

# Connecting Usability and Accessibility in Elections

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## What is the connection between usability and accessibility?

Historically, usability (or human factors) has worked to maximize the number of people who can use a product without difficulty. Accessibility work has focused on minimizing the number of people who are unable to use a product at all, or can only use it with great difficulty. The people who use any product are on a continuum, with many overlaps: a person with a disability may be a “power user”, while someone who is simply uncomfortable or unfamiliar with a technology may only stumble through its use.

Removing the *absolute barriers to access* is a critical step, but it does not guarantee that the product will now be usable to people with disabilities. The many reports of voters taking up to 45 minutes to vote with the *accessible* audio interface is an excellent example of access provided without usability.

**In other words, it takes access plus *usability* to provide *accessible usability* to all.**

Usability and accessibility go hand in hand. Improving the *accessibility* of a product can improve its usability for everyone. This is as true in ballot design and voting systems as it is in the physical environment. For example, curb cuts and automatic door openers that make streets and buildings accessible also make them easier to use for people with baby carriages or luggage carts. Large, clearly defined controls or check boxes help people with dexterity disabilities, but also help people whose hands are just a little unsteady or are not familiar with using touchscreen technology.

Improving the *usability* of a product can also improve the *accessibility* of that product. This is particularly true for cognitive, language and learning disabilities. In a presentation to the Access Board's Telecommunications, Electronic and Information Technologies Advisory Committee (TEITAC), Dr. Clayton Lewis suggested that cognitive disabilities should be seen as part of a spectrum of abilities that includes all people, rather than a special class of people with distinct behaviors, abilities and access needs. Almost any cognitive disability may be mild or severe. For example, literacy extends from those who cannot read at all through levels of proficiency to expert readers. His research suggests that many barriers to cognitive accessibility are the same as usability problems for a general user audience... but more severe. We can think about cognitive disabilities as amplifiers: problems that are simply a mild annoyance to many people can be an absolute barrier to people with specific types of cognitive disabilities.

The usability and accessibility communities are starting to work together. Although still new, the trend is clear. Leading usability and design experts now include expertise in accessibility in their

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“portfolio” of skills. There is a growing awareness in the accessibility community of the importance of usability for access features. These leaders are going beyond “access for screen readers” to consider how to provide usable accessibility for all people. This trend is driven by several forces:

- The emergence of international standards for accessibility (such as the W3C’s Web Accessibility Initiative) and national laws (including “Section 508” here in the US). This has forced designers to consider a wider range of users, including those who use assistive technology.
- The growing number of products that function in a global marketplace, forcing designers to consider cultural differences in the user experience. This has opened a rich area of research to understand how to create products that meet different needs, and work in different contexts.
- The need to create information and communication technology (ICT) products that work across platforms. This push for “standards-based” design also benefits people who use assistive technology, as these products are intended to be used in many different modes (including small and large screens, visual and audio interfaces and with different input devices).

This change does not happen in a vacuum. One of the roles of standards and legislation is to raise the bar, creating a demand that stimulates innovation to meet social needs. This is especially true in situations like elections, where there is not a mass market to create demand for new products.

### **Why are usability benchmarks important for voting systems?**

The overarching concern for both usability and accessibility of voting systems is that voters are able to vote accurately. The introduction to the draft VVSG Part 1, Chapter 3, Section 3.2 says “The voting system should support a process that provides a high level of usability for all voters. The goal is for voters to be able to negotiate the process effectively, efficiently, and comfortably.” This is a paraphrase of the standard definition of usability from ISO 9241-11:1999 which defines usability as “ability of specified users to complete tasks in a specified context of use with effectiveness, efficiency, and satisfaction.” In the case of voting system standards, the “users” are the broad group of all voters, including people with disabilities, those who speak other languages, and the full range of human abilities.

Historically, efforts to improve usability have focused on designing and developing usable voting systems. A user centered design process, and usability testing during development, is key, but does not offer a way to independently evaluate the final product. The VVSG cannot dictate design process, but it can—and does—require that products meet benchmarks. The current draft VVSG simply adds usability and accessibility benchmarks to the core reliability, mechanical, electrical, and other technical requirements.

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Testing systems against human performance in using them may be new, but it does not make these measurements any less valid. Usability benchmarks are the only way to test a system for one of the most basic requirements: the ability of voters to cast their ballot as they intend, with accuracy (as well as efficiency and confidence).

### **Why not rely on simpler design guidelines?**

Design guidelines are a useful part of any standard. They document best practices and features known to support the goals of the standard. At a minimum, they ensure that systems are capable of meeting known requirements for good usability and accessibility. But, they do not directly address the ultimate goal of the VVSG: voting systems that allow all voters to cast their ballots with a high level of usability. It is possible for a product to meet a set of design guidelines and still fail to achieve the usability goal. Many of the recent problems in elections have been powerful illustrations.

It is tempting to try to tighten the design requirements, adding new guidelines to address each problem reported. This not only adds complexity to the guidelines, but it risks constraining systems so severely that there is no room for innovation. In the end, usability testing is the summative proof that the real goals of the guidelines are met.

Two objections have been raised to the performance benchmarks:

- They are too difficult and expensive to test
- Manufacturers will “design to the test”

We simply don't believe that testing these benchmarks is too difficult or too expensive. It is new, and therefore unknown, but this is not a difficult test to administer or evaluate. Even with all the complexity of elections, the range of tasks is not large. Even with a long test ballot, voting is a relatively short task. This makes it possible to include a large number of participants in a reasonable test schedule.

As for the danger that we will see systems that work well in the test lab, but fail in the real world, frankly, anything that helps voting systems designers focus on improving usability and accessibility performance is not a bad thing.

### **Are the benchmarks high enough?**

Voting is an area where the benchmark has to be almost at the top. Every citizen has the right to vote. Any problem in design, writing, usability, or accessibility that keeps a voter from voting the voter's intention accurately and completely means that the system has failed. We have to produce systems that don't fail the voters. If the standards raise the bar, manufacturers will find a way to meet that new level. That's what standards and regulations do. And the American free enterprise system responds to the opportunities created by standards.

### **Is the test protocol appropriate for testing the performance benchmarks?**

The NIST staff has worked carefully, methodically, and thoroughly to develop the Voting Performance Protocol. This attention to detail and rigorous process is appropriate to a test method that breaks new ground, and will have such wide implications. Several aspects of the protocol are particularly important in ensuring that the test is reliable:

- The use of standard voting instructions, and “realistic, but not real” candidate and party names eliminates concerns that test participants will not take care to vote as intended, or will reject instructions that go against their own political preferences.
- The “black box” approach, including standard instructions with no additional assistance, removes the need to carefully observe the test participants’ actions, and limits any variation caused by differences in test moderators.
- The test includes no qualitative analysis. The results can be quickly and easily calculated, with no expert interpretation.

We wish the work would proceed faster, especially the benchmarking of the accessible interfaces, but we understand the challenges of this work.

### **Will the results of the performance tests be misinterpreted?**

A final objection to the performance tests is that the results will be misinterpreted as the number of people who can vote accurately. Like energy efficiency ratings, the benchmarks are designed to allow comparison, not predict actual performance. The role of the test is to create a way to compare any system to a standard measurement. This gives any system, whether conventional or innovative, an equal and fair way to prove itself. It will take careful education to ensure that election officials, the media, election advocates and the public understand the meaning of the test results.

### **How can we recognize, and certify, experts in usability and accessibility?**

The “problem” of not having certifications for usability or accessibility testing is in part a “chicken-and-the-egg” issue: there have been no public testing programs that required such certification, so there has been no market need for such programs. This does not mean, however, that experts do not exist and cannot be found when needed, or that suitable criteria could not be created. It does mean that test labs will have to reach out beyond their usual community into a new source of experts.

Even without certification, it is still possible to recognize an appropriate expert in usability, accessibility, or human performance testing.

The last balloted draft of the IEEE standard for voting systems included this definition of a usability expert, and includes a similar definition of a plain-language expert:

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“Usability experts should have experience in conducting summative, quantitative, performance-based usability tests. They should also have experience with systems for the general public and in accessibility. They should have professional qualifications or significant experience in human factors, human computer interaction, cognitive psychology, usability, or a related field. There is no standard industry certification for a usability expert.”

IEEE P1583: Voting System Standards - Section 6.3.3.1

There are few degrees with a named focus on usability, but experts often have advanced degrees or relevant professional experience in fields such as:

- Human computer interaction
- Human factors and ergonomics
- Cognitive psychology
- Social or psychological research methods

The Board of Certification in Professional Ergonomics (BCPE) (<http://www.bcpe.org/>) offers professional certifications in ergonomics. The BCPE also adheres to the criteria and policies for competency assessment set by NOCA, the National Organization for Competency Assurance, and has been endorsed by the IEA, the International Ergonomics Association, as an accredited ergonomics certifying body.

The BCPE offers two professional certifications as well as two lower-level associate certifications. (<http://bcpe.org/info/default.asp>)

- Certified Professional Ergonomist (CPE)
- Certified Human Factors Professional (CHFP)

The criteria for certification as a CPE (or CHFP) are:

- A master’s degree in human factors/ergonomics, or an equivalent educational background in the life sciences, engineering sciences and behavioral sciences to comprise a professional level of ergonomic education.
- Three (3) years of full-time professional practice in human factors/ergonomics.
- A passing score on the CPE/CHFP written examination.

Usability and human factors experts are often members of one or more of the following professional organizations:

- Human Factors and Ergonomics Society (HFES) ([www.hfes.org](http://www.hfes.org))

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- Usability Professionals' Association (UPA) ([www.usabilityprofessionals.org](http://www.usabilityprofessionals.org))
- ACM SIGCHI (ACM Special Interest Group on Computer Human Interaction) ([www.acm.org/sigchi](http://www.acm.org/sigchi))

There are also human factors and testing experts in the IEEE and the IEEE Computer Society ([www.ieee.org](http://www.ieee.org)).

### Experts In Usability Testing With Human Participants

One of the important differences between usability testing and other quality testing is that it uses human participants as part of the “test instrument.” This places some burdens on the people conducting the test.

There are several professional society ethical guidelines or codes of conduct that are relevant. Experts should be aware of these guidelines and should be able to demonstrate that they follow them.

- Usability Professionals' Association  
[http://www.usabilityprofessionals.org/about\\_upa/leadership/code\\_of\\_conduct.html](http://www.usabilityprofessionals.org/about_upa/leadership/code_of_conduct.html)
- Human Factors and Ergonomics Society  
<http://www.hfes.org/web/AboutHFES/ethics.html>
- American Psychological Association  
<http://www.apa.org/ethics/code2002.html>

There is also educational material on human participant protections from federal agencies, and a self-certification program used by the National Institutes of Health:

- National Cancer Institute - Human Participant Protections Education for Research Teams.  
“This free, web-based course presents information about the rights and welfare of human participants in research. The two-hour tutorial is designed for those involved in conducting research involving human participants. It satisfies the NIH human subjects training requirement for obtaining Federal Funds. You will have the option of printing a certificate of completion from your computer upon completing the course.”  
<http://cme.cancer.gov/clinicaltrials/learning/humanparticipant-protections.asp>

Graduate programs and academic research institutions all have similar guidelines and education, usually part of their Institutional Review Board.