A Review of Boston Election Procedures: Efficiency, Reliability, and Security

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1 Introduction

The City of Boston's 2006 general election suffered a widely reported failure: 10% of precincts ran out of ballots before the end of the voting day. As we review election procedures to ensure that these problems do not recur, we have an opportunity to also review and correct the not-so-widely reported problems and uncertainties. This report aims to identify these issues and recommend short-term solutions.

On November 7th 2006, I was the warden for Precinct 4-9 in Boston. This report is based on empirical observations made that day, prior experiences as a poll worker in Boston and Cambridge during the 2004 primaries and elections, and personal expertise in the area of voting system efficiency and security. The recommendations made in this report are intended to be practical in the short term: they should be implementable in time for the 2008 elections. As a result, these recommendations should be considered neither complete nor ideal: they assuming certain feasibility constraints imposed on us by a need to improve the system quickly.

Structure of the Report. Section 2 points out positive aspects noted throughout the election process. Section 3 presents raw observations of problems encountered. Section 4 lays out a few guiding principles, and specific recommendations are then presented in Section 5.

2 Successful Aspects

Though the press reported issues with the election in Boston, the overall experience at precinct 4-9 was quite positive, with a number of clear successes in process, people, and equipment. Before analyzing ways to improve the system, we summarize these notable positive aspects. Where appropriate we forward-reference the observations from Section 3.

Effective Training. Poll worker training was offered at a number of dates and locations, with no need to reserve a spot in advance. Predictably, the last session—which I attended—was oversubscribed. Election officials quickly found a second room to accommodate the crowd. Training started only a few minutes late. It was extremely well run:

- The trainer was clear, concise, and precise.
- The entire election process was reviewed.
- All questions were clearly and expertly answered.
- Most of the "gotcha" situations were explained.

By the end of the two hours, I felt quite prepared, though I had never been precinct warden.

Resourceful Poll Workers and Election Officials. A number of small problems were avoided or remedied by resourceful poll workers and election officials:

- When complications arose during the election setup (Observation 2), one election official was dispatched to remedy the situation. Thanks to him, the precinct was set up in time for 7am.
- When the prescribed physical setup of the polling location made the disabled-access route somewhat confusing (Observation 1), poll workers assigned to the precinct took the initiative to prepare additional signs to lead disabled voters to the right location. As a result, the disabled-voter observer found the access route without trouble.
- At the end of election day, these same experienced poll workers remembered that "some form had to be signed by all poll workers." Though instructions were lacking (Observation 3), the poll workers' observation was crucial in correctly sealing and delivering the secure silver election box.

Reliable Equipment. Though there are questions surrounding the configuration of the machine in undervote detection (Observation 5), the voting machine worked like a charm throughout election day. Temporary failures to read the ballot were easily remedied by retry, and operations at the close of elections worked without any trouble.

3 Observations

This section details a number of observations made during poll worker training at Boston City Hall on November 4th, 2006, and on Election Day at Precinct 4-9 on November 7th, 2006. All observations were directly by the author.

Observation 1 (Unexplained Operational Changes).

During the pre-opening setup, some poll workers, who had worked at this location in prior elections, remembered certain elements of the setup differently: the entrance and exit doors were reversed, the disabled access access path was more/less convenient, ... Some of these inconsistencies resulted from setup procedures which had already been performed by election office staff: at 6am, the "Vote Here" placards had already been set up in front of a different entrance path.

Observation 2 (Chain of Custody of Voting Machine).

We did not receive the optical-scanning voting machine until 6:47am, 13 minutes before the prescribed opening time, and at least 30 minutes behind schedule. When we received it, it was with the help of an election office employee who took on the machine setup tasks to help speed things up. The chain of custody of the scanner was thus unclear: who had had access to it overnight? What kind of verification was performed to ensure that it had not been tampered with? What were the proper procedures to follow to ensure this chain of custody?

Observation 3 (Problematic Instruction Manuals).
Overall, the poll worker instructions were good. A few instances, however, showed that there is significant room for improvement in a few critical cases.

1. The warden and police-officer handbooks were contradictory: the warden's handbook instructed the warden to hold on to the ballot box keys, while the police-officer handbook gave this responsibility to the police officer.
2. It was difficult to gather a consistent list of all check-in and check-out tasks, as there are multiple descriptions in various parts of the poll worker handbook, and they are not always consistent.
3. At the end of election day, the procedure for preparing, sealing, and signing off on the "silver election box" was not explained. We remembered to do it thanks to an experienced poll worker who remembered "something about signing off on some piece of paper."
4. In certain edge cases—inactive voters—, the ID requirement was not clear. Does the address on the ID have to match? Are there other stringent conditions on identifying a voter? Or is it up to the warden and clerk to determine what constitutes a valid ID?

Observation 4 (Privacy Sleeve Confusion).
Very few voters knew what to do with the privacy sleeve, even after explanation. Many voters thought it had to be inserted into the scanner along with their ballot. When told it was not to be inserted, they wondered why it was there in the first place. The confusion forced a number of awkward poll worker interventions to help voters scan their ballots, all the while respecting ballot secrecy.

Observation 5 (Incorrect Oval Filling).
A number of complete undervotes were detected by the scanner, revealing that voters often used checkmarks to indicate their vote instead of filling out the entire oval. Only complete undervotes were detected, leaving the distinct possibility that many ballots were only partially read.

Observation 6 (Central Office as a bottleneck).
For every voter not on the list, our instructions were to call the central office. During busy hours, this often required minutes of re-dialing and hold time.

Observation 7 (Provisional Ballot).
We were instructed that a voter could cast a provisional ballot in our precinct, even if they were registered in a different precinct, although their vote would *definitely* not be counted. It was thus particularly difficult to give voters clear instructions on what they should do: vote provisional, or find the time to go to their correct precinct. Since we had access to the central office, the value of the provisional ballot was in serious doubt, since it seemed clear at casting time that none of these provisional ballots would be counted.

4 Principles

In developing short-term recommendations, we followed three principles.

Principle 1 (Clarity).
The operational pressure of election day requires that all instructions and processes be clear and consistent. The determination of how to handle an edge case should be done far ahead of time, so that election workers need only follow clear directions rather than make difficult judgment calls.

Principle 2 (Efficiency).
Operational tasks should be efficient, so that the voting flow is as rapid as possible for the average voter, and edge cases interfere as little as possible with the flow for other voters.

Principle 3 (Real-World Security & Privacy).
The voting process should emphasize realistic security based on empirical evidence. More security tools does not necessarily imply better security.

5 Recommendations

As a result of our observations, we propose a number of recommendations. These should be realizable with little effort on a short timeline. Note that the recommendations are provided *in order of importance*.

Recommendation 1 (Review of Training & Instruction Manual).
All instruction manuals should be reviewed in a mock election involving all participants: election officials, police officers, poll workers, precinct site coordinators, and voters. The following specific changes should be implemented:

- The various manuals should be verified for consistency, e.g. police-officer instructions should match warden instructions (Observation 3).
- Instructions should be re-worked in a flow-centric way, with a poll-site-opening checklist, a poll-site closing checklist, and flow-chart-like instructions for edge cases like inactive voters. At any point during the day, a poll worker should be able to turn to a page that gives short, sequential instructions for handling a particular situation, e.g. an inactive voter, processing of the absentee ballots, . . . (Observation 3).

Recommendation 2 (More Stringent Undervote Detection).
In the case of an overvote, the scanner rejects the ballot and provides exact information on how many races were overvoted. The same warning and behavior should apply for undervotes: if even one race is read as empty, the ballot should be rejected and the number of undervoted races should be displayed on the screen. The same override option should remain available, of course, if a voter meant the undervote. (Observation 5.)

Recommendation 3 (Simpler Voter Instructions and Tools).
The multiple copies of detailed voter instructions are far less useful than one simple message: "Fill in the oval **completely**. If you make a mistake, ask for a new ballot." This single instruction should be displayed in large letters in every voter booth. One should resist

the temptation to add every other instruction along with this message (e.g. the voter's bill of rights, etc...), as these distract from the main task. Voters need the simplest, most direct instruction: fill in the oval. (Observation 5.)

Recommendation 4 (Single-Sided Ballots, No Privacy Sleeve).

Ballot questions should be printed single-sided, with a large-font page number on the back of each sheet. Privacy sleeves should be eliminated. A voter can then be instructed to keep their ballots "face down" when they approach the check-out desk, and when they scan their ballots. A poll worker can then more easily help the voter by keeping the ballot face-down, while verifying that they are scanning the proper sheets (one of each kind only.)

Measures should be taken to keep the ballot size to a minimum. The number of sheets should be displayed using a large poster sign, so that voters know exactly how many sheets they should be expecting.

Recommendation 5 (Improve Chain-of-Custody of Voting Machine).

There is significant evidence [**?**] that we need to secure not only the machine's memory card, but also all of its ports. The vendor should be asked to provide an appropriate sealable plastic guard on all of its machines, such that, when sealed in place, none of the machine ports are accessible. Wardens should be given specific instructions to verify that the memory card and access port seals have not been tampered with.

Recommendation 6 (Clarify the Rules on Provisional Ballots).

The rules on provisional ballots should make sense. No voter should ever be instructed to fill out a provisional ballot if it is known ahead of time that this ballot will not count.

Recommendation 7 (Provide Site-Specific Setup and Change Log).

Each precinct should have site-specific instructions regarding disabled access, flow of voters, and recommended setup of the room according to prior years. Any changes from year to year, whether requested by the site itself or election officials, should be marked in a Change Log. This information should be provided at least to the warden.

Recommendation 8 (Improve Voter Registration Web Site).

The voter registration web site already has the voter's address and precinct address. It would be trivial to provide a map and precise directions for voters to print out (using Google Maps, Yahoo Maps, or any other mapping provider.) These maps could be sent with the voter registration confirmation mail.

Recommendation 9 (Electronic/Online Pollbooks).

Current paper-based voter check-in methods seem to work *very well*, and likely do not need to change. However, in addition to these, it would be useful to have an electronic pollbook, implemented either as a standalone computer or a computer connected to the Election Office web site, in order to determine whether a voter is registered and, if so, where. This would dramatically reduce the number of calls to the central office and significantly lower the wait time for voters at the precinct.

6 Conclusion

A few relatively simple changes stand to make a significant improvement in the efficiency, reliability, and security of Boston's elections. We stress that these changes are short-term, easily implementable in time for the 2008 elections. When the time comes to look forward a few years further into the future, more involved changes may be required to further improve the people's trust in election results.