Elections and Election Technologies

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Caltech/MIT Voting Technology Project

- Formed in aftermath of 2000 presidential election, primarily to assess problems with voting technology.
- In last twelve years, we have published a number of books, scores of peer-reviewed academic papers, many working papers and reports.
- Recently updated with post-election recommendations.
Four Important Principles

• Throughout the work of the VTP, we have focused on four important principles for voting systems:
  – Reliability
  – Security
  – Performance standards and evaluation
  – Sustainable business models
Improving Reliability: The Florida Recount

• When our project began in late 2000, there was no means for measuring the reliability of the equipment used for recording and tabulating votes during actual elections.

• Observationally, key problem seen in Florida recount seemed to be the large number of ballots on which the voter attempted to express a preference but for which no preference was recorded.
Improving Reliability: Residual Votes

• Enter the *Residual Vote*: the discrepancy between the number of ballots cast and the number of votes counted for an office.

• Many reasons for residual votes, voter mistakes, system failures and intentional under- or overvoting.

• But the frequency of residual votes should not be correlated with voting technology used.
Improving Reliability: Residual Votes

• Residual vote rate for president in 2000 nationwide was approximately 2% of all ballots cast.
• Was correlated with voting technology used.
• Improvements in procedures and technologies led to residual vote rates of approximately 1% in 2006 and 2008.
Improving Reliability: The Future

• Much research on reliability and residual votes has shown improvements since 2000 (Ansolabehere and Stewart 2005, Stewart 2009).

• But there is cause for concern. Increasing reliance on voting by mail in many states might cancel out these improvements (Alvarez, Beckett and Stewart, in press).
Improving Security

• Initial focus in the aftermath of the 2000 Florida recount was not on voting system security.

• Significant concerns arose, a wave of research and reporting began with Kohno et al. (2004).
Improving Security: Verifiability

• Voter verification:
  – Voter verified paper systems for electronic voting
  – Paper-based

• Software independence: changes/errors in voting system software can’t cause undetectable changes/errors in election outcomes (Rivest and Wack 2006, Rivest 2008).
Improving Security: Verifiability

• End-to-end voting systems: systems that allow verifiability from beginning to end of process. A number of E2E systems in development and deployment.

• Election auditing.
  – Post-election ballot auditing
  – Performance audits
Improving Standards and Evaluation

• Federal voting systems standards process has stagnated recently.
• Should there be federal voting systems standards, or a strong set of state standards?
• Should standards focus on security and system testing, or should we focus on auditing election outcomes (e.g. Stark and Wagner 2012)?
Improving The Business Model

- In 2001, the VTP concluded that the biggest challenge to the future development of voting technologies was the industry’s business model.

- Is the future a stronger business model for private industry? Or a robust state and local technology and development process (e.g., LA County’s Voting Systems Assessment Project)?
Emerging Technology Issues

• There are many:
  – Technology of voting registration systems.
  – Improving system accessibility.
  – Voter authentication technologies.
  – Metrics for evaluation of technology and election administration.
  – Solutions for contingencies and natural disasters

• And there are those long lines for those trying to vote in person …
What Can Be Done About Long Lines?

• Long lines were an issue in 2012 election.
• Research from MIT colleague Charles Stewart III, “2012 Survey of the Performance of American elections”
  – 2012 survey: 200 respondents per state, fielded the week after November 6.
  – Previous rounds of the survey conducted in fall of 2007, spring and fall of 2009, and fall of 2009.
Waiting To Vote in 2012

- 35% did not wait at all to vote (2008, 42%)
- 13% waited more than 30 min. (2008, 14%)
- Longer lines for early voters!
  - Early voters averaged 20 minutes in line, compared to 13 minute average for Election Day voters
Who Waited Longer?
### Average Wait Times

#### County population density

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<th>E-Day</th>
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<tr>
<td>3(^{rd}) Qrt.</td>
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#### Race and ethnicity

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<td>All</td>
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</table>
What Can Be Done About Waits?

- People and process
  - Procedures that slow voters down
  - Long ballots
- Investments
  - Number, size and location of voting places
  - Voting systems
- New Technologies
  - Disseminate information about long waits
Conclusions


• Thanks to VTP colleagues, Jonathan Katz, Ron Rivest, Charles Stewart III.

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