CASE TEACHING NOTES
for
ELECTION 2000
A Case Study in Human Factors and Design

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INTRODUCTION

The November 2000 Presidential Election brought many controversies in election processes to light. At that time (and since) many of these controversies have been portrayed in the media through a political lens. In particular, a great deal of negative and partisan press surrounded the design of the "butterfly" ballot and subsequent difficulties interpreting imperfectly punched ballots. A goal of this case is to help students recognize how engineering (rather than political) solutions (in this case, appropriate application of interface design principles, and utilization of user centered design methods) could be brought to bear to solve problems of national importance.

Commissions and standards groups along with legislation passed after the election (the Help America Vote Act) have all indicated the need for human factors input and/or usability evaluation and testing with actual voters. Thus, this case provides students with an opportunity to apply human factors knowledge to a current problem that has not already been "solved."

The case is written for a junior or senior level undergraduate course in Human Factors or Ergonomics. It would also be appropriate for a similar level course in Human Computer Interaction or User Centered Design.

It is important to note that there are many more issues regarding the design of voting systems that are not addressed in this case study, including issues of voter registration, vote security (particularly with computerized systems), vote confidentiality, use of absentee ballots, training of poll workers, etc. Instructors wishing a more complete background on issues surrounding voting are referred to the citations in the case, particularly the reports generated by the Caltech/MIT Voting Technology Project, the IEEE Standard, and information provided by the FEC. As written, the case can be completed in two 80-minute or two 50-minute (with some out-of-class work) class periods. Inclusion of these additional topics would be appropriate to expand the case to a longer in- or out-of-class design project or laboratory exercise. Material cited in the case, as well as the web sites provided in the following bibliography, would be useful in creating expanded exercises based on this case.

Objectives

- To have students apply knowledge in user centered design to a real life design problem.
- To reinforce concepts of mappings, conceptual models, feedback, and gulfs of execution and evaluation through their consideration in a real life system.
- To allow students to incorporate individual characteristics of user populations in the design of multiple characteristics of a system (including computer input and output mechanisms, physical

system design, software interaction styles) and to learn about potential interactions among these characteristics.

- To provide students with an opportunity to develop a user centered testing process.

CLASSROOM MANAGEMENT

The case was designed for use after students have been introduced to principles of usability, such as mappings, feedback, and conceptual models, through previous lectures or assigned readings (i.e., through the book *Design of Everyday Things*—see **Norman, 1988**). In addition, students should have knowledge or access to references regarding the impact of individual differences on the design of computer systems and on basic human computer interaction styles (e.g., menus, command-line, GUI) and modes of interaction (keyboards, touch screens, etc.).

The case can be completed in two 80-minute class periods. In the first period, have students read the section that describes "The Event" and "The Design." Then, have the students form groups of three to five to discuss and answer the questions in the discussion exercise at the end of Part I. Students can then prepare materials to share their answers with the entire class (e.g., overhead slides, flip charts), listing at least one aspect of voting systems that could be addressed with the four design principles and at least one example of a gulf of evaluation and execution. Alternatively, groups could discuss the exercise and bring a completed PowerPoint slide to the next class period or write answers for submission as a homework assignment. If desired, sources such as the **Help America Vote Act**, the **Cal Tech/MIT report**, or the **IEEE voting standard** (Sections 8.5 and 8.6) could be assigned as preparation for the next class period.

In the second class period, have students read the section "Calls for Improvement and Redesign." Then, similar to the first discussion exercise, have students work in groups to prepare answers to the three design exercises described at the end of that section. Students could prepare materials such as an overhead sheet, a PowerPoint slide, or a flip-chart page to present their design-oriented materials.

Finally, the article in *IEEE Spectrum* (**Mercuri, 2002, "A Better Ballot Box"**) provides a potential design solution that can be given to students at the end of the case to provide closure in terms of one possible "answer" or to spur discussions/comparisons of the students' solutions to those in the article in a follow-on class period.

If the class meets for 50-minute rather than 80-minute periods, it would be helpful to hand out the second half of the case to students at the end of the first class and have them read the case material and answer the design questions on their own before coming to class and discussing their ideas as a group. Alternatively, the instructor can elect to eliminate two of the design discussion questions or utilize a third class period.

Finally, if the classroom is equipped to link to and project information from the Internet, it may be useful at the beginning of the first class to show the different voting schemes and ballot errors as pictured on the web site of the Florida Ballot Project at **http://www.norc.uchicago.edu/fl/index.asp**.

Adaptations

The case could be adapted to a more problem-based learning format. After reading the sections of the case, students could work in groups to research the issues of usability that were identified in the case, as well as aspects of input/output and interactions styles, individual differences, and user testing requirements (given a list of citations such as those in the references below).

For a larger class (greater than 40 students), students could proceed in a similar manner to that outlined above, but the instructor could ask groups to share only one or two conclusions from their discussions and keep a class-wide list rather than have each group present individually.

Finally, the case easily can be adapted to a more lengthy laboratory or design project assignment. Students could develop, prototype, and test designs with groups of potential voters (e.g., from the student population or a more representative sample population for smaller, more advanced classes).

ANSWER KEY

Answers to the questions posed in the case study are provided in a separate answer key to the case. Those answers are password-protected. To access the answers for this case, go to **the key**. You will be prompted for a username and password. If you have not yet registered with us, you can see whether you are eligible for an account by reviewing our **password policy and then apply online**.

For Further Reading

Print

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Internet

- Help America Vote Act of 2002
  http://www.electionline.org/site/docs/pdf/hr3295.final.pdf

- Cal-Tech/MIT Voting Technology Project
  http://www.vote.caltech.edu

- Federal Election Commission
  http://www.fec.gov

- FEC National Voting System Standard
  http://www.fec.gov/pages/vss/vss.html

- IEEE Voting System Standard
  http://grouper.ieee.org/groups/scc38/1583

- The Florida Ballot Project
  http://www.norc.uchicago.edu/fl/index.asp

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