Pack
A cartridge which plugs into scanner and contains the files unique to that precinct.

Memory Stick
A portable device which stores data.

Optical Scanner
Computer equipment that scans, counts, and accumulates the paper ballots.

Paper Trail
Verification of each voter's choices. The paper trail on the touch screen computer consists of a compilation of the voter's votes that is visible to the voter at the end of the ballot process.

Polling Place
A place where people vote, usually — but not always — voting precincts have their own polling places.

Poll Worker
A person who is trained to work in the polling place.

Proposition 41
Voting Modernization Act of 2002 — state proposition which authorized the state to sell $200 million in bonds for updating voting systems.

Proprietary
Exclusive; secret; may not be accessed by anyone but the owner.

Results Cartridge
A cartridge which plugs into the touch screen machine; it contains the unique form for that precinct and a data field for counting the votes as they are input on the screen by the voter.

Sequoia Systems
One of several voting computer system vendors; the vendor chosen by Santa Cruz County and used in the November 2006 election.

SERVE
Secure Electronic Registration and Voting Equipment.

SQL Server
SQL (Structured Query Language) is the programming language that communicates or interfaces with the database that stores voting data. The server is the main computer on which the database resides.

Touch Screen
A computer display which the voter can control by touching the screen.

Voting Precinct
One of several districts into which a city or county is divided for voting. Most precincts have their own polling places, but in Santa Cruz County's November 2006 election, some precincts shared polling places.

Findings

1. Adequacy of Security in the Election Process

A. Data Security

1. The Sequoia Systems (Sequoia) software is privately owned and proprietary. California is requesting that the code be accessible to the state.

2. Sequoia equipment and software goes through extensive testing by Sequoia Systems. This testing is required by the state.

3. The Sequoia Systems' touch screen voting machine uses a voter verified paper trail which is the fundamental protection against software errors in recording the vote, provided there is a good audit procedure following the election.

4. Procedures are in place to protect the integrity of the data on the voting machines' memory packs and results cartridges. These items are external and

removable and protected with traceable seals. Any sign of tampering with the seals is reported to the Election Department and investigated. There is a standard reporting form, and written procedures are provided to the poll workers.

5. The ballot information file for each precinct was created by the Santa Cruz County Election's Department's Information Systems Analyst and the program coordinators. It was sent electronically to Sequoia, the vendor, where the ballot election files were created. Sequoia also provided the printed paper ballots. There was a unique file created for each precinct. Files were then sent back electronically to the SQL server which resides in the Information Systems Analyst's office for updating and testing. Sequoia provided all testing scripts and assisted in the testing this past election.

6. Prior to the November 2006 election, the ballot information was reviewed, modified and approved by the county program coordinators and the Information Systems Analyst until it was ready to be sealed. The Information Systems Analyst, via a memory stick, manually extracted the data and loaded it onto a stand-alone laptop system. The cartridges for the voting machines were written from this system. They were sealed and coded. Once sealed, they were ready for distribution to the voting machines.

7. During the last election, some areas for improvement on warehouse check-in and out of equipment were noted. For example, the person checking out equipment was not identified.

B. Warehouse Security

8. All voting equipment and accessories for Santa Cruz County are stored in a secure warehouse within the city of Santa Cruz. The exception to this is the SQL server, which is used as a network server for the Elections Department, and the 400C (absentee paper ballot counter) which resides in the Information Systems Analyst's secured office. All files are backed up and stored in a storage area offsite at the Elections Department warehouse.

9. The results cartridges for the touch screens and memory packs for the scanners are created on a stand-alone computer at the warehouse. They are then loaded and sealed into the appropriate precinct equipment and stored until ready to be shipped to the polling place. Access to both the warehouse and office are controlled through the use of color-coded security badges. Four Elections Department supervisors with the widest access to the county's voting machines and voting materials have their own color-coded badge. Temporary employees, who must be escorted and supervised inside the secure area, have a different color badge, as do permanent Elections Department employees, visitors and exhibitors, and voting machine vendors.

10. The warehouse has an alarm system, provided by First Alarm. An access card is required in order to enter. The Information Systems Analyst, Department Information Systems Specialist and the Election Officer have the First Alarm access code.

11. A large door is locked from the inside. All equipment is within a caged area of the warehouse with controlled access.

C. Poll Site Security/Physical Equipment

12. The assigned person at each precinct picks up the voting equipment from the warehouse the day before the election. The cartridges are already in place and sealed. A poll worker takes the equipment home. On election day, they take it to the polling place and set it up.

13. At the close of the polls, two designated persons break the seals on the results cartridge and the memory pack and remove them from the machines. Cartridges and seals are put in a sealable orange bag. The printer is removed from the touch screen machine for transport. The orange bag and printer are prepared by an inspector and a designated person. These items are taken to the election department, where the bags are checked, verified, and stored in the Information Systems Analyst office until ready to tally. The person who checked out the equipment and brought it to the polling site is also responsible for taking it back to the county building. All voting equipment is eventually returned to the warehouse for storage.

14. After the November 2006 election, the above process was reviewed by election staff. It was found that there were delays in equipment check-in.

15. The issue of fire protection of the polling places was not addressed when the polling places were chosen. Since most poll sites are in public buildings, it was assumed that the fire protection available at the poll site location would be relied on.

2. Performance of the Voting Machines

17. Sequoia Systems is a state-approved vendor for the new voting equipment. They were chosen by Santa Cruz County to provide the voting equipment.

18. The touch screen voting machine has a printer which records the votes. It has 300 feet of paper inside the machine. During the last election, the paper often jammed.

19. During the November 2006 election, two or three scanners failed and at least 12 printers jammed. When the failed scanners were tested, it was determined that they probably had been damaged in transport.

20. The 400C Ballot Counter Machine reads the ballots very quickly. However, the catch basket, which is located outside the machine, is not large enough to hold all of the ballots. As a result, ballots can get bent or be ejected onto the floor.

3. Reliability and Accuracy of the Vote Tallies

21. The results cartridge plugs into touch screen equipment. It contains a database for capturing the votes as they are input by the voter. This cartridge cannot be removed without breaking a seal.

22. The memory pack plugs into the optical scanner. It also uses a database for capturing the votes as they are input when the ballot is scanned. The memory pack cannot be removed without breaking a seal.

23. Firmware (software imbedded in the machine) operates the machines. The Secretary of State demands the firmware be at a specific level (version). It cannot be changed after 60 days prior to election. A test is run to ensure the firmware level (version) is correct.

24. To ensure the reliability and accuracy of the equipment, logic and accuracy testing is conducted by the vendor and county personnel. Some experts believe that this testing is insufficient for validating the accuracy and reliability of the vote. They argue that it consists only of verifying whether the equipment is working. It does not evaluate the equipment's security.

25. After they are finished voting, voters who use the touch screen equipment can verify the accuracy of their votes by looking at a compilation of their votes that is displayed in a window on the machine.

26. Following a written procedure, the designated poll worker and one other poll worker break the outer seal and assist the first voter to verify prior to his or her vote that the "total votes" displayed is zero. Both the poll worker and the voter sign an official document verifying that the vote count is zero.

27. On 10 percent of machines, a random sample with full paper recount is taken to check that the machines are tallying correctly.

28. After the November 2006 election, Capitola initiated a manual recount. Each precinct was reconciled separately. With approximately 3000 votes to count, it came out to within one vote of the machine count. The final election results did not change.

29. During the November 2006 election, a number of absentee ballots had to be redone due to the types of pens used. Some voters used pens that bled through the paper and could not be read by the scanner.

30. Provisional ballots were being used for voters who had come to the wrong polling place. Some provisional ballots had to be redone because they were folded the wrong way.

4. Adequacy of Poll Worker Training

31. An organized training plan with documentation was provided for the poll workers and inspectors. One person at each polling site was trained and certified to use the machines. There were "rovers" who traveled between polling sites to check on machines and supplies.

32. Before the November 2006 election, county staff did a lot of on-the-job training while concurrently preparing for the election because the equipment arrived late.

33, The training documentation from the vendor had to be completely redone because it had to be customized to the design of the Santa Cruz County election model.

34. In the future, the Elections Department plans to create a professional DVD to supplement poll worker training.

35. Poll workers have documentation binders which have flip charts and checklists. Also, they are trained how to deal with the press and observers.

36. Poll workers indicated they wanted more "hands-on training" with the machines in addition to having more poll workers trained on the equipment. These machines are sophisticated computer equipment, and if something goes wrong, many poll workers don't know what to do. (See Poll Worker Survey in the Appendix for more information.)

5. Suitability of Polling Place Physical Arrangements

37. The physical arrangement of the polling places was similar to past elections. This consistency contributed to a stable atmosphere.

38. The touch screen machine was positioned with the back of the machine to the wall. This placement meant that the voter's selections could be seen by others standing nearby.

39. The county was proactive in making the touch screen machine wheel chair accessible by re-engineering the support legs. In addition, they custom designed carrying bags for the scanner.

40. Santa Cruz County was sued by the State Attorney General for not following Americans with Disabilities Act (ADA) regulations for polling sites. The parties agreed to settle the lawsuit without finding that the county had violated the ADA regulations.

41. Some polling places that were shared by more than one precinct also shared touch screen machines. This arrangement caused some confusion because voters had to identify which precinct they were voting in as the first step in the voting process, and many did not know.

6. Adequacy of Election Department staffing

42. In the start-up process for the new voting system, the Department Information Systems Specialist, Elections Officer, Assistant County Clerk and the Information Systems Analyst were trained first, and then they were able to provide training for others. Sometimes training occurred simultaneously with the installation of the new equipment.

43. The staffing for the poll places was conducted in the same manner as in previous elections. Polling place staff is typically temporary help from the community. The polling place supervisors are relied upon to pick up the equipment at the warehouse the day before the election, keep it at their houses overnight and take it to their polling places in the morning for set up.

7. Adequacy of Public Education of the Voting Process

44. In an effort to educate the public, the Elections Department distributed thousands of voter pamphlets to the public via U.S. mail. The department personnel also gave speeches and distributed educational material at local public schools, bookstores, the Capitola Mall, and the county fair. Media promotion included television and public radio interviews and press releases.

45. Despite the education campaign, some voters were confused as to how to mark their ballots. For example, some voters who used the paper ballots did not understand how to connect the arrows to the candidate or issue they were voting on.

46. In general, voters who used the touch screen machine seemed unaware of the importance of verifying their votes by comparing them with the compilation of their ballot that was visible through a window on the machine.

8. Suitability of the Current Strategy to Comply with HAVA

47. County election officials determined that there would be one touch screen at each polling place. The new scanner would be the main voting machine. They reported that this choice proved to be a good decision. Not only did it provide the necessary accommodations for voters with disabilities, but it also ensured the reliability of the voting process. Having a mixture of technologies ensured that votes could be cast in the event of equipment failures. For example, if the touch screen printer jammed, except for those who are sight impaired, voters had an option to use a paper ballot.

48. A recent news release announced that Florida will shift its voting system to a system of casting paper ballots counted by scanning machines. Several counties around the country will be moving to adopt the touch screen system with the paper trail.

9. Poll Worker and Voter Opinions of the New Process

A. Poll Worker and Voter Surveys

49. On election day, the Grand Jury conducted a two-part poll worker survey and collected 104 surveys for analysis. The first part of the survey covered the poll worker training (see #4 above — Adequacy of Poll Worker Training), and the second part was a critique of the election day process. While most were extremely positive as to the work of the Elections Department, they made substantive recommendations for continued improvement of the elections process including the use and placement of the equipment. [See Appendix for full results of the survey.]

    One hundred and four poll workers out of a total of 917 in Santa Cruz County were surveyed. They were asked to rate aspects of the voting experience from 1 to 5, with five being the best rating possible. The results were as follows:

    - Training materials: 4.3

    - Overall preparation: 4.0

    - Adequacy of election day staffing: 4.5

    - Ease of equipment set up: 4.3

    - Workers indicated they wanted more training on the machines and "hands on" practice.

50. The Grand Jury also conducted exit surveys with 320 voters throughout the county. (The total votes cast was recorded as 50,189 in 170 polling places.) The results of the survey are as follows:

    - Only about 19 percent of the sample chose to use the touch screen machines.

    - One hundred percent of those who chose to use the touch screen felt comfortable using it.

    - Ten percent of those who chose to use the paper ballot with optical scanner felt uncomfortable using it.

B. Grand Jury Observations

51. Members of the Grand Jury made general observations while conducting the exit voter and poll worker' surveys at the November 2006 election. They witnessed the failure of some equipment and agreed with many of the

solutions suggested by the poll workers. [See Appendix for more information about the survey.]

52. During the November 2006 election, it was observed that most poll workers gave paper ballots to the voters and did not indicate that the touch screen method was available.

53. It was also observed that not all voters were offered a receipt for voting when they used the touch screen machine.

Conclusions

1. It is a matter of national priority to have a transparent electronic process and accurate election results.

2. The County Elections Department has done a good job of securing the voting data. It has provided traceable seals, "stand-alone" cartridge creation and storage, extensive testing, detailed procedures and complete systems backup.

3. The touch screen voting machine adopted by the county uses a voter-verified paper trail which provides verifiable voting results and a method for testing. This system, combined with a good audit procedure, ensures voting accuracy.

4. For the November 2006 election, Sequoia Systems not only supplied the test cases, but also assisted in the testing. There was no independently controlled testing in addition to what the vendor provided.

5. The Elections Department warehouse — where the cartridges are prepared and stored until ready for shipment to the polling place — is sufficiently secure. Besides being badge access controlled, it is protected by the First Alarm Security System.

6. Proper procedures are in place to ensure the security of the data.

7. All types of equipment had problems. Printers jammed, and two or three scanners failed. Proactive planning by the Elections Department helped mitigate these problems.

8. The 400C Ballot Counter had problems that need to be corrected in the future. Although it counted the votes quickly, some ballots were damaged when they were ejected from the machine.

9. The Elections Department was proactive in creating written procedures for all aspects of the election process and identifying areas of improvement after the election. Poll workers were supplied with good procedures to do their jobs.

10. The touch screen set up provided adequate wheel chair access. The Elections Department was proactive in re-engineering the machine support legs to accommodate a wheel chair. However, the placement of the touch screen computers in some polling places contributed to the lack of voter privacy,

Also, some co-located precincts shared a touch screen, which confused some voters when they were asked to identify their precinct.

11. The fact that Santa Cruz County is not flat in several locations and uses many older buildings as polling sites led to a lawsuit against the county alleging the county's failure to comply with accessibility regulations. The parties agreed to settle the lawsuit without finding that the county had violated the Americans with Disabilities Act requirements.

12. Because several staffers had to be both trainers and trainees, the Elections Department was stretched very thin in training for the new voting system. Due to this shortage of staff and time crunches, some poll workers were not completely prepared. Even though the poll workers were trained to advise voters that the touch screen was available for their use, most workers presented the paper ballot as the only option.

13. Voter awareness and understanding of the new voting process could have been better. Even though voters were informed about the new process, many lacked a good understanding of how it differed from the previous process, and some were confused about the new ballots. Many understood that the touch screen was new but did not realize that their paper ballot was being scanned, which was a new process.

14. Although there was some confusion over the new process, most voters felt comfortable using the new equipment.

15. Although this change in the voting system complied with the "Help America Vote Act," using the new technology did, in fact, take longer, cost the county more and required more staff and testing.

16. The strategy to put just one touch screen at each polling place proved to be a good one. It satisfied the requirements for voter accessibility while providing more current technology for voters. The mixture of technology also provided backup. If the printer or other equipment had a problem, voters had another way to cast their votes.

Recommendations

1. The Elections Department should continue to make security improvements, thereby ensuring the integrity of the data.

2. Because this was the first year using the new electronic voting system, the Elections Department relied heavily upon the vendor for testing and support. In the future, the Election Department needs to create and conduct its own testing program.

3. The use of the verifiable paper trail on the touch screen voting machine has proven successful. Pubic awareness of this method of verification should be stressed in the future.

4. The poll workers should continue to follow procedures established for ensuring the security of the data, which include traceable seals on the memory packs and results cartridges and procedures for handling the seals. If a seal is found broken on a machine, that machine should not be used. In addition, all machines which have a broken seal at the end of the day, should undergo a full manual count.

5. The Elections Department should work with the vendor to solve the various problems that arose with the ballot counter damaging ballots.

6. The Elections Department should set up procedures for auditing the absentee ballots.

7. Because comprehensive poll worker training proved difficult to provide with a limited staff and it is important to have most poll workers trained on the machines, staffing should be increased so that the management is not stretched too far by overseeing the election process while also training other staff and temporary employees.

8. In future elections, the touch screen machines should be set up to provide more privacy for the voter. The side panels should also be larger for privacy in voting.

9. Each precinct should have its own touch screen in the future to avoid voter confusion.

10. Because the "ledger" size of the paper ballots was too large to fit comfortably in the old polling booths, the size of the paper should be adjusted to solve this problem.

11. Because of the common practice of storing the equipment at the polling place supervisor's house overnight, these supervisors should be identified as far in advance as possible to allow for additional training on security procedures and the vulnerability of the equipment.

12. The Elections Department should plan to strengthen its "advertising" campaign for future elections. It should focus on educating the voters to verify the paper trail when using the touch screen equipment.

13. The Elections Department should review the appendix to this report and take appropriate action based on poll worker and public responses.

14. Since a number of poll workers dropped out the night before and morning of election day, requiring substitutes that were not trained, a pool of trained alternate poll workers should be available on election day to substitute in case of poll worker absenteeism.

Commendations

1. The Elections Department has provided a secure warehouse to protect the equipment and store the data. They have done an excellent job with physical security.

2. Since all types of the new voting equipment had operational problems, the Elections Department should be commended for using a mixed equipment approach that allowed for backup in case a machine had problems. Except for the visually impaired, this approach mitigated most problems.

3. The Elections Department did an excellent job of ensuring that the votes were tallied correctly. Procedures were put in place to ensure a starting count of zero, traceable seals, verifiable paper trail and a 10 percent manual count.

4. The Election Department provided all workers with good procedures to do their jobs. Written procedures will ensure the smooth operations of future elections.

5. The Elections Department should be commended for being proactive in making the environment available for the voters with disabilities.

6. The Elections Department deserves a major commendation on its strategy of putting just one touch screen at each polling place.

Responses Required

Entity	Findings	Recommendations	Respond Within
Santa Cruz County Board of Supervisors		7	60 Days September 1, 2007
Elections Officer	1 - 46	1-14	90 Days October 1, 2007

Sources

Interviewed:

- County Clerk and Election Department staff

- Department Information Systems Specialist

- Information Systems Anyaly6st

- Assistant County Clerk

- Electronic Voting Expert

Reviewed:

- Board Minutes

- County Reports.

- Newspaper Articles

Web Sites:

- Santa Cruz County Elections Department. This has a great deal of information about the plan for the last November election and links to info on the products to be used. There is also information about the bidding and selection process. (http://votescount.com/).

- Online flash demo of use of a touch screen voting machine. http://sequoiavote.com/demo.php?lang=vv

- Brochure of the new optical scan system. http://www.sequoiavote.com/docs/insight.pdf

- Link to the Sequoia Brochure describing the touch screen machines. http://sequoiavote.com/docs/AVCEdge.pdf

- A national website devoted to the controversy. www.blackboxvoting.org

- A 38 page report from an Secretary of State funded study. http://accurate-voting.org/2006/02/19/security-analysis-of-the-accubasic-interpreter.pdf

- A panel appeared on the News Hour with Jim Lehrer, discussing this issue. This is a transcript of that telecast. http://www.pbs.org/newshour/bb/politics/jan-june06/voting_06-15.html

- An executive summary of the "Secure Electronic Registration and Voting Experiment" (SERVE) A few lines down is a link to click to the author's bios. http://servesecurityreport.org/

- The official site of the California Secretary of State: http://www.ss.ca.gov/

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