Myth Breakers for Election Officials

A Collection of Information Essential to Those Entrusted with Making Decisions about Election Systems in the United States

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Preface

This collection of information originated as a result of an email conversation I had with an election official. I was working with VerifiedVoting.org at the time and had become more and more bewildered by the resistance to a voter-verified paper ballot (VVPB) on election equipment. Discovering that she was in favor of a VVPB, I asked her:

> As you probably realize, we are somewhat befuddled by the opposition from so many election officials. Is there something we are missing, something we need to know to help us speak more appropriately to their objections?

She replied:

> States are under enormous pressure right now with little guidance and the whole DRE[1] security issue is something that has erupted only recently. It is also not clear to many what "studies" are legitimate or rumor. Add in a dose of politics – the comments about Diebold Execs and Bush ties – and you have a real mess.
>
> If you are a state that already invested a lot of effort in the electronic voting systems (or you purchased them) you are not likely to want to change your perspective when you can't tell what is fact and what is created to look like fact. Also, we are told adding the paper trail to these machines will cost an extra $500-1000 per machine (ES&S has said this).
>
> SO you have a situation where states have invested time if not money and now this "scandal" comes up that no one can accurately say what it really involves and changing your direction now will cost you even more money and effort. Make sense?

It did. Many of the officials responsible for making election system decisions don't have time to do the extensive, time-consuming research required to learn the enormous variety of information that has become available about voting systems. Those in one state may not be aware of the problems election officials in other states are encountering with the equipment they are using.

> For example, when Indiana officials recently discovered that ES&S had installed uncertified, unauthorized software (a violation of state law) in touch-screen voting machines used by three Indiana counties last November, they demanded that the systems be restored to the earlier version, which was certified. Well, I happened to know that the certified version was the predecessor to the version that had failed so miserably in North Carolina in 2002 (see page 6), so it was almost a sure bet that it would fail in Indiana as well. I figured Indiana officials hadn't been investigating North Carolina elections, so I called to tell them what I knew. Sure enough, they were very glad to find out. Later I read in the news that, after some heated sessions with the election commission, ES&S admitted the earlier version "might not tabulate the votes."[2]

How many officials responsible for our elections know such tidbits as these?

- Hinds County, Mississippi had to hold its November 2003 election all over again because so many of the paperless electronic voting machines (Direct Record Electronic – DRE) broke down that they couldn't determine the will of the voters.
- Neglecting to keep the DRE batteries charged between elections cost Arapahoe County, Colorado over $100,000 in battery replacements just before a recent election.
- If it takes an hour to do the Logic and Accuracy testing on one DRE, San Diego county would have to spend 1275 person-days testing before every election in order to comply with California law.

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[1] Direct Record Electronic voting machine. Votes are recorded on electronic media rather than paper.

[2] **Election Commission Bails Out Voting Machine Maker In Time for May Primary**
March 11, 2004; http://www.wishtv.com/Global/story.asp?S=1706282&nav=0Ra7LTW3

Information is always essential to making wise decisions. That premise is the basis for this collection of information, which is sort of a consumer's guide to voting systems. As the events surrounding elections have become more publicized – especially after Super Tuesday – it has become clear that DREs bring with them many, many problems, and only a few of the problems would be solved by adding voter-verified paper ballots.

Recently, the Department of Defense realized that Internet Voting had too many problems to fix at this time. Perhaps it is time to face the fact that the DREs have too many problems to fix before the next election.

A few of the items discussed in the following pages	**Read more**
♦ Help America Vote Act (HAVA) does not require the use of DREs.	Page 1
♦ The use of DREs has caused many types of election problems. Votes have been inexplicably lost, thousands of voters have been disenfranchised, and questionable results have been certified.	Page 4
♦ Extensive problems have occurred with NASED-qualified DREs, so the testing process is clearly inadequate.	Page 16
♦ The increased complexity of using DREs increases, rather than decreases, the potential for human error in our election processes.	Page 17
♦ Performing the pre-election testing required for DREs in most states can require thousands of person-days before every election.	Page 18
♦ Elections using DREs are vulnerable to all the potential problems inherent in electrical devices.	Page 23
♦ The job of being a poll worker has become so complex with DREs that it requires twice as many workers, up to four times more training, the assistance of vendor technicians, and constant access to an emergency hot line.	Page 26
♦ Election procedures are significantly more complicated and unmanageable when DREs are used.	Page 30
♦ A system of DREs costs up to three times as much as other voting systems.	Page 41
♦ The hidden costs of DREs add an enormous on-going financial burden onto the localities in which they are used.	Page 41
♦ Alternative systems – less expensive than DREs, less complicated, and equally accessible to disabled voters – are readily available for use in time to meet HAVA deadlines.	Page 42

This information is simply a collection of relevant information; **it is by no means an exhaustive work on the issue.** I offer it in the hope that it will help those reading it to make wise decisions regarding our election systems.

Respectfully,

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Acknowledgments

Thanks to the following people, whose contributions to this document were invaluable:

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Bo Lipari, founder of New Yorkers for Verified Voting (http://www.nyvv.org/contact.htm), for his review of this document and valuable suggestions.

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Version Information

Version 2 includes: changes that simplify the pricing information in Chapter 5; and an integrated map on page 10 to decrease the size of the file.

Version 3 includes: a description of my credentials; two additional items about HAVA at the end of Chapter 1; a word about source code and software for novices at the beginning of Chapter 2; one additional item in Chapter 6 about ES&S flaws that have been known for a year.

Version 4 removes information about the November 2003 election in Fairfax County, Virginia. See page 16.

About the Author

Ellen Theisen has a B.A. degree in Mathematics and an M.A in Religious Studies. She has written software documentation for 22 years, working independently on contract for the last 15 years. Her work includes hundreds of documents for dozens of products developed by dozens of companies. Types of documents include software design specifications, functional specifications, software-developer guides, tutorials, user manuals, online help, and data sheets. She has also assisted in designing the user interface, performed formal testing on some of her clients' products, written sample programs to use in tutorials, and written macros in Visual Basic for Applications (VBA). You can see more details at www.ellentheisen.com.

Last July, she became aware of the movement toward electronic voting. Her first-hand knowledge of the software and the software development process made her gravely concerned. She became involved with VerifiedVoting.org and worked more than full time as one of the core team from August 2003 until March 2004, at which time she became involved in co-founding VotersUnite!

Freedom is when the people can speak,
democracy is when the government listens.
~Alistair Farrugia

Contents

Preface iii

1 Facts about The Help America Vote Act (HAVA) 1

HAVA Does Not Require the Use of DREs 1
HAVA Does Not Prohibit Punch Card and Lever Systems 1
HAVA Allows Partial Replacement of Old Systems 2
HAVA "Audit" Requirement is Not a Meaningful Recount 2
HAVA Preserves States' Right to Use Paper Ballots 3
EAC Guidelines and Standards Are Strictly Voluntary 3

2 E-Voting Problems in Recent Elections 4

A Word About Source Code and Programming 4

Ten Types of DRE Problems in the News 6

1) Electronic Voting Machines Fail to Record Ballots 6
2) Suspicious E-Voting Tallies Cannot be Manually Recounted 6
3) Tabulation Software Tallies Votes Incorrectly 7
4) DREs Break Down During Election; New Election Required in One Case 8
5) Electronic Voting Machines Fail to Start Up 8
6) Smart Card Encoders Fail to Operate Properly and Break Down 8
7) Confusion Over Ballot Code Numbers, Voters Receive Wrong Ballots 9
8) Touch Screens Register the Incorrect Choice 10
9) Ballot Too Large for Touch Screen; Paper Supplement Required 10
10) Touch Screens Present Incomplete Ballot to Voters 11

Optical Scanners Miscount, But Manual Recounts are Possible 11

1) Optical Scanners Calibrated Incorrectly 11
2) Misaligned Ballots Cause Error in Results 11
3) Programming Error Prevents Votes from Being Counted 12
4) Defective Chip in Optical Scanner Reverses Election Outcome 12

3 Election Complexities Increased by Electronic Voting 15

Illegal Use of Uncertified Software 15
Inadequacy and Secrecy of the NASED Qualification Process 16
Chain of Custody Complexities Increase Exponentially with the Use of DREs 17
Security is Still Required – for Ballot Cards instead of Paper Ballot Boxes 18
The Realities of Conducting Logic & Accuracy Testing on DREs 19
If DREs Fail the L&A Test ... 20
Increased Problems from Human Error in Electronic Elections 21

Saving Money by Combining Precincts May Decrease Voter Turnout 22
Problems that Even Vendor Technicians Can't Fix 22
Potential Problems Inherent in Electronic Devices 23
Touch Screen Misalignment 23
Miscellaneous Breakdowns on Election Day 24
Power Surges or Static Electricity Discharges 25
Electrical Outages and Inadequate Battery Charges 25
Maintenance Challenges 26
Rapid Obsolescence and Toxic Waste Disposal 27
Running an Electronic Election - a Ballot Judge's Summary 27
Running an Electronic Election – an Election Official's Report 30
Recruitment of Poll Workers 30
Training of Poll Workers 30
Testing of Equipment 31
Troubleshooter Hotline and Other Phone Support 31
Field Support 31
Outreach/Public Education 31
Election Day 32
Preliminary Findings 32
Technical 33
Training 33
Back-Up Plans 33
Next Steps 33

4 HAVA-Compliant Alternatives to Paperless Voting 35
Systems with Voter-Verified Paper Ballot (VVPB) 35
Precinct-Count Optical Scan System 36
Ballot-Marking Devices for the Disabled 37
Tactile Ballot Templates for the Blind and Reading Impaired 37
Open Voting Consortium Software 38
DREs with Integrated Printer for Printing Voter-Verified Paper Ballots 39
Ballot Integrity Project Proposal 39

5 HAVA-Compliant Voting System Costs 40
DRE Systems 40
Increased Cost Per Ballot when DREs are Used 41
Hidden Costs of DREs 41
Precinct-Count Optical Scan System + Ballot-Marking Device 42
Precinct-Count Optical Scan System + Tactile Ballot Templates 43
Open Voting Consortium System 44
DREs with Integrated VVPB Printer 44
Estimated Capital Cost Comparison for Voting Systems 44

6 Distinguishing Truth from Misinformation 45
Reports by Computer Experts Discredit DRE Systems 45
Claims of "Successful Elections" Don't Match the Facts 47
Cleaning up Misconceptions about VVPB 47
League of Women Voters' opposition to VVPB is not a member-endorsed position 47
No systems require voters to verify their ballots 48
No System Provides a VVPB for the Voter to Remove from the Polls 48
No system requires poll workers to assist voters in verifying their ballots 48
VVPB does not violate the Americans with Disabilities Act 48
Optical scan machines are a reliable way to count paper ballots 49
Financial Ties of DRE Advocates to Vendors Suggests Bias 49
Strong Advocate of Paperless DREs Received Large Donations from Vendors 49
ES&S Paid Commission to Officials who Endorsed Their Products 50
San Diego Considers Scrapping Diebold after California Primary Disaster 50
ES&S Audit Flaws Have Been Known Since June 2003 51
Fortune's Worst Technology of 2003: Paperless Voting 52
Summary 53

Eternal vigilance is the price of freedom.

~ Thomas Paine

1 Facts about The Help America Vote Act (HAVA)

As States and localities rush to comply with HAVA,[3] many decision-makers are operating on common misunderstandings of the law. Actual provisions are explained below.

HAVA Does Not Require the Use of DREs[4]

Section 301(a)(3) of HAVA requires that each polling place provide at least one voting method that allows disabled individuals to vote in privacy. Accessibility is required; DREs are not.

> (3) Accessibility for individuals with disabilities.--The voting system shall—
>
> > (A) be accessible for individuals with disabilities, including nonvisual accessibility for the blind and visually impaired, in a manner that provides the same opportunity for access and participation (including privacy and independence) as for other voters;
> >
> > (B) satisfy the requirement of subparagraph (A) through the use of at least one direct recording electronic voting system **or other voting system** equipped for individuals with disabilities at each polling place; and

Voting systems that record votes electronically (Direct Record Electronic – DRE) are only one of the many available voting systems that provide accessibility for disabled individuals. Alternative voting systems that allow the disabled to vote unassisted are available and cost a fraction of the price of DREs. For example:

- Electronic ballot-marking devices, such as the AutoMark by AutoMARK Technical Systems.[5]
- Ballot templates (tactile ballots) like those used in Europe and Rhode Island.[6]
- Free ballot-printing software offered by Open Voting Consortium to run on PC systems. [7]

HAVA Does Not Prohibit Punch Card and Lever Systems

A common misconception is that HAVA bans the use of old voting systems. This is not true. Old systems can simply be supplemented with ballots that allow disabled individuals to vote independently. A state must replace old systems **only** if it accepts Title I funds to upgrade voting systems. Then, according to Section 102(a)(3), the deadlines for replacing the punch card and lever systems are:

- Before the first general federal election after January 1, 2004.
- Or, before the first general federal election after January 1, 2006, if the state filed a waiver by January 1, 2004. For most states, there is no hurry to purchase new equipment.

While state legislation, executive orders, or judicial orders require certain jurisdictions to replace their punch cards or lever systems, HAVA does not make that requirement. In fact, HAVA Section 301(a)(1)(B) specifically allows the use of punch card systems in conjunction with an educational program to help prevent over-voting and teach voters how to correct their ballots.

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[3] http://www.fec.gov/hava/law_ext.txt

[4] Direct Recording Electronic voting machine. Votes are recorded on electronic media rather than paper.

[5] http://www.vogueelection.com; see page 41 of this document

[6] http://www.electionaccess.org/Bp/Ballot_Templates.htm; see page 43 of this document

[7] http://www.openvotingconsortium.org/; see page 44 of this document

HAVA Allows Partial Replacement of Old Systems

If the state does not meet the deadline for replacing punch card systems and lever systems, the state simply repays any replacement funds received for the precincts that did not meet the deadline. Section 102(d) states:

> (d) Repayment of Funds for Failure To Meet Deadlines.--
>
> (1) In general.--If a State receiving funds under the program under this section fails to meet the deadline applicable to the State under subsection (a)(3), the State shall pay to the Administrator an amount equal to the noncompliant precinct percentage of the amount of the funds provided to the State under the program.
>
> (2) Noncompliant precinct percentage defined.--In this subsection, the term "noncompliant precinct percentage" means, with respect to a State, the amount (expressed as a percentage) equal to the quotient of--
>
> (A) the number of qualifying precincts within the State for which the State failed to meet the applicable deadline; and
> (B) the total number of qualifying precincts in the State.

HAVA "Audit" Requirement is Not a Meaningful Recount

HAVA Section 301(a)(2) states the audit requirements for voting systems:

> (2) Audit capacity.--
>
> (A) In general.--The voting system shall produce a record with an audit capacity for such system.
>
> (B) Manual audit capacity.--
>
> (i) The voting system shall produce a permanent paper record with a manual audit capacity for such system.
>
> (ii) The voting system shall provide the voter with an opportunity to change the ballot or correct any error before the permanent paper record is produced.
>
> (iii) The paper record produced under subparagraph (A) shall be available as an official record for any recount conducted with respect to any election in which the system is used.

While HAVA requires that all voting systems produce a paper record in order to provide a manual audit capacity, the paper record of a DRE is interpreted by voting machine vendors and some election officials to refer to an end-of-day printout of either the totals or the ballot images. However, Darryl Wold, former chairman of the Federal Elections Commission, claims that a system audit requires an independent check on the accuracy of the system and that only paper ballots inspected and approved by voters provide the means for that independent check.[8]

In support of the need for a true audit capacity, computer experts point out that if a DRE has made any errors in recording or storing votes, both its end-of-day printouts will be incorrect, and no meaningful audit can be done. When a machine produces results a second time, it's merely a reprint, not a recount.

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[8] **The HAVA Requirement For a Voter Verified Paper Record**
Darryl R. Wold; July 23, 2003
http://www.verifiedvoting.org/resources/documents/HAVA_Requirement_for_VVP_Record.pdf

HAVA Preserves States' Right to Use Paper Ballots

Some election officials are under the impression that HAVA requires them to abandon paper-based systems. This is completely false. Not only does HAVA preserve the right to use paper ballots, it also requires paper for audits.

While HAVA does not specifically require a voter-verified paper trail, it does mandate that voting systems be able to produce a "permanent paper record with a manual audit capacity." When the paper record is produced, it must be able to be audited manually.

HAVA also explicitly preserves jurisdictions' rights to use paper ballots. Section 301(c)(2) specifically says that the term "verify" may not be construed to forbid the use of paper ballots. It states:

> (2) Protection of paper ballot voting systems.--For purposes of subsection (a)(1)(A)(i), the term "verify" may not be defined in a manner that makes it impossible for a paper ballot voting system to meet the requirements of such subsection or to be modified to meet such requirements.

EAC Guidelines and Standards Are Strictly Voluntary

While HAVA charges the Election Assistance Commission with developing guidelines and voting system standards, compliance with these standards is not mandated for the states, nor is compliance required in order to receive HAVA funds for voting equipment upgrades or purchases.

This means that **states retain control over whether or not they upgrade voting equipment to the FEC 2002 standards**, which are the current standards.

Section 221(b) says the voting system guidelines developed by the Technical Guidelines Development Committee to assist the states in purchasing new equipment are "voluntary."

Section 311(a) says the EAC guidelines are intended to assist the states in meeting the voting system requirements and specifically calls the guidelines "voluntary." And Section 251(d) says that compliance with the EAC standards is not a condition of receiving funds to meet the requirements:

> Adoption of Commission Guidelines and Guidance Not Required To Receive Payment.--Nothing in this part may be construed to require a State to implement any of the voluntary voting system guidelines or any of the voluntary guidance adopted by the Commission with respect to any matter as a condition for receiving a requirements payment.

2 E-Voting Problems in Recent Elections

Errors and malfunctions are inescapable with electronic voting equipment, just as they are with any other type of mechanical or electronic device. Failures of paperless Direct Recording Electronic (DRE) systems often leave unanswered questions. Failures of optical scan systems, since there are paper ballots that can be recounted, provide a way to recover and be confident in the outcome.

A Word About Source Code and Programming

While the vast majority of Americans use software programs, most of them do not understand software. Since much of the debate surrounding electronic voting involves discussion of software, the following information is included for those unfamiliar with software.

Source Code

Many technologists are calling for open source code in voting machines. But election officials and legislators may not be clear on what source code is or why open source code is important.

Source code is the list of instructions that cause the computer to display screens, record votes, tally votes, and perform all other functions both visible and invisible. So, for example, when the voter presses the VOTE button, that action triggers a list of instructions for what the machine should do internally. Currently, nobody but the vendors know what those instructions are, and the courts have ruled that those instructions on how to handle votes are a trade secret. In other words, courts have decided that the competitive advantage that secret source code gives to the vendors has a higher priority than the right of the public to know what those instructions are.

"Open" source code means the instructions would not be a secret. Everyone would be able to look at them. Although the instructions are written in programming language, and few election officials or legislators may be able to understand it, there are many programmers who understand the language. Nevertheless, finding bugs by reading source code is not an easy task, especially when you consider that complex programs contains thousands, sometimes millions, of lines of instructions and are often not well documented.

Here is an example of C++ source code that sorts a set of numbers.

```
void Sort( INT* ItemArray, INT ArraySize )
{
   INT     Temp;
   INT     i = 0;
   INT     j = 0;
   INT     Offset  = ArraySize;
   BOOLEAN InOrder = FALSE;

   do {
      Offset  = ((8 * Offset) / 11) ;
      Offset  = ((Offset == 0) ? 1 : Offset);
      InOrder = TRUE;
      for (i = 0, j = Offset; i < (ArraySize - Offset); i++, j++) {
         if (ItemArray[i] > ItemArray[j]) {
            InOrder = FALSE;
            Temp = ItemArray[i];
            ItemArray[i] = ItemArray[j];
            ItemArray[j] = Temp;
         }
      }
   } while (!( (Offset == 1) && (InOrder == TRUE) ));
}
```

Having secret source code is comparable to having vendors write up the procedures they use to count ballots and then refusing to show anyone -- even legislators and election administrators -- what those procedures are. And then allowing the vendors to go into a locked room, carry out those secret procedures, and return to public view only to announce the results of the election.

Having open source code is comparable to the vendors showing everyone the procedures they wrote up and then going into a locked room, carrying out those procedures without anyone watching, and then announcing the final results.

One last point. Experienced software engineers expect users to make errors. Therefore, well-designed programs include lots of error-handling instructions for the sole purpose of ensuring that user errors will not waste the users' time or destroy the users' data — thus the "undo" command that is available in nearly every program marketed today. If a user's error can cause a disaster, then the fault lies in the program design, not with the user.

Ten Types of DRE Problems in the News

While many people are advocating the use of voter-verified paper ballots (VVPB) on DREs, VVPB wouldn't have been sufficient to fix many of the problems that counties have faced when they used DRE systems. This fact causes many people to question the wisdom of using the current crop of paperless DREs, even if they have a printer attached.

Many different types of e-voting problems have occurred in recent years. Hundreds of elections have been impacted by the malfunctions, causing voters to be disenfranchised and calling the results of elections into question. In some cases, paper backup was available, and election officials were able to recover the voters' intents. In other cases, there was NO paper backup, and localities have either certified the elections anyway or conducted a second election to replace the first.

Here are a variety of types of recent problems that have been reported in the news.

1) Electronic Voting Machines Fail to Record Ballots

Wake County (Raleigh), North Carolina. November 2002 [9] **Item 1**

Electronic voting machines failed to count 436 ballots cast at two Wake County early voting locations. As soon as it was discovered that the machines were not properly registering some of the votes, Cherie Poucher, the Wake County Director of Elections, returned to using the optical scan ballots.

Ms. Poucher explained that she was informed by ES&S that the firmware in the machines was defective, causing some votes not to be recorded. Ms. Poucher decided not to pursue using the iVotronic and will continue to use the optical scanner precinct count tabulators used in Wake County since 1992.

Machine: ES&S iVotronic; Firmware version 6.2.1

San Diego County, California. March 2, 2004 [10] **Item 2**

Ten votes were inexplicably lost at one polling place. An election inspector in San Carlos said when polls closed at 8 p.m. Tuesday, the number of people who signed the voter log differed from the number of ballots counted by computers. "We lost 10 votes, and the Diebold technician who was there had no explanation," he said. "She kept looking at the tapes."

Machine: Diebold Election Systems TSx; Precinct Control Module

2) Suspicious E-Voting Tallies Cannot be Manually Recounted

Broward Counties, Florida. January 6, 2004 [11]

Broward County, Florida. In a special election for the State House District 91 seat, ES&S electronic voting machines showed a total of 134 undervotes – that is, 134 ballots in which voters did not select a candidate even though it was a single-race election. The winner, Ellyn Bogdanoff, received 12 more votes than the runner-up.

Florida law requires a manual recount of invalid votes when the winning margin is less than one-quarter of one percent, which it is in this case. However, it was impossible for

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[9] **Electronic Miscounts and Malfunctions in Recent Elections**
http://www.verifiedvoting.org/resources/documents/ElectronicsInRecentElections.pdf

[10] **Poll workers, voters cite tied-up hotline, poor training, confusion**
Union Tribune; March 7, 2004; By Jeff McDonald and Luis Monteagudo Jr.
http://www.signonsandiego.com/news/politics/20040307-9999-1n7vote.html

[11] **Electronic vote recount stumps Broward officials**
Sun-Sentinel; January 10 2004; By Jeremy Milarsky and Lisa J. Huriash, Staff Writers

election officials to comply with Florida law because the 134 invalid votes were cast on electronic voting machines, and there is no record of the voter's original votes.

A suit, brought by Representative Robert Wexler (D-FL) against Secretary of State Glenda Hood and Palm Beach County Supervisor of Elections Teresa LaPore, is now pending in federal court.

Machine: ES&S iVotronic; firmware version 7.4.5.

3) Tabulation Software Tallies Votes Incorrectly

Bernalillo County, New Mexico. November 5, 2002 [12] **Item 1**

Insufficient memory capacity for the software used to tabulate the votes caused about 25% of the votes not to be counted in the initial tally. Although about 48,000 people voted on 212 touch-screen computers, the initial figures given to the commissioners indicated that no race - not even for governor - showed a total of more than about 36,000 votes.

The Microsoft SQL 6.5 software program used to report all of the votes had a capacity of only 64 kilobytes of data at a time. Any more than that fed to the reporting program in one chunk was simply refused.

Machine: Sequoia Voting Systems

Boone County, Indiana. November 2003 Municipal Election [13] **Item 2**

Electronic vote-tabulation equipment reported that 140,000 votes had been cast in a county of 50,000 residents. Only 19,000 of those residents were registered to vote and only 5,352 voted. The tabulation machine had not been initialized and it was set to give excessive numbers to call attention to the error. The county clerk said it was obvious the numbers were wrong since the county is small, but she wondered if the error would have been noticed in a large county.

Machine: MicroVote General MV-464

Robeson County, North Carolina. November 2002 [14] **Item 3**

Ballot tabulating machines failed to work properly in 31 of 41 precincts. Local election officials said the problem was the result of a software programming error, and ballots from the individual voting machines had to be retabulated.

Machine: Diebold Voting Systems, AccuVote tabulation machine

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[12] **Election results certified after software blamed**
Albuquerque Tribune; November 19, 2002; By Frank Zoretich, Tribune Reporter
http://www.abqtrib.com/archives/news02/111902_news_vote.shtml

[13] **Voting machine glitch shows thousands of extra votes**
IDG News Service; November 13, 2003; By Grant Gross, Washington Bureau
http://www.itworld.com/Tech/2987/031113votingglitch/

[14] **Voter turnout surprises officials**
Sun News; September 12, 2002; The Associated Press
http://www.myrtlebeachonline.com/mld/sunnews/news/local/4056664.htm

4) DREs Break Down During Election; New Election Required in One Case

Hinds County, Mississippi. November 4, 2003 [15] **Item 1**

Voting computers at some polling places in District 29 failed to start up. Others overheated and broke down during the election, and not enough paper ballots were available to allow all voters to vote. The Mississippi Senate decided it was impossible to determine the will of the voters. So it declared the election invalid, and a new election was held on February 10, 2004.

Machine: AVS WINVote Voting System

Orange County, California. March 2, 2004 [16] **Item 2**

Daisy-chained machines shut down when one broke down. Hundreds of voters were turned away from the polls because of problems with the touch screen voting systems, according to NBC4. They were turned away from a Huntington Beach, Calif., polling place because the electronic machines were down. A malfunction with one machine caused all nine machines to go down for about an hour, according to NBC4.

Machines:
Hart Intercivic eSlate

5) Electronic Voting Machines Fail to Start Up

Harris County, Texas. November 4, 2003 [17]

Hundreds of Houston area voters didn't get to cast ballots Tuesday morning because of problems with the eSlate system. The machines were down at some polling places, such as Greater True Light Baptist Church, so voters were told to come back later and try again. Across town there were more problems, at the Holiday Inn on the Katy Freeway the election judges were forced to improvise and had voters write their choices down on paper.

Machine:
Hart Intercivic eSlate

6) Smart Card Encoders Fail to Operate Properly and Break Down

While these problem were originally blamed on poll workers, a report released on April 12, 2004 by Diebold Election Systems shows that 186 of 763 encoders failed on election day because of hardware or software problems or both, with only a minority of problems attributable to poll

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[15] **Long lines, machine malfunctions mark today's voting**
November 4, 2003; By Clay Harden
http://www.clarionledger.com/news/0311/04/mvproblems.html

District vote set; contender may quit
Democrat says he's "been through enough" in disputed Senate race
Clarion Ledger; January 21, 2004 ; By Julie Goodman
http://www.clarionledger.com/news/0401/21/ma04.html

[16] **Voters Decide Record Bond Issue; Edwards Quits**
NBC4TV; March 2, 2004; http://www.nbc4.tv/politics/2891656/detail.html

[17] **Polling machine problems anger many voters**
From 11 News Staff Reports; 07:27 PM CST on Tuesday, November 4, 2003
http://www.khou.com/news/local/houstonmetro/stories/khou031104_mh_pollingprobs.1a536189.html

worker training. Diebold also admitted that tabulation errors during the October recall election were due to software bugs.[18]

San Diego County, California. March 2, 2004 [19] **Item 1**

At least one voter was able to vote twice on her "smart card."

At least 250 polls opened late because poll workers were unable to start up the encoders, so hundreds, perhaps thousands, of people were turned away – many of them disenfranchised because they were unable to return to the polls at a later time that day.

[Later reports estimated that this problem delayed the voting at 40% of the polls and may have occurred at as many as 80% of the polling places. See page 32.]

Machine: Diebold Election Systems TSx; Precinct Control Module

Alameda County, California. March 2, 2004 [20] **Item 2**

Precinct Control Modules, required to provide electronic ballots for voters, refused to start up. Not enough backup paper ballots were available and "no electronic votes could be cast that morning at Anna Yates Elementary School." Voters were turned away from the polls, losing their opportunity to vote in the primary as well as on other issues. Failures of voter-card encoders also occurred on Super Tuesday in Newark, San Leandro, Emeryville, Oakland, and across San Diego County.

Machine: Diebold Election Systems, TSx

7) Confusion Over Ballot Code Numbers, Voters Receive Wrong Ballots

Orange County, California. March 2004 [21]

"Poll workers struggling with a new electronic voting system in last week's election gave thousands of Orange County voters the wrong ballots, according to a Times analysis of election records. In 21 precincts where the problem was most acute, there were more ballots cast than registered voters.

"At polling places where the problem was most apparent because of turnouts exceeding 100%, an estimated 1,500 voters cast the wrong ballots, according to the Times' analysis of official county election data. Tallies at an additional 55 polling places with turnouts more than double the county average of 37% suggest at least 5,500 voters had their ballots tabulated for the wrong precincts.

"Orange County election officials have traced the problem to poll workers who were responsible for giving each voter a four-digit code to enter into the voting machines.

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[18] **Diebold reports multiple problems: Registrar wants reason for e-voting**
Tri-Valley Herald; April 13, 2004; By Ian Hoffman, STAFF WRITER
http://www.verifiedvoting.org/article.asp?id=1839

[19] **Poll workers, voters cite tied-up hotline, poor training, confusion**
Union Tribune; March 7, 2004; By Jeff McDonald and Luis Monteagudo Jr.
http://www.signonsandiego.com/news/politics/20040307-9999-1n7vote.html

[20] **Voters short changed at the polls**
Oakland Tribune; March 7, 2004; By Ian Hoffman, Staff Writer
http://www.oaklandtribune.com/Stories/0,1413,82~1865~2002277,00.html

[21] **7,000 Orange County Voters Were Given Bad Ballots (Excerpts)**
Los Angeles Times; March 9, 2004; By Ray F. Herndon and Stuart Pfeifer, Staff Writers
http://story.news.yahoo.com/news?tmpl=story&cid=2026&ncid=2026&e=3&u=/latimests/20040309/ts_latimes/7000orangecountyvotersweregivenbadballots

"After signing in, each voter received a ticket bearing his or her precinct number and party affiliation from a poll worker. The voter would take the ticket to a second worker, who was supposed to scroll through a computer screen and use the voter's precinct and political party to select an access code that would identify the appropriate ballot. Several workers who handled this stage of the process — including some who said they didn't know more than one precinct had been assigned to their polling place — gave voters codes for the wrong precincts, causing the wrong ballots to appear on their screens. "

Machines: Hart Intercivic eSlate

8) Touch Screens Register the Incorrect Choice

Muscogee County, Georgia. November 4, 2003 [22] **Item 1**

In the sales tax vote, allegations of widespread complaints by citizens who voted "no" but saw the machines register "yes" caused county officials to take the machine out of service during the election.

Machine: Diebold

Dallas County, Texas. October 22, 2002 [23] **Item 2**

The Democrats said they received several dozen complaints from people who said that they selected a Democratic candidate but that their vote appeared beside the name of a Republican on the screen. Some votes cast for Republicans were counted for Democrats.

Note: The article points out that the previous year, the outcomes of 18 suburban Dallas County elections remained unclear days after the election because of vote-counting problems on the same machines. About 5,000 of nearly 18,000 ballots cast during the early voting period were not properly assigned to candidates.

Machine: ES&S iVotronic

9) Ballot Too Large for Touch Screen; Paper Supplement Required

Broward County, Florida. March 2004 [24]

The text for responses to one of the questions on the ballot didn't fit on the electronic machine's touch screen. Pompano Beach residents voting March 9 on whether to support the annexation of Leisureville had to use paper ballots for that issue. Voting for all other issues and candidates was done electronically on the touch screen machines.

Machine: ES&S iVotronic; firmware version 7.4.5

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[22] **NAACP disputes sales tax results**
DuBose files complaint in Muscogee Superior Court
Ledger-enquirer; November 13, 2003; By Mark Rice, Staff Writer

[23] **Area Democrats say early votes miscounted**
Court hearing delayed as meeting planned on touch-screen problems
The Dallas Morning News; October 22, 2002; By Ed Housewright and Victoria Loe Hicks
Staff writers Gromer Jeffers Jr. and Todd J. Gillman contributed to this report.

[24] **Blah-blah ballot too long for touch screen**
Miami Herald; Feb. 26, 2004; By Jesse Abrams-Morley
http://www.miami.com/mld/miamiherald/news/local/states/florida/counties/broward_county/8043698.htm

10) Touch Screens Present Incomplete Ballot to Voters

Montgomery County, Maryland. March 2, 2004 [25]

At least one voter was not presented with a complete ballot. After casting his vote, he realized that the Senate race had not been presented to him for his vote. When he complained, the poll workers simply told him, "Once you've cast your vote, you can't vote again."

A poll worker asked if the voter had pressed the magnification button. The worker said they knew that the error occurred when the magnification button had been pressed. How many other voters missed the Senate race and didn't notice?

Machine: Diebold Election Systems TSx

Optical Scanners Miscount, But Manual Recounts are Possible

These examples illustrate the importance of auditing optical scan machines by performing random recounts. Fortunately, voters use paper to record their votes in an optical scan system, so paper ballots are available to confirm the voters' intentions.

1) Optical Scanners Calibrated Incorrectly

Napa County, California. March 2004 [26]

A calibration error in the ballot-counting machine caused as many as thousands of votes to go untallied. The machine failed to detect purple ink used by voters used on their absentee, mail-in and non-partisan ballots. The Logic and Accuracy Board, who tested the machine, already knew it didn't detect red and pink inks or highlighters.

2) Misaligned Ballots Cause Error in Results

Bay County, Florida, March 9, 2004 [27]

In Florida's Panhandle, Bay County found itself recounting ballots after a printer error on a fill-in-the-oval optical scan ballot caused votes for Democratic presidential candidate John Kerry to be counted for Dick Gephardt, who had dropped out of the race. The error forced the ballot to be out of alignment. **The problem is another reason to support paper ballots, Bay County Elections Supervisor Mark Andersen said. The paper provided a record he could eyeball to determine voter intent.**

---

[25] **Think You Voted in Md.? Think Again**
Washington Post; March 7, 2004; By Jeffrey F. Liss, a lawyer who lives in Chevy Chase
http://www.washingtonpost.com/wp-dyn/articles/A37007-2004Mar6.html

[26] **Murphy's Law? Ballot recount hits snag**
Napa News; March 18, 2004; By Jay Goetting, Register Staff Writer
http://www.napanews.com/templates/index.cfm?template=story_full&id=0C216A74-92C4-46F6-8DDD-BA1903A2DC43

[27] **Ballot questions remain after dress rehearsal**
Palm Beach Post Editorial; March 15, 2004
http://www.palmbeachpost.com/opinion/content/auto/epaper/editions/monday/opinion_0455f25eb14f219400ae.html

3) Programming Error Prevents Votes from Being Counted

Lubbock, Texas, March 9, 2004 [28]

The Lubbock County Department of Elections always verifies elections results before they are proclaimed final. While they were going through that process on Wednesday, they found something that didn't add up. It appeared no one had voted in the Democratic Chair race for Precinct 8. In actuality, a programming error had prevented any and all votes from being counted.

"Now, election officials are waiting for corrected computer software to re-count of all Lubbock County votes in every race. "

4) Defective Chip in Optical Scanner Reverses Election Outcome

Scurry County, Texas. November, 2002 [29]

A Scurry County election error reversed the outcomes in two commissioner races. A defective computer chip in the county's optical scanner misread ballots Tuesday night and incorrectly tallied a landslide victory for Republicans. Democrats actually won by wide margins.

The problem was discovered when poll workers became suspicious of the margins of the vote. A new computer chip was flown to Snyder from Dallas. By Wednesday morning, the votes had been counted twice by hand and once again by scanner with the replacement chip, which verified the hand count and reversed the outcome of the election.

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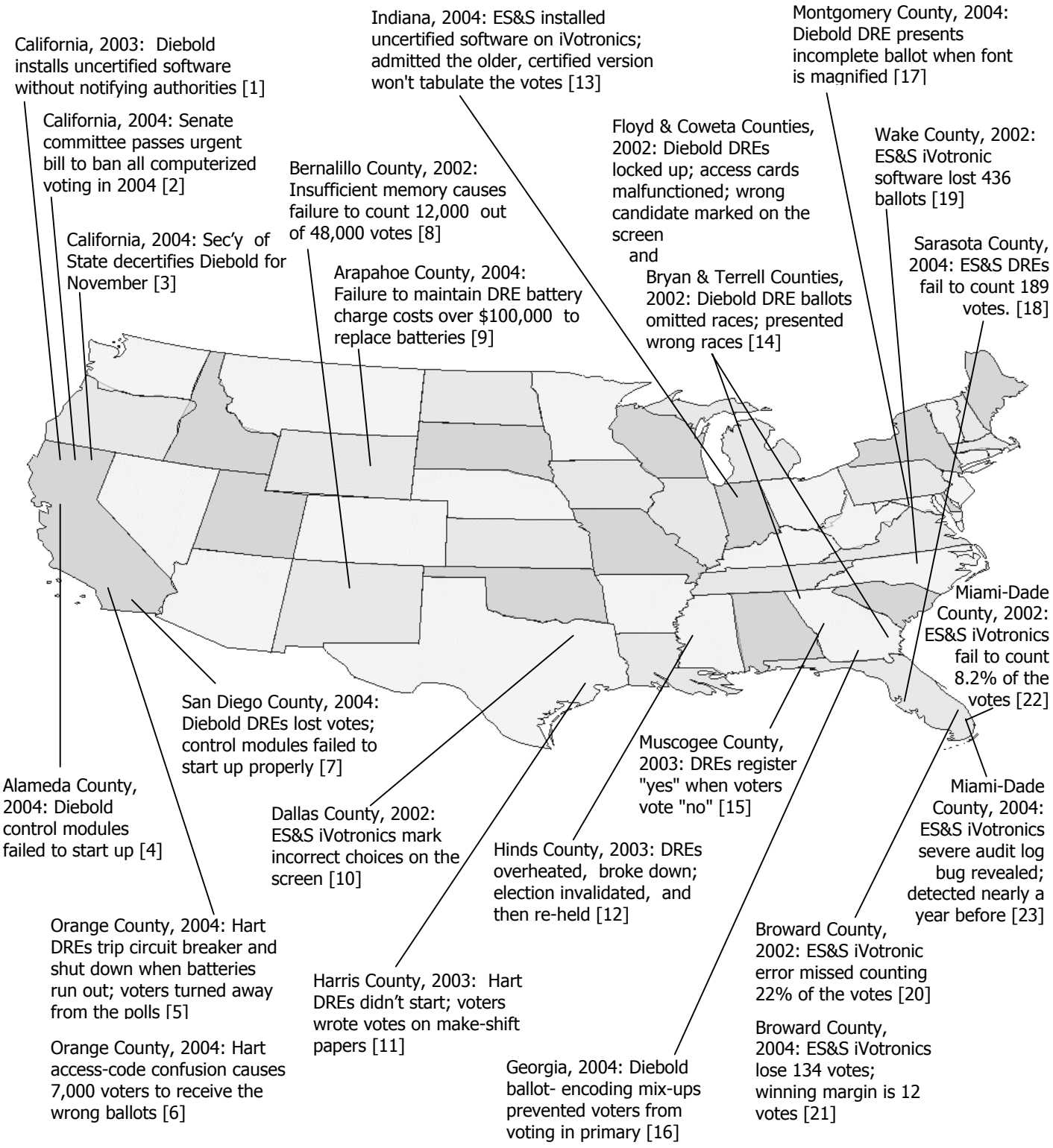
[28] **Lubbock County to Recount Ballots**
KCBD TV; March 10, 2004
http://www.kcbd.com/Global/story.asp?S=1703706

[29] **Chip glitch hands victory to wrong candidate**
Houston Chronicle; Nov. 11, 2002; Associated Press
http://www.truthout.org/docs_02/11.13C.vote.chip.p.htm

Paperless Voting Machine Performance Gets an "F"

Recent Elections: A Partial List of Incidents Reported in the News



[1] **E-Voting Undermined by Sloppiness** Wired News; December 17, 2003; by Kim Zetter; http://www.wired.com/news/evote/0,2645,61637,00.html?tw=wn_tophead_2

[2] **Senate committee approves bill to ban all e-voting machines in November;** Monterey Herald; May 5, 2004; By Anna Oberthur (AP) http://www.montereyherald.com/mld/montereyherald/news/8596394.htm

[3] **High-Tech Voting System Is Banned in California;** New York Times; May 1, 2004; By John Schwartz, http://www.nytimes.com/2004/05/01/national/ 01VOTE.html

[4] **Voters short changed at the polls** Oakland Tribune; March 7, 2004; By Ian Hoffman; http://www.oaklandtribune.com/Stories/0,1413,82~1865~2002277,00.html

[5] **Voters Decide Record Bond Issue; Edwards Quits;** NBC4TV; March 2, 2004; http://www.nbc4.tv/politics/2891656/detail.html

[6] **7,000 Orange County Voters Were Given Bad Ballots;** Los Angeles Times; March 9, 2004; By Ray F. Herndon and Stuart Pfeifer http://story.news.yahoo.com/news?tmpl=story&cid=2026&ncid=2026&e=3&u=/latimests/20040309/ts_latimes/7000orangecountyvoterswereregivenbadballots

[7] **Poll workers, voters cite tied-up hotline, poor training, confusion;** Union Tribune; March 7, 2004; By Jeff McDonald and Luis Monteagudo Jr. http://www.signonsandiego.com/news/politics/20040307-9999-1n7vote.html

[8] **Election results certified after software blamed;** Albequerque Tribune; December 19, 2002; By Frank Zoretich; http://www.abqtrib.com/archives/news02/111902_news_vote.shtml

[9] **Getting zapped for vote: Clerk's recall election $100,000 pricier after batteries for voting machines lose juice;** Rocky Mountain News; February 5, 2004; By Jim Tankersley, http://www.rockymountainnews.com/drmn/election/article/0,1299,DRMN_36_2631038,00.html

[10] **Area Democrats say early votes miscounted;** The Dallas Morning News; October 22, 2002; By Ed Housewright and Victoria Loe Hicks

[11] **Polling machine problems anger many voters** From 11 News Staff Reports; November 4, 2003; http://www.khou.com/news/local/houstonmetro/stories/khou031104_mh_pollingprobs.1a536189.html

12] **Long lines, machine malfunctions mark today's voting;** Clarion Ledger; November 4, 2003 ; By Clay Harden; http://www.clarionledger.com/news/0311/04/mvproblems.html

[13] **Election Commission Bails Out Voting Machine Maker In Time for May Primary** March 11, 2004; http://www.wishtv.com/Global/story.asp?S=1706282&nav=0Ra7LTW3

[14] **Despite some glitches, new election machines running smoothly**; Macon Telegraph; November 6, 2002; Mark Niesse; http://www.macon.com/mld/macon/4455701.htm

[15] **NAACP disputes sales tax results DuBose files complaint in Muscogee Superior Court**; Ledger-enquirer; November 13, 2003; By Mark Rice, Staff Writer

[16] **Mix-ups irk some who voted Poll problems reported in Athens, other areas** Athens Banner Herald; March 4, 2004; By Allison Floyd http://www.athensnewspapers.com/stories/030504/new_20040305038.shtml

[17] **Think You Voted in Md.? Think Again** Washington Post; March 7, 2004; By Jeffrey F. Liss, a lawyer who lives in Chevy Chase http://www.washingtonpost.com/wp-dyn/articles/A37007-2004Mar6.html

[18] **Sarasota to forgo paper trail for ballots.** Sarasota Herald Tribune; April 30. 2004. By Kim Hackett http://www.starbanner.com/apps/pbcs.dll/article?AID=2004204300361

[19] **Electronic Miscounts and Malfunctions in Recent Elections;** http://www.verifiedvoting.org/resources/documents/ElectronicsInRecentElections.pdf

[20] **Election glitch missed 103,000 votes in Florida county;** CNN; November 8, 2002 http://www.cnn.com/2002/ALLPOLITICS/11/07/elec02.florida.votes.missing/

[21] **Votes from 134 residents were not counted** Miami Herald; January 07, 2004; By Erika Bolstad; http://www.miami.com/mld/miamiherald/7655457.htm

[22] **Buyers' remorse;** Broward Daily Business Review; February 3, 2003; by Matthew Haggman http://verify.stanford.edu/EVOTE/buyers-remorse.html

[23] **Count Crisis?** Miami Daily Business Review; May 13, 2004; by Matthew Haggman; http://www.law.com/jsp/article.jsp?id=1084316008117

3 Election Complexities Increased by Electronic Voting

In addition to the security and accountability problems that others have documented in detail (see page 45), numerous other practical and operational problems result from the use of touch screen voting systems. Contrary to many election officials' hope that electronic voting will make elections run more smoothly and simplify election processes, they add a significant number of unfamiliar and unexpected complexities.

Illegal Use of Uncertified Software

Most states require electronic voting equipment to be certified before it can be used in an election. If the state requires federal certification, only equipment with a NASED certification number may be used. Some states also require state certification for all voting systems.

In violation of state laws and without the knowledge of election officials, uncertified software has been used in elections in at least three states: California, Indiana, and Maryland.

California – Diebold [30]

> An audit of Diebold Election Systems voting machines in California has revealed that the company installed uncertified software in all 17 counties that use its electronic voting equipment.
>
> While 14 counties used software that had been qualified by federal authorities but not certified by state authorities, three counties, including Los Angeles, used software that had never been certified by the state or qualified by federal authorities for use in any election. ... The extent of the changes that Diebold made to upgrades of its software is still unknown.

Indiana – ES&S iVotronic [31]

> "Election Systems & Software provided illegal software for last year's election, lied to the board about a temporary fix and fired a helpful project manager, said Clerk of the Courts Jill Jackson."

Maryland – Diebold [32]

> Black Box Voting reported that Diebold has used uncertified software in Maryland. According to Diebold employee emails, prior to the 2002 election, certified software was installed but then overridden by uncertified software - before the election – making the vote count illegal. This also raises questions about the accuracy of the vote count.

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[30] **E-Voting Undermined by Sloppiness**
Wired News; Dec. 17, 2003 ; by Kim Zetter
http://www.wired.com/news/evote/0,2645,61637,00.html?tw=wn_tophead_2

[31] **Election vendor under fire: Repeated mixups raise issues of trust, reliability**
Indy Star; March 4, 2004; By Andy Gammill
http://www.indystar.com/articles/3/126117-1993-016.html
Cached at: http://216.239.53.104/search?q=cache:hMrRjHfo_ygJ:www.indystar.com/articles/3/126117-1993-170.html+Election+vendor+under+fire:+&hl=en&ie=UTF-8

[32] From Campaign for Verifiable Voting in Maryland to Karl S. Aro, Department of Legislative Services, Annapolis, MD; http://www.truevotemd.org/2003-12-22_Karl_Aro_Letter.pdf

Inadequacy and Secrecy of the NASED Qualification Process

In the NASED Qualification process,[33] an Independent Testing Authority (ITA) tests voting equipment against the voluntary Federal Voting System Standards approved by the Federal Election Commission. If the system meets or exceeds the standards, the system is placed on the list of NASED "Qualified" machines and is assigned a NASED qualification identification number. Hardware and software are tested separately by different ITAs and are assigned separate NASED numbers. If any changes are made to a system, the vendor must apply anew.

ITAs are private testing laboratories selected by NASED. According to the NASED description of the qualification process, ITAs will not respond to outside inquiries about the testing process, specific machines, or specific vendors. This means that the testing process is kept secret from election officials, the media, and the general public. Vendors contact the ITAs to enter the testing process; all contracts and contacts about the process are directly between the vendor and the ITA. The Election Center (see page 49) performs the day-to-day coordination among the FEC, NASED, jurisdictions, and the ITAs. All inquiries about the process must be directed to the Center.

Certification is performed by the states and involves checking the functionality to make sure that it meets the state's needs, for example, the ability to do candidate rotation on the ballot, to allow cross over voting, or to perform other functions required by the state. States are not required to use systems that are NASED qualified.

It is important to note that the **ITAs test a machine's design** against the federal standards. There is no process (except perhaps the vendors') for testing and qualifying individual machines. **So, while a design may be qualified, the individual machines used in elections are not.**

Note also that virtually all voting machines currently qualified have been tested against the 1990 standards, not the current 2002 standards.[34] (To add perspective, 1990 was when the 486 microprocessor was state-of-the-art and only a few people had heard of the Internet.)

As a result, NASED qualification and state certification are no guarantee that a particular voting system will operate correctly. Qualified and certified systems often fail during elections, for example, in these three states: New Mexico, North Carolina, and California. [35]

New Mexico – Sequoia Voting Systems lost 12,000 votes [36]

> Although about 48,000 people had voted early on 212 Sequoia-supplied touch-screen computers at six sites in the county, the initial figures given to the commissioners indicated that no race - not even for governor - showed a total of more than about 36,000 votes.

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[33] http://www.nased.org/ITA_process.htm and http://www.nased.org/NASEDApprovedSystems1.03.pdf

[34] http://www.nased.org/NASEDQualifiedVotingSystems12-03-Present.pdf

[35] Editor's note: Previously this list included a report that one WINvote machine tested in Fairfax County Virginia subtracted one out of a hundred votes for Rita Thompson. Margaret Luca, Secretary of the Fairfax County Virginia Electoral Board, told VotersUnite! that, contrary to the news article we quoted, the test showed the WINVote machine unhighlighted Thompson's name one out of a hundred times. No independent test was conducted. The news article is here:

Fairfax Judge Orders Logs Of Voting Machines Inspected
Washington Post; November 6, 2003; By David Cho, Washington Post Staff Writer
http://www.washingtonpost.com/ac2/wp-dyn?pagename=article&node=&contentId=A6291-2003Nov5&notFound=true

[36] **Election results certified after software blamed**
Albuquerque Tribune; November 2002; By Frank Zoretich, Tribune Reporter
http://www.abqtrib.com/archives/news02/111902_news_vote.shtml

North Carolina – ES&S iVotronic lost 294 votes [37]

> Electronic voting machines that were supposed to solve Florida's election problems have created problems at two Wake County voting sites. Election officials said it appears some of the high-tech machines cannot count. ... The electronic machines failed to count 294 ballots cast last week at a Cary senior citizens center and a Raleigh police substation.

California — Diebold TSx lost 10 votes[38]

> Ten votes were inexplicably lost at one polling place. An election inspector in San Carlos said when polls closed at 8 p.m. Tuesday, the number of people who signed the voter log differed from the number of ballots counted by computers. "We lost 10 votes, and the Diebold technician who was there had no explanation," he said. "She kept looking at the tapes."

Chain of Custody Complexities Increase Exponentially with the Use of DREs

When votes are cast on paper ballots, they are placed into a ballot box. Carefully developed custody procedures have been in place for decades to ensure the security of the paper ballots – before they are counted and afterward in case a recount is needed. Custody procedures become significantly more complex when electronic equipment is used in elections, particularly when DREs are used.

- Once officials are certain that certified software is installed, every single DRE must be secured to ensure that the software is not illegally altered between elections.
- Each DRE, after being tested and zeroed out, must remain secure until election day.
- When machines break down, the chain of custody must be maintained. Electronic machines break down during an election and are removed for repair. Procedures must be developed for retesting the machines before they are placed back in service.

All DREs and peripheral equipment must remain secure before and after the election – terminals, control modules, ballot cards (see page 18), and all other software and hardware used in the election process. Years of trial-and-error have led to the procedures that keep paper ballots secure. Procedures for protecting electronic voting equipment are just now being developed. There has not been time to refine them. The current procedures are complex and, even if they were adequate, they are often not used in accordance with the law.

This means that the election equipment is particularly vulnerable to tampering after it has been tested but before it is used. For example, San Diego county allowed precinct workers to take the electronic machines home with them after the training program (up to a week before the election) so they would not have to pick them up the morning of the election. [39]

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[37] **Electronic Ballots Fail To Win Over Wake Voters, Election Officials Machines Provide Improper Vote Count At Two Locations**
WRAL.com; November 2, 2002
http://www.wral.com/news/1753809/detail.html

[38] **Poll workers, voters cite tied-up hotline, poor training, confusion**
Union Tribune; March 7, 2004; By Jeff McDonald and Luis Monteagudo Jr.
http://www.signonsandiego.com/news/politics/20040307-9999-1n7vote.html

[39] **See "County ordered to offer voters paper ballots"**
North County Times; February 12, 2004; By Gig Conaughton, Staff Writer
http://www.nctimes.com/articles/2004/02/13/news/top_stories/2_12_0422_53_18.txt

As Pam Smith of SAVE-Democracy (Safe, Accurate, Verified Elections) pointed out:[40]

> In spite of the vulnerability of Diebold's electronic voting system, the registrar sent computerized voting machines, cards, keys and card encoders to be stored in poll workers' homes before the election, secured only by easily removed stickers and flimsy plastic zip-ties.
>
> In one precinct observed by SAVE-Democracy's poll watchers, these security stickers had never even been placed over the memory card ports ---- where votes are stored ---- as they should have been.
>
> Poll workers were given extra zip-ties to hold the machines and key-card pouches closed. These were not inventoried and apparently were not even inspected, so no one knows if machines were tampered with.
>
> An Oceanside voter said that his precinct's machines had no paper in their printers, which means no "zero tapes" were run that morning upon the opening of the polls. When at least two poll workers called the registrar's hot line at the end of the day to ask what to do about tallies not printing or count discrepancies, they said the response seemed to be not to worry ---- it didn't matter.

Security is Still Required – for Ballot Cards instead of Paper Ballot Boxes

Using electronic voting equipment does not eliminate the need to track and preserve the physical records of votes. It's just that the physical records are now in the form of ballot memory cards rather than paper ballots. Unlike paper, the ballot cards are not a permanent form of storage since the data can be erased or overwritten; thus, the level of security required is even higher. This means that new procedures for electronic elections must be strictly followed, in addition to procedures similar to the old ones when paper ballots were used.

Note also that the loss, damage, or tampering of a ballot card is comparable to the loss, damage, or tampering of a ballot box, since each card contains hundreds or even thousands of votes. Since each memory card is about the size of a stack of five credit cards, they are much more challenging to track and protect than a ballot box. It would be very easy for cards to be lost or removed without detection.

> Hundreds of electronic ballot cards were lost Tuesday in San Joaquin County, left at a warehouse where elections' officials later discovered them, the registrar of voters acknowledged.
>
> Election workers found eight metal cases containing ballots from eight precincts at the Stockton warehouse after precinct officials boxed the ballots instead of handing them to elections officials, Registrar of Voters Deborah Hench said.
>
> Elections officials searched through trucks and boxes to get hold of the ballots, retrieved about two hours after first election returns alerted elections officials the ballots were missing, Hench said.
>
> The scramble delayed San Joaquin County election reports, the last of which was submitted at 4:43 a.m., later than all but one other California county, according to the Office of the Secretary of State. Counties counting similar numbers of ballots submitted reports between 11 p.m. and 1 a.m.

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[40] **Electronic voting was a fiasco**
North County Times; February 12, 2004; By: Pamela Smith - Commentary
http://www.nctimes.com/articles/2004/03/16/opinion/3_15_0422_26_59.txt

> Precinct officials reported a "mile of cars" waiting to turn in ballots at the warehouse, one of four buildings to which ballots could be brought. At least one official said he took ballots home and returned later to deliver them.
>
> "That's the biggest screw-up I've ever seen in my life," said Frank Rauzi, the official. [41]

The Realities of Conducting Logic & Accuracy Testing on DREs

Most localities are required to perform Logic and Accuracy (L&A) testing on every voting machine before every election. For example, in California:

> At every election, all voting equipment is required to be tested by the local elections official conducting the election. This testing includes "Logic and Accuracy" testing, a process during which voting equipment is tested with a known number of votes and must produce exactly that result in order to be certified for use in the election. [42]

In Jefferson County, Washington, the only electronic voting equipment is a single central-count optical scan machine. The county auditor's office spends as long as eight hours preparing the test plan and filling out the ballots that will be used for the test. Then the test, which is performed in public, takes about an hour. Once the test is completed, all the tested components are stored in a box locked with a security device until the election.

The importance of the L&A testing is undisputed:

> In November 2001, the failure of Registrar of Voters managers to fully perform logic testing on the computer coding for the ballot counting machines resulted in votes for some candidates going to other candidates. All 82 elections were subjected to a hand recount, with the results in 13 local water and school board races overturned. Registrar Ingrid Gonzales resigned months later.[43]

In a county with multiple DREs at each polling place, the time and effort required for L&A testing increases significantly. For example, to comply with California law, the Registrar of San Diego County must test 10,200 DREs before every election. If it takes an hour to do the Logic and Accuracy testing on one DRE, San Diego county would have to spend 1275 person-days testing before every election.

In addition, securing the tested components until election day becomes a significant challenge, and, in fact, the components in San Diego were not secured. They were sent home with poll workers after the training sessions, and the poll workers transported them to the polling places (see page 17).

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[41] **Electronic S.J. ballot cards lost**
The Stockton Record (San Joaquin County); March 4, 2004; By David Siders
Excerpt reproduced on http://www.calvoter.org/news/blog/2004_03_01_blogarchive.html

[42] **Major Issues And Questions Addressed By The Task Force**
California Ad Hoc Task Force; March 2003
http://www.ss.ca.gov/elections/taskforce_report_2.htm

[43] **Ballot counting resumes in San Bernardino County after four-hour delay**
The Press-Enterprise; March 3, 2004; By Sharon McNary
http://www.pe.com/breakingnews/local/stories/PE_News_Local_websnafu03.9ff35.html

The following information is adapted from the Computer Professionals for Social Responsibility (CPSR) description of testing DREs: [44]

> Each "ballot" of a logic and accuracy test for a DRE must be entered into the DRE by hand – by voting the test ballot on the DRE itself. DREs present two special problems for logic and accuracy testing:
>
> 1. The process is time-consuming, so a small number of ballots is used – often too small to catch important mistakes. Thus, in order to minimize the cost associated with testing, the effectiveness of the testing may be sacrificed.
> 2. It is difficult to correctly generate a series of test ballots on a DRE without a single error. It is much more likely that an election worker will make a mistake in entering test ballots than that an actual voter will make such a mistake, because the voter only has to remember one set of votes: the votes they wish to make. The DRE tester has a much more difficult problem. Consequently, election workers must conduct DRE logic and accuracy tests with extreme deliberation and caution, as even a single error requires that the entire logic and accuracy test be repeated. In practice, this results in logic and accuracy tests that are smaller yet, to the point where the test is testing for little besides a stuck button or a completely nonfunctional DRE.
>
> One "solution" to this problem is to perform the logic and accuracy test by inputting ballots using a different method than the voter would use, for example by inputting them automatically using a communications port. However, this method tests only part of the DRE. The parts of the DRE that display contests to the voter and record the voters choices are left untested. Furthermore, a maliciously-modified DRE could easily pass a logic and accuracy test of this type and still not count votes correctly.
>
> Theoretically, these problems could be solved by using automated methods (robotics) to test the DREs. However, no automated DRE testing device is available that is suitable for logic and accuracy tests, and such a device would be very difficult to build and unquestionably very expensive. Unfortunately, CPSR can offer no attractive course of action. Logic and accuracy tests are simply more difficult to conduct on DREs than on other election systems.

If DREs Fail the L&A Test ...

Ideally, every L&A test would show that the machines are operating correctly. However, there is a possibility that one or more machines could fail. Consider the ramifications of having the tests on even one DRE show that it was losing ballots or recording votes incorrectly.

- It would be necessary to take the machine out of service or have it repaired.
- If the software were flawed (as software was in Wake County, NC, see page 6), the flaw would be present in all DREs using that same software.
- It is likely that it would be too late to have a software patch developed, tested, certified, and installed in time for the election.
- It is also likely that it would be too late to print absentee ballots for the entire county to use for the election.

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[44] **CPSR Comments on the California Touch Screen Task Force Report**
August 1, 2003; Computer Professionals for Social Responsibility
http://www.cpsr.org/issues/vote-catouchscreen.html
For information on the task force report, go to:
http://www.ss.ca.gov/elections/taskforce.htm

- It might be necessary to use uncertified software and hope it isn't flawed. Forced into a corner by other circumstances, several California counties used Diebold's uncertified Precinct Control Modules in the March 2004 primary election. Some results are described on pages 8 and 30 of this document. Recently, some Indiana county officials found themselves forced to use either uncertified software or admittedly flawed (but certified) software in the May 2004 primary. Commissioners chose to use the uncertified software but demanded a $20M bond from ES&S to cover any problems that might arise.[45] At the time of this writing, the results of using the uncertified software are not known.

Increased Problems from Human Error in Electronic Elections

While many have advocated computerized elections as a way of reducing human error, the fact is that human error may be on the increase because of the new and complex problems they present to poll workers. Hundreds of voters have been disenfranchised and many others voted on the wrong ballots because trained poll workers had difficulty with the voting computers.

Texas – Hart/Intercivic eSlate Systems [46]

> Greater True Light Baptist Church, a northeast Houston polling site, did not open until about 9 a.m. An election worker there had difficulty setting up the equipment, and did not call for help quickly enough, Kaufman said. Between 50 and 100 voters were turned away.
>
> ... At the Holiday Inn Hotel at 7787 Katy Freeway, election workers decided to use paper ballots when they thought the eSlate voting machines were not working properly. About 75 makeshift ballots were cast -- and signed.
>
> But the eSlates were not malfunctioning. Workers were entering incorrect information into the machines that assigned the wrong ballots to voters.

California, Orange County – Hart/Intercivic eSlate Systems [47]

> Poll workers struggling with a new electronic voting system in last week's election gave thousands of Orange County voters the wrong ballots, according to a Times analysis of election records. In 21 precincts where the problem was most acute, there were more ballots cast than registered voters.
>
> ... At polling places where the problem was most apparent because of turnouts exceeding 100%, an estimated 1,500 voters cast the wrong ballots, according to the Times' analysis of official county election data. Tallies at an additional 55 polling places with turnouts more than double the county average of 37% suggest at least 5,500 voters had their ballots tabulated for the wrong precincts.
>
> Problems occurred in races throughout the county — including five out of six congressional races, four of five state Senate contests, and five of the nine Assembly races that are decided in whole, or in part, by Orange County voters.

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[45] **Election contractor has one more chance**
Daily Journal (Indiana); April 6, 2004; By JASON MICHAEL WHITE
http://www.thejournalnet.com/Main.asp?SectionID=1&SubSectionID=113&ArticleID=42839

[46] **Electronic Ballot: ESlate voting proves smooth, not flawless**
Houston Chronicle; Nov. 5, 2003; By Eric Berger
http://www.chron.com/cs/CDA/ssistory.mpl/metropolitan/2201121

[47] **7,000 Orange County Voters Were Given Bad Ballots**
Los Angeles Times; March 9, 2004; By Ray F. Herndon and Stuart Pfeifer, Staff Writers
www.latimes.com/news/local/la-me-machines9mar09,1,6221417.story?coll=la-home-headlines

California, San Diego County – Diebold TSx [48]

> While elections officials continue to size up everything that went wrong with San Diego County's first stab at electronic balloting, the problems ran much deeper than a simple technological glitch, voters and poll workers say.
>
> After the polls closed Tuesday, signatures on voter rolls in at least one precinct did not match the number of ballots recorded by machines. In other polling places, people were wrongly given provisional ballots.
>
> Poll inspectors across the county complained they had been poorly trained to deal with even minor problems. For long stretches on election day morning, the hotline set up to tackle emergencies was so swamped that poll workers were not able to get through.
>
> In Carmel Valley, one voter said she was allowed to cast a second ballot after the computer spit out her activation card while she was weighing her choices. She later said the card showed that her original vote had been counted.

Saving Money by Combining Precincts May Decrease Voter Turnout

Some counties are combining precincts to reduce the number of polling places. The reason for combining is two-fold. When county officials first consider the cost of the new electronic voting machines, they realize how much it is going to cost and try to save money by buying fewer machines. One way is to combine precincts.

After the first election with the new machines, they realize that they now need twice the number of poll workers they did before they used the complicated new systems. So they consider combining more precincts to cut down on the cost of poll workers and training.

Every time a polling place is closed, voters must go somewhere else to vote. This causes some confusion and, in many cases, forces voters to travel further to vote. Comfort levels go down, and some citizens don't bother to vote.

Problems that Even Vendor Technicians Can't Fix

With electronic voting machines, there are many electronic components that can malfunction. Even if several components operate correctly, a problem with another one can create chaos. In this case problems occurred in the transmission of vote totals from ballot cards across the modems.

This article indicates how intimately Diebold technicians and representatives work within the election process. Running an electronic election is a very complex process, even after **six** elections have been held on the same equipment. Even vendor technicians can't operate it successfully.

> Walker County election officials worked until after midnight, following Tuesday's election, to rectify problems tallying results.
>
> Problems became apparent with Walker's first returns about 9 p.m. when neighboring counties were wrapping up their tallies. **A Diebold computer technician began providing incorrect numbers to news organizations.** The botched returns were fed to the media for more than two hours after the polls closed before the problem was corrected.

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[48] **Poll workers, voters cite tied-up hotline, poor training, confusion**
San Diego Union Tribune; March 7, 2004; By Jeff McDonald and Luis Monteagudo Jr.
http://www.signonsandiego.com/news/politics/20040307-9999-1n7vote.html

"Their technicians were not loading something right," Walker County Board of Elections and Registration Chief Clerk Barbara Berry said Wednesday. "That's the reason we can't even use the modems to get our results in. We have tried and tried to get our results in by modem, and something is wrong somewhere."

The modems, housed inside the electronic voting machine, are intended to transmit results automatically and quickly to the central server in Berry's office at the Walker County Courthouse.

Diebold manufactures and supports the electronic voting machines used across Georgia. Poll workers at the courthouse said elections ran more smoothly using paper ballots.

... Only a handful of modem transmissions have been successful since the electronic voting machines were introduced last year, Walker Elections board member Harold "Eddie" Hughes said.

"Diebold just pushes us aside," Berry said, adding she does not understand the company's actions or why results came in as they did. "We don't have good representation."

Two representatives from the company in February programmed the machines for the March 2 election, Berry said. Two different representatives arrived on election night, including a field worker to manage problems at the precincts and another person to manage the computer at the election office in LaFayette.

... The voting machines have been used for six elections, three of which were for the same State House District 1 race. **Problems have cropped up at every election.** [49]

Potential Problems Inherent in Electronic Devices [50]

Touch Screen Misalignment

The sensors in touch screen devices can be knocked out of alignment by shock and vibration that may occur during transport. Unless these sensors are realigned at the polling place prior to the start of voting, touch screen machines can misinterpret a voter's intent. For example, a voter might touch the part of the screen identified with candidate Jones, but candidate Smith's box would light up instead. Instances of such malfunctions have already occurred.

As reported in an editorial in the San Jose Mercury News on January 23, 2003:

> Isolated but disturbing cases of malfunctioning and wrongly programmed machines continue to crop up. In one Florida precinct last November, votes that were intended for the Democratic candidate for governor ended up for Gov. Jeb Bush, because of a misaligned touch screen. How many votes were miscast before the mistake was found will never be known, because there was no paper audit. [51]

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[49] **Ballot card problems delayed election returns (Georgia)**
Walker County Messenger; March 4, 2004; Eric Beavers
http://news.mywebpal.com/news_tool_v2.cfm?show=localnews&pnpID=730&NewsID=531127&CategoryID=3511&on=0

Note: Contrast the information in this article with the claim of "no problems" made, on Atlanta television, by Georgia's chief election official just days after the problems in Walker County, Georgia. (see page 47).

[50] Much of this section is based on information compiled by Robert Kibrick, research astronomer for the University of California Observatories / Lick Observatory; see http://voting.idlecircuits.com/

[51] **Gee whiz, voter fraud?**
San Jose Mercury News; January 23, 2003
http://www.mercurynews.com/mld/mercurynews/news/opinion/5011944.htm

According to the October 22, 2002 edition of The Dallas Morning News, similar problems were reported with touch screen voting machines used during the early voting period for the Texas 2002 elections.

Diebold, ES&S, and Sequoia products all use resistive touch screens. The longest warranty provided for a resistive touch screen is five years. [52]

Miscellaneous Breakdowns on Election Day

It's not reasonable to expect journalists to report all the miscellaneous problems and breakdowns that occur at the polls. As concern about electronic voting machines has increased, more people are collecting information about problems. In response, many voters and poll workers have written up descriptions of their experiences and posted them on the Internet.

One such report was posted by a Systems Inspector in San Diego County. In addition to pointing out the substantial complexity that electronic voting machines add to the poll workers' tasks, the report describes two different errors that occurred on the Diebold TSx machines – the screens paging backwards and the summary screen failing to appear. Both errors required the machines to be taken out of service for the rest of the day. This means that one-third of the machines at that precinct failed.

Here are the relevant excerpts from the report. [53]

> About half an hour into the poll, one voter had apparently gotten halfway through her ballot before the station began going to the previous page. I had her go forward to the last page on which she had been able to vote, and we both stepped back and watched the machine page backwards to the instructions. I'm guessing that this was a broken touchscreen. It worked well enough for me to cancel the ballot and move her to a different station; I closed the broken station for the rest of the day, and our Inspector called the troubleshooter hotline. There were supposedly one hundred Diebold employees and some county troubleshooters covering about 1,200 precincts, which seems generous to me, but they didn't dispatch anyone. Our problems were apparently minor compared to those at many of the other precincts.
>
> ... We had another technical problem later in the day, when a voter reported that his summary screen (the last step before casting the ballot) was blank. I confirmed that it was; everything else seemed normal, and the boxes were checked next to each candidate on the ballot, but there wasn't anything on the screen where the votes should have been listed. I moved the voter to another station, chalking it up to a card programming error, and kept checking on that station. Another voter had the same problem shortly afterwards, and I closed the station. It appeared to have recorded all of the votes properly, but I can't be 100% certain. If it hadn't recorded some data, there wouldn't have been anything that we could do. Again, the troubleshooter hotline didn't send anyone out; we only had a few more hours to go, and still had four machines working.

When problems like this occur, and the poll worker must examine the DRE while the ballot is on the screen, the ballot secrecy is violated. But what else can the voter do to convince the poll worker the DRE is not working properly? Without showing the poll worker that the machine isn't working, the voter can't get a fresh ballot on a different machine.

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[52] http://www.elotouch.com/products/accutec/accben.asp

[53] http://www.nukefreezone.net/archives/000140.html

Power Surges or Static Electricity Discharges

Like any computer or electronic system, touch screen voting machines could be disturbed by power surges or static electricity discharges, such as those that sometimes occur during lightning storms. Such interference could cause votes already cast to be lost or a voting station to become inoperative. Although touch screen machines are required to meet certain specifications regarding immunity to electrostatic discharges, during conditions of severe weather, such discharges might exceed the specified limits.

Electrical Outages and Inadequate Battery Charges

Electronic voting equipment is dependent on electricity. Although many of these machines have batteries, many of those batteries are unlikely to provide sufficient capacity to keep the machines powered during a lengthy power outage. Should such a lengthy outage occur during an election, voters could be prevented from voting.

Most touch screen voting machines have a backup electrical power that is provided by means of an internal, rechargeable battery similar to those in a small Uninterruptible Power Supply (UPS). These batteries, if fully-charged, are intended to provide several hours of backup power, so that power outages of moderate length should not impact the operation of the voting machine.

Unfortunately, on the morning of an election, the batteries in these voting machines might be either partially or fully discharged. In some cases, voting machines may have batteries that are no longer able to take a charge. That is because between elections, such machines may be stored for months at a time in an unpowered state.

Many of these machines use sealed lead acid batteries, which will discharge over time. The longer they remain uncharged, the less able they are to be fully recharged. Due to a phenomenon known as lead sulfation, the lifetime of such batteries is significantly degraded if they are not recharged on a regular basis. Anyone who leaves a car undriven for months at a time is likely to find that car with a dead battery that will perhaps refuse to take or hold a charge. The same concept applies to touch screen voting machines that employ lead acid battery technology and which are left for months at a time disconnected from electrical power.

> "Arapahoe County will spend an extra $100,000 on Tracy Baker's recall election, because nobody bothered to charge the batteries in county voting machines.
>
> County commissioners blame Baker, the clerk and recorder, who oversaw the machines as they sat unplugged and their power seeped away. Baker blames commissioners, saying they took away his ability to charge the machines by placing an elections worker on administrative leave.
>
> Ed Bosier, the county assessor put in charge of the recall, won't blame anyone. But he said Wednesday that the cost of replacing 800 batteries - which can't be recharged once they've died - will probably push the price of the election over $400,000.
>
> ... Bosier, who discovered the dead batteries in October and ordered them replaced in time for the recall, said new batteries will cost about $80,000.
>
> Installing them, county officials say, will cost around $15,000 more." [54]

[54] **Getting zapped for vote**
Clerk's recall election $100,000 pricier after batteries for voting machines lose juice
Rocky Mountain News; February 5, 2004; By Jim Tankersley,
http://www.rockymountainnews.com/drmn/election/article/0,1299,DRMN_36_2631038,00.html

To ensure that the batteries of touch screen voting machines will be fully charged on the morning of an election, in the days or hours before the polls open, election officials need to test every touch screen voting machine in their inventory to:

- Verify that the battery in each unit is still able to take a charge, and if not, replace it with a new battery,
- Verify that the battery recharging electronics in each voting machine are operating correctly and are able to charge the battery, and
- Verify that the battery in each voting machine is fully-charged before the polls open.

If such precautions are not taken (and it is likely that they will not, given the time and level of manpower required to carry them out), then the batteries in these voting machines will not provide the number of hours of backup power that are advertised in their respective vendors' specifications. Thus, should a power outage occur during an election, it is likely that many of these voting machines may become unusable because their batteries will not have sufficient charge to keep them operating during the outage.

Example: In Solano County, California, on March 2, 2004, Diebold TSx voting machines were daisy-chained together and plugged into a single outlet. While this is handy for charging batteries during storage and keeping cables to a minimum during elections, it places a high load on the circuit. The overloaded circuit breaker shut off, and the machines kept running on batteries. Since it affected only the single circuit, poll workers didn't notice the problem. After three hours, the batteries ran down and all the machines shut off. The poll workers called the Fairfield headquarters and were told to hand out provisional ballots until the circuit was reset and the machines were re-started. [55]

In those cases where a battery has been fully discharged and is unable to take a charge, if the power goes out, the voting machine may shut down without any warning. If this occurs while voters are in the midst of casting their votes, they will be left in limbo, not knowing whether or not their vote has been cast. They will have no way of finding out until power is restored, and it is unlikely that they will be able to remain at the polling place waiting for that to happen. The votes of such voters, as well as those who arrive at the polls to find voting machines disabled by a power outage, will thus likely be lost.

Maintenance Challenges

As touch screen voting machines age, like all electronic equipment, they will inevitably develop maintenance and reliability problems. This will require more technically-savvy election workers at each polling place, that is, workers who have the skills needed to troubleshoot and respond to such problems. Already, many localities are having difficulty finding adequate numbers of temporary workers to operate their polling places.

The deployment of touch screen machines will aggravate this already serious problem, as can be seen by the situation in San Diego on Super Tuesday (see page 32). While some elections officials may argue that touch screen machines will be easier for poll workers to deal with than optical scan paper ballots, it is simply not true that a malfunctioning touch screen machine will be simpler to deal with than a marking pen that has run out of ink.

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[55] **Registrar says electronic vote went smoothly**
Times-Herald; March 4, 2004; By Matthias Gafni, Times-Herald staff writer
http://www.verifiedvoting.org/article.asp?id=1428

Rapid Obsolescence and Toxic Waste Disposal

Given the rapid pace at which computer technology advances, touch screen voting machines will become obsolete and potentially unmaintainable within a few years. When that occurs, they will be expensive to replace, and funds may not exist at that time for their replacement.

When touch screen machines are retired from service, like any other computer, they represent a toxic waste disposal problem. Unlike optical scan ballots, they can't be readily recycled. While the volume of toxic waste generated by the disposal of touch screen machines represents a small fraction of the total, nevertheless it is an issue to consider when selecting a voting system, especially since there are less toxic alternatives.

Rechargeable batteries in these touch screen voting machines will wear out and require replacement. This adds to the long term operating and maintenance costs for these voting machines. These expended batteries will also present a toxic waste disposal issue. While small in magnitude when compared to the number of car batteries that are disposed of every year, the problem of voting machine battery disposal is not incurred by alternative voting technologies such as optical scan ballot cards.

Running an Electronic Election - a Ballot Judge's Summary

One of the challenges of using electronic voting equipment is recruiting and training poll workers. The challenge is increased by the fact that the systems are new and the inexperienced trainers are teaching new procedures. Here is an edited description of one ballot judge's training experience in Montgomery County, Maryland.[56]

> We are on a collision course in Montgomery County using the new electronic voting machines. After 3 hours of training, and multiple years of actual experience as a Ballot Judge, my fear is that the process will be time consuming, messy, and an irritating experience for voters and staff. It will also expand opportunities for voter fraud.
>
> Before the use of electronic "machines", voting volunteers arrived at 6:00 at the polling sites to set up the mechanical ones. Now, volunteers are asked to meet the day before elections (**new**) for some additional set up duties. On the actual voting day, volunteers will do much of the same as they previously did except for those new functions that result from using the new electronic equipment.
>
> The new "machines" now have a plastic seal which needs to be broken (**new**) to assure the absence of tampering. Previously, no seal was used or necessary. Seal numbers now must be recorded (**new**) on a control sheet (**new**), put into a plastic zipper bag (**new**), and returned (**new**) to the Board of Elections, presumably for validation and cross checking. A tally sheet (**new**) also needs to be stuck to the side of each "machine" (**new**) for use as voters are escorted (**new**) to the "machines". That has implications to be explained later.
>
> The "machine" is plugged in and turned on - it has a battery pack should there be a power failure. The Chief Judges come with a key (**new**) open the gates to the hard drives (**new**) and record the data from each (**new**), presumably the number of the drive, perhaps the count on the "odometer" and the count on the "counter" for the day's tallies. They will do the same at the end of the day (**new**), all this for "security." Note that all functions described are done "in tandem", that is by two people, each representing one of the major parties, again for "security".

[56] Jaime Manzano, Bethesda, Maryland

Meanwhile, those responsible for checking incoming voters are scurrying to set up shop. Cards and registers are distributed alphabetically at the tables for checking proper voting eligibility. Now the fun starts. As each voter enters, he is to present an ID. He is then checked off the register and a card with his name, address, and registration is handed to him for visual checking, and signature. Once checked and signed, the Voting Register Judge initials the card and hands it back to the voter. The Judge also activates a plastic voting card (**new**) identifying the voter's party registration. The Judge can also arrange for the voting card to trigger the "machine" to magnify the voting screen (**new**), or to activate voice instructions for voters hard of hearing (**new**). Then these fine volunteers mark off the event on a tally sheet (**new**).

Now the voter approaches the Ballot Judge. Before, the Judge took the paper card from the voter, checked that it was properly signed, and handed the voter an activated plastic voting card. The voter went to the machines, and the Ballot Judge kept the paper card. This card was later sorted alphabetically by hand and returned at the end of the day to the Voter Registration Judges. They manually counted the cards and recorded the result presumably for comparison against their Registration printouts or entrance tally sheets.

The new process is different. Now, the Ballot Judges, generally standing (**new**), greet the voter, accompany the voter to the "machines" (**new**) and assist, as necessary, in the proper insertion of the activated plastic card into the machine (**new**). The judge then checks the screen to see that the proper party registration has appeared (**new**). By now he has also checked that the paper card has been signed by the voter, and that the Voter Registration Judge has also initialed the card.

If all is copasetic, the Ballot Judge then "tallies" the transaction on the sheet pasted on the side of the "machine" (**new**), initials the paper card himself (**new**), and puts the card into a large brown envelope tacked to the side of the "machine" (**new**) The Judge then retires from the voter and the "machine" to assure that voting can occur in total privacy.

The voter, once completing his/her civic duty, returns the plastic voting card to the Ballot Judge, or puts into a cardboard box placed in some obvious place. The act of voting deactivates the card and it cannot be used again until reactivated by the Voter Registration Judges. Oh! The Ballot Judge also hands the voter an "I Voted" sticker. More security and control against voter fraud.

There is more. Since there will likely be a backup line of voters, the Ballot Judges will need to facilitate the flow by organizing the lines (**new**), and check to see if the voters need sample ballots or instructions on how to trigger the "machines" (**new**). It is also possible that a glitch can occur with the voting machine, e.g., the machine quits on a voter. There are procedures for that. But for the moment, lets keep the process simple.

Note that the Ballot Judges have been on their feet throughout the process (**new**). That means that the Judges will be walking about in the precinct for about 15 hours. Most Ballot Judges are senior citizens and will likely be hard pressed doing this task all day. The County is aware of this and recommends, during training, that proper walking shoes be used. Perhaps additional staff will be there.

At the end of the day, the Ballot Judges will assist the Chief Judges in closing down the "machines" and assembling the required tally sheets, namely, those of the Voter Registration Judges, and those on the "machines." Once closed down, the "machines" will be sealed with plastic locks which are also noted on a control sheet (**new**).

Before, the Ballot Judges would then take the reports prepared by the Chief Judge and the Voter Registration Judges. These are based on the tally sheets, the hard drives removed from each "machine" and the master tabulating "machine". The reports were then delivered by car to the County Election Board Office. The Judges would drive up, a line of cars having been assembled, wait their turn, and hand over the "machine", hard drives, and reports to notably courteous County employees and police officers. They would then ride back to their precincts to drop off the opposite party's Judge at his or her car. The day would end close to midnight.

Now, the drive to the County Election Board Office has been passed on to the Chief Judges (**new**). Some of the precinct "machines" would have had modems to transfer the tabulations of votes to the County mainframe computer. Presumably, those precincts that don't would do the old hard drive/master "machine" lugging task. In any case, the Chief Judges would hand in their tally reports and head for home. The work would be similar, only the load has been bucked from the Ballot Judges to the Chief Judges.

Any way you look at it, the introduction of the "machines" has complicated the voting process and increased the workload of the volunteer staff. It has also introduced a number of opportunities for voting mischief. One simple example. The plastic voting cards are activated by a device a little larger than a credit card in the hands of the Voter Registration Judge. Put in the hands of a voter intent on voting more than once, the plastic voting card could be "activated" over and over again while the voter was at the "machine". Alternatively, the voters might have a number of activated plastic cards in their pockets and vote multiple times. The tally sheets would give some indication that voter hanky-panky occurred, but how often, and for whom, would be undetectable.

There is also the possibility for electronic falsification of voting at the hard drive, the modem, the phone lines, or the main frame. It would be technically more difficult, but, if tried, it could be more massive and influential in the election outcome. Unhappily, the voter fraud problem has grown bigger, not smaller, with the use of machines.

Now, aside from increased complexity, questionably useful tabulation controls, and increased volunteer staff workload, there is the increase in system costs. Each machine costs approximately $3,000. Each plastic Activating Card costs about $1,500. Each plastic Voter Access Card cost about $6.00. The understanding is that 10 Voter Access Cards and one plastic Activating Card would be available for each machine. That means that $4,560 would have been spent for each "machine" station. The precinct in which I work uses about 15 machines. That means that $68,400 of equipment was purchased for the precinct. The computer software prepared to run on the equipment probably doubles that cost to, say, about $150,000.

The precinct runs with 12 volunteers who are paid about $100 each. Chief Judges received a little bit more. Thus, the payroll for volunteers should come to about $1,500. Of course, the new "machines" and procedures required 3 hours of volunteer training performed, presumably, by County Staff. Volunteers did not anticipate being paid, and perhaps County Staff did their work on County time. But there was extensive training material produced, the main piece being a professionally assemble three-ringed binder with about 150 pages of instructions and illustrations. That must have cost a pretty penny. Further, the training will, of necessity, be repeated before each election.

Running an Electronic Election – an Election Official's Report

The official report on San Diego's use of touch screens on Super Tuesday shows increased need for poll workers, poll worker training, machine testing, pre-election education, and poll-worker support on election day.

The following excerpts are taken from the official San Diego County polling report released after the California primary on March 2, 2004. They show that the effort involved in running an election is significantly increased by the use of touch screen voting machines. (Bold highlighting has been added to notable comments.) [57]

Recruitment of Poll Workers

Recruitment of the needed **6,800 poll workers for 1,611 polling places** began in mid-November of 2003 with the mailing of a recruitment letter to poll workers who had helped in the past and also to a new group of people who had expressed interest in helping out at the election. Recruitment efforts continued through the use of press releases, referrals, and other means all the way up to the day prior to the election, filling in vacant slots and covering for poll workers who had dropped out. Because of the move to the new voting system, the Registrar of Voters recruited **600 more poll workers than in past elections.** A new County employee poll worker program was implemented, and approximately **900 County staff served in key poll worker positions** throughout the day.

Training of Poll Workers

In prior elections, two poll workers – a Precinct Inspector and Assistant Precinct Inspector – were trained on the voting equipment, election processes and the legal aspects of operating the polls. Because of new procedures and requirements for the touch screen machines, two more positions were added – the Systems Inspector and the Systems Assistant – who were responsible for the set up and operation of the machines.

Each of the more than 3,200 Systems Inspector and Assistant Systems Inspector received 2-1/2 hours of hands-on training specifically on setting the equipment up, creating voter access cards, logging into the card-encoding devices, use of the touch screens, and closing down the equipment at the end of election day.

The Precinct Inspector and Assistant Precinct Inspector received two hours of training on the election processes and the legal aspects of operating the polls (e.g. provisional voting, nonpartisan cross-overs, etc.). They also had an opportunity to try the new equipment, but were not trained on the detailed operation of the machines.

All poll workers received a detailed guide and procedural checklist to help them through the various processes of the day, from set-up in the morning to closing at the end of the day. Troubleshooting tips were mailed to the Systems Inspectors the week prior to the election.

To ensure that the voting equipment was at the polling site in a timely manner, poll workers were instructed to set up the equipment at their precinct the night before the election and be at the polling site by 6:30 a.m. If they were unable to set up the night before, they were told to be at their polling site by 5:30 a.m. Equipment was issued to the

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[57] **Correspondence, written report regarding Touchscreen voting system used for the first time March 2, 2004 by the County of San Diego.**
From: Walter F. Ekard; Chief Administrative Officer
http://www.signonsandiego.com/news/politics/county/20040310-1315-report.html

Systems Inspectors during training. For security reasons, the equipment was kept under seal and could not be activated until the morning of the election. [58]

Testing of Equipment

The touch screens and related equipment – both hardware and software – went through Federal testing at certified Independent Testing Authorities. Subsequently, the California Secretary of State's technical expert reviewed the equipment and the Secretary of State approved the touch screen machines for use on November 10, 2003, and subsequently approved use of the PCM devices on February 21, 2004.

All 10,200 touch screens and 1,700 Precinct Control Modules underwent acceptance testing at the Registrar of Voters.

Troubleshooter Hotline and Other Phone Support

The Registrar of Voters had the following phone support available to answer questions from the polling places:

- 11 troubleshooter hotline phones. All poll workers were provided with this phone number.
- 12 direct lines to recruitment staff that had been working with the poll workers during the weeks and months prior to the election.
- 38 Registrar of Voters phone bank lines that supplemented the other lines during the peak incident period.
- 10 dispatch phones for communicating with Supervising Troubleshooters.
- 26 Supervising Troubleshooters. Diebold also had 12 staff at the Registrar's office to assist with technical support and to address systems questions.

Other Registrar of Voters staff also stepped in to deal with calls and to give instructions.

Field Support

The Registrar of Voters recruited 26 Supervising Troubleshooters, who were available in the field from 5:30 a.m. until the polls closed on Election Day. These Supervisors were coordinating and working with approximately 200 Rovers who were supplied by Diebold, each assigned to monitor a set of polling places in their designated area. Rovers began making their rounds at 5:30 a.m. as well.

[Ed – So, in addition to thousands of poll workers and hotline support personnel, San Diego also used support from vendors to solve technical problems during the election.]

Outreach/Public Education

The Registrar of Voters made a significant effort to educate the public on the use of the new system. A public education campaign was developed with the help of the contractor. This included a web site, educational brochures and other written materials, and an instructional video. Additionally, teams from the Registrar of Voters demonstrated the equipment at shopping malls and at community meetings throughout the county during the months preceding the election. More than 60 demonstrations were conducted, reaching more than 5,000 voters.

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[58] Note: This report fails to mention that the county allowed poll workers to take the electronic machines home with them before the elections so they would not have to pick them up the morning of the election. See page 17.

Election Day

Each polling location received four to eight Diebold TSx touch screen voting machines, based on the number of registered voters, and a Precinct Control Module (PCM). The system used in this election uses an encoded card to give voters access to their appropriate ballot on the touch screen machines. These access cards are encoded by the PCM. The encoded card is then inserted into one of the voting machines to activate the appropriate ballot for each individual voter.

Early on election morning poll workers at each polling site removed the PCM from its sealed case and set it up. **At approximately 40% of the sites, poll workers found that the machine did not display the expected login screen.** Some of the more computer-savvy poll workers were able to maneuver through a series of screens until they found the specific login screen upon which they had been trained. Other poll workers did not, as they had only been trained with the expected screen. Therefore, they were not able to perform the card-encoding function. **Without the ability to encode the electronic ballot cards at those polls, voters could not vote.** There were no back-up paper ballots at the polling locations. Provisional ballots were also electronic. Therefore, many poll workers could not open the polls for voting at 7 a.m.

As a back up for a potential PCM failure, the 26 Supervising Troubleshooters and 200 Rovers were trained to convert one of the TSx machines into a card encoder. However, poll workers were not trained on this procedure since it required an additional level of technical acumen. These poll workers were dependent upon reaching the troubleshooter hotline to help guide them through any technical problems.

Supervising Troubleshooters and hotline workers, assisted by Diebold staff in the Registrar's office, had a list of troubleshooting tips and were able to identify and fix this problem in minutes. The actual fix was a four-click process that took less than one minute to execute. Rovers in the field were able to assist in the resolution of the problem at many polls. **At a few locations, voters actually assisted poll workers in maneuvering through the start up process to reach the login screen.** These citizens did not have access to the PCM during login nor did they have access to the touchscreen software.

Many poll workers, however, were unable to reach help immediately because of the large number of calls coming in during a very narrow window of time.

At 7 a.m. 64%(1,038 of 1,611) of polling sites were operational. By 8:00 a.m., 88% (1,419) were open and by 9:00 a.m., 98% (1,580) were open. Before 10:00 a.m., 21 more polls were open. Nine additional polls were open after 10 a.m. and the one final poll opened at 11:05 a.m.

[Ed – Since Rovers were available to help starting at 5:30, some estimates indicate that the problem may have occurred at as many as 80% of the precincts.]

Preliminary Findings

Most aspects of the March 2 election went very well. Voters expressed positive feedback about the machines to reporters and election officials; there have been no breaches of security reported, nor any count irregularities, and the results were delivered in a timely manner. For the first time, visually impaired voters were able to vote unassisted and the ballot was provided in the three languages – English, Spanish, and Tagalog – mandated in San Diego County.

However, there were problems that must be addressed. Most importantly, there was a significant and unexpected problem, which resulted in the delayed opening of 573 out of 1,611 polling places. This inconvenienced many voters, some of whom returned later or went to another polling site, and some who were unable to return at all to vote. **There is no method to accurately measure how many voters were unable to vote.**

Technical

Approximately 40% of the PCM devices failed to "boot-up" to the correct screen when turned on by the poll workers. Diebold Election Systems, manufacturer of the voting machines has made a preliminary determination that the problem experienced with the PCM devices was **caused by an unexpected discharge of the internal battery.** This loss of power caused an unfamiliar screen to come up for poll workers upon start up. Diebold has a team of engineers working to determine the cause of the battery drain, and expects to issue a report in approximately two weeks.

The possibility of this large-scale hardware problem was not anticipated by the manufacturer. However, it was determined to be a possibility on a smaller scale and 26 supervising troubleshooters were armed with the remedy, as they were for other potential issues that might arise.

Technical support in the field was not consistent in that some precincts received support, and others never received a visit from their roving support person.

Training

Expanded training is required. Poll workers were trained in the setup and use of the electronic voting machines and the PCM devices. Additionally, poll workers received a detailed training manual and procedural checklist to use as a reference guide throughout the day. **The reference guide did not include the fix to the PCM. A widespread problem with the PCM devices was considered to be "low probability."** Therefore, no alternative methods for gaining access to the login screen or encoding voter access cards were given to the poll workers. Using a common triage approach, only the 26 supervising troubleshooters and support staff at the Registrar of Voters were trained to handle this PCM problem. Approximately 400 poll workers are not trained due to the nature of their clerical duties at the polling place.

Back-Up Plans

Existing back-up plans were not adequate to handle the widespread difficulties that resulted in delayed opening of many polling sites. Back-up plans were geared towards problems at a small percentage of polling places. It was not contemplated that a widespread number of polling sites would simultaneously face this failure. In the event of a PCM failure, rovers were supplied with extra PCMs. Additionally 226 troubleshooters were trained to convert touchscreens to card activators.

Alameda County experienced the same problem with their PCMs, but they were able to issue paper Provisional ballots to some voters. Because the problem was so widespread, they soon ran out of paper ballots and were forced to turn voters away.

Next Steps

The Review team is currently interviewing poll workers and troubleshooters to determine the nature and extent of problems experienced on March 2. As with any election, minor problems were identified throughout the day, and ongoing analysis will be performed. The Review Team will also analyze reports received from external entities, as well as the summary results of the post-election canvassing activities to determine if there are any other significant issues that have surfaced. Subsequent reports will be issued as determinations are made, and as other agencies complete their reports.

The experience of this election has direct impacts on how the Registrar will prepare for and conduct future elections. As further analysis and feedback from pollworkers is received, action plans will be created to address all of the lessons learned.

The following actions will be taken prior to the November election:

- The source of the battery discharge problems will be identified and corrected by the equipment manufacturer.
- Communications capacity will be expanded, including but not limited to, the ability to communicate to all polling places simultaneously; increase call-in capacity at the troubleshooting hotline; and provide poll worker-to-supervising trouble shooter communications.
- Increase technical skill requirements for poll workers.
- Provide more extensive written troubleshooting instructions, including scenarios and fixes at each polling site.
- Enhance and increase training hours for hands-on technical staff.
- Provide back-up ballot options at all polling sites.
- Provide instruction to convert backup machine to card encoder to each polling site.
- Examine methods for distribution of voting equipment and supplies.
- Create new criteria for polling places to facilitate improved communications.
- Implement new timeline requirements for set-up and testing at polling places.
- Develop check-in system to notify Registrar's office when polling place is open.
- Explore regional "early voting" centers.
- Pursue legislation that would provide for regional election-day "super voting centers" to improve efficiency and quality of service.

4 HAVA-Compliant Alternatives to Paperless Voting

Systems with Voter-Verified Paper Ballot (VVPB)

While some states, such as Maryland and Georgia, appear to be moving toward election systems that are fully paperless DREs, there is a great deal of resistance to paperless voting on many fronts. Many officials and citizen groups are strong advocates of voter-verified paper ballots to provide evidence of the voters' intentions and allow for a meaningful recount.

Legislation and executive orders requiring VVPB also require the availability of ballots on which disabled individuals can vote without assistance. Several vendors already provide such machines. Since the California Secretary of State has mandated that all voting machines used in California provide an accessible VVPT by 2006, other vendors are now in the process of developing technological solutions.

As Susan Nielsen, Associate Editor of The Oregonian says, "It's not because they distrust technology. It's because everything in democracy needs checks and balances. And every vote, whether for local sewer commissioner or national president, needs to be counted openly. Not tallied and zapped."[59]

- **Federal legislators:** Bills in the U.S. House and Senate offer HAVA amendments intended to increase verifiability and reliability of elections by banning paperless, unauditable DREs. At the time of this writing, these bills (H.R.2239 and S.1980) are supported by 138 members of the House and Senate, 76 organizations representing over 3,000,000 members and the entire spectrum of political parties,[60] and over 4000 individual endorsers representing all states.[61]
- **State legislators:** Bills aimed at ensuring a voter-verified paper ballot on election equipment have been introduced into at least 15 states.[62] Illinois law already requires a voter-verified paper ballot.
- **Chief election officials:** Officials in at least eight states[63] have declared that they will insist on voter-verified paper ballots for elections in their states. Some say that since there is time before the HAVA deadlines, they are waiting for the development of a technology that gives them and their constituents confidence in the election outcomes.
- **Citizen organizations:** Coalitions of concerned citizens have formed in at least 16 states for the sole purpose of working for verifiable elections in their states. Several national organizations are dedicated wholly to this same goal, and others are forming departments to work in various ways toward verifiable elections across the country.

Other citizens, discouraged by the multitude of problems that have come to light as election equipment has come under recent scrutiny, are advocating the exclusive use of optical scan equipment or even a return to the simplicity and verifiability of paper ballots, hand counted.

This chapter describes a variety of alternatives to paperless DRE systems, including other long-proven types of machines and a couple of citizen proposals.

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[59] **An America where votes disappear;** April 4, 2004 http://www.oregonlive.com/news/oregonian/susan_nielsen/index.ssf?/base/editorial/1080997112176372.xml

[60] http://www.verifiedvoting.org/endorsers_s1980.asp

[61] http://www.verifiedvoting.org/endorsers_ol.asp

[62] Alaska, Arizona, California, Colorado, Connecticut, Florida, Georgia, Maine, Maryland, Minnesota, New York, Ohio, Virginia, Vermont, Wisconsin.

[63] California, Missouri, Montana, New Hampshire, Nevada, Oregon, Vermont, West Virginia

Precinct-Count Optical Scan System [64]

Optical scan paper ballots are printed on large sheets of paper. Ballots can be available in different languages as needed. Voters cast their votes by filling in the "bubbles" on optical scan ballots. Voters use lightweight, portable voting booths to afford privacy while voting. These are available in heights to accommodate standing voters as well as ADA-compliant wheelchair-height versions. [65]

Once voters complete their ballots, they insert them into the precinct-count optical scanner. Over voted ballots are rejected, and the voter gets a fresh ballot. Under-voted ballots produce a warning, and the voter gets the opportunity to correct the under-vote (by marking any unmarked races). After a ballot is successfully completed and accepted by the optical scanner, the votes on the ballot are counted into the scanner's memory, and the scanner deposits the ballot into a locked ballot box.

At the close of the polls, the optical scanner produces a printout of all of the vote totals, the totals are sent to election central, and the locked ballot box is transported to election central in case the ballots were needed for any subsequent recount or audit.

Examples Of Large States & Cities Using Precinct-Count Optical Scan

Illinois	The State of Illinois is an example of a large urban state that has successfully used precinct-count optical scan systems for their elections. For example, 41% of the population of Illinois voters (5 million) use such systems. Will County, Illinois has posted a web page describing their rationale for choosing a precinct-count optical scan solution. [66]
Arizona	80% of the State of Arizona, including Phoenix, uses precinct-count optical scan. [67]
Michigan	The Secretary of State of Michigan has recommended that that entire State use precinct-count optical scan. [68]
Seattle	An example of another large city that uses precinct-count optical scan is Seattle. [69]
Other	Other states that use mostly precinct-count optical scan systems also include ♦ South Dakota [70] ♦ Minnesota [71]

Adding a single ballot-marking device at each polling place fulfills the HAVA requirements for accessibility to the disabled.

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[64] Examples: ES&S Model 100 precinct-count optical ballot scanner; http://www.essvote.com/pdf/m1000516.pdf Additional information is available at: http://www.essvote.com/index.php?section=products&rightnav=products

Diebold Election Systems AccuVote-OS; http://www2.diebold.com/dieboldes/accuvote_os.htm

Vogue Election Systems AutoScan; http://www.vogueelection.com/products_autoscan.html

[65] Example: Vogue Election Systems Vogue-I voting booth http://www.vogueelection.com/products_votingbooth.html

[66] http://www.willclrk.com/votingsystem.htm#Why%20was%20the%20optical%20scan%20system%20selected?

[67] http://www.sosaz.com/election/Az_election_law_white_paper.htm

[68] http://www.michigan.gov/sos/0,1607,7-127-1640_9150-43906--M_2001_5,00.html

[69] http://www.metrokc.gov/exec/news/1998/vote421d.htm

[70] http://www.sdsos.gov/2000/00pripre.htm

[71] http://www.sos.state.mn.us/election/Interactive%20Election%20Guides/HTML/15.htm

Two major studies of voting systems determined that precinct-count optical scan systems outperformed DRE voting machines in terms of residual voting errors and cost per voter. [72] [73] Note that, at the time the reports were prepared, ballot-marking devices were not available.

The limited funds available under HAVA would be better spent on optical scan ballot technology, which has been demonstrated to be one of the most accurate and reliable voting technologies currently in use. Optical scan ballot technology can provide a cost effective and accountable solution that meets the needs of both absentee voters and those who cast their ballots at a polling place.

Ballot-Marking Devices for the Disabled

Ballot marking devices[74], which allow disabled persons to vote independently, can be easily used in conjunction with precinct-count optical scan machines. In addition to the standard touch screen interface (non-DRE), they provide an audio interface for blind, visually-impaired, or reading-impaired voters and print each voter's choices on the standard optical scan ballot inserted by the voter.

They provide over-vote and under-vote protection, thus ensuring that the optical scan ballot completed on behalf of any voter is correctly filled in. Thus, any optical scan ballot completed by the ballot-marking device will be readily accepted by the precinct-count optical scanner.

Vision-impaired individuals can use the ballot-marking device to verify their ballots. When a completed ballot is inserted, the machine reads the ballot and either displays it on the screen or provides an audio description of the votes through the headphones.

Tactile Ballot Templates for the Blind and Reading Impaired

"Working in partnership with local disability organizations and national election commissions, IFES has developed Ballot Templates (also known as Tactile Ballots) for use by blind and visually impaired voters. These templates help ensure that voters are able to vote independently and in secret."[75]

Tactile ballot templates are currently in use throughout Rhode Island, in conjunction with their optical scan systems.[76] The templates are made from standard ballots. The actual ballot is placed inside the template. The voter can feel bumps on the template beside the choices, while an audio explanation of the meaning of each set of bumps assists them in completing their ballots. The cost is a minimal addition to the cost of printing ballots.

While ballot templates would not provide accessibility to voters with severe manual disabilities, if used with a Braille instruction sheet, they would allow voters who are both blind and deaf to vote unassisted – an advantage neither DREs nor ballot-marking devices have.

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[72] **Report on Election Systems Reform.** July, 2001. George Washington University, Institute For Communitarian Policy Studies. http://www.gwu.edu/~icps/

"In conclusion, our analysis points to paper ballot, fill-in-the-dot, precinct-count optical mark reader systems as the clear technological option of choice on cost-benefit grounds." http://www.gwu.edu/~icps/ExecutiveSummary.pdf

[73] **Caltech-MIT Voting Technology Project: Voting - What Is, What Could Be.** July 2001. http://www.vote.caltech.edu/Reports/2001report.html

[74] Example: http://www.vogueelection.com/products_automark.html http://home.businesswire.com/portal/site/google/index.jsp?ndmViewId=news_view&newsId=20040331005716&newsLang=en

[75] http://www.electionaccess.org/Bp/Ballot_Templates.htm

[76] http://www2.corps.state.ri.us/ELECTIONS/faqs/braille_or_tactile.htm

Open Voting Consortium Software

"The Open Voting Consortium (OVC) is a non-profit organization dedicated to the development, maintenance, and delivery of open voting systems for use in public elections."[77]

A group of computer scientists and engineers with the Open Voting Consortium is developing electronic voting software that can be run on standard computers, even the older models that have been replaced by leading edge technology. Counties could rent computers for elections or use old computers stored in their basements. The software is open-source, which means that it is open to public scrutiny.

The system is fully HAVA compliant. OVC voting systems will accommodate different languages and scoring methods, as well as voters with special needs. The OVC expects the software to be certified early in 2005. They will distribute it free of charge. Following is an excerpt from a newspaper article written before the April 1 demonstration of the system in San Jose, California.

> Although it's far from a finished product, the system retains what's good about current electronic voting systems. It's voter-friendly, easier than older systems to administer, and accessible to blind voters without assistance.
>
> It also addresses the concerns of today's critics. First, it uses open-source software that's available for public inspection - eliminating the secrecy that outrages critics of today's proprietary "black box" systems.
>
> Second, the software is free and can run on a variety of computer platforms, which makes the system cheaper to acquire and maintain. Third, it creates a paper trail of printed ballots that can be counted by hand or machine in case of disputed elections - without compromising privacy for the blind.
>
> ... In the consortium's system, the voting terminal can be a touch screen like today's electronic touch-screens, with the same type of audio accessories for blind voters. But the terminal's main job, once the voter is finished, is to print a paper ballot that identifies the voter's choices - along with a bar code that records the information in computer-readable form.
>
> Once the voter is satisfied, he puts the ballot into a locked box. To verify their ballots, blind voters can hide their printed choices in a security folder and run the bar code under a verifying scanner, which reads back their votes through headphones - eliminating the paper ballot's privacy concerns.
>
> When the polls close, the ballots are scanned on a separate tabulating system. Election judges can compare the scanned totals with those stored in the voting terminals to see if there are any discrepancies. The original ballots are still available to settle disputes - and unlike scanned paper ballots in older systems, the voter's choices are always clearly marked. [78]

You can download and test the software or simply see a simulation on the Internet.[79]

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[77] http://www.openvotingconsortium.org/

[78] **Open system might plug up holes in the e-voting process**
Baltimore Sun; April 1, 2004; By Mike Himowitz
http://www.baltimoresun.com/technology/custom/pluggedin/bal-pl.himowitz01apr01,0,4595991.column?coll=bal-pe-pluggedin

[79] http://gyaku.pair.com/~vote/ballot.html

DREs with Integrated Printer for Printing Voter-Verified Paper Ballots

Like a DRE, a touch-screen voting machine with an integrated VVPB printer[80] prevents over-voting and warns about under-voting as well as providing an audio interface for blind, visually-impaired, or reading-impaired voters. It provides an accessible voter-verified paper ballot (VVPB) printer, with an audio read-back capability for those voters.

Note that, while printing a voter-verified paper ballot may increase the complexity of the systems, the safeguard of a paper ballot appears to be necessary, given the unreliability of the currently available DREs.

Ballot Integrity Project Proposal

In their common belief that "Accuracy can only be assured through publicly observed hand counts of all ballots cast," an organization called the Citizens for Election Integrity are advocating a return to paper ballots, hand counted.[81] The group's long term goal is stated below.

> American election history has demonstrated the poor reliability of vote counting machines. More serious than frequent accidental counting errors is the threat of intentional vote fraud. Computer technology now makes possible massive vote fraud that is often undetectable. American democracy will never be secure as long as votes are counted inside black box machines.
>
> It is therefore recommended that all U.S. elections be conducted under the following conditions:
>
> 1. All votes cast on paper ballots having legal vote status.
> 2. Upon close of polling place, immediate hand count of all paper ballots in public view.
> 3. Upon completion of hand count, vote totals recorded immediately in triplicate on official report forms and signed by all election officials present.
> 4. One official report form posted immediately on wall of polling place.
> 5. Two remaining official reports and sealed ballot box delivered immediately to appropriate election authorities.
> 6. All paper ballots retained by election authorities in secure location until statute of limitation expires.
> 7. Publicly funded nonpartisan exit polls conducted and reported on Election Day for all federal, state and other key elections.
> 8. Computerized voting machines producing a voter-verified paper ballot may be used in addition to, but not in lieu of, a manual parallel accounting control system.

This group's proposal underscores the severe concern many Americans now have about electronic vote-recording and tabulation. Since the proposal addresses tabulation only, the paper ballot recommendation could easily allow independent voting for the disabled if the voting systems offered optical scan ballots with a ballot-marking device or tactile template.

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[80] Examples: Avante, http://www.aitechnology.com/votetrakker2/home.htm
and AccuPoll, http://www.accupoll.com/
and TruVote, http://www.truvote.com/

[81] **The Ballot Integrity Project: Proposal for the Creation of a National Task Force**
March 29,2004; By Citizens for Election Integrity
http://www.wesavedemocracy.org/docs/BIP_TF-proposal_reviewed_032904.doc

5 HAVA-Compliant Voting System Costs

DRE Systems

The capital costs of DREs vary, depending on the contract. The following examples are partial costs, since the primary sources were newspaper reports that didn't mention items such as training, maintenance, additional peripherals, and software.

Best Price in Nation Guaranteed to Ohio by Three Vendors

Ohio has signed contracts with Election Systems and Software, Diebold Election Systems, and Maximus/Hart Intercivic/DFM Associates to provide voting equipment for the state. "Blackwell estimated that at least three electronic voting devices or one optical scan device would be needed at each of the state's 11,434 precincts."[82]

In the contracts, the vendors agreed to sell their products to Ohio at the lowest prices in the nation and with the best warranty, service, and maintenance terms. If any of the three vendors sell at a lower price to other states, **Ohio receives a discount**. Article excerpt:

> "We have a few things in our contract that benefit the state and taxpayers" that Sequoia did not agree to, LoParo said. "We were able to negotiate for the best pricing in the nation for election systems, and included in that pricing was the best warranty terms, best service and maintenance terms vendors have ever agreed to.
>
> One of the issues Sequoia did state to election officials is they didn't want to be tied to Ohio's low prices.
>
> "We also have the stipulation if they offer another government entity a price that is lower than Ohio, they would have to give Ohio a discount."
>
> Blackwell's office also retained the right to terminate the contract. [83]

The contracts call for the following prices for each machine:

Manufacturer	Model	Price Each	3 DREs each in 11,434 precincts
Diebold	AccuVote-TS	$2,964	$101,671,128
ES&S	iVotronics	$2,896	$99,338,592
Hart Intercivic	eSlate 3000	$2,997	$102,803,094

Diebold DRE Price for San Diego

San Diego County paid approximately $3040 per Diebold DRE, including printer, which are yet to be supplied.

> San Diego County spent about $31 million to buy 10,200 Diebold AccuVote-TSx touch-screen machines.[84] Diebold agreed to upgrade the machines to include a printer that would print a voter-verifiable paper record, at no additional charge.[85]

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[82] **Three companies sign contracts to sell machines**
San Jose Mercury News; Feb. 09, 2004; Associated Press
http://www.mercurynews.com/mld/mercurynews/news/politics/7913465.htm

[83] **County to choose voting system; Three companies selected as eligible vendors**
Newark Ohio Advocate; February 11, 2004; By Lachelle Seymour, Advocate Reporter
http://www.newarkadvocate.com/news/stories/20040211/localnews/394868.html

Additional costs for San Diego included, among other items:

♦ One Precinct Control Module for each of the 1611 precincts	$2,125 each	= $3,423,375
♦ Thirty early voter vote-card encoders	$495 each	= $14,850
♦ Four central optical scan machines for absentee ballots	$60,000 each	= $240,000

Diebold DRE Price for Maryland

Purchasing 16,000 machines for $55.6M, Maryland paid approximately $3475 per Diebold DRE, not including a printer.[86] [87] This figure, presumably, will also include similar additional costs.

Increased Cost Per Ballot when DREs are Used

One of the arguments made in support of paperless touch screen voting machines is that they will save jurisdictions money by reducing the amount spent on printing and distributing paper ballots. But, ballots must be provided for absentee voting. In addition, ballots are typically provided at polling places for use in case of equipment failure. So, the use of DREs does not eliminate the costs associated with printing ballots; it merely reduces the total number of ballots that must be printed.

But, regardless of the number of ballots printed, these costs remain the same:

- The labor cost of designing and laying out the ballot.
- The one-time printer setup charges.

Thus, while the use of DREs may reduce the total cost of printing paper ballots, the cost per ballot for printing absentee ballots and extra ballots is actually higher. In addition, cost breaks for large orders are reduced, further increasing the cost per paper ballot.

Hidden Costs of DREs

Because of the many hidden costs of DREs, any anticipated costs savings from their purchase and use are likely to prove illusory. Given that the initial capital outlay to acquire such machines can be two to three times more expensive than a comparable optical scan voting system, the deployment of touch screen voting machines to meet the needs of able-bodied voters appears to be an extravagant use of public funds.

The hidden costs could easily negate (and overwhelm) any savings achieved from printing fewer paper ballots. Among these hidden costs are:

1. Increased costs for secure and environmentally-controlled storage for these machines when they are not in use.

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[84] **County priming public on new voting machines**
San Diego Union Tribune; February 29, 2004; By Luis Monteagudo Jr. staff writer
http://www.signonsandiego.com/news/metro/20040229-9999-news_1m29voting.html

[85] **County proceeds on touch-screen voting machines**
San Diego Union Tribune; November 26, 2003 ; By Helen Gao, staff writer
http://www.signonsandiego.com/news/metro/20031126-9999_7m26vote.html

[86] **Hi-tech voting machines 'threaten' US polls**
Scientist warns that electronic votes cannot be safeguarded
The Guardian; Monday February 16, 2004; Tim Radford and Dan Glaister
http://www.guardian.co.uk/uselections2004/story/0,13918,1149135,00.html

[87] Campaign for Verifiable Voting in Maryland to Karl S. Aro, Department of Legislative Services, Annapolis, MD, Page 2; http://www.truevotemd.org/2003-12-22_Karl_Aro_Letter.pdf

2. Increased energy costs for keeping the backup batteries charged between elections.
3. Increased labor costs for security when these machines are stored overnight at the polling place before an election.
4. Increased costs for hardware maintenance and software upgrades for each of the thousands of such machines for a typical large county.
5. Increased costs for expendable parts, including the backup batteries and smart cards used by these machines.
6. Increased labor costs for verifying that each machine has the correct version of the software and firmware installed immediately before the start of every election and again immediately after each election is concluded.
7. Increased labor costs for individually performing logic and accuracy tests on every one of thousands of machines prior to the start of every election and again immediately following each election.
8. Increased labor costs for hiring additional poll workers (San Diego doubled the number of poll workers when it switched to DREs).
9. Increased costs for poll worker training, both for longer training sessions and larger number of poll workers to train on using a much more complicated system.
10. Massive costs for replacing these machines when they age and the technology they employ is no longer maintainable or supported by the vendor.

Precinct-Count Optical Scan System + Ballot-Marking Device

While some jurisdictions are purchasing DREs for every booth in every polling place, it is only necessary to have one booth with full accessibility to disabled persons. A system with one precinct-count optical scan system and one accessible ballot-marking device is much less expensive and provides the additional value of a voter-verified paper ballot (for details, see page 36).

The equipment required for a precinct-count optical scan system is readily available from several major manufacturers of voting equipment. The cost for each polling place depends on the number of voting booths needed. The minimum number of booths would be one; the maximum would probably not be more than 10.

OS Equipment needed per polling place	Approx. Cost Each
One precinct-count optical scanner with ballot box [88]	$5,000
As many voting booths as needed [89]	$250

Enhancing each polling place's optical scan system to include an accessible voting method for the disabled would only require the addition of one ballot-marking device to accommodate the needs of blind, visually-impaired, and language-impaired voters. The devices print directly onto the same ballots completed manually by other voters and fed into the optical scanner.

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[88] Example: Vogue Election Systems SpaceSaver 2000, http://www.vogueelection.com/products_spacesaver.html

[89] Example: Vogue Election Systems Vogue-I voting booth http://www.vogueelection.com/products_votingbooth.html

According to AutoMARK Technical Systems (formerly Vogue Election Systems), which manufactures a ballot-marking device, the cost for the device would be comparable to the cost of a DRE with a printer attached. Figuring approximately $4,000 for the addition of the ballot-marking device, the following table shows the cost of three sizes of polling places:

Polling Place Size	Optical Scanner	Voting Booths	Marking Device	Total
1-voting booth	$5,000	$250	$4,000	$9,250
5-voting booths	$5,000	$1,250	$4,000	$10,250
10-voting booths	$5,000	$2,500	$4,000	$11,500

Precinct-count optical scan systems can provide a significant savings over DRE systems, even considering the additional costs of printing ballots, especially when you compare them with DRE systems that have voter-verifiable printers attached.

The CalTech/MIT Voting Project report, published in July 2001, estimates that the cost of purchasing DREs **without** a voter-verifiable printer is over three times the cost of purchasing optical scanners. While the cost of operating DREs is about half the operating cost of optical scanners, it would take about 20 years of operation before the overall costs would be equivalent — and this doesn't account for the other hidden costs of DREs outlined on page 41. The CalTech/MIT report says:

> "Even though optical scanning systems have much higher operating cost, the difference in the acquisition cost is sufficiently large that the total cost of the optical scanning system is somewhat lower over the fifteen-year operating life of the machinery. If we assume a twenty year lifespan, the costs are identical." [90]

The CalTech/MIT study determined the acquisition and operating costs per voter as follows:

Machine type	Acquisition	Operating
DRE (Touch screen)	$18-25/voter	$0.5-1/voter
Optical Scanning (in Precinct)	$6-8/voter	$1-2/voter

Precinct-Count Optical Scan System + Tactile Ballot Templates

Tactile ballot templates (see page 37) are currently in use throughout Rhode Island, in conjunction with their optical scan systems.[91] The cost is a minimal addition to the cost of printing ballots and might be a reasonable solution for small jurisdictions.

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[90] **CalTech/MIT Voting Project, pages 23, 24**
http://www.vote.caltech.edu/Reports/
At the time of this report, ballot-marking devices were not yet available, and voter-verifiable printers were not included in the capital costs of the DREs.

[91] http://www2.corps.state.ri.us/ELECTIONS/faqs/braille_or_tactile.htm

Open Voting Consortium System

OVC[92] will provide free voting software that runs on standard PC hardware. In addition, each precinct needs a printer and a bar code reader. Counties may choose to install and run the software on rented equipment, or they may purchase re-marketed computers and sell them back after the election. Either way, counties avoid the costs of storage, maintenance, and toxic waste disposal of retired systems. Assuming a cost of $1000 per computer and $200 per printer for each voting booth, and then $500 for a bar code reader, the capital cost for a 5-booth polling place would be $6500.

DREs with Integrated VVPB Printer

Certified systems currently available[93] are comparable in cost to paperless DREs with an attached VVPB printer. They range from about $3600 to about $4200 per machine.

Estimated Capital Cost Comparison for Voting Systems

The following table shows the cost for a typical polling place, which has five voting booths. Note that a 5-booth DRE system requires five DREs, while a 5-booth optical scan system requires only one optical scanner plus a method of allowing disabled individuals to vote.

System Type	5-Booth Polling Place
DREs with integrated VVPB Printer	$20,000
Paperless DRE System	$17,500
Optical Scan + Ballot-Marking Device	$10,250
Optical Scan + Tactile Ballots	$6,500
Open Voting Consortium System	$6,500

[92] http://www.openvotingconsortium.org/

[93] Examples: Avante, http://www.aitechnology.com/votetrakker2/home.htm
and AccuPoll, http://www.accupoll.com/
and TruVote, http://www.truvote.com/

6 Distinguishing Truth from Misinformation

For many people today, it is difficult to tell legitimate reports from biased information. Finding out the facts has become easier recently as journalists cover the stories more often and in more depth.

Reports by Computer Experts Discredit DRE Systems

Johns Hopkins/Rice Report [94]

In July of 2003, four scientists from Johns Hopkins and Rice Universities had an opportunity to study the source code of the software used for Diebold tabulation equipment. The software was found, by Bev Harris of BlackBoxVoting.org, on an unprotected Diebold web page. The scientists who analyzed the source code wrote a 24-page report. The following excerpts are the first and last paragraphs of the abstract.

> Our analysis shows that this voting system is far below even the most minimal security standards applicable in other contexts.
>
> ... We conclude that this voting system is unsuitable for use in a general election. Any paperless electronic voting system might suffer similar flaws, despite any "certification" it could have otherwise received. We suggest that the best solutions are voting systems having a "voter-verifiable audit trail," where a computerized voting system might print a paper ballot that can be read and verified by the voter.

SAIC Report [95]

Wanting another opinion on the Diebold software, in early August 2003 the state of Maryland hired a third-party consulting firm (SAIC – Science Applications International Corporation) to perform an analysis of Diebold's AccuVote-TS voting system.[96]

On September 24, 2003, Maryland released a version of the report, but about two-thirds of the report was censored and remains secret because of concerns that the information it contains might enable malicious hackers to exploit the security vulnerabilities documented in the secret portions of the report. However, the non-secret portions of the report raise serious concerns about the security vulnerabilities of the Diebold touch screen systems currently in use. The final paragraph of the executive summary begins:

> **"The system, as implemented in policy, procedure, and technology, is at high risk of compromise. "**

Despite the problems identified in the Johns Hopkins/Rice and SAIC reports, Maryland still proceeded with the $55.6 million dollar purchase of Diebold AccuVote-TS voting systems.

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[94] **Analysis of an Electronic Voting System**
July 23, 2003; By Tadayoshi Kohno, Adam Stubblefield, Aviel D. Rubin, and Dan S. Wallach
http://avirubin.com/vote/

[95] http://www.dbm.maryland.gov/dbm_search/technology/toc_voting_system_report/votingsystemreportfinal.pdf

[96] **Risk Assessment Report: Diebold AccuVote-TS Voting System and Processes**
September 2, 2003; by SAIC
http://www.dbm.maryland.gov/dbm_search/technology/toc_voting_system_report/votingsystemreportfinal.pdf

Ohio Compuware [97]

Another study, released in December 2003, was commissioned by the State of Ohio and conducted by Compuware Corporation. The scientists examined security vulnerabilities in four major vendors' touch screen machines: Diebold AccuVote TS, ES&S iVotronic, Sequoia AVC Edge, and Hart InterCivic eSlate. The study showed that all four of the voting machines had serious security problems. These problems are described in great detail in the report, which is over 200 pages long.

Once again, an official report of a state government agency found numerous security vulnerabilities in these electronic voting machines. And yet all four of the machines covered in this report had previously been approved by the Independent Testing Authority, the federal certification authorities, and several state certification authorities. This points up the serious weaknesses in the existing certification procedures (see page 16 for examples of problems that occurred during elections held on two of these machines).

Despite the problems identified in the Johns Hopkins/Rice, SAIC, and Compuware reports, Ohio's Secretary of State Blackwell is encouraging the counties to select the DRE machines approved by Ohio.

RABA Report [98]

In what appears to be yet another attempt to get a good report on the Diebold machines it had purchased, the Maryland legislature contracted for a practical test of the systems. It hired computer science experts to work with six machines for a week and attemp to hack the machines.

- The computer science experts gave the systems a failing grade.
- Diebold representatives said the test confirmed the accuracy and security of their systems.

Here are excerpts:

> William Arbaugh, a University of Maryland assistant professor of computer science who participated in the test, graded the system an **"F," "with the possibility of raising it to a 'C' with extra credit -- that is, if they follow the recommendations we gave them.**"
>
> "I was really surprised with the totality of the problems we found. Just about everywhere we looked we found them," Arbaugh said.
>
> Diebold officials could not be reached directly for comment. But in a press release, the company said Thursday that the study "validates" the Diebold election systems for the primary.
>
> Diebold President Bob Urosevich said in the release that the Raba Technologies report **confirmed "the accuracy and security of Maryland's voting procedures and our voting systems as they exist today."** [99]

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[97] http://www.sos.state.oh.us/sos/hava/files/compuware.pdf

[98] http://www.raba.com/press/TA_Report_AccuVote.pdf

[99] **E-Vote Still Flawed, Experts Say**
Wired News; January 29, 2004; by Kim Zetter
http://www.wired.com/news/business/0,1367,62109,00.html

Claims of "Successful Elections" Don't Match the Facts

Georgia Secretary of State Cathy Cox

The article about Walker county on page 22 ends with this statement:

> ... The voting machines have been used for six elections, three of which were for the same State House District 1 race. **Problems have cropped up at every election.**

Contrast the information in the article with the claims made, on Atlanta television, by Georgia's chief election official just days after the many problems in Walker County, Georgia.

> "Though Georgia Secretary of State Cathy Cox said the state's 26,000 elections voting machines performed **without any problems** on Super Tuesday earlier this week, some lawmakers Thursday said the machines may nonetheless be vulnerable to fraud and wanted printed receipts to serve as proof of the computer tabulation."[100]

Such conflicting reports of the "success" of electronic equipment are not unusual.

Florida Secretary of State Glenda Hood

Two of the many severe election problems that have recently occurred in Florida are mentioned on pages 6 and 23. One of the incidents led to the federal lawsuit filed by Representative Robert Wexler (D-FL) and currently scheduled for a hearing in August of 2004.

However, on Lou Dobbs tonight, the day before the Florida primary election, Secretary of State Glenda Hood said this:[101]

> Well, I have a high confidence level. And it's based on the fact that, since 2002, when we put new equipment in place in the state of Florida, that **we have had no problem whatsoever,** according to our 67 supervisors of elections.

Cleaning up Misconceptions about VVPB

Many arguments against voter-verified paper ballots are based on misconceptions. Here are the facts about a few of the most prevalent misconceptions.

League of Women Voters' opposition to VVPB is not a member-endorsed position

Since early in 2003, the Executive Board of the League of Women Voters has defended paperless DREs with a statement that was **not supported by a formal study and not approved by a vote of the members**. It has publicized its statement and widely distributed a document entitled "Questions and Answers on Direct Recording Electronic (DRE) Voting Machines, "[102] which advocates paperless voting and advances some of the other misconceptions in this list.

Many rank and file members strenuously object to the policy and have launched a website in opposition to the Executive Board's action.[103] The site includes a request to the President of the National League to retract the policy statement. It also includes a link to a document written by Dr. Barbara Simons, a League member and computer expert nationally recognized for her work

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[100] **Printers Wanted for Voting Machines**
WXIA-TV Atlanta; March 5, 2004; Reported By: Keith Whitney
http://www.11alive.com/news/news_article.aspx?storyid=43824

[101] **Lou Dobbs Tonight**
CNN; March 8, 2004; http://www.cnn.com/TRANSCRIPTS/0403/08/ldt.00.html

[102] http://www.lwv.org/join/elections/hava_resources.html

[103] http://www.leagueissues.org

as a co-author of the report that convinced the Department of Defense to abandon its Internet voting program. The document[104] is a point-by-point response to the Questions and Answers document. In her response, Dr. Simons clears up some of the misconceptions put forward by the League leadership.

No systems require voters to verify their ballots

Some proponents of paperless voting teach that VVPB refers to systems that **require** voters to verify their votes.[105] However, none of the supporters of (VVPB) advocates requiring each voter to verify his or her paper ballot. The requirements for VVPB pending in many state legislatures apply to the machines, not the voters. Machines would be required to provide a method by which voters could verify paper ballots, but voters would not be required to verify them.

No System Provides a VVPB for the Voter to Remove from the Polls

The term "receipt" has been used by many who advocate a voter-verified paper ballot. They point out that you get a receipt for deposits made at the ATM, and you should get a receipt for your electronic vote as well. Some proponents of paperless voting claim that VVPB systems would allow voters to remove the paper ballot from the polling place, thus allowing for vote-selling.[106]

However, in a VVPB system the "receipt" is the ballot itself, and no system provides a ballot that the voter removes from the polls. All VVPB systems require the paper to be retained by election officials and securely stored at the polling site.

No system requires poll workers to assist voters in verifying their ballots

Some advocates for organizations of the disabled misunderstand how paper verification would operate for visually-impaired people. Voters could have their ballots read back to them through earphones by an automated audio facility. No poll workers would be involved. The secrecy of their ballots would not be violated.

VVPB does not violate the Americans with Disabilities Act

Some people are concerned that providing different verification methods to sighted and blind individuals would be a violation of the law. The United States Department of Justice disagrees. It issued an official opinion, through its Office of Legal Counsel, stating that including a voter-verified paper audit trail as a feature for a Direct Record Electronic (DRE) voting machines would be consistent with both the Help America Vote Act and the Americans with Disabilities Act, so long as the DRE voting system provides a similar opportunity for sight-impaired voters to verify their ballots before those ballots are finally cast. [107]

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[104] **A Response To: The League Of Women Voters Of The United States Questions and Answers on Direct Recording Electronic (DRE) Voting Systems;** By Dr. Barbara Simons; http://www.leagueissues.org/lwvqa.html

[105] **Questions and Answers on Direct Recording Electronic (DRE) Voting Machines,** page 5 The League of Women Voters of the United States

[106] **Questions and Answers on Direct Recording Electronic (DRE) Voting Machines,** page 8 The League of Women Voters of the United States

[107] **Memorandum Opinion For The Principal Deputy Assistant Attorney General, Civil Rights Division;** October 10, 2003; http://www.usdoj.gov/olc/drevotingsystems.htm

Optical scan machines are a reliable way to count paper ballots

Some people claim that we should avoid paper ballots because the machines that count them aren't reliable. For example, Jim Dickson, vice president for governmental affairs at the American Association of People with Disabilities, says: [108]

> "As a matter of fact, not theory, whenever paper ballots are counted by an automatic tabulator you never get the same results twice."

While it is true that punch card tabulators might produce different results when the same cards are run through the machine, this is because chads can hang, shift, and fall off during the tabulation process, causing the machine to misread. Optical scan machines, however, simply read the marks on the paper ballots and the marks don't change from one run to the next. As a result, optical scan machines can reproduce results reliably. In fact[109], "Optical scanning has the best track record of all equipment types currently in use."

Financial Ties of DRE Advocates to Vendors Suggests Bias

Strong Advocate of Paperless DREs Received Large Donations from Vendors

R. Doug Lewis, executive director of the Election Center, is a major source of the arguments for paperless DREs and against a voter-verified paper trail. Early in 2003, the Election Center widely distributed a letter defending the security and reliability of DREs. His arguments have been refuted by many computer science experts, notably David Jefferson, a member of the California Electronic Voting Task Force, who wrote a point-by-point rebuttal of the letter.[110]

Nevertheless, Lewis's arguments are still quoted in the position papers of organizations that advocate paperless electronic voting.

In March of 2004, it was discovered that, for years, the Election Center has been receiving large donations from the three major manufacturers of paperless electronic voting. Excerpts follow.

> The Election Center, which trains election workers and advises Congress and government agencies on election process issues, has taken donations from manufacturers of electronic voting machines even as it has issued strong statements supporting the security of the machines.
>
> The Houston-based nonprofit organization bills itself as a nonpartisan group representing election officials from throughout the country.
>
> Its executive director, R. Doug Lewis, confirmed this week that the center had taken donations from makers of electronic voting machines - Sequoia Voting Systems Inc. of Oakland, Calif., and Electronic Systems & Software Inc. of Omaha, Neb. In addition, donations came from "probably Diebold" Inc. of North Canton, Ohio, Lewis said.
>
> The Sequoia donations came to light on the organization's latest 990 IRS filing, a copy of which was reviewed by The Inquirer. It inadvertently revealed donations of $10,000 per year from 1997 through 2000. The IRS usually removes such names before documents are made public.

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[108] **The Ballots are Still Full of Holes**
The Progressive; March issue; By Marc Eisen
http://www.progressive.org/march04/eisen0304.html

[109] **Caltech/Mit Voting Technology Report: What is; What Could Be: Fast Facts**, page 4.
July, 2001; http://www.vote.caltech.edu/Reports/july01/fast_facts.pdf

[110] http://verify.stanford.edu/EVOTE/ECresponse.html

... Lewis issued a report last year saying that "well-intentioned people, some of them even highly educated and respected, scare voters and public officials with claims that the voting equipment and/or its software can be manipulated to change the outcome of elections."

The report went on to say: "Do not be misled into believing that elections are reliant upon technology which can be manipulated... . It may be possible to do many things, but like time travel (which is theoretically possible), it is highly unlikely at this time."

Lewis said he did not think accepting donations from the manufacturers presented any conflict of interest or breach of ethics. [111]

ES&S Paid Commission to Officials who Endorsed Their Products

The Florida Association of Counties endorsed ES&S machines exclusively, as a result of the lobbying efforts of Sandra Mortham. Both the association and Mortham received commissions from ES&S on the equipment sold.

A former Florida secretary of state profited by being a lobbyist for both the state's counties and the company that sold some of them touch screen voting machines used in last month's botched primary election.

Sandra Mortham, who served as the state's top elections official from 1995 to 1999, is a lobbyist for both Election Systems & Software and the Florida Association of Counties, which exclusively endorsed the company's touch screen machines in return for a commission. Mortham received a commission from ES&S for every county that bought its touch screen machines. The exact terms have not been disclosed.

... The association will receive about $300,000 in commissions, according to the agreement.[112]

San Diego Considers Scrapping Diebold after California Primary Disaster

A month after the March 2, 2004 California primary, more Diebold problems are showing up, this time with the optical scanners. Points mentioned in the April 7 article in the North County Times include:[113]

Diebold's use of uncertified software in an Alameda County election.

A "still-mysterious power drain" that prevented poll workers from programming the "smart cards" used by voters to display their ballots on the DRE, thus delaying voting at 36% of the 1611 San Diego precincts.

Optical scanners counting 2,821 absentee for Dick Gephardt, when they were actually cast for John Kerry.

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[111] Excerpt from: **Group that called electronic vote secure got makers' aid**
Philadelphia Inquirer; March 15, 2004; By Linda K. Harris
http://www.mercurynews.com/mld/mercurynews/news/world/8273865.htm

[112] Excerpt from: **Lobbyist made money from touch screen sales**
St. Petersburg Times; October 6, 2002 ; ©Associated Press
http://www.google.com/search?q=cache:WJT4jZ8WH0AJ:www.sptimes.com/2002/10/06/news_pf/State/Lobbyist_made_money_f.shtml+Florida+%2B+ES%26S+problems&hl=en&ie=UTF-8

[113] Excerpts from: **New electronic scanners miscounted some county votes**
North County Times; April 7, 2004; By: Gig Conaughton
http://www.nctimes.com/articles/2004/04/08/news/top_stories/22_27_394_7_04.txt

The latest problem also cast doubt on whether the Diebold system could or would be used by San Diego County voters in November. State officials said they are conducting a hearing next week to discuss the situation and that "possible decertification is on the table."

Diebold officials did not return calls Wednesday.

The company has come under intense criticism over several months from the secretary of state's office, which is investigating the company's use of "uncertified" software in an Alameda County election. In addition, critics have argued that electronic voting systems are inherently untrustworthy and could be rigged to manipulate elections.

On Tuesday, San Diego County Chief Administrative officer Walt Ekard sent a letter to Diebold President Bob Urosovich expressing the county's "dissatisfaction," and stating, "These performance failures are unacceptable."

... Asked if the county could seek to break its agreement with Diebold over performance issues, Jacob said, "It's too soon to tell. We would have to take a look at that."

San Diego County supervisors voted unanimously in December to spend $31 million on 10,200 Diebold electronic voting machines after two years of study. However, Jacob said Wednesday that none of that money has yet been paid, and she said the company is contractually obligated to pay for whatever system the county uses in November if its machines are decertified.

... Pam Smith of SAVE Democracy, a group based in Carlsbad that has been very critical of the county's decision to use the machines, said she thought the new problem would add fuel to criticism.

"There's only so many times you say 'I told you so,'" Smith said. "We have a lot of concerns. I'd like to see them scrap the whole thing and make a sculpture out of it."

ES&S Audit Flaws Have Been Known Since June 2003

Information provided to the California Voting Systems and Procedures Panel meeting on April 22, 2004[114] indicated serious audit problems with the iVotronic. A news article describing the situation was published on May 13, 2004[115]. It tells that "serious bugs" in Miami-Dade's ES&S election equipment have been known for **nearly a year**. The article reports:

A scathing internal review of the iVotronic touch-screen voting machines used in Miami-Dade and Broward, Fla., counties, **written by a Miami-Dade County elections official,** has raised fresh doubts about how accurately the electronic machines count the vote.

The review, contained in a June 6, 2003, memo that came to light last month, concludes there is a "serious bug" in the voting machine software that results in votes potentially being lost and voting machines not being accounted for in the voting system's self-generated post-election audit.

... "We thought the system had basic integrity in terms of how it recorded and tabulated votes," said Lida Rodriguez-Taseff, a partner at Duane Morris in Miami who chairs the

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[114] **Meeting; State of California; Secretary of State; Voting Systems and Procedures Panel,** pp 483-489. April 22, 2004. Testimony of Professor Martha Mahoney.
http://www.ss.ca.gov/elections/vsptranscript0422.pdf

[115] **Count Crisis? Elections official warns of glitches that may scramble vote auditing**
Miami Daily Business Review; May 13, 2004; by Matthew Haggman.
http://www.law.com/jsp/article.jsp?id=1084316008117

coalition. "But we are dealing with a problem that is even more dramatic. We have a system with systemic problems that does not accurately report or tabulate votes."

... In his memo, Suarez analyzed a precinct where just nine electronic voting machines were used. He first examined the audit logs for all nine machines, which was compiled onto one combined audit log. He found that the audit log made no mention of two of the machines used in the precinct.

In addition, he found that **the audit log reported the serial number of a machine that was not used in that precinct**. The phantom machine that appeared on the audit showed a count of ballots cast that equaled the count of the two missing machines.

Then he looked at the vote image report that was an aggregate of all nine voting machines. He discovered that **three of the machines were not reported in the vote image report**. But a serial number for a machine not used in the precinct appeared on the vote image report. That phantom machine showed a vote count equal to the vote count on the two missing machines. The other missing machine showed no activity.

"I find this unacceptable from an auditing and a certification perspective," he wrote in the memo.

Puzzled by what he found in his review of the audit report and vote image report, Suarez reviewed each report a second time on a separate computer. This time he made an even more disturbing finding.

Unlike in his first review of the audit log, he discovered that **38 votes cast went unreported in the audit log but not in the vote image report.** The 38 votes was the exact total number of ballots cast on the two machines not reported in the audit log.

In his second review of the vote image report, he found that the report showed two "made-up" machines which were not actually used at the precinct. The number of votes cast in the phantom machines matched the number of number of votes in the actual machines in the precinct.

"In my humble opinion (and based on my over 30 years of experience in the information technology field)," Suarez wrote, "I believe that there is/are a serious 'bug' in the program(s) that generate these reports making these reports unusable for the purpose that we were considering (audit an election, recount an election and if necessary, use these reports to certify an election)."

Fortune's Worst Technology of 2003: Paperless Voting

Fortune magazine's winner of the worst technology of 2003 award is "Paperless Voting." Fortune considers this technology even worse than implanted identification devices, which only won the runner-up award.[116]

[116] **Winners and Losers of 2003: Worst Technology**
Fortune Magazine; December 2003; By Peter Lewis
http://www.fortune.com/fortune/technology/articles/0,15114,558787,00.html

Summary

Election transparency is the fundamental basis of election integrity.

In transparent elections, all the processes of handling and counting ballots are completely open to public view. Nothing is hidden, nothing is secret – except, of course, each individual's voting choices.

Election fraud and miscounts have occurred throughout history, and they will continue to occur. Transparency is the only way to minimize them, but with electronic voting, transparency is eclipsed. Electronic processes that record and count the votes are not open to public scrutiny. Courts have ruled that election software is a trade secret, so even a losing candidate with a computer consultant cannot view it.

With electronic voting, the most important and vulnerable election processes – storing and tallying the votes – are performed in secret, without public oversight. These processes were not developed by government officials charged with ensuring election integrity, but by anonymous software engineers, hired by vendors and not publicly accountable for the results of their work.

One would expect overwhelming benefits to accompany this sacrifice of transparency and the resulting loss of public control over election processes. **That's the myth.** Ironically, overwhelming disadvantages accompany the sacrifice. The logical question is "Why make the sacrifice?" It's a question more and more people are asking.

The facts presented in this document dispel many of the myths surrounding electronic voting. It is crucial to lay these myths to rest quickly, for as long as they are held by decision-makers, our democracy is at risk.

Here is a summary of some of the myth breakers presented in the previous pages (with page numbers in parentheses):

- No federal law requires us to record and count votes electronically (1).
- In recent elections, electronic voting machines have:
  - failed to count votes (6, 12)
  - tallied votes incorrectly (7, 11)
  - broken down during elections (8, 24)
  - disenfranchised voters (8)
  - handed votes to the wrong candidate (11)
  - reversed election outcomes (12)
- The use of DREs **increases**:
  - the complexity of election procedures (17)
  - the need for "ballot box" security (18)
  - the potential for human error (21)
  - the time required for pre-election testing (19)
  - the cost of storing election equipment between elections (41)
  - the capital cost of election systems (44)
- DREs are **not** the only way to provide independent voting for the disabled (35).
- Critics of paperless DREs do not hold their positions out of a fear of technology (45, 52).
- Some of the most vocal defenders of paperless DREs
  - don't have their facts straight (47, 49)
  - have received donations from DRE vendors (49)

An electronic election is not transparent.