policy brief

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Modernizing California's Voting Technology: A Look Back, A Look Ahead

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Over the past decade, California has invested hundreds of millions of dollars in new voting equipment. Other states likewise have spent tens or hundreds of millions of dollars in recent years to upgrade voting systems.[1] This policy brief summarizes the recent history of California voting systems, the federal and state legislation that paved the way for counties to purchase new equipment beginning in 2002, and Los Angeles County's ongoing efforts to modernize its voting system. It offers policy questions to consider that could help facilitate the successful development, acquisition and deployment of a new voting system for Los Angeles County, which would also benefit all other jurisdictions in the state by giving them more choices when considering future voting system upgrades.

Punch Card Voting and Los Angeles County

Los Angeles County, today the most populous and complex county election jurisdiction in the state and nation, was hand counting paper ballots prior to the 1968 Primary election, when the county introduced voters to the "Votomatic" punch card voting system. By that time several other counties had also adopted this voting system, including Humboldt, Marin, Sacramento, San Bernardino, Santa Clara, Santa Cruz and Solano (in 1966), and

Monterey and San Joaquin (in 1964). In addition to Los Angeles, Fresno and Tulare also debuted the Votomatic system in 1968.

The name "Votomatic" was derived from a shoeshine machine called the "Shine-O-Matic" and was developed by Joseph P. Harris and William Rouverol, professors at the University of California at Berkeley.[2] As the former, longtime member of the Secretary of State's Election Division staff Ed Arnold recaps in his 1999 report, "History of Voting Systems in California":[3]

> "A voter uses the Votomatic by inserting a prescored ballot into the top of the voting device. A ballot booklet of candidates' names and issues to be voted is affixed in the voting device. Alongside the choices printed on each page, arrows point to holes that match numbered rectangles on the underlying card. The voter turns the pages and punches out the rectangles that express his or her choices by a stylus chained to the device… .The completed ballot is then placed in the ballot envelope, which will be dropped in the ballot box."

To paraphrase Arnold, the Votomatic had its advantages and disadvantages. Unlike mechanical lever machines, which were widely used throughout California and the United States by the early 1960's,[4] the Votomatic system included a paper audit trail of each individual vote that could be used to check the results. The amount of time needed to cast ballots was less than with the mechanical lever machines. Hundreds of contests could be featured on a single ballot which was incredibly efficient, particularly in large counties with growing numbers of voters such as Los Angeles.[5] The system was also affordable and easy to store and transport, unlike mechanical lever machines.

But the Votomatic system had drawbacks as well. The "hanging chad" and "dimpled chad" issue, where a prescored selection box had been punched but not completely removed, was a known problem, at least among some California election officials and candidates, by 1980.[6] Hanging and dimpled chads made voter intent difficult to determine and caused inaccuracies in vote counting. And unlike the lever machines, the Votomatic system also could not prevent voters from overvoting by marking more than one choice in a contest and thus invalidating their vote. This weakness made the system vulnerable to fraud if bad actors simply punched out extra holes after the election to invalidate votes in specific contests. The absence of candidate names on the ballot made it difficult for voters to verify whether they punched the correct hole, adding to the potential for overvoting as well as accidentally undervoting by leaving a choice blank.

According to Arnold, at its peak in 1980, the Votomatic system was used by 22 California counties. Nationwide in 1980, over 29 percent of U.S. voters were voting on Votomatic-style punch card ballots.[7] By the 1996 general election, the number of California counties using this system had dropped to nine. Between 1980 and 1996, many Votomatic counties switched to optical scan balloting or to other punch card voting systems. One, called Pollstar, operated in a way very similar to the Votomatic; the other, called Datavote, used a

punching device but did not use prescored ballots, rather candidates and contests were featured directly on the ballot itself. Both the Datavote and optical scan systems often required multiple-page ballots in order to fit all the candidates' names and contests put before voters in California elections.

California's larger, more populous counties were the ones most likely to implement the prescored punch card voting systems like Votomatic and Pollstar. Once the large counties adopted punch card systems, they typically stuck with them. San Diego purchased its Votomatic system in 1964 and used the same system for four decades until it moved to an electronic voting system in 2004. Los Angeles first used the Votomatic in 1968 and continued its use until the system was replaced with a similarly-designed system called InkaVote in 2003. Santa Clara, San Bernardino and Sacramento all adopted Votomatic systems in the 1960's, replaced them with the similarly designed Pollstar system in the early 1990's, and continued using them until 2002-2003.

One reason the larger counties favored prescored punch card voting systems is because these counties were home to a significant portion of California's minority voters, who were more likely to live in California's large, urban counties. These voters were also more likely to speak languages other than English, and the punch card system was particularly economical for those counties that were required under the federal Voting Rights Act to provide voters with multilingual access to the ballot. Using a prescored punch card voting system's small ballot card allowed these counties to avoid having to print ballots in potentially numerous different languages; they could simply print the ballot overlay book, which could be used multiple times, in the required languages.

Punch Cards and the 2000 Election

The 2000 Presidential election vote counting problems in Florida led to widespread awareness of the limitations of punch card voting, and in particular the inability of Florida election officials to discern voter intent due to hanging and dimpled chads and an absence of uniform, statewide procedures for how to count such ballots.

Following that election, academics and election reform activists began studying election results to assess the error rate for punch card systems. The term "residual vote" was used to describe the difference between the number of potential votes that could be cast in the Presidential race and the number that were actually cast. The residual votes are therefore comprised of intentional undervotes, accidental undervotes, and overvotes. (Researchers assumed that the contest at the "top of the ticket" would be the least likely to be one where voters intentionally left their choices blank and therefore was a good yardstick for measuring a voting system's performance.)

"Voting – What is, What Could Be,"[8] a landmark 2001 study by the CalTech-MIT Voting Technology Project, estimated that two million of the 100 million votes cast for President in 2000 – two percent – were not counted because ballots were unmarked, spoiled or ambiguous. They further estimated that .5 percent of those non-cast votes were

intentionally left blank; the remaining 1.5 percent represented 1.5 million people who thought they voted for president but their votes were not recorded, due primarily to faulty equipment and poor ballot design. Another 2001 study conducted by UC Berkeley Professor Henry Brady and his colleagues concluded that:

> "DRE, lever machines, optical scan, and paper ballots *all* produce significantly fewer residual votes, between 1/2% to 1% less on average, than punch cards."[9]

Decertifying Prescored Punch Card Voting Systems in California

Following the 2000 Presidential election, the American Civil Liberties Union, California Common Cause, and other voting rights groups filed a federal lawsuit in April 2001 claiming the punch card voting systems unfairly discriminated against minority voters. In its news release announcing the lawsuit, the ACLU said:

> "Significantly, African American and Latino voters are much more likely to reside in one of the pre-scored-punch-card-using counties. According to one recent study, only 58.3 percent of white voters resided in counties using the substandard punch card systems, whereas 80.8 percent of African American voters and 66.6 percent of Latino voters reside in those counties."[10]

A few months later, in September 2001, then-California Secretary of State Bill Jones announced his decision to decertify the prescored, punch card voting system. In announcing his decision, Secretary Jones stated that:

> "We cannot wait for a Florida-style election debacle to occur in California before we replace archaic voting systems."[11]

At the time, these machines were in use by 8.5 million voters in nine counties,[12] including the largest in the nation, Los Angeles.[13] Together these counties comprised more than half of the state's registered voters. Secretary Jones' decertification order gave counties until 2006 to replace their prescored punch card voting systems with electronic, touch screen voting systems or paper-based, optical scan systems. The ACLU/Common Cause lawsuit was successful in advancing that deadline to March 2004.[14]

State and Federal Funding for New Voting Equipment Becomes Available

At both the state and federal levels, political leaders were at work throughout 2001 to line up funding for state and local governments to help replace aging voter equipment with newer systems. In September 2001, the California Legislature passed Assembly Bill 56, the Voting Modernization Bond Act of 2002, also known as the "Shelley-Hertzberg Act", to provide $200 million in state bond funds to help counties pay for new voting equipment. The measure was approved by Governor Gray Davis the following month and placed on the

March 2002 ballot. AB 56 became Proposition 41 and was approved by a 52 percent vote in favor of the measure.

Prop. 41 stipulates that "Fund moneys shall only be used to purchase systems certified by the Secretary of State" and that counties receiving funds must match "fund moneys at a ratio of one dollar ($1) of county moneys for every three dollars ($3) of fund moneys."[15] Prop. 41 also established the Voting Modernization Board, whose five members are appointed by the Governor and Secretary of State. The first order of business for the board was to establish a funding formula for awarding bond funds, which took into account each county's number of eligible, registered and participating voters and number of polling places.[16]

At the federal level, Congress passed and President George W. Bush signed the Help America Vote Act of 2002, also known as HAVA. Among its many provisions, HAVA provided federal matching grants to states to help pay for modernizing voting equipment.

For California, this amounted to another $195 million in government funds to pay for new voting equipment and educate voters how to use it. HAVA also provided an additional $57.3 million to California specifically for replacement of punch card voting systems.[17] Much of these funds were distributed to counties between 2003-2009[18] [19] and were accompanied by several new federal voting mandates. HAVA requires every polling place to be equipped with an accessible voting device that allows voters with disabilities such as visual impairment to cast a ballot privately and independently. It also requires states to implement so-called "second chance voting" methods, ensuring voters are notified if they have selected more than one candidate for a single office on the ballot and providing them with the opportunity to correct their ballot before casting it.[20]

From Punch Cards to Optical Scan and Touch Screen Equipment

By the November 2002 election, significant voting equipment changes were taking place in California. For that election, Alameda County replaced its Votomatic system with a paperless, electronic touch screen voting system, also known as "DRE", short for "Direct Record Electronic." By the October 2003 gubernatorial recall election, Shasta had also implemented a DRE system.

The remaining seven punch card counties implemented new systems the following year, meeting the court-ordered March 2004 deadline for phasing out prescored punch card voting systems. San Diego, Solano, Santa Clara and San Bernardino all implemented electronic, DRE systems, while Sacramento and Mendocino chose paper-based, optical scan systems. Many other counties also implemented new systems in 2004 using HAVA and Prop. 41 funds to meet the HAVA accessibility and second-chance voting requirements. Los Angeles, unique among all the counties because of its size and diversity, worked with its vendor to develop a new voting system in-house rather than purchase something already available in the marketplace. This was not the first time Los Angeles worked

directly with a vendor to innovate a new voting system. In the late 1950's, Los Angeles contracted with the Norden Division of United Aircraft to develop an easier and faster way to count ballots, leading to the second type of voting machine invented, the optical scan system.[21]

The new Los Angeles system, called "InkaVote" made its state election debut in the March 2004 California primary election after first being tested out in a 2003 local election.

InkaVote and InkaVote Plus

The InkaVote system made a significant technical improvement over the previous Votomatic system, while retaining many of that system's administrative benefits. Rather than punching out a prescored hole, the voter instead marks a box with a pen that is scanned by an optical scan reader. This ballot marking method does not produce any hanging or pregnant chads and therefore reduces that potential challenge to determining voter intent.

In other respects, the InkaVote system works the same way as the Votomatic system did. Small ballot cards with ballot item positions printed on them are inserted into a ballot card reader (called the Vote Recorder) that is also fitted with a booklet that overlays the card. The voter still must line up the machinery properly. Like the Votomatic system, candidates and contests do not appear on the ballot, which means verifying choices is still a difficult process, requiring voters to double check that they marked the correct ballot positions to correspond with their ballot choices. This kind of ballot design increases the chances of a voter accidentally overvoting or undervoting on a contest compared to the optical scan and DRE systems used in all other counties.

In November 2006, Los Angeles enhanced the system by introducing InkaVote Plus, which now includes an in-precinct ballot reader that alerts voters if they overvoted or left their entire ballot blank. The upgrade also includes the addition of an audio ballot booth in each polling place to give voters with disabilities a way to vote in private and independently, thus complying with that HAVA mandate.

Los Angeles never intended InkaVote and InkaVote Plus to be a permanent solution; rather, these systems were interim steps toward deployment of an electronic voting system countywide, which was planned to be purchased and implemented in 2005.[22] However, in the 2004 March Primary election, several counties – most notably Alameda and San Diego – experienced widespread problems with their new, electronic voting systems, resulting in significant voter disenfranchisement. These problems were largely attributed to faulty equipment that had not been adequately tested before being certified.[23]

Challenges for Electronic Voting Systems in California

Following the March 2004 election, then-Secretary of State Kevin Shelley decertified Diebold's electronic voting system, requiring the vendor to retest and recertify its equipment. In addition, that September, then-Governor Arnold Schwarzenegger signed legislation unanimously passed by the Legislature to require that electronic voting machines produce voter-verified paper audit trails of electronic ballots,[24] essentially codifying an earlier directive issued by Secretary Shelley in November 2003.[25]

These developments, as well as the high cost of purchasing, maintaining and deploying electronic voting machines for Los Angeles' 5,000 precincts (even with federal and state subsidies) led Los Angeles County to revisit its plans for upgrading its system and utilize InkaVote Plus until a viable replacement system is developed and scalable to the size and complexity of the county.

As then-Los Angeles County Registrar of Voters Conny McCormack told a reporter in April 2006:

> "The laws for electronic voting are changing at a dizzying pace. We've seen how other counties have gone out and bought systems and in a few years they can't even use them. For us, with the kind of financial commitment we'd need to make, it doesn't make sense at this time."[26]

The following year, in 2007, California's newly-elected Secretary of State, Debra Bowen, undertook a comprehensive "Top to Bottom Review" of California's voting equipment, bringing in experts from several universities to examine and test the state's systems.[27] Following the review, Secretary Bowen established new, restrictive conditions for use of several electronic voting systems that severely reduced their use and caused several counties that had recently adopted electronic voting systems to switch to optical scan systems instead.

Since that time, very little activity has taken place with California's voting systems.[28] Most counties today are using paper-based, optical scan systems for polling place voting, and all counties are using these systems to facilitate voting by mail, which is an increasingly popular option for California voters.

But many of these existing systems are now ten or more years old and will soon be in need of replacement. Given the increase in vote-by-mail balloting, several counties have expressed a desire in particular to replace old "central count" scanners used for counting large numbers of ballots at county election offices. There remains a total of $65 million in Prop. 41 bond funds that are unspent, and another $62.9 million in HAVA voting equipment funds slated for spending by 2015.[29] Several counties, like Los Angeles, have a significant amount of Prop. 41 and HAVA money remaining that is earmarked for their voting system upgrade needs.

Los Angeles' Voting Systems Assessment Project

In July 2008, Los Angeles County appointed Dean C. Logan as its Registrar-Recorder/County Clerk. Logan served as the Department's Chief Deputy prior to that time, and had previously served as the election official in King County, Washington and as the State Elections Director in the Washington Secretary of State's office.

One of Logan's early initiatives as Los Angeles County Registrar began in 2009, when he and his office launched the Voting Systems Assessment Project (VSAP), a multi-year process for identifying and developing a new voting system for the county's current and future voters.[30]

In announcing the launch of the VSAP, Registrar Logan observed that:

> "Over the past decade, the environment and demands under which elections are administered in Los Angeles County have become increasingly complex; challenged by a growing and diverse electorate, an aging voting system, a fluid regulatory environment that has limited voting systems development, and the recent phenomenon of special vacancy elections. The goal of the Voting Systems Assessment Project is to ensure that as we navigate the complex environment of voting systems and election law that the needs of our voters and the core principles associated with accessible and transparent elections serve as our guide in this process. For too long the acquisition of voting systems has been about Election Officials' reaction to the regulatory environment and the voting systems market, rather than the market and regulatory environment reacting to the needs of the voters."[31]

Logan further explained the need for the VSAP in a quarterly memo to the Los Angeles County Board of Supervisors:

> "While the County's current voting system has served the voters of Los Angeles County with accuracy and integrity, the design of these systems and the age of their technology do not offer the technical and functional elasticity necessary to continue to accommodate the growing and increasingly diverse electorate.
>
> "The size and diversity of Los Angeles County and the limited voting systems market, however, make it almost impossible to reasonably consider a commercial off-the-shelf voting system solution. Any voting system solution will entail a significant development or customization process in order to satisfy the County's needs, General Voting System Principles and technical requirements."[32]

Los Angeles County's Voting Systems Assessment Project is noteworthy because it is attempting to first to define the kind of voting system it wants and then to be directly involved in that system's development. While this approach is an unusual one for an election agency to take, it is not unusual for L.A. County, as it has previously led voting technology innovations in the 1950's and more recently with InkaVote and InkaVote Plus.

The VSAP process in Los Angeles County is also noteworthy because of its commitment to transparency and public involvement throughout the entire project. Since 2009, the VSAP has achieved several milestones: an advisory committee of stakeholders was created to help oversee the project and provide input; the county partnered with the Caltech/MIT Voting Technology Project to conduct extensive field research on voter attitudes and expectations about the voting experience; and it developed and released "General Voting System Principles."[33] Furthermore, the VSAP completed an Open Design Search which engaged designers, voters and other stakeholders in envisioning a design for the county's new system. The VSAP now seeks to synthesize the data gathered through these activities and produce voting system design options. Registrar Logan and his staff continue to reach out, through hearings and conferences, to advocates and experts – and the voting public – across the country for input and advice.

Advancing Los Angeles' Voting Modernization

While the Voting Systems Assessment Project is making good progress, some significant roadblocks lie ahead, which were detailed by Registrar Logan in a 2012 memo.[34] It is important from a statewide policy perspective to review and understand these challenges, because all the other counties in California stand to benefit substantially from the lessons learned as Los Angeles goes through the voting equipment modernization process.

A first important issue relates to funding. Because Los Angeles has the largest population of voters in the state, the county was allotted a significant portion of state Prop. 41 dollars and federal HAVA funds. To date, Los Angeles has spent only a small portion of these funds to purchase a limited number of electronic voting machines and to pay for InkaVote and InkaVote Plus, so that approximately $27 million in HAVA funds and $49 million in Prop. 41 funds earmarked for Los Angeles' voting equipment modernization remain to be spent. However, Prop. 41 restricts the use of bond funds to purchasing systems that are certified by the Secretary of State, requiring federal testing and certification before approval by the Secretary of State. Prop. 41's authors did not anticipate that a county would take the initiative, such as Los Angeles has, to first define the kind of voting system it wants and to be involved in that system's development.

Thus, one change in state law that would help Los Angeles move forward in its modernization efforts is to make an exception to Proposition 41, the Voting Modernization Bond Act of 2002, which currently requires counties to use their bond funds exclusively for the purchase of voting systems that are already certified. The language of Proposition 41 allows the funding provisions of the measure to be amended by a two-thirds vote of both

houses of the Legislature as long as the amendment is consistent with, and furthers the purposes of the act.[35]

Such an amendment could help fund Los Angeles' county-driven development process and allow the county to use its bond funds to develop a more open and publicly-owned or not-for-profit voting system, and then obtain certification and approval prior to its deployment in an election.

A second, significant challenge for Los Angeles is the state voting system approval process. The current regulatory framework and certification process are tailored to procuring existing commercially marketed voting systems and do not, therefore, support new systems development or non-proprietary, publicly-owned solutions. For example, the California statute explicitly states that:

> "No jurisdiction may purchase or contract for a voting system, in whole or in part, unless it has received the approval of the Secretary of State."[36]

Current state law precludes any county from spending any money to contract for the development of a voting system, placing Los Angeles in a "Catch-22". Even if the county could spend its Prop. 41 funds to develop a new system, it cannot under state law contract for a voting system that has not already been approved.[37]

And any voting system approved by the state will need federal approval as well. However, the federal testing process is administered by the Election Assistance Commission (EAC), and that federal agency is currently less than fully functional due to a lack of commissioners and uncertainty as to whether any will be appointed in the near future. The lack of commissioners is keeping the EAC from adopting an update to its 2005 Voluntary Voting System Guidelines, which have been in development since 2009 and include new accessibility and security requirements.[38] Without commissioners in place, improvements to the guidelines, or to the federal certification process itself, are on hold.[39]

There is also currently a lack of detailed, written guidelines for California's certification process beyond what is included in statute; this makes it difficult for anyone to develop a new system because they cannot anticipate and follow all the state certification and testing requirements.[40] [41]

Another certification obstacle for Los Angeles will be the cost. The current regulatory framework, and certification and approval processes, are tailored to procuring existing, commercially marketed voting systems. Federal testing and certification is an expensive process paid for by equipment vendors. State approval requires that systems be tested "end-to-end", making this an expensive process, too.

These processes assume such costs can be borne by vendors because it is assumed the vendors are making a commercial product they intend to profit from through sales. But the Los Angeles approach is to create a publicly-owned, not-for-profit voting system.[42] Los

Angeles County estimates the costs incurred through testing, certification and approval will be approximately $2.5 million and require 2.5 years to complete.[43] It is unlikely these costs will be recouped through sales or service contracts, as are certification and testing costs incurred by commercial vendors. However, also to consider are the long-term cost-savings Los Angeles will likely enjoy by implementing a non-commercial voting system that presumably will not incur the same ongoing licensing and service costs associated with commercial voting systems.

Policy Questions to Consider

The policy questions that lawmakers, regulators and all election officials need to consider to help facilitate development and approval of a new voting system for California include the following:

- How can the testing and certification environments be made more accessible to not-for-profit voting systems?
- Should California consider incorporating federal testing standards into the state's approval process rather than requiring federal approval of voting systems?[44]
- Should changes be made to state law to allow Los Angeles County to use its voting modernization bond funds to develop a new, not-for-profit voting system?
- Are there different approaches to certification and testing, such as states collaboratively testing equipment, that would be more efficient and economical than having California go it alone?
- Should a not-for-profit, publicly-owned voting system be held to the same testing and certification requirements as commercial, for-profit systems?
- What changes, if any, could be made to the state's voting system approval process to improve opportunities for innovation in California's voting systems?

Conclusion

Los Angeles County is well-positioned by virtue of its size and its access to funding to pioneer a new generation of voting systems that can serve not only the county's own voters but also voters in other California counties, and in other states as well. Los Angeles is unique in its position of having access to the funding needed to create a new voting system from the ground up; it is not, however, unique in its need to upgrade its voting system. And it is not the only California county that has undertaken a wholesale effort to rethink the way it votes; the City and County of San Francisco established its Voting Systems Task Force in 2008, which issued recommendations in 2011.[45]

As previously mentioned, several counties need to replace aging technology and are limited by the range of options currently available. A survey of counties conducted in Spring 2012 by the Voting Modernization Board found that 90 percent of respondents said they wanted to apply for more bond funds to make further upgrades. Several expressed concern about the lack of approved systems on the market in California.[46]

There is a strong probability that if Los Angeles is successful in innovating a new voting system, it will ultimately benefit voters across the state and nation. Whether Los Angeles is able to move forward will depend to a great extent on whether the California Legislature and Secretary of State provide the county with the regulatory and fiscal flexibility and support it needs to develop a new voting system for its voters, while maintaining the oversight required to ensure security, accountability and transparency in state voting systems.

About the California Voter Foundation

The California Voter Foundation (CVF) is a nonprofit, nonpartisan 501(c)(3) organization working through research, oversight, outreach and demonstration projects to improve the election process so that it better serves the needs and interests of voters. Since 1994 CVF has championed emerging democracy and technology issues, pioneering online nonpartisan voter education, online disclosure of campaign finance data, and public verification of software vote counts. CVF has worked collaboratively and in partnership with government officials and agencies, universities, nonprofits, foundations and the media to implement significant electoral changes in California, including redistricting reform, online voter registration, and voter privacy protections. CVF's web site, www.calvoter.org, features an array of election reform resources and publications as well as nonpartisan election and government information for California voters.

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[1] See "Strengthening the Electoral System One Grant at a Time: A Retrospective of Grants Awarded by EAC April 2003 – December 2010," Election Assistance Commission Report to Congress on State Expenditures of HAVA Funds - 2003-2010, page 6: http://www.eac.gov/assets/1/Documents/FY2010%20Grants%20Report%20FINAL.pdf.

[2] "Broken Ballots – Will Your Vote Count?" by Douglas W. Jones & Barbara Simons, published 2012, CSLI Publications, page 49, http://timbergroves.com/bb/home.

[3] "History of Voting Systems in California," produced under the direction of Edward G. Arnold, prepared for publication by Bill Jones, California Secretary of State, 1999. Available online at http://josephhall.org/arnold_ca_vs_hist.pdf. The quote excerpted appears on pages 29-30; the original source cited is "Annals of Democracy – Counting Votes," by Ronnie Dugger, The New Yorker Magazine, November 7, 1988.

[4] Arnold, ibid., page 23.
[5] Los Angeles County utilized mechanical lever voting machines in some precincts from 1928-1952, according to Arnold's "History of Voting Systems in California," discontinuing their use after the 1952 general election due to the length of the ballot (p. 16).
[6] Former California State Senator Patrick Johnston tells the story of his 1980 San Joaquin County election recount involving hanging chads in the Preface to "More Votes that Count," a 2012 study published by the University of the Pacific, http://www.amazon.com/More-Votes-That-Count-Mobilization/dp/0877724415.
[7] "Broken Ballots – Will Your Vote Count?," page 54, with reference to Election Data Services' "Voting Equipment Report – 1992."
[8] "Voting – What is, What Could Be," published July 2001 by the California Institute of Technology and the Massachusetts Institute of Technology Corporation.
[9] "Counting all the Votes: The Performance of Voting Technology in the United States," by Henry Brady et al, University of California Press, published September 2001.
[10] http://www.aclu.org/voting-rights/aclu-files-ca-voting-rights-lawsuit-saying-punch-cards-belong-junkyard-not-voting-boot.
[11] "California Voting Tech Developments", CVF-NEWS, newsletter of the California Voter Foundation, September 19, 2011, http://www.calvoter.org/news/cvfnews/cvfnews091901.html.
[12] "Move to make California a chad-free state by 2006; $200 million for new voting machines," by Robert Salladay, San Francisco Chronicle, September 19, 2001.
[13] Six counties used the Votomatic system in 2000: Los Angeles, San Diego, Mendocino, Alameda, Solano and Shasta. Three used the Pollstar system in 2000: San Bernardino, Santa Clara, Sacramento. See http://www.calvoter.org/issues/votingtech/pub/1102votepercentages.html for a comparison of the rates of California ballots not registering votes for President in 2000 by county and voting system.
[14] "Federal court grants ACLU victory in punch card voting case," ACLU of Southern California news release, February 13, 2002, http://www.aclu-sc.org/federal-court-grants-aclu-victory-in-punch-card-voting-case/.
[15] "Text of Proposed Laws, Official State Voter Information Guide," published by Secretary of State Bill Jones, pp 64-66, online at http://www.sos.ca.gov/elections/viguide_pe02/prop41_text.pdf.
[16] "Proposition 41 Funding Allocations Enacted by the Voting Modernization Board at the July 17, 2002 Meeting," http://www.sos.ca.gov/elections/vma/pdf/vmb/documents/revised_form_cal.pdf.
[17] For a breakdown of how much of these funds have been spent, see the spreadsheet entitled, "County 251 contracts – updated Jan. 15, 2010," online at http://www.caceo58.org/assets/documents/Updated%20contracts%20-%20status%20011510.xls.
[18] See "HAVA State Plan 201 Update," page 75, http://www.sos.ca.gov/elections/hava/state-plan/state-plan-final.pdf.
[19] According to data the author received from Susan Lapsley, Deputy Secretary for HAVA Activities and Counsel for Secretary of State Debra Bowen, of the $195 million HAVA Section 301 funds California received, $87.7 million had been spent by fiscal year 2007-2008, and $62.9 million has been reallocated for fiscal year 2011-2012; current HAVA contracts between the Secretary of State and counties are set to expire December 31, 2015.
[20] See H.R. 3295 of 2002, the "Help America Vote Act," Section 301(a)(1)(A)(iii), http://www.eac.gov/assets/1/workflow_staging/Page/41.PDF.
[21] "History of Voting Systems in California," by Ed Arnold, page 25.

[22] See the Voting Modernization Board's "Los Angeles County Staff Report," February 9, 2004, page 2, http://www.sos.ca.gov/elections/vma/pdf/vmb/documents/staff_reports/la.pdf and also former Los Angeles County Registrar of Voters Conny B. McCormack's Board of Supervisors memo entitled, "Update: New Voting System(s) Implementation," February 17, 2004.
[23] "Official says state was forced to certify voting machines," by Gig Conaughton, North County Times, March 17, 2004, at http://kimalex.blogspot.com/2004/03/official-says-state-was-forced-to.html.
[24] Senate Bill 1438 of 2004, co-authored by State Senators Ross Johnson and Don Perata.
[25] "Secretary of State Kevin Shelley Announces Directives To Ensure Voter Confidence in Electronic Systems," http://www.sos.ca.gov/admin/press-releases/prior/2003/03_106.pdf.
[26] "Many counties returning to paper ballots," by Chris Metinko, Contra Costa Times, April 24, 2006.
[27] See http://www.sos.ca.gov/voting-systems/oversight/top-to-bottom-review.htm for more information.
[28] See the California Voter Foundation's "Maps of California Voting Systems" to access statewide maps of voting systems in use by counties from 2003 – present, http://www.calvoter.org/issues/votingtech/vtdirectory.html.
[29] See footnote 19 above.
[30] http://www.lavote.net/Voter/VSAP/.
[31] http://www.lavote.net/GENERAL/PDFS/PRESS_RELEASES/09212009-043742.pdf.
[32] "Memo to Los Angeles County Supervisors re VSAP Quarterly Report- 3rd Quarter 2012," http://www.lavote.net/Voter/VSAP/PDFS/VSAP_BoardReportQ32012_Final.pdf.
[33] "Towards a Voter-Oriented Voting System – General Voting System Principles for Los Angeles County," October 3, 2011, online at http://www.lavote.net/Voter/VSAP/PDFS/VotingSystemPrinciples.pdf.
[34] "Program Overview: Voting Systems Assessment Project (VSAP)," by Los Angeles Registrar-Recorder/County Clerk Dean C. Logan, June 13, 2012.
[35] "19234.5. The Legislature may amend subdivisions (c) and (d) of Section 19234 and Section 19235 by a statute, passed in each house of the Legislature by rollcall vote entered in the respective journals, by not less than two-thirds of the membership in each house concurring, if the statute is consistent with, and furthers the purposes of, this article." Proposition 41 text, page 65, http://www.sos.ca.gov/elections/viguide_pe02/prop41_text.pdf.
[36] California Elections Code 19201(b), http://www.leginfo.ca.gov/cgi-bin/displaycode?section=elec&group=19001-20000&file=19200-19217.
[37] For more on the regulatory challenges facing Los Angeles, see "Building a Better Ballot Box – Improving the Regulation of Voting Systems in California," by Elissa Barratt, Max Moir Messern, Hiroaki Nose and Peter Ruscitti, published by the Registrar-Recorder/County Clerk, County of Los Angeles, September 28, 2011, online at http://www.lavote.net/voter/vsap/PDFS/Document_Building_Better_Ballot_Box_09282011.pdf.
[38] See "Draft Voluntary Voting System Guidelines, Version 1.1, May 27, 2009 draft," online at http://www.eac.gov/assets/1/Page/VVSG%201.1%20Volume%201.pdf.
[39] For an excellent overview of voting system testing and certification issues nationwide, see the papers presented at the second annual State Certification and Testing of Voting Systems Conference, June 14-15, 2012, Bowen Center for Public Affairs at Ball State University, IN, http://bowencenterforpublicaffairs.org/institutes/policy-research/election-admin/conference.
[40] The Secretary of State's web site provides the following list of elements included in California's voting system approval process:

- Review of the application and documentation of the system;
- End-to-end functional examination and testing of the system;
- Volume testing under election-like conditions of the system and/or all voting devices with which the voter directly interacts;
- Security testing that includes a full source code review and penetration (red-team) testing of the system;
- Accessibility examination and testing of the system; and
- Public hearing and public comment period; online at

http://www.sos.ca.gov/voting-systems/cert-and-approval/vsysapproval/vs-conditions.htm.

[41] For more details about the status of California's voting system testing process, see the meeting notes and presentations from the VSAP Advisory Committee Meeting and Roundtable held on November 4, 2011, online at http://www.lavote.net/Voter/VSAP/Comm_Past_Meetings.cfm?nov042011=Yes#nov042011.

[42] See "Addressing Challenges to Voting Systems Innovation," by John Sebes of the Open Source Digital Voting Foundation, http://www.lavote.net/Voter/VSAP/Comm_Past_Meetings.cfm?nov042011=Yes#nov042011.

[43] See "Building a Better Ballot Box," slide 6, http://www.lavote.net/voter/vsap/PDFS/Document_Building_Better_Ballot_Box_09282011.pdf.

[44] According to the Election Assistance Commission, California is one of twelve states that require federal certification of voting systems. Ten states require testing to federal standards, 13 require testing by federally-accredited laboratories, and 20 have no federal requirements for voting systems. See http://www.eac.gov/assets/1/Page/State%20Requirements%20and%20the%20Federal%20Voting%20System%20Testing%20and%20Certification%20Program.pdf, page 5.

[45] http://www.sfgov2.org/index.aspx?page=1862.

[46] See "VMB Second Funding Round Survey – May 2012," online at http://www.sos.ca.gov/elections/vma/pdf/vmb/documents/vmb-second-funding-round-survey2012.pdf.