NIST
**National Institute of
Standards and Technology**
U.S. Department of Commerce

VVSG 2.0 draft requirements:
Improving the accessibility and usability of voting systems

Part 1: Introducing the human factors requirements

The National Institute of Standards and Technology and the Center for Civic Design, hosted by the Center for Technology and Civic Life

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Hello, there!

Sharon Laskowski
NIST
sharon.laskowski@nist.gov

Whitney Quesenbery
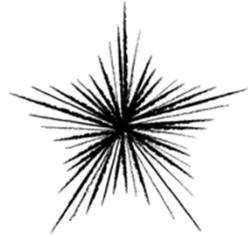Center for Civic Design
whitney@civicdesign.org

Kurt Sampsel
Center for Technology and Civic Life
kurt@techandciviclife.org

National Institute of Standards and Technology
U.S. Department of Commerce

The 2002 Help America Vote Act has given NIST a key role in helping to realize nationwide improvements in voting systems, including assisting the Election Assistance Commission with the development of voluntary voting system guidelines.

vote.nist.gov

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The Center for Technology and Civic Life

Using technology to improve how local government and communities interact

@helloCTCL
www.techandciviclife.org

The Center for Civic Design

Democracy is a design problem! We work to ensure voter intent through design.

@CivicDesign

www.civicdesign.org
civicdesign.org/projects/roadmap/

Housekeeping

- Use chat to communicate
- Update your screen name
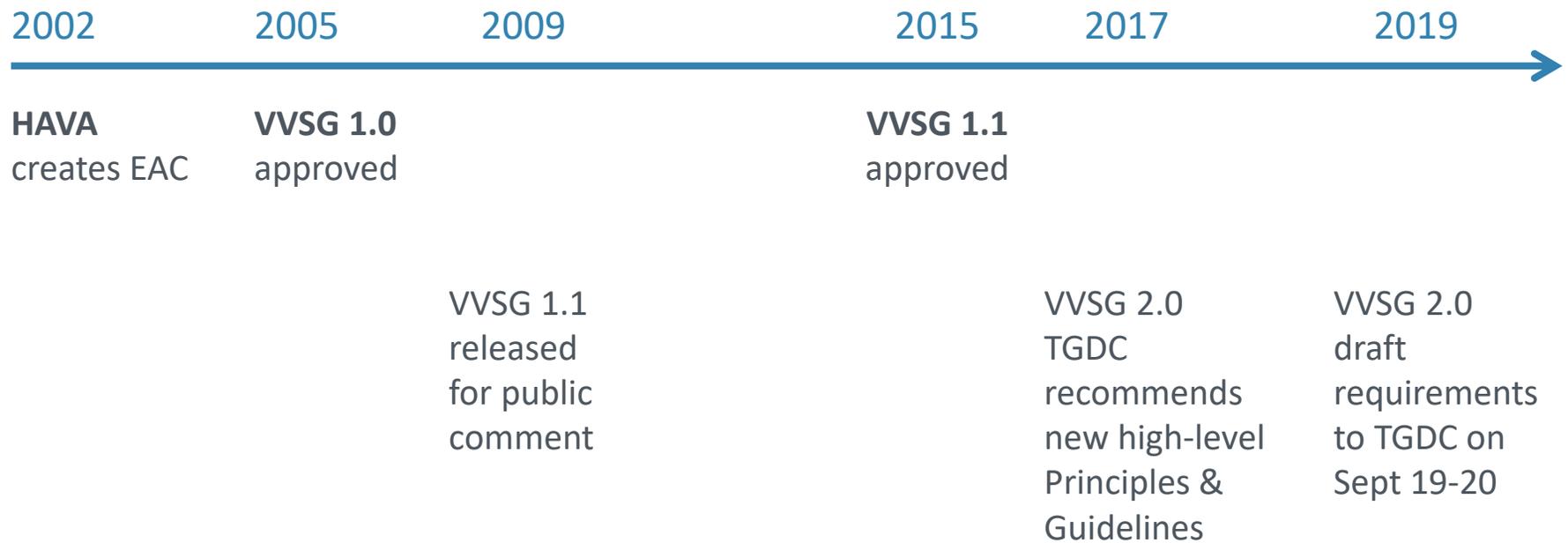- Mute your audio if you aren't speaking

About the Voluntary Voting System Guidelines (VVSG)

The Help America Vote Act (HAVA) directs the Election Assistance Commission to create voting system guidelines and defines the process.

How the draft requirements are developed

- Recommendations drafted by the NIST Voting Project team as directed and approved by the Technical Guidelines Development Committee (TGDC).

- The Election Assistance Commission (EAC) reviews the draft, consults with its boards, and collects public comments, and can update before approving.

- For VVSG 2.0, NIST Public Working Groups added input from government, election officials, product developers, vendors, academic researchers, and advocates.

- The **Human Factors Public Working Group** focused on guidance for accessibility and usability, and consideration of these across all requirements.

Timeline of the VVSG development

2002	2005	2009	2015	2017	2019
HAVA creates EAC	**VVSG 1.0** approved		**VVSG 1.1** approved		
		VVSG 1.1 released for public comment		VVSG 2.0 TGDC recommends new high-level Principles & Guidelines	VVSG 2.0 draft requirements to TGDC on Sept 19-20

HAVA includes basic requirements for accessibility

HAVA includes requirements that voting systems:

- **Are accessible for individuals with disabilities** with same opportunity for participation (including **privacy and independence**) as other voters.

- Provide voters an opportunity to **verify their choices**, and **change the ballot** or **correct any error** before the ballot is cast and counted, in a **private and independent** manner.

- Provide **alternative language accessibility** pursuant to Section 203 of the Voting Rights Act.

Section 301 (3) and (4)

What we will cover in this webinar

Part 1: Introducing the human factors requirements to improve the accessibility and usability of voting systems.

- How VVSG 2.0 and the requirements are organized

- How the requirements were developed using an evidence-based process

- Overview of the human factors principles and the key concepts in the requirements

What we will cover in the next webinar

Part 2: Updates to best practices and new technologies for voting systems

- Examples of new or updated requirements
- How the new requirements will improve the accessibility and usability of voting systems

VVSG 2.0 is a fresh start

Organizes the technical requirements into
15 principles for good elections

VVSG 2.0 - Principles

1: High quality design

2: High quality implementation

3: Transparent

4: Interoperable

5: Equivalent and consistent voter access

6: Voter privacy

7: Marked, verified, and cast as intended

8: Robust, safe, usable, and accessible

9: Auditable

10: Ballot secrecy

11: Access control

12: Physical security

13: Data protection

14: System integrity

15: Detection and monitoring

VVSG 2.0 Principles for accessibility and usability

1: High quality design

2: High quality implementation

3: Transparent

4: Interoperable

5: Equivalent and consistent voter access

6: Voter privacy

7: Marked, verified, and cast as intended

8: Robust, safe, usable, and accessible

9: Auditable

10: Ballot secrecy

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How the principles and requirements work together

The **principles (and guidelines)** are high level goals for a voting system.

The detailed **technical requirements** are specific, testable ways to meet the goals of the principles.

Goals for the accessibility and usability updates

- Address issues that voters still encounter with accessible voting systems

- Catch up to current best practices in election systems

- Catch up to best practices in user interface design and usability

- Cover new technologies now in common use

- Match updated laws and standards

- Write clear, testable requirements

A universal design approach

Designing a product or service so that it can be accessed, understood and used to the greatest extent possible by all people regardless of their age, size, ability or disability

Principles of Universal Design
Center for Universal Design at North Carolina State University

Clear relationship to other laws and standards

- **Election laws**

  Help America Vote Act, Voting Rights Act

- **Disability laws**

  ADA, Access Board ICT Standards "Section 508" and W3C Web Content Accessibility Guidelines (WCAG 2.1), Assistive Technology Act

- **Technical standards and guidance**

  FCC Hearing Aid Standard, ISO Software Quality Requirements and Evaluation standards, FDA process requirements, NIST research reports

Requirements written in plain language

Number and title

Normative text

Discussion

Metadata

  References

  VVSG source

  Scope

8.1-B – Flashing

If the voting system emits lights in flashes, there must be no more than three flashes in any one-second period.

Discussion

This requirement has been updated to meet WCAG 2.0 and Section 508 software design issue standards, see:

- WCAG 2.0 requirements for flickering and flashing
- Section 508 requirements for flicker and flash

External references:	WCAG 2.0/Section 508
Prior VVSG sources:	VVSG 1.1 - 3.2.5.a.i
Applies to:	Electronic interfaces

An evidence-based process

The NIST Public Working Groups let us gather input from researchers, advocates, vendors and election officials

Getting from VVSG 1.1 to the draft VVSG 2.0

- **Reorganize the requirements into principles**
  A bottom-up look at how the requirements fit into the new structure

- **Gap analysis**
  Bi-weekly Human Factors Public Working Group discussions looked for gaps where voter needs were not met

- **Research guidance**
  Looked at new research literature and current practices

- **Draft and review**
  Continued public discussions to review and refine the requirements

Research guidance took a deep dive into key topics

Interaction details

- Text size and contrast
- Plain language
- Scrolling on a ballot
- Navigation from the review screen
- Navigation issues for long contests
- Remote accessible ballot marking
- Ballot verification

Landscape analysis

- Emerging assistive technologies that might be used in a polling place
- Reports and recommendations from the Accessible Voting Technology projects
- Election accessibility issue reports

Overview of the human factors principles

Most requirements for usability and accessibility are in Principles 5 - 8

Principle 5
Equivalent and Consistent Voter Access

All voters can access and use the voting system regardless of their abilities, without discrimination.

- Voters have a consistent experience throughout the voting process within any method of voting.
- Voters receive equivalent information and options in all modes of voting.

Modes of voting

Principle 5 defines the presentation and interaction modes needed for accessibility

Presentation modes

- Visual
- Enhanced visual (text size and contrast)
- Audio

Interaction modes

- Touch
- Tactile controls
- Non-manual access

Principle 6
Voter Privacy

Voters can mark, verify, and cast their ballot privately and independently.

- The voting process preserves the privacy of the voter's interaction with the ballot, modes of voting, and vote selections.

- Voters can mark, verify and cast their ballot or other associated cast vote record, without assistance from others.

Voter privacy vs ballot secrecy

Principle 6 meets HAVA requirements for independent and private voting. Voter privacy is separated from ballot secrecy (covered in Principle 10)

Voter privacy

Privacy during voting including a voter's interaction with the ballot, modes of voting, and selections

Includes the ability to mark, verify, and cast a ballot without assistance

Ballot secrecy

Preventing links between a voter and a ballot after the ballot has been cast to prevent identifying how someone voted

Principle 7
MARKED, VERIFIED, AND CAST AS INTENDED

Ballots and vote selections are presented in a perceivable, operable, and understandable way and can be marked, verified, and cast by all voters.

- The default voting system settings present a ballot usable for the widest range of voters, and voters can adjust settings and preferences to meet their needs.

- Voters and election workers can use all controls accurately, and voters have direct control of all ballot changes and selections.

- Voters can understand all information as it is presented, including instructions, messages from the system, and error messages.

POUR Principles

Principle 7 is organized to match the principles of the Web Content Accessibility Guidelines (WCAG)

Perceivable

Operable

Understandable

Robust (covered in Principle 8)

Principle 8
ROBUST, SAFE, USABLE, AND ACCESSIBLE

The voting system and voting processes provide a robust, safe, usable, and accessible experience.

- The voting system's hardware, software, and accessories are robust and do not expose users to harmful conditions.
- The voting system meets currently accepted federal standards for accessibility.
- The voting system is evaluated with a wide range of representative voters, including those with and without disabilities, for effectiveness, efficiency, and satisfaction.
- The voting system is evaluated for usability for election workers.

Principle 2
HIGH QUALITY IMPLEMENTATION

The voting system is implemented using high quality best practices.

- 2.2 - The voting system is implemented using best practice user-centered design methods that consider a wide range of representative voters, including those with and without disabilities, and election workers.

Usability testing and user-centered design

Principle 8 and Principle 2.2 require a process and specific approaches to usability testing voting systems including:

- What aspects of the system must be tested
- Who is included in the testing
- When testing takes place
- How the results of any usability test are reported
- How the overall user-centered design process is reported

Usability

The effectiveness, efficiency and satisfaction with which specified users achieve specified goals in particular environments.

Definition from an international standard
ISO 9241

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Accessibility

The extent to which products, systems, service, environments and facilities can be used by people from a population with the widest range of characteristics and capabilities to achieve a specified goal in a specified context of use.

Definition from an international standard
ISO 9241

Usability testing with voters and election workers

The usability tests required in Principle 8.3 and 8.4 are final checks to be sure that the voting system can be used to complete typical tasks

For voters

- Completing an entire voting session including activation, marking, review and verification, and casting the ballot

- Includes accessible voting for people with disabilities

For election workers

- Opening the polls

- Conducting polling including all accessibility features

- Closing the polls

Voting systems must be tested with a wide audience

The VVSG specifies that voting systems need to be usable by the following groups:

- Voters in the general population, using the visual interface
- Voters who speak a system-supported language as their primary language
- Voters who are blind, using the audio-tactile interface
- Voters with low vision, using the enhanced visual features with or without audio
- Voters with low dexterity, using the visual-tactile or non-manual interface

Usability testing is done by the system vendor

Vendors arrange for usability testing and include the report in their materials for certification testing.

Guidance on how to conduct and report on this usability testing includes

- An outline of the process of running a test

- Guidance on working with voters with disabilities

- Sample forms and other materials

- A standard template for reporting, the CIF for Voting Systems, a modified version of the Common Industry Format in ISO/IEC 25602

User-centered design (UCD)

A way of building systems focused on meeting users' own goals. UCD includes activities and methods for discovering what users need, and what meets those needs.

Definition from an international standard
ISO 9241

User-centered design is a process

A good user-centered design process includes different methods, conducted at each phase of a voting system's development.

Early in the design/ development	**As the system is developed**	**Final evaluation to confirm final design**
Conducting research to understand what voters need, including preferences and constraints for accessible voting	**Evaluating** the design by trying out early versions and making changes to better support voters and election workers	**Usability testing** the complete system to be sure all the parts work together before certification testing

UCD includes a variety of methods for different goals

Goal	Related methods		
Develop requirements and understand user needs	**Observation** of current or potential people using existing voting systems	**Interviews** with election administrators or voters	**Surveys** of existing customers about how they use their current systems
Validate initial feature ideas and prototypes	**Usability testing** of rough prototypes with a small group	**Exploring new ideas** after testing	
Identify usability problems in features under development	**Usability testing** of in-development software, focusing on particular features	**Inspection** of near-completed features by experts for common usability issues	
Establish evidence of finished system usability	**Usability testing** with a diverse set of potential users	**Survey**s of people using the new system to identify usability issues discovered in the wild	

UCD is documented with a report of the process

The report includes:

- Timeline of activities and methods used.

- Participants included in the activities, including their role and any voters with disabilities included.

- Detail on the activity and VVSG Principles covered.

- Summary of the results of the activity: what was learned that was incorporated into the voting system implementation.

The goal

Voting systems that meet the human factors principles in the VVSG and are designed, implemented, and evaluated using best practices for user-centered design, usability, and accessibility.

The next webinar looks at what's new

Part 2: Updates to best practices and new technologies for voting systems

- Example of new or updated requirements
- How the new requirements will improve the accessibility and usability of voting systems

Group discussion questions

What resonated with you today?

What did we cover that you have questions about?

Is there some thing we didn't discuss today that you're curious about?

Resources

Human Factors Public Working Group
https://collaborate.nist.gov/voting/bin/view/Voting/HumanFactors

VVSG 2.0 Draft Requirements
https://collaborate.nist.gov/voting/bin/view/Voting/VVSG20DraftRequirements

NIST and the Help America Vote Act
https://vote.nist.gov

A Roadmap for Usability and Accessibility of Elections
https://civicdesign.org/projects/roadmap/

Find these webinars online?

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We will post the webinars when they are captioned and approved by NIST