



# CALTECH/MIT VOTING TECHNOLOGY PROJECT

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## AMERICAN ELECTIONS: A CRITICAL MOMENT FOR RESEARCH AND REFORM

R. Michael Alvarez  
Caltech

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# **American Elections: A Critical Moment for Research and Reform**

**R. Michael Alvarez**  
**Professor of Political Science, Caltech**  
**Co-Director, Caltech/MIT Voting Technology Project**

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## **Summary**

- The 2004 election provided important lessons regarding the performance of voting technology, about continuing problems with voter registration and provisional balloting, issues with procedures and poll site voting practices, and raised questions about the liberalization of early and absentee voting.
- There are a series of important issues that should be the focus of the election research and reform agenda in coming years:
  - ✓ Developing and implementing statewide voter registration databases.
  - ✓ Improving poll site practices.
  - ✓ Should ballot casting be tied to geography?
  - ✓ Electronic voting security, integrity and reliability.
  - ✓ Internet registration and voting.
  - ✓ Achieving a more open and auditable election administration process.
  - ✓ Understanding the preferences and perceptions of the consumers of election administration products --- citizens and voters.

## **The Context**

The 2000 presidential election gave many Americans a wake-up call regarding the precarious state of our democratic process. An extremely close presidential election, especially in a number of battleground states (including Florida), exposed a wide variety of flaws in our electoral system. Some of these flaws include poor procedures for administering elections, inadequate laws for regulating what happens in close contests, problems in the maintenance of voter registration lists, inaccurate and difficult-to-use voting technologies, under-trained poll site workers, and insufficiently staffed and poorly designed polling places. It took the actions of the U.S. Supreme Court (in *Bush v. Gore*) to end the immediate controversy in Florida, but the flaws exposed in our election process galvanized many individuals and organizations into action to help improve the electoral process in this country.

The Caltech/MIT Voting Technology Project (VTP) was one product of the 2000 presidential election. Originated at the initiative of Caltech President and Nobel Laureate David Baltimore and MIT President Charles Vest --- and supported initially by the

Carnegie Corporation of New York --- the VTP began efforts in late 2000 to determine what went wrong in the 2000 election and to devise solutions for those problems. Our mandate was to use the unique intellectual resources from both campuses, bringing to bear the talents of faculty and students from diverse backgrounds (including computer science, economics, management, mechanical engineering, and political science) to develop and help implement technological and policy solutions.

Our initial work culminated in a report released in July 2001, "Voting: What Is, What Could Be." This report provided a sweeping analysis of the election process, from end-to-end, examining problems and proposing solutions in voting technology, voter registration, absentee and early voting, and election administration. Perhaps surprisingly to many, our research estimated that between 4 and 6 million votes were lost in the 2000 election:

- 1.5 to 2 million lost because of faulty equipment and confusing ballots
- 1.5 to 3 million lost because of registration problems
- up to 1 million lost because of polling place problems.

We were unable at that time to estimate the number of votes that were lost due to problems with absentee and early voting.

The solutions proposed by the VTP have been debated, discussed, and many have been adopted in federal and state legislation. In particular, the "Help America Vote Act" (HAVA, passed in 2002) included many recommendations made by the VTP: nationwide implementation of provisional balloting, the development of statewide electronic voter registration databases, efforts to move from antiquated voting technologies (like punchcards) to modern and accurate voting systems, and the creation of a new federal office to oversee election administration. Between the release of our initial report in the summer of 2001, and the recent presidential election in 2004, the VTP has been actively involved in basic research on voting technologies and practices, and has played a critical role in the development and implementation of election reforms throughout the nation.<sup>1</sup> Our efforts have been supported primarily by the Carnegie Corporation of New York and the John S. and James L. Knight Foundation.<sup>2</sup>

## **What Important Lessons Were Learned In 2004?**

### ***Voting Technology.***

The 2004 presidential election witnessed the first widespread use of electronic or DRE voting systems in a contested national setting. Table 1 provides information on the basic transitions that are now occurring with voting technologies in the United States,

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<sup>1</sup> Our research, publication history, and reports, are available on the VTP website, <http://vote.caltech.edu>. Our website provides the various reports the VTP has released since 2000, as well as the results of our research activities (including a working paper archive and list of publications).

<sup>2</sup> The VTP, and individuals working as part of the VTP, have also received research support from other organizations; those smaller grants are reported on our website.

charting the changes from 1980 through 2000 and 2004.<sup>3</sup> In terms of the population coverage of voting technologies, paper ballots, lever machines and punch card voting systems are being phased out across the nation, while optical scanning voting systems and electronic voting systems are taking their place. Only 9.8% of Americans of voting age could have used an optical scan voting system in 1980, while over 35% had that opportunity in 2004. Likewise, about 2% of Americans of voting age could have used an electronic voting machine in 1980, but almost 30% could use one in the 2004 election.

Thus, the 2004 presidential election provided an important opportunity to test electronic voting technologies, a fact that received widespread attention in the weeks and months before election day. Despite all of this attention to electronic voting systems, before and after the election, there is little indication of systematic problems occurring with these voting systems. Scattered problems with electronic voting technologies were reported, mainly dealing with tabulation of electronic ballots and not the voting machines themselves.<sup>4</sup> How electronic voting technologies fared on other dimensions, however, such as on the important issue of relative accuracy and reliability, will be the focus of much scrutiny in the coming months as final vote tallies are made public. Expectations are high for electronic voting machine performance; Charles Stewart’s study of Georgia’s transition to statewide electronic voting documented dramatic increases in accuracy and reliability between 1998 and 2002, especially in rural, heavily African-American, and less affluent counties.<sup>5</sup>

Table 1: Voting Technology Transitions, 1980-2004

	Percent of Counties Using Technology			Percent of 2000 Population Covered by Technology		
	1980	2000	2004	1980	2000	2004
Paper Ballots	40.4	12.5	9.6	9.8	1.3	0.7
Lever Machines	36.4	14.7	8.5	43.9	17.8	13.0
Punch Card	19.1	19.2	10.5	32.7	34.4	11.5
Optical Scan	0.8	40.2	45.9	9.8	27.5	35.2
Electronic (DRE)	0.2	8.9	20.0	2.3	10.7	29.5
Mixed	3.0	4.4	4.8	10.4	8.1	8.9

While much attention in 2004 focused on electronic voting technologies, it must also be noted that many voters were still using outdated and problematic voting technologies this fall --- especially punch card voting machines. These voting devices have been repeatedly shown to result in greater rates of uncounted ballots than other voting technologies, partly because they do not block “overvoting” (marking more ballot

<sup>3</sup> The data for 1980 and 2000 come from the 2001 Caltech/MIT VTP report; data for 2004 came from a summary provided by Election Data Services, Inc.

<sup>4</sup> See, for example, John Schwartz, “Mostly Good Reviews for Electronic Voting”, *The New York Times*, November 12, 2004.

<sup>5</sup> See Charles Stewart III, “The Reliability of Electronic Voting Machines in Georgia.” VTP Working Paper, October 2004, <http://vote.caltech.edu>.

positions than allowed for a candidate race or ballot measure), and partly due “undervoting” (the inability of voters to sufficiently remove the “chad” to record their vote intention). These devices were used in almost 11% of American counties in the 2004 election, and were widely used in a number of battleground states, like Ohio where perhaps 70% of the state’s votes may have been cast using these voting devices. The issue of how the older and more problematic voting machines fared in this recent election relative to the newer electronic and optical scan technologies has not gained due attention in recent months and needs careful study.

But, many states and counties have mounted significant voter education efforts since 2000 --- efforts that might have provided voters with an improved, easier, and more effective voting experience. Some of these efforts have been initiated by local election officials, while others have been facilitated by HAVA provisions and funding. Thus, if we observe that jurisdictions improved the relative accuracy or reliability of balloting, we must be careful to determine if these improvements are due to changed voting technology itself, to new voter education initiatives, or to the combination of the two.

For example, this issue has arisen in relation to the Georgia transition in 2002 to electronic voting technologies. As Stewart noted in his study, when Georgia implemented their new voting technologies, the transition “was accompanied by an unprecedented amount of vendor support and precinct worker training” (page 20). This education effort involved the Georgia Secretary of State’s Office, Kennesaw State University’s Center for Election Systems, and Diebold (the vendor). It focused on training for county election officials, precinct workers, and even voters. Another very interesting voter education effort was mounted in Los Angeles County, California, where the election officials instituted a very clever “Got Dots?” education effort throughout the county, involving a very aggressive use of advertising to inform voters about the InkaVote system used in that jurisdiction for the first time in a contested presidential election.<sup>6</sup> The impact of these activities on voting system accuracy and reliability need study.

### ***Voter registration and provisional balloting problems.***

As noted above, voter registration problems were estimated by the VTP to be the single most significant source of lost votes in the 2000 presidential election. These widespread problems in 2000 lead to many state and local reforms --- most importantly efforts to clean up voter registration databases, to streamline voter registration procedures, and to implement nationwide provisional balloting.

At this point, we lack information as to how prevalent voter registration problems were throughout the nation in the 2004 election, so we are unable to estimate accurately

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<sup>6</sup> Reproductions of some of the “Got Dots?” advertisements, including those used in print media and on highway billboards, can be found at <http://vote.caltech.edu/Election2004.html>. VTP researchers were actively involved in monitoring precinct voting on November 2, 2004 in Los Angeles County, and observed the voter education efforts regarding the InkaVote system in a variety of precincts. In the near future, we hope to release research products and recommendations based on our observations and analyses.

how many votes might have been lost due to voter registration difficulties in this presidential election cycle. That information will be available in coming months, including reports from state and counties on the election as well as some other important sources of data on the conduct of the election.<sup>7</sup>

We do know that questions arose about provisional balloting in the 2004 election. Provisional, or “fail-safe” balloting, is a procedure designed to help resolve voter registration problems at the precinct --- if a voter is not on the registration rolls when he or she shows up to vote, but he or she believes they are in the correct precinct, a provisional ballot can be provided to the voter to give them the opportunity to cast a ballot. The provisional ballot is typically placed in an envelope, where the voter completes identification information and signs the envelope --- this information on the outside of the envelope is then verified, and if the voter is deemed eligible to vote, their vote is then included in the post-election tabulation.

The problems that arose regarding provisional balloting in the 2004 election were significant. The first issue concerned how states treated provisional ballots cast by eligible voters, who simply were casting the provisional ballot in the wrong precinct. Some states (for example, Ohio) mandated that a provisional ballot cast by an eligible voter in the wrong precinct would not be tabulated at all; other states (for example, California) allow election officials to count as much of the ballot as possible, even when the ballot was cast in the incorrect precinct by an otherwise eligible voter.

A December 2, 2004 report indicates that in Ohio there were 156,977 provisional ballots cast this fall, of which 121,598 were validated and included in the final tabulation of the vote.<sup>8</sup> The Ohio Secretary of State then also reported 5,574,476 ballots cast. Thus, about 2.8% of ballots cast were provisional ballots --- and 77.5% of the provisional ballots cast were included in the final tabulation. At this time, we do not know why Ohio’s provisional ballots were not validated; the likely reasons are that voter’s were not eligible, or that the ballots were not cast in the correct precinct.

California counties, though, provide an important comparison to Ohio, as California changed its provisional ballot procedures in January 2003 to allow election officials to count all of the candidate races or ballot measures on the ballot that the voter was eligible to vote on. Before the law was changed, in Los Angeles County between 60 and 70 percent of provisional ballots were deemed valid --- and between 30 and 40 percent were deemed invalid and not tabulated. But in the first election held after the law was changed, the 2004 primary election, 92% of provisional ballots cast in Los Angeles County were deemed eligible and were tabulated to the extent possible, while 8% of the provisional ballots cast were not tabulated. It is also important to note that in the 2004 primary election, 44,232 provisional ballots were cast in Los Angeles County (40,686

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<sup>7</sup> Of particular importance here will be the Census Bureau’s November 2004 Voter Supplement to the Current Population Survey, which is a very important database for studying voter registration problems across the nation.

<sup>8</sup> This is based on an Associated Press report, available on December 2, 2004; <http://www.newarkadvocate.com/news/stories/20041202/localnews/1685424.html>.

were deemed eligible, 3,546 were ineligible) out of 1,379,747 ballots cast; thus, in the most recent election for which we have this data from Los Angeles County, 3.2% of ballots cast were provisional.

Thus this simple comparison of Ohio and Los Angeles County indicates that the rate of provisional ballot use in the presidential election in Ohio might be in line with the use of provisional ballots in other jurisdictions. But this simple analysis also shows that the regulations on voter eligibility, especially the question of whether an otherwise eligible voter casts a provisional ballot from the correct precinct, does play a significant role in determining how many of these provisional ballots are tabulated. The issues associated with provisional balloting --- including their usage, why they are being used, how often they are used, how often they are validated and tabulated, and the reasons why they are being invalidated --- need careful and detailed analysis.

### *Procedures and poll site voting.*

Simply put, very little is known about how poll site voting practices affect the quality of the voting experience on election day. While increasing numbers of voters opt out of poll site voting by using early voting or absentee voting opportunities (which I will say more about below), it is still the case that in most states the majority of ballots are being cast on election day in poll sites.

There were a wide variety of problems regarding poll site practices. The most obvious of these problems were long lines --- there were reports of people waiting for hours to vote on November 2 in many of the contested battleground states. Our poll site observers witnessed waiting times to vote in non-battleground states, at peak volume voting times (early morning, lunchtime, and evening) of thirty minutes and longer.

Why are these long lines forming? A simple answer is that long lines form when the volume of those seeking to vote exceeds the carrying capacity of the poll site. While we do not yet have precise metrics on the basic parameters of what volume of voters can be processed, our observations this fall provide some qualitative indication of what the problems are. When a voter enters a poll site, they have to authenticate themselves --- the poll site workers check with the voter registration list to make sure that the individual is eligible and has not already voted. Then in many cases there is a second stop, where the voter interacts with a second poll site worker to obtain something associated with voting, such as the ballot, punch card, smart card, PIN, or something else that enables them to vote. Third, another potential delay may arise depending on the availability of voting devices in the precinct --- the voter may then have to wait in another line.

But it gets worse, as this describes a well-performing poll site. Every time that something outside standard operating procedure arises, for example a voter's name is not in the registration book, a provisional ballot needs to be cast, questions arise about the voting technology, a person comes into the poll site to return an absentee ballot, poll site workers get distracted from their basic tasks, and then the lines form and lengthen.

Things are further exacerbated when small problems arise, like the situation that we witnessed the evening of November 2 when a very crowded poll site, with at least a 30 minute wait to vote, had trouble facilitating provisional balloting because they only had one black pen that potential provisional voters could use to complete their provisional balloting application!

We know from past research that long lines in poll sites lead to lost votes; the VTP estimated that these problems may have lead to as many as 1 million lost votes in the 2000 presidential election. We will have to wait for additional data from the 2004 election to estimate how many votes may have been lost due to poll site problems, but it is clear from the qualitative evidence collected to date that there were significant issues nationwide regarding poll site practices on November 2.

### ***Absentee and early voting.***

Liberalization of early and absentee voting regulations accelerated significantly after the 2000 election; estimates before the 2004 election were that as many as many as one-fifth to one-quarter of ballots cast would be from early or absentee voters. In some states the absentee or early vote will be substantially greater than the national average, as a number of West Coast states have seen widespread use of early or absentee voting in recent years (Oregon has shifted to a system where all votes are cast by mail; in recent Washington elections well over half of the ballots have been absentee; and in California as many as a third of ballots are cast absentee in recent elections).

Early and absentee voting is seen as a potential solution to poll site problems --- after all, by getting voters to participate before the election, election officials are necessarily reducing the potential volume of poll site voters on election day. But it is increasingly clear that early and absentee voting can create other election administration problems. For example, demand for early voting can sometimes outstrip the availability of early voting sites and voting devices; voters can then be forced to wait in long lines to vote early, a problem that arose throughout the nation before November 2. Another problem is finding the staff and resources to devote to the influx of absentee ballot request, to authenticate them and return ballots to eligible absentee voters quickly and accurately. A last issue associated with absentee voting, especially voting by mail, is the security of that process.

Clearly, liberalized early and absentee voting practices are the trend across the United States --- and voters are likely to continue to demand the convenience associated with these voting methods. Much more research is required to determine how effective these practices are on facilitating participation, whether non-precinct voting is more reliable and accurate than poll site voting, how secure these voting methods are, and what the broader ramifications are of increased use of early and absentee voting methods.

### **What Are The Up And Coming Issues?**



In my discussion so far, I've already noted in a number of places there are important gaps in what we currently know about election administration and voting technologies. Here I provide a list of other issues, some that I've mentioned earlier and some of which I believe may become very important issues in the election reform debate in coming years.

One of the most significant changes that HAVA mandates is that states develop centralized, statewide voter registration databases. This is significant for a number of reasons. It is significant because it potentially represents a broad shift of election administration responsibilities from counties and localities to the state government. It is also significant because these new databases will give election officials unprecedented opportunities to check the veracity of existing registration data, as well as information provided by new applicants, against data from other counties --- and against data from other databases (including state Department of Motor Vehicles databases, and the Social Security Administration). Some states like Michigan and Pennsylvania are far along the path to implementing these databases --- while most other states are still in the process of developing their systems and working to implement them. These databases have vast potential to improve the registration process for voters, to ease the burden of checking registration data, and to make voting easier; they also have serious downside risks as well, especially if they are not well-designed, well-implemented, and highly secure.

A second major concern is poll site practices. Clearly, there is much room for improvement in how poll site voting is conducted, and this is a major area for research and policy initiatives. We need to know more about poll site best practices, we need to know what problems arise in poll sites and how they can be dealt with, we need to know more about proper education programs for poll workers and voters, and we simply need to figure out appropriate ways to make the poll site voting experience quicker and more effective. Despite the trends towards early and absentee voting, the problems seen in poll site voting in the past two presidential election cycles will not simply disappear.

This does lead to a third question. Do we need to continue with the existing practice of ballot casting that is tied to specific geographic locations? Can we develop and implement procedures and technologies that could enable eligible voters to cast their ballot at any poll site in a county or state on election day? The current generations of electronic voting technologies can do this, as in many states and counties electronic voting devices are used in this way for early voting. And there are precedents for this practice --- in the 2003 California recall election, there were only four items on the ballot (two relating to the recall, and two ballot measures). The fact that all voters statewide had the same ballot, and California's law regarding provisional balloting, made it possible for voters to vote in any precinct in their county of residence (although they did have to cast a provisional ballot if they were not in their actual voting precinct).

The fourth issue that we will continue to face regards electronic voting. Despite the lack of widespread problems with electronic voting in the recent presidential election, concerns about the security, integrity and reliability of electronic voting will continue. In particular, the issues of voter verification of their electronic ballot and how to audit and

recount electronic ballots will be important parts of this debate. We need continued research on the security, integrity, and reliability of currently-used electronic voting technologies. We need new research on how to improve these electronic voting systems for the future, including the development and implementation of better technologies.

A fifth issue that looms in the background of electronic voting is the evolution of current electronic voting technologies to different platforms. Today, electronic voting machines are typically deployed as independent computing platforms, or as part of a small precinct local-area network. What technological improvements are required in order to move towards a more distributed type of electronic voting environment, including of course, the Internet? How can we best experiment and develop new voting technologies, including Internet-based registration and voting applications, especially for voters who might benefit the most by these technologies (for example, overseas citizens, those in the uniformed services, the disabled, and others who may have trouble obtaining and casting an absentee ballot by mail)? We need a rational policy approach that includes research and development efforts in this area.

Sixth, we need to examine, from start to finish, the openness of the election administration process. One important place to begin is the process by which all voting technologies (including all software and hardware that is used in election administration, not just precinct voting machines) is developed, tested, and certified for use at the federal and state levels. Currently this process is focused solely on ballot casting, not on other important aspects of the process like voter registration software applications. Also, the current process is not open to public scrutiny, as it is largely a relationship between a private firm (the vendor) and another private firm (the “independent testing authorities”). Details of the testing and certification process are not commonly made available to the interested public, which leads to a process that is not necessarily fair to the firms producing the hardware and software (as it is impossible for one voting system vendor to know the precise process that their competitors are required to follow), nor one which provides public assurances of the quality or integrity of the testing and certification.

Another important place to make the election process more open is to require that state and local election officials retain and make public much more information about the conduct of elections in their jurisdiction. The VTP issued a report on this before the November election, “Insuring the Integrity of The Electoral Process: Recommendations for Consistent and Complete Reporting of Election Data.” Our report and recommendations are just one step in the direction of more detailed reporting of election administration information and data, a step that we believe can only lead Americans to be more confident in the integrity of the election process.

While releasing detailed and high-quality data on the conduct of elections is an important first step toward strengthening the integrity of our election process, we also need to develop methodologies and procedures for auditing of elections. There has been a great deal of attention paid in the weeks after the November 2, 2004 election to various alleged anomalies in election results. We need more research into methodologies to detect and assess potential election irregularities, including statistical methods for

studying election returns, the use of pre-election and exit polling techniques to assess election conduct, and other methods of assessing anomalies and irregularities. This research then needs to be translated into the development of policies and procedures, so that standardized approaches for studying possible election problems can be made a regular part of the post-election auditing process.

Last, we need basic research on the perceptions and opinions of American citizens and voters about our elections practices. In the past four years, especially the past few months, we have heard many claims about the lack of trust that American citizens and voters have in our election process. There have been claims that Americans don't trust electronic voting, and that they do not feel confident that their votes are being counted as intended. In fact, there has been surprisingly little research on what American citizens and voters think about voting technologies, registration practices, and other possible election reforms. Citizens and voters are the consumers of the "product" of election administration; we need real research on their perceptions and opinions about the election process --- not rhetoric. This is clearly an important question for research and policymaking.