Usability & accessibility of next generation elections

NIST Roadmap

Notes from the October 8-9, 2014 workshop

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A preliminary report on the workshop, Oct. 8-9, 2014

This was the first of two workshops in a process to create a roadmap for developing usability and accessibility guidance, best practices, and standards for next generation voting systems that will help election officials, manufacturers, and other stakeholders to ensure that all voters can vote independently and privately.

The roadmap, when completed, will outline steps needed to produce this guidance for election officials, manufacturers, and other stakeholders. It will identify issues, gaps, new technology, and processes, how to develop guidance, as well as relevant research and best practices that can be used to improve voting systems given next generation technology.

In this first workshop, we:

- Explored uses of current and future technology in elections,
- Identified gaps in the research, and
- Brainstormed new ideas to develop useful guidance.

The goal of these activities was to identify the topics that new guidance must consider and explore the issues that shape current thought on these topics.

Workshop participants

- Andrew Baranak, GTRI
- David Bjerke, Falls Church, VA
- Stephen Blosser, MSU RCPD
- Steven Booth, NFB
- Mike Byrne Rice University
- McDermott Coutts, Unisyn Voting Solutions
- Jim Dickson Nat'l Council on Ind. Living
- Jeremy Epstein, NSF
- Josh Franklin, NIST
- Bob Giles NJ Division of Elections
- Thomas Hicks, House Admin. Committee
- Merle King, Kennesaw Center for Election Systems
- Ben Long, NIST
- Christy McCormick U.S. DOJ
- Alysoun McLaughlin, Montgomery County, MD
- Whitney May, ELECTricity
- Tammy Patrick, Bipartisan Policy Committee
- Sarah Swierenga MSU UARC

- EAC
  - Megan Dillon
  - Monica Evans
  - Brian Hancock
  - Patrick Leahy
  - Alice Miller
  - Jessica Myers
  - Robin Sargent
  - Brian Whitener

- University of Baltimore GAs
  - Jaime Lee
  - Kathryn Locke
  - Emily Rhodes
  - Caitlin Rinn
  - Joel Stevenson

Background

NIST has worked on voting system standards since the Help America Vote Act of 2002, both establishing requirements for certification test labs and creating the Voluntary Voting System Guidelines (VVSG). The VVSG 2005 included the first comprehensive usability and accessibility standards for voting systems.

Elections are changing. There are new technologies, new research, new laws, and new elections procedures since the 2005 Voluntary Voting System Guidelines 1.0 were published. Keeping up with these changes requires a new approach to usability and accessibility guidance for election systems.

Recent years have brought changes to the state of the art and technology for voting systems, as well as public expectations about how voters will participate in elections.

Background (2)

Despite 12 years of work within elections on standards for usability and accessibility, the reality is that there are still many barriers.

Even newer systems show poor accessibility and usability, suggesting lack of knowledge of best practices and existing standards and guidelines. This is true of both voting systems and related technology.

As more jurisdictions have switched to paper ballots, there is even more isolation of the "accessible" voting system.

- The accessible systems may go unused through the entire day, further reducing the likelihood that they will be set up and ready to use.
- Systems for UOCAVA voters under the MOVE Act allow for online ballot marking. Disability rights groups advocate for making these systems available to voters with disabilities (or all voters). Security experts point out many pitfalls.

What is a roadmap?

A NIST roadmap is an outline for future work.

A roadmap:

- Identifies gaps in knowledge to be filled
- Identifies issues to be resolved
- Looks at technology, processes, standards & guidelines
- Recommend approaches to the work

It does not:

- Prescribe solutions
- Recommend specific guidelines
- Rather, it shows how to structure work to accomplish the goals

This roadmap will cover future guidance to ensure the usability and accessibility of election systems.

Possible goals for the roadmap

Increase the level of knowledge for how to design, develop, deploy, and use of usable and accessible elections systems.

- Promote consistent levels of usability and accessibility across technology in all parts of the elections process.

Make systems more usable for everyone in the elections process, including voters, poll workers, elections staff, and third-parties like election interest and advocacy groups or technology developers.

Shift from single focus on standards and certification to identifying the appropriate guidance and how to implement the guidance, including:

- Guidelines for best practices
- Procedural support
- Training

About the workshop

The group started from this focus question:

What will the voter experience of elections be like in the future?

Through a KJ* activity, the group identified 4 priority areas for breakout topics:

- **Convenience voting and "Vote Anywhere"**
- **Accessibility and universal usability**
- **Trust, security and verification**
- **Design and evaluation of the user interface**

The groups rotated through the breakout topics during the first afternoon.

* See *How to KJ: Setting Priorities Quickly* http://uxpamagazine.org/how-to-kj/

About the workshop (2)

The discussions of the focus topics identified:

- Current and possible future scenarios for usable and accessible elections
- Conditions required for these scenarios for future elections
- Strategies for supporting voters in navigating across the voter journey
- Conditions, challenges, or limits that could constrain these scenarios

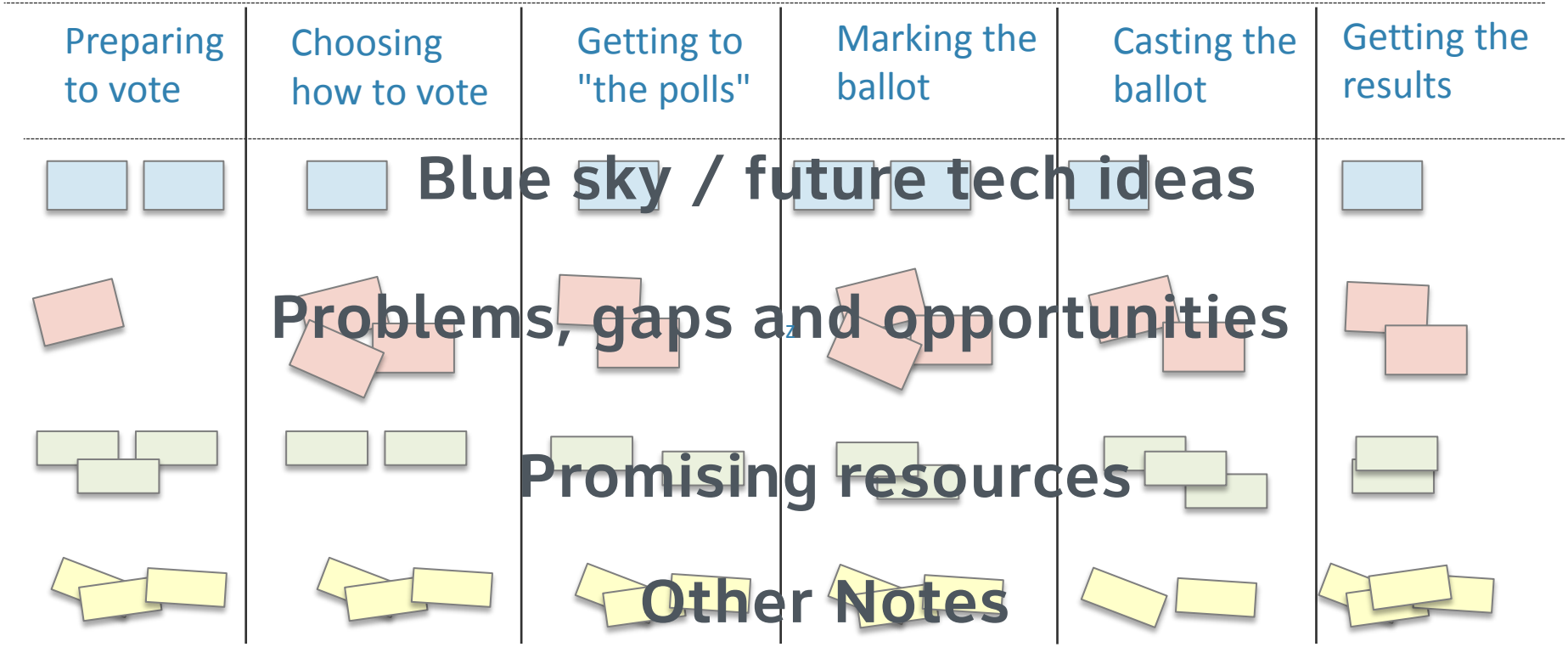
This resulted in higher quality notes than just listing issues in each category. However, it can also be hard to capture free-ranging discussion, so the outcomes of these discussions are really **input to a more structured discussion in the second workshop.**

The voter journey (1)

As the group worked on the 4 priority topics, we used portraits of voters (called 'personas') as a reminder of the range of people who use election systems.

We also looked at the user experience across the entire process of voting, not just marking and casting a ballot. The goal was to be able to think about the context in which the systems are used, not just the equipment.

A simple timeline helped organized the notes by both stages in the voter journey and type of notes.



The voter journey (2)

The election process and voter journey is a useful organizing principle, to ensure that the scope is grounded in the voter's process rather than specific technology.

- Elections are a service design, requiring coordination of people, procedures, policy, information, and systems.
- The voter journey includes learning and making choices as well as the core activities of participation.
- There is a wide array of technology systems in use. They include specialized systems, systems used throughout the journey, and general systems used as part of elections
- Technology and procedures are used in the context of the voter journey. Guidance for them must take context into account.
- Inclusion of a process or technology on the voter journey map does not mean that NIST or the EAC will automatically write standards for it.

The next slide shows a summary of the notes collected on the journey map during the workshop.

The Voter Journey

Preparing to vote	Choosing how to vote	Checking in/ getting ballot	Marking the ballot	Casting the ballot	Verification & results
Blue Sky Ideas					
Elections know me Use the cloud Virtual voter representative the "knows" voter configuration	SMS and texting for voting Vote from home Vote on a smartphone Vote on home PC Build in "negotiation" vs. using personalized config and PII Preferences for voters match to choices (OK Cupid)	UberVote (car service) Absentee voters can vote anywhere Pushing ballot to people the way they want Online ballot marking tool and backup support	Designed and built by states and voting jurisdictions A well-designed ballot should be shared via internet or by NIST Photos of candidates on ballots Common interactions patterns layout template (so good, you'd be foolish not to use it) A pilot project with small elections would usability test a ballot design Ballot designed to work on standard computers	Paper based system then PDF'd and goes to the cloud Take picture of your ballot and mail or upload it Audio version of the ballot	One "time zone" for elections
Other Notes					
Voters need the ability to "rehearse" to prepare Identify preferences, not abilities Personal settings "card"		My details have changed - how to update Bringing voting (iPad) tech to you	Ballot marking saves $? Support phone lines for voters Marking/reading anywhere give syou time Online ballot marking prevents error	All systems must be subject to the same standards - not like current double-standard for paper and DRE Minimum standards vs. goals	Votes don't get announced until a specific time

Overall Thoughts

Plain language

Universal ID

Universal WIFI for all devices

Your choice is your choice, regardless of disability

The Voter Journey (continued)

	Preparing to vote	Choosing how to vote	Checking in/ getting ballot	Marking the ballot	Casting the ballot	Verification & results
Problems						
		Coercion How to deploy ballots on many devices I don't have a smartphone Current laws do not allow for voting anywhere Big brother issues, including PII that might help voters Options can be a burden	USPS not reliable Long wait times degrade trust and confidence	Changing for different abilities, aging - like vision Supporting voters with invisible disabilities How to print out forms from online One system for everyone? How to match the right person to the right ballot	QR codes scare people - can we make the machine read real text Technology is a problem not a full solution Poll workers and procedural security Racial and social issues with pictures on ballots Voters not educated enough, lack of access in general Trust in the system to count as cast Trust in poll workers until something goes wrong	Trust that the outcomes are as voters voted Tasks for voter self-audie in conflict with tools for preserving privacy/vote selling Compromising privacy if auditing Many kinds of voters
Overall Thoughts	Time Voting systems can't touch internet Costs: universal design is expensive to implement					
Other Notes						
	Voters need the ability to "rehearse" to prepare Identify preferences, not abilities Personal settings "card"		My details have changed - how to update Bringing voting (iPad) tech to you	Ballot marking saves $? Support phone lines for voters Marking/reading anywhere give syou time Online ballot marking prevents error	All systems must be subject to the same standards - not like current double-standard for paper and DRE Minimum standards vs. goals	Votes don't get announced until a specific time

The Voter Journey (technology)

Preparing to vote	Choosing how to vote	Checking in/ getting ballot	Marking the ballot	Casting the ballot	Verification & results
Official Elections Web Sites and Social Media (Local and State)					
Eligibility info Sample ballots/voter ballot info	How to vote info Hours and dates Voting locations Accessibiity info Language info	Voter ID requirements Ballot delivery options	Marking instructions	cCasting instructions	Election results
Online voter registration 'My Voter' portals	Polling place lookup VBM request	Blank ballot access and delivery	Online ballot marking tools	Ballot printing and return tool	Interactive data E2E verification
Technology in the Polling Place					
		Pollbooks Ballot activators	Ballot marking tools Ballot readers Ballot printers Phone/Voice Assistive technology	Electronic ballot casting Ballot scanners Ballot readers for review	
Voter's Technology					
Computer/Mobile Social Media	Computer/Mobile Social Media	Computer/Mobile Passbook/Wallet (ID) GPS	Computer/Mobile Input/Output AT	Input/Output AT	Computer/Mobile Social Media
Other Organizations (Campaigns, Advocates, Good Government...)					
Third party registration apps VIP-type information app	Apps built on public information	?? Blank ballot access and delivery ??	?? Online ballot marking tools ?? Personal AT	Support tools for returning ballots Personal AT	Citizen ballot review E2E verification

Resources identified in the workshop

- **EML or Common Data Format** – allows multiple devices to share election data. Critical for component architectures.
- **QR codes, NFC, Hollarith grids, or other tokens** – ways to transport ballot choices efficiently and privately
- **GPII or other preferences manager** – allows system to match needs and preferences to options available.
- **Identification:** Biometrics (eyescan, fingerprint) or a secure national ID (like miltary CAC), two factor authentication, Disney Fast Pass
- **Other certification programs:** FDA, slot machines, banking audits
- **Related working groups:** NASED, Bipartisan Policy Center, State certification group, FVAP, EAC
- **Research centers** at Rice, MIT, Caltech, Georgia Tech, MSU, U. Baltimore, GPII
- **Election initiatives:** Humboldt County ballot project, VSAP, Star Vote, risk limiting audits

Blue sky? Or fundamentals?

Many of the blue sky ideas are based on some fundamental concepts. All of them are in use in some current context – the "blue sky" part of the idea is how to apply them to elections effectively and consistently.

- Vote anywhere, with options for casting
- Well-designed ballot (and other) – so good, you'd be foolish not to use it
- More use of COTS
  - In voting systems
  - Enabling use of voters' own systems
- A way to transfer information easily between parts of the system, different devices, and person technology
- Universal ID
- Easy personalization – either quickly set up, or recognized from ID/token
- Plain language

The Voter Journey (a possible structure)

	Preparing to vote	Choosing how to vote	Checking in/ getting ballot	Marking the ballot	Casting the ballot	Verification & results
Learn	What is on the ballot?	Where do I go to vote				Who won?
	Am I/How do I register?	What are my choices?	How do I get my ballot	How do I mark as I intend?	How do I cast my ballot?	Did my vote count?
Do		Access to 'Polling Place'	Receive 'ballot'	Mark the ballot	Review the ballot	See election results
	Register to vote	Request a VBM (or other)	Authenticate/Sign In	Activate or open the ballot	Cast the ballot	Verify ballot was received
Use	Registration Forms/OVR	Online VBM SYstem	Pollbook or Sign-in	Pre-Marked Ballot	Mail Ballot Return	E2E Verification System
	"My Voter" Portals	"My Voter" Portals	Ballot Delivery System	Ballot Marking System	Electronic Casting	VBM/Ballot Tracking
	Elections Web/Phone	Elections Web/Phone	Transportation to Polls	Ballot	Ballot Scanner	Elections Web/Phone
People	Registrar	Elections office	Poll workers	Poll workers	Poll workers	Elections office
Policy	Voter Ed	Voting Options	Voter ID	Sample Ballots	Counting Rules	Ballot Access
	Eligibility	Hours/Places	Provisional	Helper Rules	Helper Rules	Canvass

Notes on the priority topic discussions

Trust, security and verification

Convenience in voting and "Vote Anywhere"

Accessibility and universal usability

Design and evaluation of the user interface

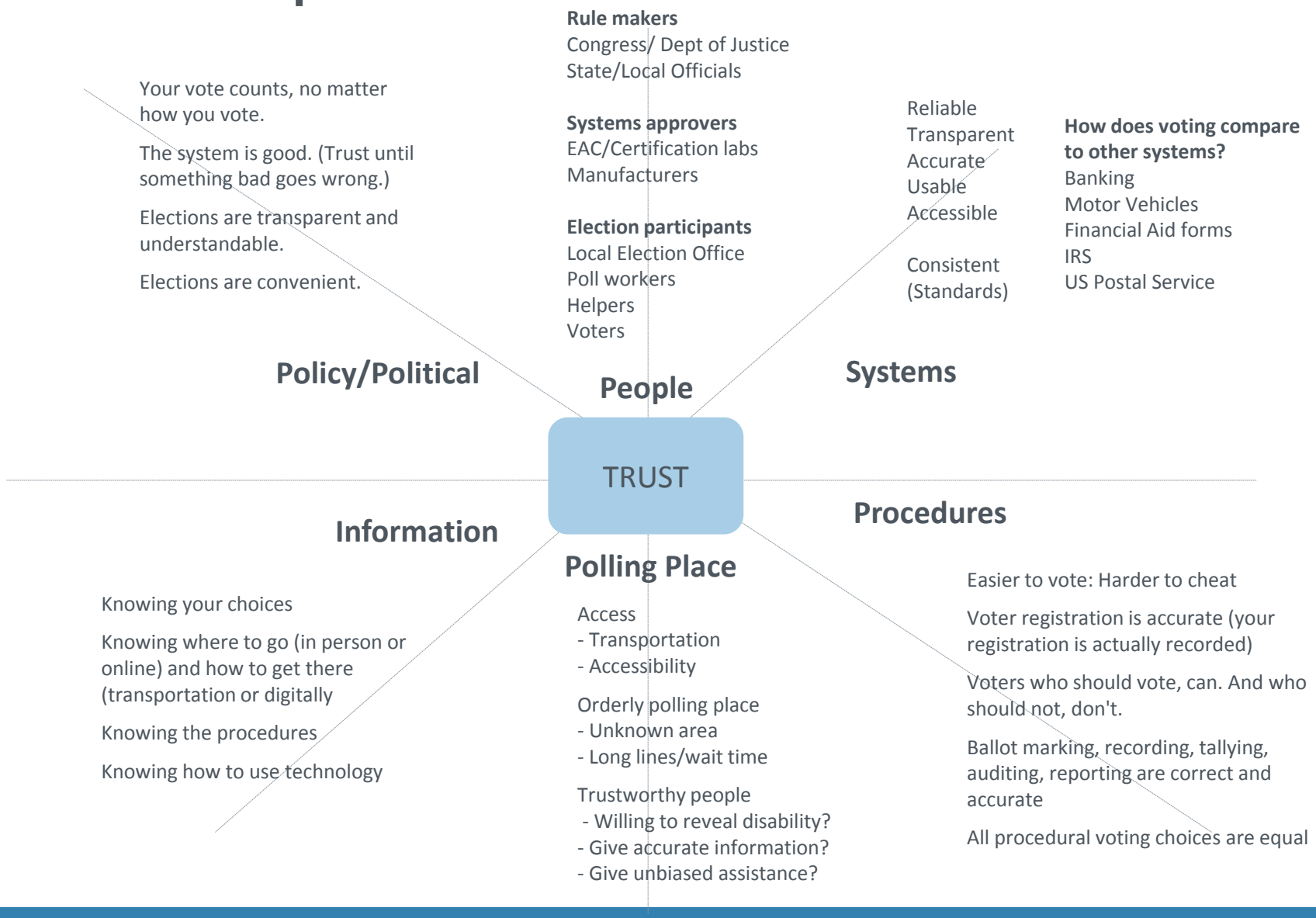
Trust, security, and verification

Priority topic: Trust, security, and verification

The discussion of trust, security, and verification mapped trust as an element in elections:

- People
- Procedures and processes
- Systems
- Policy and political issues
- Polling places (and voting outside of them)
- Information

Trust is based on each individual's perception of the overall process



Trust in the Voter Journey

Preparing to vote	Choosing how to vote	Checking in/ getting ballot	Marking the ballot	Casting the ballot	Verification & results
Voter registration – was it actually completed? Is the information official?	All choices are equal and votes count equally Vote centers are backup for VoteByMail Can I track my VBM ballot?	Authentication: • Trust in who is voting • Trust those who sholdn't vote, don't Signature verifiation is fundamental to current laws & procedures Election officials trust in voters Challenges: - Unknown area - Long lines - Wait time - Lack of information - Use of tech/Internet	Is it trustworthy? Does it do what it is supposed to do? Does it break down? Is the ballot accurate and complete? Do trends ike vote early, then change our minds suggest giving up privacy?	Will my vote be cast as I intend? Will it be counted as cast? Which ballot counts? (Last? First?)	Recording is complete Tally procedures are good. Auditing/reporting is correct
Blue Sky Ideas and Resources					
		Identity: Witnesses for vouching for identity	Live pilots for testing as part of certification – see it in use. Eliminate the secret ballot	Use COTS scanning devices (like grocery scanner) Voting equivalent to direct deposit.	Every ballot gets scanned to the cloud: Humboldt project Risk limiting audits

Questions to answer for better trust

How do we decide which systems or people to trust, and who has to trust them?

- Every trust change ends with a human being.
- Small problems add up to decreased trust.

How do we improve trust in the political and social aspecsts of elections?

- What part do election procedures play in trusting elections.

Is privacy sacred?

- Are we moving towards eliminating the secret ballot?
- Many online options are difficult because of the identifiation issue

How do we deal with security problems?

- There are time boundaries in elections when issues can be addressed.
- Elections rarely allow a "do-over."

Convenience in voting

Priority topic: Convenience in voting

The discussion of convenience in voting and the ability to "vote anywhere" covered a wide range of issues, and what "convenience" means in this context.

One answer was to allow more personal choice, including:

- When to vote
- Where to vote
- What systems or assistance to use

Voting should be the most convenient government service as voting is a right and not just a privilege.

Voters with disabilities use "convenience voting" options more than the general population. These options include:

- Early voting centers
- Mobile early voting vans
- Vote by mail and online ballot marking

More convenient voting can expand and improve procedures and equipment already in use

- Allow use of personal technology to mark ballots
- Allow more flexibility in where and how to vote
- Use online tools to mark and cast ballots

Convenience in the Voter Journey

Preparing to vote	Choosing how to vote	Checking in/ getting ballot	Marking the ballot	Casting the ballot	Verification & results
Expand and improve procedures and systems already in use					
Improve voters' access to resources and information: • Hours, dates, locations • Information about candidates and measures • Finding the closest polling place.	Allow for multiple ways to vote (remote and in-person) to accommodate personal preferences and needs	Allow voting at any polling place (near work, near hoem, etc) Bring the polling place to those who can't get there • Long term care facilities • Shut-ins • Disasters	Have voting systems support all types of personal assistive technology. Allow voters to use their own systems at the polling place Allow voters to mark their ballot online	Improve convenience through technolgy • Scan a QR code or other token on a pre-marked ballot • Upload a picture of a marked ballot from a smart phone	
Blue Sky Ideas					
SMS-based voter information for basics like election dates, hours, polling place and early voting locations Interactive app that uses voice search (like Siri) to let voters ask for information about their ballot of how to vote		"Uber Vote" – a car service that could bring you to the polling place This service could also extend curb-side voting to longer distances. Polling place child care Biometics (eyescan, fingerprint) for voter identification GPII or other ID that carries setup preferences	Voter Support Lines to help if those who have difficulty marking/casting a ballot online. Vote by Phone to allow voters to vote anywhere at any time. Vote via SMS – support voters who don't have smartphones.		

Tensions to resolve in increased convenience

How do we increase convenience without sacrificing the voter's privacy or security?

- Remote voting may not be private, or may be coerced.
- Serious security concerns for casting a ballot online.

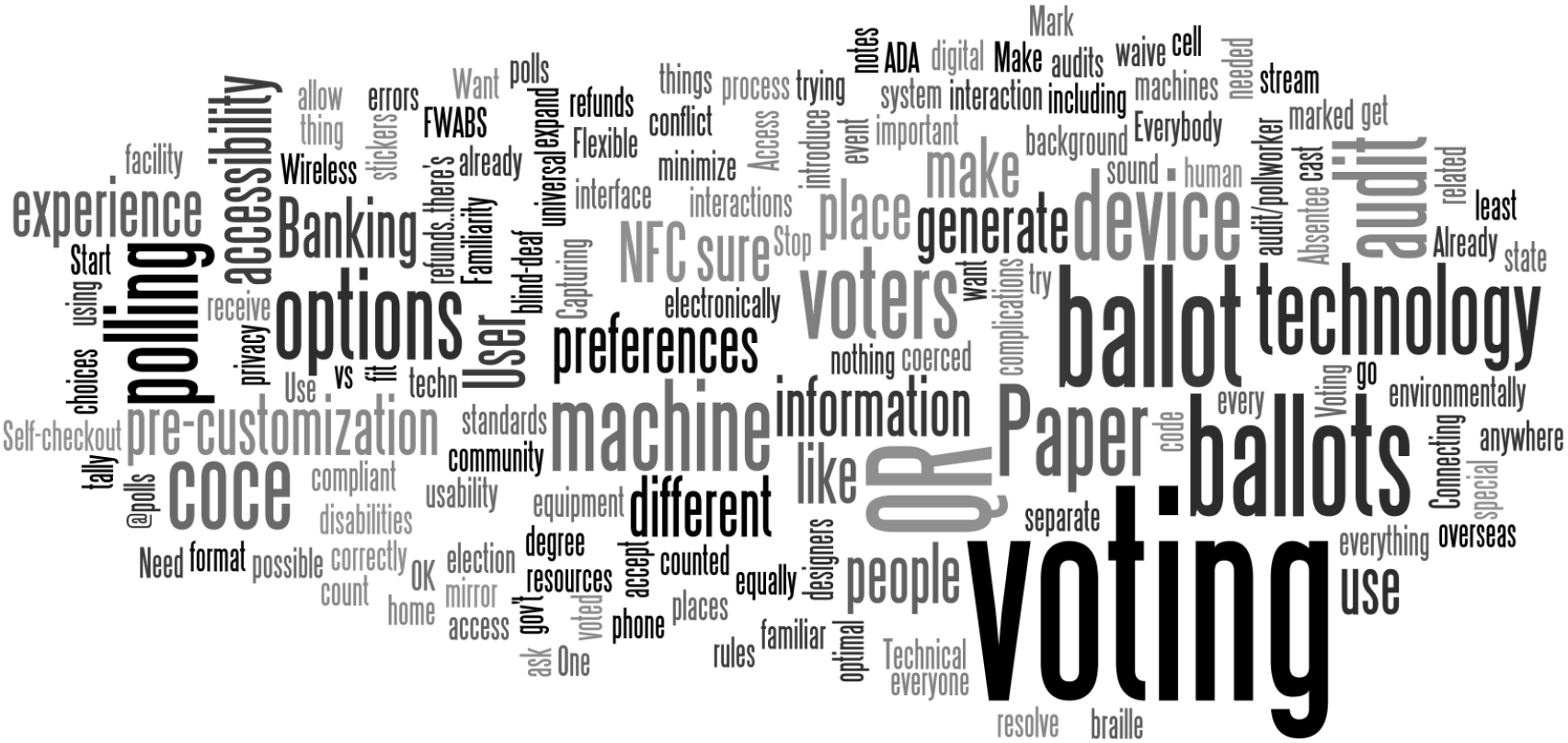
How do we ensure that voters are provided with the resources and support they need to vote from anywhere?

- Do we need a better organization of voter outreach and support?
- Especially support for using assistive technology

Is there a conflict between personalization and equality of experience for all?

- Do all voters have equal access to choice and personalization?
- What is the impact of the digital divide in what kinds of personal technology (like mobile devices) people own?
- How to we address differences in assistive technology?

Accessibility and Universal Usability



Priority topic: Accessibility and Universal Usability

This topic overlapped with the discussion of convenience in voting.

- How far can the goal of universal usability work when technology changes are inevitable?
- How can personalization support voters in creating a more usable and accessible voting experience?
- How can we use systems and interfaces that voters have already tailored for their own use?

Reaching universal design is a challenge when there are so many different voter needs.

Allow more personalization for individual needs and preferences.

- The digital divide is a real issue: some voters do not have smartphone
- Access to information, resources – not just voting.
- Mobile devices are already in use for notes to prepare for voting

Optimal usability is an important step

- Stop creating a separate machine for people with disabilities

We need to address e-casting, not just e-marking.

- Paper ballots introduce errors, are not environmentally sound, are not ADA compliant.
- Why can't we accept electronically cast ballots that we count as a separate "stream" like we do with overseas FWABS (minimize audit/pollworker complications)

Universal Usability in the Voter Journey (close-up view)

Preparing to vote	Choosing how to vote	Checking in/ getting ballot	Marking the ballot	Casting the ballot	Verification & results
Ensure equal access to all parts of the voter journey for all, even without personalization or individual technology					
Resources					
Existing standards – WCAG 2.0, Section 508		NFC or QR codes	NFC or QR codes Mobile phones are important as a way to bring a marked sample ballot to the polling place (but not always allowed) Need to include technology like Braille [preferred by some, critical for deaf-blind)	Separate "stream" for electronically cast ballots	

Thoughts about universal usability

Can standards and solutions for voting expand to all government related interactions?

- Capturing preferences could extend to all interactions
- Consistency is more important for AT users and those with challenges

Can one size fit all?

- We have to consider voters who arrive at the polls with no AT
- Should the system be modular with alternatives for different needs?
- Can the system be flexible with different interaction options?

How do we deal with differences between jurisdictions?

- Every state has different rules – what is the common denominator?

Design and Evaluation

Priority topic: Design and evaluation

Discussion of design and evaluation included:

- Design and development processes that encourage good usability and accessibility.
- Ways to write guidance for best practices, standards, and test methods.
- Different test approaches and how they might fit into the certification process.

Design and Evaluations supports the voter journey

Challenges

US Constitution

EAC and NIST limited to voting systems. WIll the EAC be able to change directions?

Standards are too absolute

- A "testing standard" has become a "design standard"
- High level vs. detailed requirements
- Cost of iterative design/feedback loop+ certifiction

Until voters actually vote on the machine, there is not way to know it will work

We test voting systems, but not other parts of the election system

2018/2020 and the impending crisis of out-of-date systems

Writing Guidance

Guiding principles that reach for an outcome

Usability standards based on efficiency, effectiveness, satisfaction

What technique tells you what

Classify voters not systems

Involve a broad group of election officials in generating standards

Testing Approaches

Testing with hardest, not easiest, users

Create a voter expo for combined testing days to make it easier to assemble a large and diverse group of voters as test participants.

Design iterations and testing

Attractive and simple ballot that is used by everyone

Certification Process

Benefits of certification: license to use

Procurement intersects with certification to force procedures and decisionmaking

EAC doing federal and state certification at the same time

Piloting at different levels

Better feedback on the outcomes of systems in use

- Practice voting and testing constantly
- Consumer reports for voting sysems
- Vendor review website (Yelp for voting systems)
- Common/shared user data to create better voting systems

Resources

Existing standards

- WCAG 2.0, Section 508
- IEEE common data format for reporting/log files

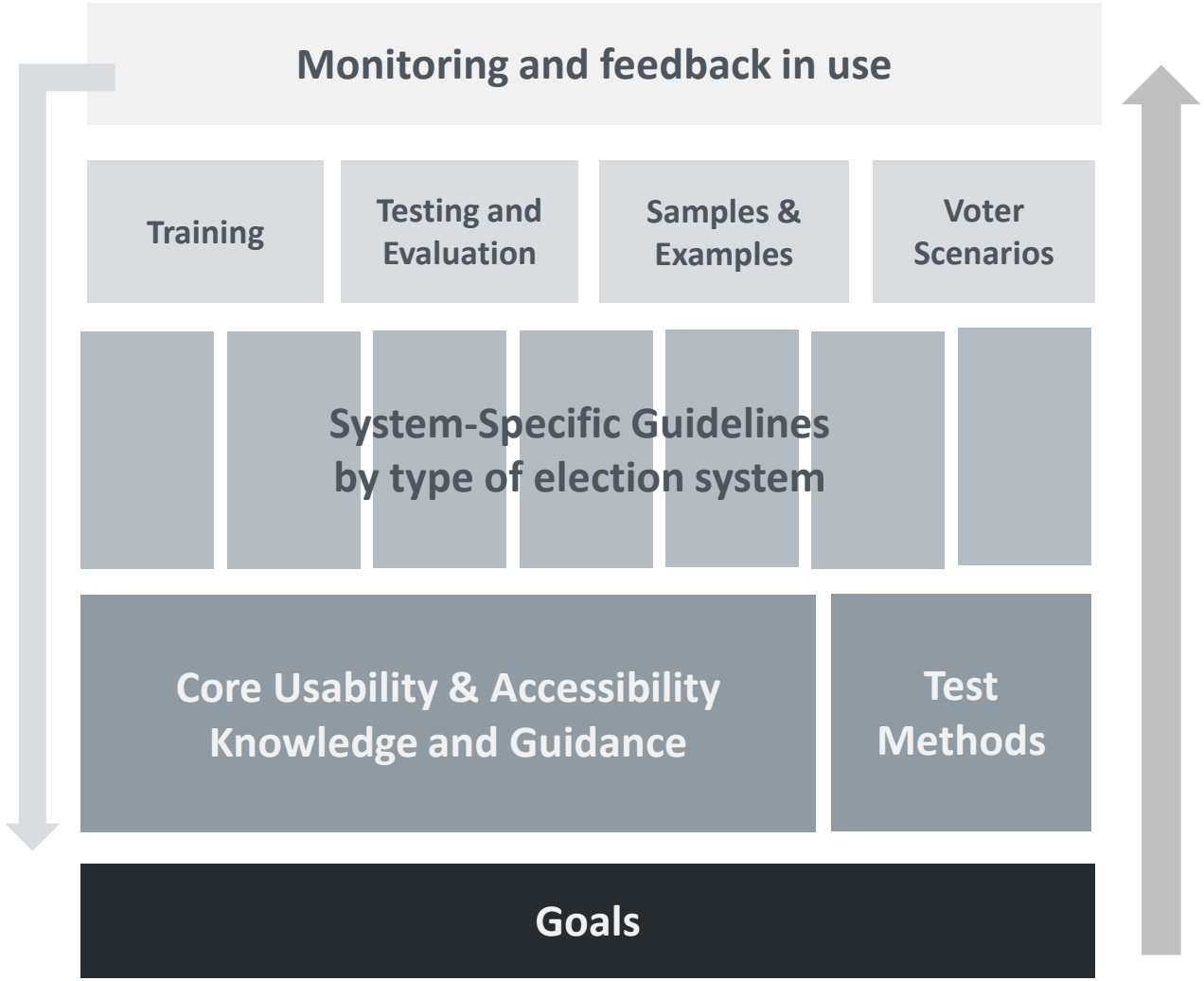
Industry standards

- Slot machine certifcation
- Bank audits
- FDA
- FAA Declaration of Conformance

Committees

- NASED
- State Certification Group

A concept for useful guidance in the right form



Continued monitoring and feedback (from the formal to informal) allows regular review of both the goals and the guidance.

Voter scenarios illustrate the guidelines in action, helping meet the goals.

Samples show design and code best practices.

Testing and evaluation methods inform the design of systems.

Training supports those new to the field and continued learning.

The system-specific guidlines extend the core rules for types of systems, such as:

- Informational websites
- Interactive web features
- ePoll books
- Voting systems
- Election management systems

The Core Requirements are testable usability basics that apply to any interactive system.

Clear statments of goals help everyone understand the reason for any requirement or guidelines.