

## A PROJECT TO ASSESS VOTING TECHNOLOGY AND BALLOT DESIGN

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The events surrounding the 2000 presidential election called attention to a variety of seldom discussed facts: that voting technology and ballot design can influence election outcomes; that most polling places in the United States employ outdated technology; that training in election administration is inadequate; that minorities and the poor are more likely to cast their ballots on outdated systems; and that voting procedures affect how voters feel about their ability to exercise their right to vote and their willingness to accept the results of an election as legitimate. Since 2000, states have commissioned studies, revamped election administration, redesigned ballots, and begun to invest in new voting equipment. More research, particularly on the interface between voters and various voting machines and ballots, is needed to provide a basis for the massive voting reform that is being undertaken.

This project brings together social and computer scientists from a number of disciplines to study voting technology and ballot design. We will first assess the impact of existing technology and ballot designs on a variety of factors: the ability of voters to cast their ballots accurately and efficiently, voter ease in casting complete ballots (if so desired), voter comfort using different technology and ballot interfaces, voter confidence that their ballots will be accurately recorded, and the level of voter turnout. We also will analyze the effects of alternative voting systems and ballot formats on the frequency of incomplete ballots and split ticket voting.

To facilitate our research, we have formed partnerships with various state election officials and federal agencies. We have received feedback from an advisory board that we formed of political scientists, psychologists, election officials, and computer scientists. We also have presented our project at conferences hosted by the National Institute of Standards and Technology (NIST), the National Association of County Recorders, Election Officials, and Clerks (NACRC), and the upcoming Usability Professionals' Association in Minneapolis.

Our forthcoming research will use a variety of research designs, data collection methodologies, and analysis techniques, including expert review, laboratory experiments, close up observation, field tests, and natural experiments that occur as local jurisdictions change their voting technology and procedures. The purpose of an expert review is to have a small number of people who are professionals in interface design and evaluation look at a specific system with the goal of identifying possible shortcomings based on their expertise and experience. The expert review will involve five to ten interface design experts. It will test seven voting systems, each of which represents a different set of design principles, and four prevalent ballots styles (office bloc with no straight party device; office bloc with a straight party device; party row/column with no straight party device; and party row/column with a straight party device). Collectively, participants will examine and compare each style of ballot with each machine, allowing for the possibility that all ballot styles and voting systems are not compatible.

The laboratory tests will provide a micro-level view of voters' actions as they cast votes. It will make it possible to observe the source of usability difficulties as they are occurring and to gain insight into their causes. This part of the study will involve an over-sampling of users with limited computer experience because, we believe, they are the most likely to experience usability problems. To the extent that members of this population are able to use different voting systems, others should find them even more usable.

The purpose of the field tests is to have a more representative sample of the voting population use voting systems and ballots to see if they have any obvious problems. Among other things, we hypothesize that: 1) elderly voters and voters who have less experience using computers are likely to have more difficulty using the new voting systems than are others; and 2) more frequent computer users are likely to have less trust in the new voting technology than are others because they are more familiar with viruses, software crashes, and other computer problems.

The natural experiments will assemble over time data on jurisdictions where shifts in technology have occurred and where appropriate data are available for small units of aggregation such as precincts or state legislative districts. Where possible, we will also attempt to obtain individual ballot images without personal identification. Using the measures described above, we will look for differences in the same jurisdiction when the technology switched from punch cards to DRE devices, for example. In general, we will focus on entire states, starting with California, Florida, and Michigan. We will also add other, smaller jurisdictions where new technologies have been less widely adopted.

The public benefits of these various approaches include the development of principles to guide voting technology and ballot design and of protocols to enable election administrators to make better decisions when purchasing voting machines, approving ballot formats, and matching particular machines with specific ballots. Scholarly benefits include improved understanding of human computer interaction as it relates to voting behavior and commencement of a new approach to data collection and analysis in the study of voting technology, ballots, and voting behavior.

The project will be guided by regular interaction with practitioners and policy makers who have responsibility for the administration of elections in the United States. Regular interaction will allow greater dissemination of information about the project, encourage potential beneficiaries to review the findings and use the testing protocol, and be sure that project findings and recommendations are taken seriously by all concerned. We are also working directly with voting machine manufacturers to facilitate the collection and analysis of data on the entire array of equipment that is becoming available. Our results will be communicated to all of the relevant communities of interest, including manufacturers, practitioners, policy makers, and the academic community.