Uniformly applied, research-based design and test standards are needed to ensure that voting systems across the United States are reliable, easy to use, and accurately reflective of voter intent. Human factors/ergonomics experts can contribute knowledge and expertise in addressing this need.

Issue
Valid election outcomes depend not only on the unbiased opportunity for citizens to cast ballots but also on the accurate reflection of their intent in the systems by which their votes are registered and tabulated. As simple manual voting systems have given way to a wide array of more powerful, technology-aided systems, a number of highly publicized problems and challenges have arisen that threaten the accurate recording of voter intent.

Foremost among these problems are so-called usability issues—system-induced tendencies for errors to occur as voters register their preferences. Complicating the situation is the fact that systems in use across the United States vary widely, and each (including the simplest manual ones) presents its own usability issues. Although such issues were well recognized prior to the 2000 U.S. presidential election, the nationwide publicity stemming from that event has led to a variety of efforts by local, state, and federal agencies to adopt voting systems that are more “user-friendly” and less prone to error.

Unfortunately, the results of research conducted to date have not been encouraging. Research beginning after the 2000 election and continuing today has demonstrated that the type of voting system used can have a measurable effect on voter performance in terms of errors, undervoting, spoiled ballots, and abandoned ballots ([2], [4], [5], [8]).

Ballot designs have also continued to be an issue since the 2000 infamous “butterfly” ballot. As recently as 2006, a visual design flaw in the ballot layout appears to have deprived nearly 18,000 voters of the opportunity to register their preferences in Sarasota’s closely contested 13th Congressional District election ([3], [7], [9]). The National Institute of Standard’s own efforts to develop performance-based benchmarks have demonstrated that statistically different—and significant—performance errors occur when participants attempt to complete identical tasks on identical ballots using different machines (all of which are currently in use in elections; [6]). Although design standards have been promulgated and testing standards are being developed, there is inadequate specification based on arguable evidence. Moreover, the adoption of these standards across the many jurisdictions is at best sporadic.
The effect of errors related to voting systems not only can affect election outcomes; it has also had a negative impact on voter confidence in the election process ([1]). Despite good intentions, current efforts to improve the usability of voting systems have achieved limited success because of both insufficient utilization of existing knowledge about user-oriented design and inadequate investment in research and development aimed explicitly at voting system usability.

Relevance of Human Factors/Ergonomics (HF/E)
HF/E is a scientific field devoted to improving the usability of systems through the discovery, application, and testing of design principles that take into account both human and nonhuman (“machine”) characteristics and their integration. For over a half-century, HF/E professionals have contributed significantly toward improving the effectiveness and safety of systems ranging in complexity from simple hand tools and consumer products to nuclear power plants, advanced military and aviation systems, manufacturing operations, medical systems, and a host of others. The utilization of HF/E principles and experts in efforts to improve voting systems to date, however, has been limited and sporadic.

In view of the obvious costs associated with replacing or retrofitting existing voting systems using older or flawed technologies, and the variety of such systems currently in use, the goal of developing a uniform set of design and test standards based on HF/E usability principles and test methodology is clearly of critical importance. The replacement of current systems with more uniform and demonstrably user-friendly means of registering voter intent across the nation would result in more consistently accurate election outcomes. Implemented over time, such an approach would also likely incur considerably less cost than the current piecemeal, trial-and-error approach.

Existing knowledge, adapted to this context by qualified experts from HF/E specialty areas, would go a long way toward defining initial design parameters, but the systematic involvement of samples of users (e.g., voter, poll worker, ballot designer) in iterative test-redesign cycles is essential if voting system usability is to be improved. Targeted research, though not always necessary, would aid in resolving specific issues that might arise in the development process. The results of such research, along with design standards, should be made widely available to manufacturers and state and local officials involved in the evaluation of voting systems.

HF/E Sources and Resources
Although the body of knowledge and list of qualified HF/E experts relevant to this topic are far too extensive to include in this document, a sampling of each is provided below to enable contact by interested parties. Through these sources, access to other individuals and documentation can be achieved as desired.


For more information, contact the Human Factors and Ergonomics Society, P.O. Box 1369, Santa Monica, CA 90406-1369 USA; 310/394-1811, Fax 310/394-2410, http://hfes.org, info@hfes.org.