Guidelines for testing voting systems for poll worker usability

This document provides guidance on how to test a voting system for poll worker usability as required by **Principle 8.4: The voting system is evaluated for usability by election workers.**

You should also be familiar with the guidance document **How to test for voter usability**, which offers an overview of conducting usability testing.

Related documents:

- NISTIR7519 Style Guide for Voting System Documentation
- The report template: CIF Template for Voting Systems-VVSG2 and its companion guidance documents.
- Sample ballot and instructions: CIF Template-Ballot-and-Instructions.docx
- Sample appendixes and useful forms: PWU Template-Sample-Appendixes.docx

Contents

Testing voting systems with poll workers

Poll worker includes their ability to use the equipment as they would in an election and whether the documentation provided by the manufacturer supports them in doing so.

To ensure that a voting system can be used effectively by poll workers, usability testing combines expert review of the system and documentation with the results of a "mock election" where participant poll workers follow instructions from the documentation to perform tasks.

A report on this testing is part of your certification materials for meeting requirement 8.4-A in VVSG 2.0.

- The introduction to usability testing, **How to test for voter usability**, provides general information about conducting usability tests
- The review of the documentation is based on the guidelines in **NISTIR7519 Style Guide for Voting System Documentation**.

Who is this document for?

This document is intended to be used by anyone conducting a usability test of a voting system with poll worker or who is reporting on that usability test.   It may also helpful for anyone reading the report

How is the usability test with poll workers used?

The usability test described in this document has been prepared to help voting manufacturers meet the Voluntary Voting System Guidelines (VVSG) 2,0 developed and maintained by the U.S. Election Assistance Commission (EAC).

It is part of the requirements to meet a principle for testing a voting system:

> **Principle 8.4** The voting system is evaluated for usability by election workers.

> **8.4-A** requires usability testing with election workers that includes setup, operation, and shut down and using all accessibility features of the voting system.

Step 1: Performing the expert review

The first step is to determine whether a voting system is usable for poll workers in an expert review of the documentation. This review is completed before testing the system with poll worker to determine whether or not the voting system and documentation are fit to perform the test.

To review the voting system itself, the experts performs a "dry run" of the test, enacting the role of a poll worker, completing the tasks that will be required in the usability testing.

In the review of the documentation, the expert conducting the test determines whether the documentation has been constructed based on best documentation practices found in:

- NISTIR7519 Style Guide for Voting System Documentation
- VVSG 2.0 requirements in principle 7.3
    - o 7.3-O—Instructions for election workers
    - o 7.3-P—Plain language

How to conduct the review

Two experts in usability play the role of poll workers who must operate the voting system, based on the system documentation.

The review starts with the system as intended to be delivered to the polling place. You may assume that ballot definitions have already been loaded, but the system may be packaged as if delivered from a central warehouse. Accompanying system documentation intended for use at a polling place or vote center is included.

> **Tip**
>
> ✓ System documentation may include instructions for complex operations and troubleshooting, but this material will not be used in the test..
>
> ✓ The documentation may consist of paper manuals, quick setup guides, and electronic media, such as DVDs. The overall documentation strategy is up to the manufacturer.

Step 1.1 – Review the instructions

The experts first find the instructions for normal setup, operation and maintenance, and shutdown. It should be reasonably easy to isolate this "poll worker" material from the documentation of more complex procedures (e.g., ballot definition, equipment repair, or diagnostic testing).

The poll worker documentation is then reviewed for clarity, organization, appropriate level of writing, internal consistency, completeness, and other attributes of good documentation usability.

The system fails if the poll worker documentation:

- is not written at a level readily understandable by non-experts
- is not organized for easy use in a polling place or vote center during an election
- does not clearly explain how to verify that the system is in a correct state for setup, operation, and shutdown
- has any other serious problems revealed in the expert review

Step 1.2 – Inspect the set-up, operation, and shut down tasks

Based on the documentation, the experts shall go through an entire setup / operation (including the casting of at least three full ballots) / shutdown cycle.

The purpose is to review both the accuracy of the documentation, and the degree of difficulty of the procedures themselves. Within the inherent degree of complexity of the tasks, the expert review is intended to detect situations presenting special difficulties (physical or cognitive) to poll workers.

During this part of the test, the experts will review all messages and warnings generated by the system. Each message shall be reviewed for:

- Accuracy - Does the message accurately reflect the state of the system?
- Completeness - Does the message tell the poll worker what steps need to be taken?
- Clarity - Does the message follow the guidance in the requirement 7.3-P-Plain Language?

If the results of the expert inspection include any failures, then the system is not fit to perform the next part of the test and the test is stopped and reported as a failure. The system fails if:

- the documentation contains significant inaccuracies or omissions with respect to the actual procedures
- the procedures are judged to be excessively difficult, complex, or error-prone
- all the messages encountered are not deemed clear and usable

Step 2: Preparing for the test

Preparing for the usability test with poll works includes 3 steps:

1. Recruit and schedule participants
2. Set up environment
3. Set up voting system

In all activities in this stage of the test and in conducting the usability test with poll workers, comply with state and federal human subject protection laws and ethical practices, such as use of Internal Review Board (IRB) services or compliance with appropriate professional codes of conduct. More information is in the guidance document **How to test for voter usability.**

Step 2.1 – Recruit and schedule participants

Recruit 8 two-person teams (a total of 16 participants). Each team consists of one experienced and one inexperienced member as defined in the table below. Also recruit 2 "backup" participants for each group, bringing the overall total to 10 participant teams (20 participants).

Use the screening questionnaire in **Appendix A** to ensure that each meets the following target demographics.

Required characteristics	Desired number of participants
Poll worker experience	**Ensure each poll worker team has 1 experienced and 1 inexperienced poll worker.**
5 elections within 3 years (experienced)	9-11
1-2 elections within the last 12 months (inexperienced)	3-5
Attended poll worker training but may have not worked an election yet (inexperienced)	5-7
Age	**Try to obtain a fairly even split between age groups.**

Required characteristics	Desired number of participants
18-40	7-9
41+	11-13
Gender	**Try to obtain a fairly even distribution between gender groups.**
Women	8-12
Men	8-12
Restrictions	**Ensure all participants meet these requirements**
Citizenship	Participants must be U.S. citizens who are eligible to vote
Literacy	Must be literate in English
Relationships	Must **not have** a significant connection to any voting system manufacturer, including close relatives, employees or owners.

Compensation

Participants are typically compensated for their time.

> **Tip**
>
> ✓ Compensation may vary depending on the geographical location. For example, in the metropolitan DC area, a reasonable compensation might be $50.
>
> ✓ Backup participants who come to the facility to "stand by " in case they are needed should also be compensated.

Scheduling

After selecting participants, schedule each group for a 2 hour session.

Provide them with details regarding the test time and location, with directions to the facility and information about their compensation.

> **Tip**
>
> ✓ Allow time between sessions to reset the voting system and other materials. This time might be 30 minutes or more depending on the system being tested.

Step 2.2 – Set up environment

The goal, as far as possible, is to simulate a high quality polling place. Thus, any errors detected will not be traceable to extraneous environmental factors. There must be sufficient room in which to carry out the mock setup and voting, using a single voting station.

The voting area should have the following characteristics of a typical public facility:

- Size: minimum 12' by 15' by at least 8' high.
- Ambient lighting should be in the range of 400-600 lx. If possible, use indirect lighting rather than overhead fixtures or direct sunlight so as to reduce glare.
- Ambient noise levels should be below 40dB
- Ventilation should be set to avoid either a "stuffy" or "drafty" feeling.
- Temperature should be between 68 and 76 Fahrenheit
- Relative Humidity should be between 20% and 60%

See this OSHA guideline for more detailed recommendations. This University of Wisconsin webpage on safety is also useful.

Step 2.3 – Set up the voting system

The performance of this process establishes a consistent, fixed starting state from which all participant teams begin the test.

Plan the set up so that before each participant team begins the test, the system has been returned to a fully "packed" state (as it would typically arrive at the polling place). For the consistency of the test, the tester must always return the system to this state after each test (and before each next participant team). Use a process for shutting down the voting system and

returning it to the "packed" state. This includes the re-packing of accessories and all materials provided for the test.

Before the test, load the voting system with a ballot based on the NIST standard ballot specification (in the CIF Template Sample ballot and instructions). The manufacturer is responsible for the actual ballot design (fonts, layout, etc.). Once this ballot has been loaded on the VSUT, the test lab must leave each system in its "arrival state" from the manufacturer, the state in which a poll worker will first receive it.

Test materials
Print out the following materials.

Materials	Number of copies
Test administrator checklist for greeting and preparing participants	1 copy per administrator
Test administrator script for running the session	1 copy per administrator
System documentation manuals	1 copy of each
Participant task sheets	1 copy of each
Data recording and session evaluation checklist	1 copy per session
Paper ballots for systems that use them	1 fully voted 1 under-voted 1 over-voted 1 blank ballot

Tip

✓ Print each participant task scenario on a separate sheet of paper in large type, such as a 14 point sans-serif font.

Step 3: Conducting the test sessions

Conducting the usability test with poll works includes 3 steps:

1. Prepare participants
2. Conduct the test session
3. Collect data during the test session

Before each session begins, check that all materials are in place, using the checklist in **Appendix B.**

Step 3.1 – Prepare participants

The test staff is responsible for preparing the participants for the test procedure.

- Greet the participants an introduce them to each other.
- Give each participant a copy of the informed consent form to review and sign. Sign it yourself after each participant has signed theirs.
- Verify that participants match the selection criteria by reviewing the information they supplied when they were recruited for the test. To do this, ask the screening questions in a pre-test interview. If participants' answers do not match what they said in the original screening interview, they should be released and replaced with other participants.
- Follow the test administrator script (**Appendix C**) for introducing the test to participants and use the provided consent form (**Appendix D**).

Step 3.2 – Conduct the testing session

The test administrator should use the scripts provided in **Appendixes B and E** to run and end the testing session. Review all scripts and forms provided prior to participant sessions so you are familiar with them. Test staff must use the provided session evaluation checklist to record data and observational evidence during all tasks and also as a guide when making observations.

After each test (and before beginning this test protocol with the next participant), follow the description in Step 2 to return the system to a "packed" starting state.

During testing, test staff minimize their interaction with participants to maintain the objectivity of the test. Only specific interactions are allowed such as those required to get them started or to deliver required instructions.

Sufficient number of sessions

The test should be performed until 8 valid sessions (each having a participant team) have been performed. Note that a valid session is one in which participants follow the instructions given and testers adhere to the test protocol as specified. If, however, the entire pool of backup participants has been applied and the desired total valid sessions has not yet been reached, the protocol must be abandoned as invalid and rerun at a later time with a new set of participants.

If a participant team does not arrive as planned or does not follow instructions, their session may be terminated. In such cases, contact and test the respective backup participant team as a replacement.

Overview of the session

To begin each session, the test staff escorts the participant team to the voting system and gives them instructions, following the script in **Appendix E** and using the task scenarios in **Appendix F**

In the session, participants provide poll worker support to an entire "mock election" by performing a series of typical poll worker tasks, following the documentation. The tasks include:

- opening the polls
- conducting polling
- closing the polls

For each task, they must locate and follow instructions from the documentation. Test staff will observe their activities while recording data and observational evidence.

Once the session ends - either due to successful completion of all tasks or to non-completion of any task - the participant team is given a debriefing survey and is compensated for their participation.

Step 3.3 – Collect data during the test session

Use the session evaluation checklist in **Appendix G** to decide whether or not each participant team has successfully completed a task.

1. Before the test begins, review the checklist. Be sure you understand the Evidence and Criteria on the left and the task end states across the bottom (the shaded area on the form).
2. As participants work on tasks, keep the evidence and criteria in mind.
3. When participants have completed a task or were unable to complete a task and have stopped, mark the Yes checkboxes for the task if the criteria have been met; mark the No checkboxes if the criteria have not been met.

4. Make a final determination for the task. Does the voting system support poll workers in this task or not?
5. **If participants were unable to complete the task according to the end state for the task**, the voting system fails and the test ends. Do not go on to the next task.
6. **If participants were able to complete the task according to the end state**, participants go on to the next task.

Collecting timing data during testing

The data logger is responsible for timing the first task. The first task is timed because a fixed amount of time (on average, about an hour) is usually scheduled for opening the polls in a real election.

Timing begins when the participants finish reading the task scenario and start performing the task. Once the participant team has completed the poll worker task and have indicated this verbally, the data logger will record the elapsed time on the session evaluation checklist.

During task performance, starting and stopping times are recorded as well as whether or not the participant team could complete a given task using only the documentation provided.

A time limit of 60 minutes is placed on the first task (Opening the polls),. If a participant team cannot complete a given task within that time their session will be terminated, at which time they will be thanked and compensated.

Tip

✓ All records and test data (whether created by the voting system or by the test staff) should be stored safely and privately for future reference. The purpose is twofold: first to protect participant privacy, and second to allow any questions about the test results to be resolved based on direct evidence.

Step 4: Analysis and reporting

Analysis and reporting the usability test with poll workers includes 2 steps:

1. Analyze data
2. Report system results

Step 4.1 – Analyze data

A pass/fail determination is made for the voting system being tested, based upon the number of participant teams who complete each of the three tasks (opening the polls, conducting polling, and closing the polls).

Throughout, successful task completion means that the team completed each task and ended with the voting system in the correct state within the time allotted for that task, and without external assistance (such as coaching from the test administrator).

The system fails if there was any task that more than half the participant teams did not complete because:

- System messages were difficult to understand or follow.
- The documentation was too technically complex.
- The documentation is not presented in a format suitable for the polling place.

It is important that the team not only complete the task at hand, but recognize that it has done so.

- The system passes if for each of the tasks, at least half the participant teams completed the task and then confirmed that completion to the test administrator

As the tester observes the teams completing each task, it should be evident that the documentation is actually helping them to do so.

The system fails if there was any task that more than half the participant teams did not complete because:

- The system (instructions and documentation) failed to provide clear and sufficient guidance
- The overall system operation is excessively difficult, complex, or error-prone.

Step 4.2 – Report system results

The report should be prepared using the Common Industry Format (CIF) for Voting Sytems template.

The report should include:

- Identification (make and model) of the voting system being tested
- Results of each pass/fail assertion evaluated (both for the expert inspection/review as well as the test)