



UC DATA
Data Archive & Technical Assistance

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To: Alan Dechert
From: Henry E. Brady *Henry E. Brady*
Professor of Political Science and Public Policy
Director, Survey Research Center and UC DATA
Re: A Proposal to Improve Voting Systems in California

I am very enthusiastic about working together with you in a joint project to improve voting systems in California. I believe that our interests and capabilities are quite complementary, and the following integrates your interest in developing alternative PC-based voting systems with my interest in understanding the patterns of over and under-votes in California in order to find ways to reduce them to the bare minimum. The project proposed below, I believe, will provide invaluable information and some very useful models for improving voting systems in California. Indeed, this project is thoroughly consistent with the University of California's origins as a land grant university and with its traditions of working to make contributions to the state of California.

Outline of a Proposal -- You have proposed a voting system development project that would be PC based, open source, and inexpensive. This idea has real and substantial merit, and it is definitely worth exploring. In fact, as you know, Roy Saltman,¹ the author of the two best known books on computerized voting, has agreed to work on this project, and he is enthusiastic about developing the kind of system you have proposed. The Survey Research Center of the University of California at Berkeley, with its long tradition of helping the state of California solve its data collection problems, is an excellent place to undertake this kind of research and development effort. In effect, the task of tallying votes is a very specific kind of data collection problem with features that are very familiar to our professional staff. The Survey Research Center provides a range of data collection services which address problems that are similar to the ones that we will confront in this project. Through the SRC's Survey Services Facility, we design questionnaires and conduct surveys. The design of questionnaires, especially self-administered questionnaires, is very similar to the problem of designing effective ballots, and conducting surveys leads to problems of obtaining reliable information and insuring confidentiality that are central to the vote tallying task. Through our Data Archive and

¹ Roy G. Saltman, *Accuracy, integrity, and security in computerized vote-tallying*, Gaithersburg, MD: U.S. Dept of Commerce, National Bureau of Standards, 1988.

Roy G. Saltman, *Effective use of computing technology in vote-tallying*, Washington, D.C.: Clearinghouse on Election Administration, Office of Federal Elections, General Accounting Office.

Technical Assistance program (UC DATA), we develop computerized data collection systems and we analyze the data produced from these systems for integrity and reliability. Again, these problems are parallel to the difficulties faced by computerized vote tallying systems. Through our work, we are also knowledgeable about problems of privacy and confidentiality, and we have done studies for the National Academy of Sciences and the State of California on these issues. For this project, your expertise in developing software and hardware solutions for human-machine interactions is an essential addition to our capabilities.

In order to provide the State of California with the best possible information about its current and prospective vote tallying systems, we propose a study that completes the following five steps:

(1) Assessment of the Current Situation -- Assess the current state of the vote counting system in California by using already available statistical data and by generating new data through surveys and interviews of election officials. This study will not only study the role that voting systems themselves play in the effectiveness of vote counting, but it will also study the administrative factors that lead to effective vote counting. As you know, I am already deeply involved in these kinds of studies, and I can take the lead.

(2) Delineation of Technological Needs -- Delineate the common and unique vote counting needs of California's 58 counties in order to determine what kinds of technological improvements could improve the effectiveness of vote counting in California. This step will require a survey of the 58 counties and in-depth interviews with election officials from all parts of California. The SRC is well-equipped to complete this task.

(3) Development of a Prototype System -- Develop a prototype system that is PC based, open source, and inexpensive as a way to learn more about the needs of the counties and to determine the feasibility of alternatives to the currently available commercial systems. The work on this element will interact with the efforts in all other areas. By actually developing a system, we will learn more about the technological issues involved, and we will be placed in a situation where we must be responsive to the election officials who must ultimately cope with the problems of counting votes.

(4) Work with the Private Sector -- Study the strengths and weaknesses of the available systems by working with vendors. We will also work to encourage the private sector to develop new technologies that will improve our voting systems. This step will involve meeting with vendors, acquiring and studying their products, and providing feedback to them on the needs that we find in California's counties.

(5) Conference with California Officials to Present our Results -- Once we have made substantial progress in steps 1-4, we will have a conference involving state election officials and others to discuss our preliminary results.

I have been working on items (1) and (2), and you have been working on items (2) and (3). Item (4), will ensure that we make the best possible use of the options currently available from the private sector. I think that the main task involved in completing (4) is meeting with the vendors and discussing their systems. We will jointly organize the conference described in (5).

Completing Steps 1 and 2 – Assuming that funding would begin by June 1st, I believe that a *detailed draft* of a report for step 1 and step 2 could be completed by the late Fall of this year. This step would involve the following kinds of analysis:

- A statistical report using available data from the California Statewide Database
- Collection and analysis of undervote and overvote data at the precinct level from as many counties in California as possible
- A survey of all 58 county election officials to learn about their procedures and approaches to counting ballots
- In-depth interviews with a large number of county election officials
- Planning a conference to present results and receive feedback.

Although the SRC will do much of the work on steps 1 and 2, I believe that you will want to be involved in some of these tasks, especially the in-depth interviews of county election officials.

Completing Steps 3 and 4 – You will be the project director for these steps, and you will work with me, my staff, and graduate and undergraduate students. As we discussed, the central task will be to develop a PC-based, open source, and inexpensive voting system. In addition to setting up a polling place mock-up where the public can try out PC-based voting, we will produce a report or reports incorporating data collection and analysis covering the following topics:

- Multi-use equipment verses dedicated equipment. Can we identify where PCs might be used between elections?
- Open source software for vote recording verses proprietary systems
- Open source software for vote tabulation verses proprietary tabulation software. Can we enable voters to check tabulation using precinct-level data?
- Printing completed ballot verses no printed ballot at all
- Using the Internet to publish precinct-level election results. Would it also be feasible to publish each ballot?

- Vulnerability to Election Day power outages.
- Can we enable voters to vote at any polling place?
- What other equipment is needed (e.g., furniture) to accommodate these systems at the polling places? How expensive are these items to purchase, transport, and store?
- How are write-in votes handled?
- How vulnerable are these systems (these systems = PC based systems and DREs) to malicious insiders?
- How vulnerable are these systems to malicious outsiders?
- Should the voter get a printed receipt that includes details of how he or she voted? Or, should a receipt only include a ballot number? Or, is no printed receipt necessary?
- Since the PCs are standalone, how do we transfer the votes from the individual voting machines to a more central location?
- Should votes be tabulated and published at the precinct level before they go to a more central location?
- How can election results be fully audited and certified on these systems?
- How well do these systems work for visually impaired voters?
- How well do these systems work for non-English voters?
- How do these systems work with absentee and provisional ballots?
- Is it necessary to have a paper ballot backup in case voters can't or don't want to vote on the electronic systems? How could this be accomplished?
- Compare initial costs of these systems. Compare life-cycle costs of these electronic systems, and compare to existing non-electronic systems. Compare multi-use PC based systems with dedicated PC based systems and dedicated DREs.
- How difficult is it to recruit and train pollworkers to work with these systems?
- What are some of the best alternatives for absentee ballot tabulation for counties using DREs or PC based systems in the polling places?

- Provide a method to determine the percentage of the voters that can use a mouse-based system at each polling place.

In order to insure that we are addressing these questions in the most effective manner, we will have periodic reviews of progress by an internal SRC board of experts including myself, Dr. Fred Gey (Assistant Director for Technical Services and an expert in computing technologies, information retrieval, and database management), Dr. Tom Piazza (Head Statistician and an expert in survey design and statistical issues), and Dr. Donna Eisenhower (Director of Survey Services and Senior Research Scientist and an expert in survey design and data collection methodology). We will also bring in outside experts such as Dr. Roy Saltman as we go along.

Completing Step (5) -- After we have completed the draft report, we will have a conference of California election officials to discuss both the report and your progress on a prototype PC system.

Proposed Budget -- The SRC cost of completing these steps would be to support some of my time, to support some time of my professional staff to help manage and direct the project, to support four graduate and/or undergraduate students for twelve months at 100% during the summer and 50% during the school year, and to cover miscellaneous costs. The costs would be:

- *Principal Investigator* -- Total \$19,200. Henry E. Brady, Professor of Political Science and Public Policy, Director, Survey Research Center and UC DATA. One month of my time; Salary plus benefits at \$19,200.

- *Technical Lead* -- Total \$150,000. Alan Dechert, $\frac{3}{4}$ time for one year (1500 hrs) at \$100 recharge rate, \$150,000.

- *Project Management* -- Total \$21,800. Twenty percent of the time of one member of SRC professional staff (that is, one day a week) to oversee the project. Salary plus benefits at \$21,800.

- *SRC Professional Staff Technical Oversight* -- Total \$10,000. Regular monthly meetings of Dr. Donna Eisenhower, Dr. Tom Piazza, and Dr. Fred Gey with the PI, Technical Lead, and others to ensure proper technical direction and to provide help on technical issues as needed.

- *Four Graduate/Undergraduate students* -- Total \$107,000. Each student at 3 summer months at 100% and 6 school-year months at 50% for a total of 5000 hours. (500 hours for each person during the summer and 750 hours during the school year.) Each one would cost approximately \$17 per hour plus tuition/fee remissions. (The University requires that we charge these tuition/fee remissions.) The total should be something like \$87,000 for wages, 17,000 for fee remissions, and \$3,000 for benefits.

- *Technical Consultants* -- Total \$40,000. Consultants on various topics including -
(These may be external consultants or UC Berkeley Professors)

Computers and voting systems - E.g., Roy Saltman

Conduct of Elections—E.g., Curtis Gans

Conduct of Experiments -E.g., Professor Rob Maccoun

Other Consultants - Experts on software and government

- *Supplies, Expenses, Travel* -- Total \$15,000. Expenses for telephone, office supplies, duplication, mailing, University liability program, \$4,000. Expenses for travel \$10,000 including trips for consultants and extensive travel within California to interview election officials. (There will be site visits to many of the 58 counties and telephone interviews with officials from around the state.)

- *Equipment* - Total \$35,000. PCs and peripherals (including touch screen overlays) to be used for testing and setting up a polling place mock-up. Three DRE or optical scan systems from different manufacturers.

- *Rental Facilities* - Total \$18,200. Office for SRC staff and graduate students. (Total of \$6,000.) Office for Dechert for 12 months (at \$600 per month) for \$7,200 and "polling place," probably in a mall for five months for experiments and evaluations by the general public, \$5000 (at \$1,000 per month).

- *Conference* - Total \$10,000. The conference will be held in Sacramento and it will be designed for one day and lunch will be served. The costs would be for food, organization, renting a space, etc. All county and state election officials will be invited as well as people from the state legislature. Hence, it could run to 100 people or more.

TOTAL COSTS: The total direct cost for completing these steps is \$426,000. In addition, there will be a University fee for indirect costs that will run anywhere from 10% to 36% of the project cost. All or part of this can be waived under some circumstances.