



Citizens Audit: A Fully Transparent Voting Strategy

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Executive Summary

A paramount concern in elections is how to regularly ensure that the vote count is accurate.

Most voting systems commonly offer "assurances" of accuracy, and ask for our "trust." But this evades the issue: Vote counts will remain controversial as long as "proof" is absent.

Is there a way to obtain proof for each election? Yes, there is a way—perhaps the only way: Publish the ballots openly. This will permit every citizen to check the accuracy of the count.

We call this the "Citizens Audit." Ideally, it includes the following:

1. A computer previews the voter's ballot, so that the voter can correct any errors.
2. The computer prints a human-readable, flawless ballot, which the voter then verifies.
3. After all ballots are cast, they are videotaped by private citizens, and then are published.
4. Election officials tally the votes as usual, from the original ballots; the community tallies the votes from the published copies. Any difference between the two counts draws scrutiny.

Convenience. A "Citizens Audit" is unobtrusive. It need not place demands on the attention of poll officials, and it need not disrupt, delay, or otherwise impede the election process.

Cost. Given today's technology, the cost of a "Citizens Audit" can be negligible.

Cornerstone

On page eight of [*Myth Breakers: Facts about Electronic Elections*](#), author Ellen Thiesen affirms the importance of transparency in elections:

Election transparency is the fundamental basis of election integrity.

In transparent elections, all the processes of handling and counting ballots are completely open to public view. Nothing is hidden, nothing is secret-- except, of course, each individual's voting choices.

Election fraud and miscounts have occurred throughout history, and they will continue to occur. Transparency is the only way to minimize them....

But in virtually all discussions of election transparency, one line of thinking has remained taboo: The idea that even the ballots themselves could be made "transparent."

After all, wouldn't that violate the principle of the "secret ballot"?

But there's one thing puzzling about that principle: What, precisely, is being kept secret?

- It's not the ballot. During handcounts, the ballot commonly gets read aloud in public.
- It's not the voters. After all, voters publicly announce their names in the polling place.

Yet we still feel that the principle of the "secret ballot" is being honored. Why is this?

The reason is this: The true meaning and intent of the "secret ballot" is not to keep the ballot a secret, nor to keep the voter a secret. It's to keep secret *which voter cast which ballot*.

What's intended to be kept secret is precisely the authorship of the ballot, not its contents.

A more apt name for this policy is, the "anonymous ballot."

Once we grasp this distinction, a new vista opens, one in which we are freed to conceive voting systems that are fully transparent and verifiable: Systems in which not merely the vote totals, but the very ballots themselves, become an open and integral part of the public record.

Outline of the Process

1. A computer helps the voter compose a defect-free ballot. (Optional.)
2. The computer prints the paper ballot. (Optional, though required by step one.)
3. The voter verifies the paper ballot.
4. The voter deposits the ballot into the ballot box.
5. During the vote count, interested citizens make photographic copies of the ballot.
6. The copies are made available to the general public.

Details of the Process

1. A computer helps the voter compose a defect-free ballot. (Optional.)

The voter's intent in any given contest may be undecipherable if the voter makes an error in marking the ballot. Common errors include--

- Overvoting (casting too many votes in a particular contest).
- Undervoting (unintentionally failing to cast a vote in a particular contest).
- Marking the ballot ambiguously ("Is it an underline or a crossout?").
- Entering a write-in candidate illegibly.
- Marking the wrong box, and then deciding not to correct the mistake.

Such errors are avoided if the voter is assisted by a touch-screen voting machine.

For instance, unintentional undervotes can be avoided if each contest offers a box with the caption, "None of the above." The computer can then require that each contest have at least one box marked.

Note: Computer voting machines, like all devices, are prone to malfunction. If this occurs during voting hours, voters may be denied the opportunity to vote. For this reason, each polling place must offer voters the option to mark their ballot manually.

2. The computer prints the paper ballot. (Optional, though required by step one.)

Computer records are inherently alterable. If they weren't, computers would be useless.

But this alterability means that votes which reside inside a computer are not secure from alteration. There is always a chance that the internal computer copy of a voter's choices may deviate from the voter's intent. Deviations can result from a hardware glitch, a software bug, intentional tampering, operator error, electrical interruptions, or other causes.

Encryption schemes are sometimes claimed to hold promise for preventing alteration of the ballot. But, even apart from the above problems, encryption schemes are fallible.

- In order to be usable, the ballot has to be unencrypted at certain times. During those times, it is vulnerable to alteration.
- The encryption software itself may be defective. For instance, a security hole was open for more than two-and-a-half years in the "VPN" encryption module in Windows 2000 and Windows XP. (<http://www.extremetech.com/article2/0,1558,587234,00.asp>)

A paper ballot (whether computer generated or hand marked) is immune to such problems.

3. The voter verifies the paper ballot.

As discussed above, the computer copy of the voter's choices can differ from those on the paper ballot. To remove all doubt about the accuracy of the paper ballot, the voter must be permitted to verify the actual ballot, not merely verify the on-screen copy of the ballot.

Since it is the paper document that is the legal bearer of the voter's choices, any hidden problems in the voting machine become irrelevant. Once in hand and confirmed by the voter, the paper ballot is outside the control of the computer. The voter is thereby freed of concern about the political leanings of the computer manufacturer, about the competence of the software engineers, and about the chances that the votes will be lost or altered by computer tampering. The threat—and incentive—for machine tampering is neutralized.

The paper ballot can provide equal assurance to handicapped voters, since it can be read back audibly to the voter by a suitable device. Once again, to eliminate concerns about computer accuracy, it should be the actual paper ballot, and not the computer's internal record of the ballot, that is read back to the voter.

4. The voter deposits the paper ballot into the ballot box.

- If the depositing or discarding of the paper ballot is controlled by the computer, and is not done in public view, voters may question whether the ballot was routed correctly.
- If the computer can both create and deposit a ballot, a malfunction may result in the computer's creating and depositing unauthorized additional ballots.
- Requiring the voter to publicly deposit the ballot prevents the voter from creating and depositing more than one ballot without being observed.
- The voter will not mistakenly remove the ballot from the polling place if the ballot is a familiar, full-size placard (instead of a "receipt"), and if the ballot box is prominent.

5. During the vote count, interested citizens make photographic copies of the ballot.

There is always a concern that the official set of completed ballots may become adulterated. This concern can be allayed by creating certifiable backup copies of the ballots.

This can be easily done by videotaping the entire set of ballots.

a. The video copying should be unobtrusive and not interfere with the counting process.

This can be accomplished by placing each ballot on display for a few seconds during the counting. The display device can be as simple as a "music stand," or as involved as an image magnifier/projector.

To ensure that there is no computerized tampering with the displayed image, any image magnifier should be relatively low tech: for instance, an opaque projector, or fresnel lens.

b. *The video copies should be created while the ballots are being counted. (Optional.)*

This will ensure that there is a one-to-one match between the ballot originals and the ballot copies.

- If the votes are being counted by hand, the judges can count the votes on each ballot while it is on display. This allows adequate time for videotaping the ballots.
- If the ballots are being tabulated by optical scanner, each ballot can be placed on display for a few seconds after being optically scanned. Again, this offers sufficient time for videotaping.
- If the ballots are being counted by "photoscan," the display considerations are the same as those for optical scanning, above.

"Photoscan" refers to taking a snapshot of the displayed ballot with a digital camera. When all the ballots have been photographed, their images are downloaded into a handheld or laptop computer, which tallies the votes by analyzing the ballot images.

Each poll watcher can bring their own photoscan equipment and can generate a separate, personal audit of the vote count—possibly at the polling place itself.

(Estimated cost of such equipment is \$600 - \$750 at June 2005 prices. A working prototype has been built using a \$50 digital camera, a notebook computer, OCR software that came free with a flatbed scanner, and additional free software.)

In each case above, the display of the ballots is seamlessly integrated into the counting process, and does not delay, impede, or interrupt the proceedings.

But suppose a jurisdiction does not tally the vote by using the paper ballots? In that case, displaying the paper ballots for videotaping becomes a separate and distinct process, and the time it consumes does become a factor.

Nevertheless, if it takes only seven seconds to handle and display a ballot, and if five hundred ballots were cast in the precinct, then the time consumed in videotaping will be less than one hour. And the delay becomes effectively even less if the videotaping is done in parallel with other wrap-up tasks in the polling place.

c. *Each copy should incorporate inherent proof of its own completeness and accuracy.*

This is accomplished if each videotape captures, from start to finish, without pause, the entire process of displaying the ballots.

d. *The news media and the general public must be permitted to make such copies.*

As described in the next section, allowing the general public to make video copies will introduce a new, thoroughgoing check and balance on the election process.

6. The copies are made available to the general public.

a. *Publishing the ballots allows every citizen to verify the vote count.*

The election jurisdiction or the news media can publish each precinct's ballots on the Internet in text, graphic, or even video format. This can be done at little or no expense.

Citizens are allowed to double-check those copies against the original videotapes, so that those copies can be used confidently to confirm or to contest the official vote count.

Such freely available audits of the ballots should remove any question about the accuracy of the count, and should virtually eliminate any need or demand for a recount.

b. *Publishing the ballots will not compromise the secrecy of the ballot.*

To reiterate, the "secret ballot" is not intended to hide the identity of voters, nor to hide the contents of their ballots.

The "secret ballot" aims at concealing only one specific datum: "who cast which ballot."

That information is not compromised by reading each ballot aloud in the polling place, even though observers may be audiotaping the proceedings. Likewise, that information is not compromised by viewing each ballot openly in a public arena. (This all assumes that the ballots received a proper shuffling upon removal from the ballot box.)

c. *Publishing the ballots makes possible highly detailed research into voting patterns and possible election irregularities.*

By publishing images of the ballots, we make "every vote count" not only during the election, but also during later research into voting patterns. Researchers no longer need to rely on polls, sampling, and guesswork in order to assess voter intent and behavior.

One special benefit is that fully detailed studies can help reveal suspicious vote patterns, ones that may indicate large-scale malfunctions or tampering, unnoticeable on the local level. This would help us discover and remedy—and perhaps deter—such problems.

An excellent return for such a modest investment.

[end]