2016 Post Election Audits in Maryland

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Background

- We used a new voting system statewide in 2016 - a paper-based system.
- This system captures and stores images of all ballots cast in the election.
- This meant that we could audit the election results at a ballot level and didn’t have to touch the voted ballots.
- We piloted 3 audit methods after the 2016 Primary Election
What is an audit?

• A comparison of 2 independently produced results that are derived from the same data.

Why audit election results?

• To protect and ensure the integrity of the election process
• To verify and confirm the accuracy of the voting systems reported results
• To ensure that the voting system is accurately tabulating ballots
• To ensure that the winners of each contest are called correctly
• To increase confidence in the election results
What audit methods did we pilot?

• Ballot level audit applying risk limiting audit (RLA) principles – The sample size of ballot images was determined by the margin of victory in the contest and the selected ballot images were tabulated manually.

• Fixed percentage audit – 100% of all ballot images in 1% of randomly chosen precincts were manually tabulated.

• Independent Automated Software Audit – Relied solely on independent software to tabulate the ballot images.
Ballot Level Audit Applying RLA Principles

- Needed a statistician to:
  - Select the contest with the smallest margin of victory
  - Determine the number of ballot images to review and which ballot images to review
- Teams of 2 manually tallied the votes on the selected ballot images and compared the votes on ballot images against how the voting system counted that ballot.
Fixed Percentage Audit

• Needed a statistician to:
  • Ensure that each ballot cast had an equal chance of being selected, regardless of the precinct size.
  • Based on the number of votes cast by precinct, assign a range for each precinct in each county.
  • Used a ten-sided dice to select the precinct being audited.
  • Teams of 2 manually tallied the votes on the selected ballot images.
  • Compared the manually tallied results against the voting system’s precinct results.
Independent Automated Software Audit

• Sent vendor images of voted ballots
• Vendor tabulated the ballot images
• Compared the vendor’s aggregated results against the voting system’s aggregated results
• Sent the vendor precinct-level reports from the voting system
• Vendor provided 4 different audit reports by county
  • Comparison of Cards Cast
  • Comparison of Ballots Cast by Precinct
  • Comparison of Votes Cast
  • Contest Discrepancy Threshold report
What did we learn?

All 3 audit methods verified the accuracy of the voting system results.
Ballot Level Audit Applying RLA Principles

• Difficult to estimate budget and staff needed because it depends on the margin of victory
• Need a statistician
• Difficult to explain
• Extremely difficult to implement statewide because of the highly variable number of ballot images that must be reviewed
• A close margin of victory means complete manual re-tabulation of the ballot images
• Human error required an additional review of the ballot images and the Cast Vote Records
Fixed Percentage Audit

- Difficult to estimate budget and staff needed because don’t know the size of the precinct being selected
- Need a statistician
- Less confident in audit results because only ballot images from a single or small number of precincts are audited
  - A small precinct (15 ballots) could be selected when hundreds of thousands of ballots could have been cast in that county
- Human errors could require a 2nd or 3rd manual review of the ballot images
Independent Automated Software Audit

- Re-tabulates 100% of the ballot images using tabulation software that is different than the voting system
- Maximizes the use of technology in election administration (a Maryland legislative mandate)
- Requires very little resources from state and local election officials
- Can be completed prior to election certification deadlines
- Eliminates the subjective and error-prone human element
- User friendly
What criteria did we use to select an audit method?

- Maximize the technological functions of the new voting system
- Minimize human error and eliminate chain of custody issues by using securely stored ballot images, rather than actual voter paper ballots
- Minimize the use of valuable staff time at the local election office in the days following the election
- Complete the audit prior to legally binding certification and swearing-in deadlines
- Be conducted at the ballot-level
- Be independent of the primary voting system
For all the reasons mentioned...
We used an independent automated software audit for the 2016 General Election. The vendor selected to perform this audit was the Clear Ballot Group.

This audit confirmed the accuracy of the voting system and we discovered a lot more.
Folds through write-in area were counted as votes

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<thead>
<tr>
<th>or write-in:</th>
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<tbody>
<tr>
<td><strong>Write-in panel</strong></td>
<td><strong>Click Here</strong></td>
<td></td>
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Note: Maryland tabulates write-in votes whether the oval is filled in or not
The ability to see the full ballot allowed us to see the fold clearly.

This issue was identified prior to certification and was corrected.
Residue and scratches on the scanner’s lens caused overvotes
The ability to see the full ballot allowed us to see the lines clearly. This issue was identified prior to certification and was corrected.
“Double Pull” issues on high speed scanners
This happened when the scanner pulled 2 ballots but scanned as 1
Hovering over the multi-feed ballots showed different contests than the one we expected to see.

The ability to see the full ballot allowed us to see that more than one ballot was scanned.

This issue was identified prior to certification and was corrected.
What kinds of questions can be answered using an independent automated software audit that are challenging, if not impossible, to answer without one?
Why would a large number of voters show up and vote for more than 1 candidate for President?

After reviewing the ballot images, we determined that they were true overvotes.
Why would a large number of voters show up and not vote for any Presidential candidate?

After reviewing the ballot images, we determined that they were true undervotes.
Why would voters show up to the polls and decide to cast blank ballots?
What else can an independent automated software audit identify?
Identify voting locations where more poll worker training is needed

During the review of the unreadable ballot images, the vendor discovered that the stubs had been scanned. The stub should have been removed by the poll worker prior to scanning.
Identifying equipment issues

These issues were discovered during the review of unreadable ballots. In all these cases, the voting system tabulated the ballots correctly.
You can easily see the interesting ways that voters mark their ballots.
And...

- Helps resolve recount issues or allows for more targeted recounts
- Informs election administrators on issues with ballot design that lead to voter confusion (high percentage of voter error)
- Assists election officials in evaluating how certain precincts are doing
What about the future?

• Use the technology to analyze images from pre-election testing to identify issues with voting equipment before an election.

• Develop way to detect ballot images that are too long to identify ballots scanned with stubs and “double pull” issues.

• Compare the voting system cast vote records and the independent automated software audit cast vote records to identify differences at the ballot level.