



INTERVIEW with Ben Shneiderman

Ben Shneiderman is professor of computer science at University of Maryland, where he was founder and director of the Human-Computer Interaction Laboratory from 1983 to 2000. He is author of the highly acclaimed book *Designing the User Interface: Strategies for Effective Human-Computer Interaction*, now in its third edition. He developed the concept of direct manipulation and created the user interface for the selectable text link that makes the web so easy to use.

JP: Ben you've been a strong advocate of measuring user performance and user satisfaction. Why is just watching users not enough?

BS: Watching users is a great way to begin, but if we are to develop a scientific foundation for HCI that promotes theory and supports prediction, measurement will be important. The purpose of measurement is not statistics but insight.

JP: OK can you give me an example?

BS: Watching users traverse a menu tree may reveal some problems they have, but only when you start to measure the time and number of branches taken can you discover that broader and shallower trees are almost always the winning strategy. This conflict between broader and shallower trees emerged in a conference panel

discussion with a leading researcher for a major corporation. She and her colleagues followed up by testing users' speed of performance on searching tasks with two-level and three-level trees.

JP: But is speed of performance always the important measure?

BS: Measuring speed of performance, rate of errors, and user satisfaction separately is important because sometimes users may be satisfied by an elaborate graphical interface even if it slows them down substantially. Finding the right balance among performance, error rates, and user satisfaction depends on whether you are building a repetitive data-entry system, an air-traffic control system, or a game.

JP: Experiments are an important part of your undergraduate classes. Why?

BS: Most computer science and information systems students have had little exposure to experiments. I want to make sure that my students can form lucid and testable hypotheses that can be experimentally tested with groups of real users. They should understand about choosing a small number of independent variables to modify and dependent variables to measure. I believe that students benefit by understanding how to control for biases and perform statistical tests that confirm or refute the hypotheses.

My students conduct experimental projects in teams and prepare their reports on the web. For example, one team did a project in which they varied the display size and demonstrated that web surfers found what they needed faster with larger screens. Another group found that bigger mouse pads do not increase speed of performance (www.otal.umd.edu/SHORE2000). Even if students never conduct an experiment professionally, the process of designing experiments helps them to become more effective analysts. I also want my students to be able to read scientific papers that report on experiments.

JP: What “take-away messages” do you want your students to get from taking an HCI class?

BS: I want my students to know about rigorous and replicable scientific results that form the foundation for this emerging discipline of human-computer interaction. Just as physics provides a scientific foundation for mechanical engineering, HCI provides a rigorous foundation for usability engineering.

JP: How do you distinguish between an experiment and usability testing?

BS: The best controlled experiments start with a hypothesis that has practical implications and theoretical results of widespread importance. A controlled experiment has at least two conditions and applies statistical tests such as t-test and analysis of variance (ANOVA) to verify statistically significant differences. The results confirm or refute the hypothesis and the procedure is carefully described so that others can replicate it. I tell my students that experiments have two parents and three children. The parents are “a practical problem” and “a theoretical foundation” and the three

children are “help in resolving the practical problem,” “refinements to the theory,” and “advice to future experimenters who work on the same problem.”

By contrast, a usability test studies a small number of users who carry out required tasks. Statistical results are less important. The goal is to refine a product as quickly as possible. The outcome of a usability test is a report to developers that identifies frequent problems and possibly suggests improvements, maybe ranked from high to low priority and from low to high developer effort.

JP: What do you see as the important usability issues for the next five years?

BS: I see three directions for the next five years. The first is the shift from emphasizing the technology to focusing on user needs. I like to say “the old computing is about what computers can do, the new computing is about what users can do.”

JP: But hasn’t HCI always been about what users can do?

BS: Yes, but HCI and usability engineering have been more evaluative than generative. To clarify, I believe that deeper theories about human needs will contribute to innovations in mobility, ubiquity, and community. Information and communication tools will become pervasive and enable higher levels of social interaction. For example, museum visitors to the Louvre, white-water rafters in Colorado, or family travelers to Hawaii’s Haleakala volcano will be able to point at a sculpture, rock, or flower and find out about it. They’ll be able to see photos at different seasons taken by previous visitors and send their own pictures back to friends and grandparents. One of our projects allows people to accumulate, organize, and retrieve

the many photos that they will take and receive. Users of our PhotoFinder software tool can organize their photos and annotate them by dragging and dropping name labels. Then they can find photos of people and events to tell stories and reminisce.

HCI researchers who understand human needs are likely to come up with innovations that help physicians to make better diagnoses, enable shoppers to find what they want at fair prices, and allow educators to create more compelling experiences for students.

JP: What are the other two directions?

BS: The second opportunity is to support universal usability, thereby bringing the benefits of information and communications technology to the widest possible set of users. Website designers will need to learn how to attract and retain a broad set of users with divergent needs and differing skills. They will have to understand how to accommodate users efficiently with slow and fast network connections, new and old computers, and various software platforms. System designers who invent strategies to accommodate young and old, novice and expert, and users with varying disabilities will earn the appreciation of

users and the respect of their colleagues. Evidence is accumulating that designs that facilitate multiple natural-language versions of a website also make it easy to accommodate end-user customization, convert to wireless applications, support disabled users and speed modifications. The good news is that satisfying these multiple requirements also produces interfaces that are better for all users. Diversity promotes quality.

The third direction is the development of tools to let more people be more creative more of the time. Word processors, painting tools and music-composition software are a good starting point, but creative people need more powerful tools so that they can explore alternative solutions rapidly. Creativity-support tools will speed search of existing solutions, facilitate consultations with peers and mentors, and record the users' history of activity so that they can review or revise their work.

But remember that every positive development also has a potential dark side. One of the formidable challenges for HCI students is to think carefully about how to cope with the unexpected and unintended. Powerful tools can have dangerous consequences. ■