

Navigation from the review screen

A white paper for the EAC-NIST Human Factors Public Working Group

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This brief white paper looks at requirements in the VVSG for how voters navigate from the review screen comparing the current VVSG requirements with more recent research evidence and making recommendations for how the VVSG might be updated.

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Principles this relates to

PRINCIPLE 2: Cast as marked

2.4: The voting process helps voters avoid errors that invalidate their ballot, including blank ballots, undervotes, overvotes, and marginal marks.

Principle 3: Marked as intended

Ballots are presented in a clear, understandable way, and is operable by all voters.

3.2: Operable - Voters and poll workers must be able to use all controls accurately, and all ballot changes are made with the direct control of the voter.

3.3: Understandable – Voters can understand all information as it is presented.

Current VVSG requirement

There is no current requirement for how an electronic interface behaves when the voter reaches the end of the ballot, after progressing through all of the contests.

Why this interaction needs guidance

This issue applies only to electronic ballot marking systems.

Research evidence suggests that the interaction from the review screen is confusing to voters without strong digital literacy skills or strong mental models for how a ballot works.

What should the VVSG say?

The VVSG or related materials might include the following guidance:

Best practice for navigation from the review screen is an “out and back” pattern that allows voters to navigate “out” from the review screen to a contest and then directly “back” to the review screen.

If included in the VVSG, the system designers should be able to prove that their design works for low-propensity voters and voters with low-literacy or low digital skills, and those who use the audio ballot or magnification.

The alternative is either tedious (requiring voters to navigate sequentially through all contests to get back to the review screen) or less usable (relying on voters finding and understanding a button outside of the normal navigation to go directly back to the review screen).

Research evidence

From voting system prototypes and research

Anywhere Ballot

The [Anywhere Ballot](#) uses an “out and back” navigation from the review screen.

- In normal navigation, the button in the bottom right corner of the screen reads “Next” and takes the voter to the next contest on the ballot.



- If a voter decides to make a change from the review screen, the button says “Return to review and cast your vote” so that instead of proceeding through all of the contests, they go immediately back to the review screen.



The review screen includes clear messages below each contest that is undervoted

You did not vote for anyone
If you want to vote, touch here

or

You voted for 3 people you can vote for 2 more
If you want to vote, touch here

Los Angeles Voting Systems Assessment Project (VSAP)

The VSAP design implements the “out and back” navigation pattern, with the button in the bottom right changing from *Next* to *Back to Review*

STAR-Vote RFI

Specifies the Anywhere Ballot with modifications, including:

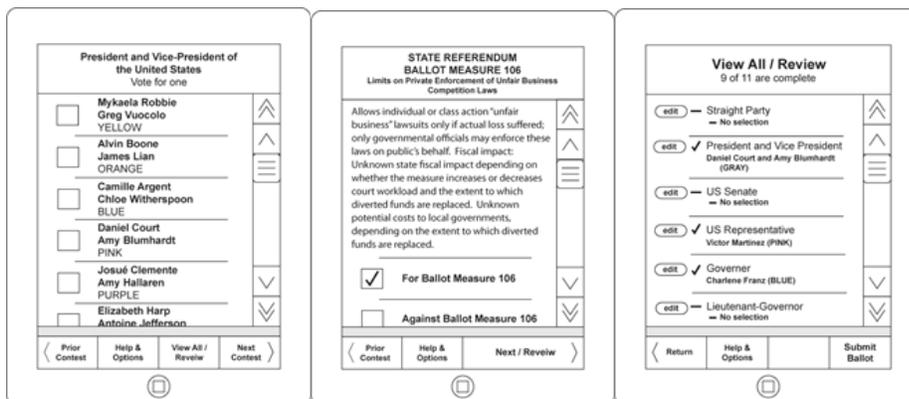
9.3.1.10.5 - If the voter elects to make a change from the review screen after the new choice is selected, and the voter pushes the button that returns them to the review screen, the voter must be returned to the exact spot in the review screen from where he or she left off.

Michigan State University Mobile Interface Specification

MSU Usability/Accessibility Research and Consulting [created](#) and [tested](#) a user interface for accessible mobile voting systems based on prior research.

- A button to access the review screen is always present on all contest screens on the ballot, as are buttons to access next/previous contests.
- The next contest and review screen buttons (which are adjacent on contest screens) are combined into a single "Next / Review" button on the final contest screen.

- The review screen allows users to jump directly to any contest on the ballot, and also has a button to return to the screen they were previously on, giving voters a choice for how to navigate.
- Users reach the review screen before they can submit their ballot.



3 screens from the MSU prototype (1) Contests page, (2) Final Contest page, (3) Review page

Usability testing of a prototype based on the specification conducted with individuals with dexterity impairments, low vision, dyslexia, and no impairments resulted in several findings and design recommendations:

- Most users did not appear to notice the review screen button on contest screens and/or were unsure of the purpose of the review screen before reaching it (i.e., that they can quickly change prior contest selections, skip contests, and/or submit their ballot using it), but found it useful after discovering this screen.
- Many users were unsure of how to submit their ballot prior to reaching the review screen, and suggested renaming the button that accesses the review screen to include "submit" (the button was named "View All / Review" in the prototype).

Research study at Rice University on sequential voting vs. direct access voting

“How to Build an Undervoting Machine: Lessons from an Alternative Ballot Design.” K. K. Greene, M. D. Byrne, S. N. Goggin, 2013.

<https://www.usenix.org/conference/evt2013/workshop-program/presentation/Greene>

A research study conducted at Rice University compared the usability of two different navigation approaches to an electronic ballot. That study found that **starting the ballot** at a summary or review screen and asking voters to go out and back for each voting interaction was a poor design. It led to significantly increased under-voting (an increase from 0.2% to 13%).

It makes sense that the “out and back” interaction works well for reviewing but not for the overall voting interaction because the process of voting a ballot is different from the process of reviewing:

- In marking the ballot, the voter moves through and marks each of the contests in sequence. The focus is on the action of recording decisions (whether that decision is to vote or not vote).
- In reviewing the ballot, the voter reads the selections in sequence, but acts selectively, making corrections for each contest as needed before continuing to the next. The focus is on making the decision to accept or change the vote.

The research found that turning the naturally sequential process of voting into a forced out and back navigation adds extra actions and extra cognitive effort to mark a vote for each contest desired, with the predictable effect of increased errors.

From current voting systems

Comparative testing of voting systems in Maryland

In preparation for choosing a new voting system, the Maryland State Board of Elections and the University of Baltimore tested current voting systems.

Most of them had the same navigation from the review screen. Once a voter went to a contest to correct the selection, they were simply dropped back into the ballot at that point and had to either navigate through all the contests or find a “review” button to skip forward to the review screen. Low literacy voters, older voters, and audio-only voters were the most harmed by this navigation.

In the testing:

- Some voters got disoriented, and some re-voted the whole ballot from that point forward.
- Some voters did find their way back to the review screen using the navigation options.
- Voters using the audio ballot were mostly not able to find their own way back to the review screen, and were thus compelled to re-vote the ballot from that point forward, which was pretty time-consuming with the audio interface.

Sequoia Systems and Dominion Systems

The Sequoia Edge and Advantage (in use, but no longer sold) and some other Dominion System voting systems have no real review process. Instead, if a voter asks to review their choices, the system simply cycles through all of the contests again. Some current This is especially tedious for the audio ballot.

From usability testing with voters

Low literacy voters, older voters benefited from going out and back because this pattern maintains the voter’s context in the “review” process -- “I am finished, and I am double-checking my choices.” These voters were also the most harmed by the alternative because they did not have a strong understanding of the difference between the contest and review screens.

Audio-only voters benefit because the alternatives require them to navigate through all of the contests, a slow process.

What are the research gaps?

This is an area that needs more usability testing, including comparison of the different navigation options from the review screen, following a sequential navigation through the ballot contests.