Voting Technology and Innovation

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The 2008 election was different from the last two presidential elections in that there was a clear winner on Election Day and the winner was a Democrat, Barack Obama. Controversies over voting technology that raged in 2000 and 2004 were relatively dormant. Instead, the election controversies that did come up were mostly discussions of lines to vote.[1] This lack of discussion does not mean that there were not important issues related to voting technology that took place in 2008, just that they were not things deemed important by the media.

In fact, the 2008 election has proven to be a watershed election in voting technology considered more broadly because in this election, more than one-third of voters nationally voted before election day. As the *2008 Survey of the Performance of American Elections* (Alvarez, Ansolabehere, Berinsky, Lenz, Stewart III, & Hall, 2009) noted, "37% of voters cast their ballots before Election Day, either in-person at early voting centers (18%) or by mail, mainly via absentee ballots (19%). The elderly, individuals with disabilities, and better-educated voters were more likely to use these "convenience voting" methods." This slow revolution in voting is requiring election officials, policy makers, and voters alike to rethink what elections mean, how voting technologies function in this new environment, and how laws, processes, and procedures need to be updated to reflect this new reality. The old mindset of election day as a singular event is no longer a reality. In that vein, voting technology is not

[1] See http://electionupdates.caltech.edu for a digest of the coverage from the 2008 election.

some “thing” that is used by a voter to vote but rather is part of a larger process that runs from pre-election voting machine testing through post-election audits.

Every election involves an important interaction between technology, people, and processes. The focus on voting technology—especially voting technology in a single election day implementation—to the relative exclusion of people and processes is problematic in several respects. First, it puts undue credit or blame for election problems on the inanimate technology used in the election. If voters or poll workers have problem with a voting technology because of poor voter education or ineffective poll worker training, a technology-centered focus means that the voting technology caused this problem. Second, the lack of focus on people and processes also limits the ability of policy makers to understand how to improve the system in which the election occurred. Finally, there may be severe gaps in people and process issues that may go unexamined unless there is an evaluation of the people and process components as well. The movement to convenience voting is likely to exacerbate these issues.

In this paper, I review the people, process, and technology aspects of voting. In particular, I consider the evaluations of all three that occurred after the 2008 election. Then we consider where we stand in relations to innovations with voting technology and the path forward for improving this aspect of voting, both in the United States and internationally.

Voting Technology

In 2000, America was introduced to the role that voting technology plays in elections. The problems with unreadable paper ballots in that election have been well studied and issues with

electronic voting that have occurred in 2002 through 2007 have been well studied as well.[2] The basic study of voting technology has been the examination of residual votes. Work in this area has been around for some time, in the study of ballot roll-off, but the Caltech/MIT Voting Technology Project (VTP) made this a focal point of their initial studies of the 2000 election and subsequent work by Charles Stewart and others has extended this research.[3] Stewart (2006) found that, in the 2004 election, residual vote rates declined across jurisdictions compared to the 2000 residual vote rates, regardless of the type of voting technology used. This suggests that there was some educational or management affect that led to a reduction in residual votes. However, Stewart also found that switching systems reduced residual vote rates even more. Residual votes were lowest in those jurisdictions that switched from punch cards or from optical scan voting to Direct Recording Electronic Voting equipment (DREs). Alvarez and Hall (2008a) found that there are important variations in residual vote rates attributable to switching voting technologies; DREs resulted in lower residual vote rates than did switching to optical scan voting. However, there were wider variations across the DRE jurisdictions compared to the optical scan jurisdictions, suggesting that administrative talent may more closely relate to successful implementation of DREs compared to optical scan technologies.

In addition, the work of Herrnson, Niemi, Hanmer, et al. (2008) provided a comprehensive study of the way in which individuals interact with voting technologies. In their work, they had actual voters simulate the voting process across an array of voting technologies. They discovered that important issues like ballot design—such as (1) standard office-block

[2] See Ansolabehere & Stewart III, 2005 and Alvarez & Hall, 2008a for reviews of this literature.

[3] See especially VTP 2001; Stewart 2006; Ansolabehere & Stewart III, 2005; Tomz & Van Houweling, 2003.

ballot versus (2) office-block ballot with straight party voting feature versus (3) party column ballot—affect how individuals interact with voting technologies. They also determined that not all voting technologies are equal. Voters interact with various voting technologies differently, make different mistakes across technologies, and have different evaluations of the quality of the experience they have with these various voting technologies.

People

One of the interesting features of these studies is that many of the problems that exist with all voting technologies is the human-technology interaction. Alvarez and Hall (2004, 2008a) note that there are analogous problems with voting technologies, whether a person votes on paper or electronically, and document such analogous problems in both electronic and paper voting. Quite simply, problems with technologies are often problems not with the technology itself but with the way in which people—poll workers, voters, or election officials—interact with that technology. Even residual votes have at their root a human-machine interaction.

Studies of voter confidence and the quality of the voting experience, gathered from both voters and poll workers, have expanded our knowledge about voting technology. One of the key new variables that have been studied in this regard is voter confidence. Starting in 2004 there have been systematic studies of the interaction between voting technology and voter confidence.[4] This research gives us important purchase on the question of how individuals perceive voting technologies.

[4] For example, see Alvarez and Hall 2008a, Alvarez, Hall, and Llewellyn 2008, 2009; Atkeson, Alvarez, and Hall 2007; Atkeson and Saunders 2008; Hall, Monson, and Patterson Forthcoming; Stewart 2009)

The most recent work on this topic has been conducted by Charles Stewart (2009). Using data from the *2008 Survey of the American Electorate*, supplemented with voting technology data collected by Election Data Services, Stewart was able to determine how voting technology affected a voter's confidence. Stewart found that there are important interactions between voter confidence in DREs and the voter's ideology; strong liberals are less confident in DRE technologies than are other voters. He also found that DRE voters were less confident than voters who voted on optical scan ballots (although paper ballot and lever machines voters were more confident than were optical scan voters). Stewart replicated and extended the work done by Alvarez, Hall, and Llewellyn (2008) and (Atkeson & Saunders, 2007)about voter confidence. He also clearly shows that attitudes about voting technology are affected by an individual's ideological preferences. The *2008 Survey of the Performance of American Elections* also found that fewer than two percent of voters reported any voting machine problem in the 2008 election. However, these types of problems did lower voter confidence severely if they occurred.

Finally, and important to the idea that voting technology is part of a larger interaction between people, process, and technology, Stewart examined the question of whether DRE voters waited longer in line to vote. The answer to this is both simple and complex; the simple answer is that yes, DRE voters did wait in line longer than paper ballot voters. The complex answer is that DRE voters wait in longer lines not because of the DREs but because of management and administrative decisions. Lines were far more associated with race and population density than the voting technology used. In fact, when race and population density

are included in a model with DREs, the DRE variable is not a significant reason why voters wait in line.

The other aspect of the people question in elections is the poll workers. Research on poll workers has found that the image of elections being run by 72-year-old poll workers is an urban legend. Systematic studies of poll workers in Iowa, Ohio, New Mexico, Utah, and from national survey data all have found that poll workers have a median age ranging between 55 and 67.[5] Several of these studies have also found close links between poll worker training and poll worker attitudes regarding voting technology. Poll workers are not afraid of new voting technologies, which is not surprising since a large percentage of poll workers started as poll workers after the 2000 election. However, well-trained poll workers tend to have fewer problems with implementing any voting technology and tend to be more confident in the electoral process (Hall, Monson, & Patterson, 2008). Given the importance of poll worker-voter interactions in affecting voter confidence, the training of these poll workers receive can be critical not only in ensuring that the voting technology is well-implemented but also that the voters are confident in the election process (Hall, Monson, & Patterson, Forthcoming).

Process

The largest issue in election administration that has been less studied is the actual administration of the processes and procedures that govern the implementation of voting technology and the environment in which such implementations occur. The chain of custody rules for elections are critical for ensuring that election rules are implemented uniformly,

[5] See for example Atkeson, Alvarez, & Hall, 2007; Center for the Study of Elections and Democracy, 2008; Hall, 2009; Hall, Monson, & Patterson, Forthcoming.

correctly, and in a way that secures that ballots and voting technology correctly, especially given how decentralized election administration is in the United States (Alvarez & Hall, 2008b; (Alvarez & Hall, 2006). These rules have become of interest in some election audit work, which considers the way in which elections are implemented on election day in polling places (Atkeson, Alvarez, & Hall, 2007; Center for the Study of Elections and Democracy, 2008) but less so in the implementation of voting technologies.

For instance, the chain of custody rules that govern how voting systems are secured during the electoral process were not a part of the "top-to-bottom" voting system review that was done in California in 2007.[6] The California review of voting systems did not include an evaluation of these systems within a functional environment that took into account the way in which the law requires voting systems to be secured. For example, the security and operations of the voting system were considered largely without taking into account the existence of poll workers in polling places, the use of security seals and logs, and the conduct of various testing procedures before and after the election.

The California experience can be contrasted with a similar review that was conducted in Alaska.[7] In the Alaska study, the voting systems were tested within the context of how voting technologies are implemented. Therefore, their security recommendations included factors such as (1) improving poll worker training related to security, (2) using security seals and tamper-proof tape to secure the envelopes and shipping containers used when voting machines and ballots are in transit, (3) improving password selection and the frequency of changes to

[6] http://www.sos.ca.gov/elections/elections_vsr.htm
[7] http://www.elections.alaska.gov/votingequip.php

passwords, and (4) better tracking of voting machines and ballots through the use of inventory control technologies (e.g., bar codes).

One other interesting process in elections that has been relatively unstudied is absentee voting. The process of handling such ballots, the issue of when and whether they are returned, and the disposition of such ballots by election officials has only been subject to a small number of evaluations (e.g., Imai & King, 2004; Alvarez, Hall, & Sinclair, 2008). Absentee voting is a growing mode of voting yet understanding the intersection of people and this specific process are not well-understood (Fortier, 2006). For example, several studies have found that absentee voters are less confident that their ballot will be counted compared to election day voters (Alvarez, Hall, & Llewellyn, 2008; Alvarez, Ansolabehere, Berinsky, Lenz, Stewart III, & Hall, 2009; Atkeson & Saunders, 2007; Stewart III, 2009) yet this voting mode was not included in the voting system security studies conducted in Alaska, California, or Ohio. The *2008 Survey of the Performance of American Elections* did find relatively few problems associated with absentee voting but it is not clear whether individuals avoid absentee voting because of concerns that they have with this voting process.

Innovation in Voting and the Future of Voting

Currently, the largest technological innovation related to voting technology is Internet voting. This voting technology is used commonly in Switzerland and Estonia but it represents an innovation in the United States, especially for overseas civilians and military personnel (Alvarez & Hall, 2008a; McNeal & Tolbert, 2004; Trechsel & Mendez, 2005; Trechsel, Schwerdt, Breuer, Alvarez, & Hall, 2007). There have only been a small number of experiments with

Internet voting in the United States but two of them were conducted in the 2008 election cycle. The first case was implemented in March 2008, when the Democrats Abroad conducted their primary election for the Democratic presidential primary using Internet voting as one mode for voting. This effort was implemented without any problems and thousands of voters used this mode.

However, even this remote voting technology is being re-thought in the United States, with greater consideration given to the people and process component of this type of remote voting. In the November 2008 general election, Okaloosa County Florida allowed overseas voters to vote over the Internet from kiosk locations in the United Kingdom, Japan, and Germany. This was not traditional remote internet voting; instead, voters had to vote from specific Internet voting polling locations, which allowed the election officials greater control over the Internet voting process. The voter verification process used in the kiosks were quite robust and the physical security of the equipment could be greater because of the kiosk design.

The Okaloosa County kiosk voting process was used by 93 voters (one additional voter started the process but did not cast a ballot); 40 of the voters were in England, 33 voters were in Germany, and 21 voters were in Japan. The system did not have wide usage but also was not tested in either of the two primary war zones—Iraq and Afghanistan—where there would be the most potential users. However, as a test of concept in rethinking the remote voting process, it was a successful attempt to reconsider how the process and people in the Internet voting equation can be reconsidered.

Internet voting represents an interesting medium for understanding the future of voting because this new mode of voting requires election offiicals and policy makers to think through carefully the way in which a technology—voting over the Internet—can improve the election process for voters, especially special populations of voters such as overseas civilians and military personnel overseas. The barriers to voting for these individuals highlights the problems that arise when certain groups of voters have difficulties navigating the voting process and there are not effective technologies to address their problems.

Internet voting also highlights how much of the voting process, but especially voter registration, is predicated on an election world governed by paper. For example, the National Voter Registration Act (NVRA) was written in a time pre-internet and other electronic technologies and its requirements—as well as many other election laws at the federal and state level—have not kept up with things such as digital signatures, electronic data transmission, and similar ways to faciliate services using the Internet or even email. There is a great need to experiment more with Internet voting, as well as electronic mechanisms for registering voters and supplying voters with information. These experiments have the capacity to move the debate over voting forward and to promote better election management.

Conclusions

As U.S. elections move more toward convenience voting, the integration of people, processes, and technologies will continue to be an important issue. The example of the California review of voting is a case in point; the State has almost 42% of its votes cast via absentee balloting but the review of the State's voting system did not consider absentee voting

to be a voting system. If voting is not considered holistically, then focus on technology to the detriment of processes and people can lead to implementations of voting systems that have weaknesses in their chains of custody. Voting technology needs to be thought of not merely as a piece of hardware or piece of paper, but as an integral part of a larger activity, that is, election administration.

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