Bridging the Digital Divide with Universal Usability

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How do you explain a trashcan to a culture that doesn't have one? How do you describe a "stop loss limit order" to retirees managing their funds? Can you design a text-only interface that conveys the contents and experience of an animated Flash presentation?

These puzzles emerged during the first ACM Conference on Universal Usability (http://www.acm.org/sigchi/cuu/), held on November 15-17, 2000 near Washington, DC. The international group of organizers, presenters, and attendees of this conference shared an unusual commitment and passion for making information and communications services accessible, usable, and useful. They want to see effective healthcare services and appealing distance education. They want to create successful e-commerce and accessible government services for all. Realizing these possibilities requires more than low-cost hardware or broadband networks. These mass-market services are often too complex, unusable, or irrelevant for too many users [1]; usability and design become the keys to success.

The source of these problems was often attributed to designers who make incorrect assumptions about user knowledge. This leads to difficulties with technical terminology and advanced concepts that are not balanced by adequate online help or live assistance. Unfortunately, most designers never see the pain they inflict on novice and even expert users. These problems have contributed to the growing digital divide in internet technology adoption levels between low-income poorly-educated and high-income well-educated users [2]. Even as the gap between men and women internet users has been eliminated and the gap between young and old is shrinking, the slow adoption rates by poor and poorly educated users remains a problem. Low-cost equipment is needed, but progress in design will help make internet services more accessible to more people.

While hardware devices, software architectures and user interfaces have improved in the past two decades, user needs and expectations of users have grown faster. The challenges faced by designers were illustrated by the exemplary work of Gary Perlman [3] who had to develop an English, French and Spanish website for Windows and Macintosh, using Microsoft Internet Explorer and Netscape Navigator. He also accommodated a range of screen sizes, network bandwidths, and printer formats. His software architecture, based on display independence, also enabled cell phone access and user-controlled customization. But the punch line to his story was that the software architecture also facilitated rapid revisions when management presented new system requirements, thus saving substantial time and money.

A University of Toronto paper (Baecker, Booth, Jovicic, McGrenere and Moore) presented three projects to make complex designs more accessible to novices, including a 3-level word processor

to give novices control over the interface complexity. Two of the early heroes in the movement for universal design, Alan Newell and Gregg Vanderheiden, helped in the conference planning and participated by presenting their latest work. Newell described User Sensitive Inclusive Design paradigms and Vanderheiden detailed EZ Access (TM), which offers multi-modal help for mobile devices and kiosks at a cost increase of only 1% of the retail price.

Other papers presented ambitious technical goals including:
- making information and communications technology available at low cost, while improving the quality of service
- reducing system complexity and user frustration, while expanding functionality
- enabling users with older equipment or slower network access to participate fully, while advancing high-end technologies
- increasing the utility and comprehensibility of services for low-income and poorly educated users, while enabling advanced users to explore novel strategies
- facilitating access by users who need support for visual, auditory, physical and other disabilities
- enabling multi-lingual multi-platform designs for diverse users, while reducing development time and maintenance costs

The enthusiasm of many participants for designing for diverse users was inspiring. Their devotion to serving poorly educated, novice, disabled, or elderly users helps to expand our repertoire of techniques that could benefit all users. They talked about how to apply usability testing to prevent mysterious metaphors, technical terminology, and unreasonably long load times. Presenters described strategies for minimizing confusing menu choices, disorganized web sites, and the traditional problems of incomprehensible error messages, incompatible file formats, and unexpected crashes. These problems were often cited as barriers to novice and discretionary users, but the evidence is growing that they confuse and disturb even motivated and experienced users. Fresh strategies with substantial commercial potential were proposed to accommodate varying network bandwidth, processor speed, or screen size. Cell phone access to internet services by text or voice was a frequently expressed goal, but automatic conversion from a display independent mark-up language is still a research and development challenge.

The participants were eager to help bridge the Digital Divide and fulfill the visionary commitment of the Code of Ethics of the Association for Computing Machinery which states: "In a fair society, all individuals would have equal opportunity to participate in, or benefit from, the use of computer resources regardless of race, sex, religion, age, disability, national origin or other such similar factors." I believe that information and communications professionals will be enriched by and respected for their commitment to serving diverse users. Designing for diversity is the right thing to do and it is also the smart thing to do. It increases audiences and produces better experiences for all users. Diversity promotes quality.

The conference organizers benefited greatly from the willingness of professionals in the Association for Computing Machinery (ACM) and related societies to help promote our conference. The ACM's Special Interest Group on Computer-Human Interaction (SIGCHI) took the lead and its Executive Council was strongly supportive, especially the Chair Marilyn Tremaine. Similarly the ACM United States Public Policy Committee (USACM) chaired by Gene Spafford and Barbara Simons warmly supported our cause.

Two special features of the Conference on Universal Usability (CUU) were Student Fellows and the CUU Fellows. The 20 Student Fellows from the United States had travel support from the National Science Foundation that was obtained by Jenny Preece and administered by the University of Maryland Baltimore County. An additional eight international Student Fellows were supported by funds from our sponsors. They were led by Kori Inkpen, Brad Mehlenbacher and Joanna McGrenere who coordinated their pre-conference efforts to construct a website with relevant resources (http://www.universalusability.org). During the conference the students provided valuable support and wrote session summaries with digital photos that were quickly placed on the conference web site (http://www1.acm.org/sigs/sigchi/cuu/proceedings/report.html), by the conference webmaster, Keith Instone. This provided a permanent record for attendees and others. We appreciated the contributions of the students but the organizers also wanted to energize the next generation of leaders for these important themes.

The CUU Fellows program, organized by Joelle Coutaz, was another creative and administrative challenge. Joelle convened a committee of organizers, who solicited applications from international representatives of diverse cultures, elders, minority, low-income, and disabled users. In the months leading up to the conference, the CUU Fellows, from countries such as Australia, Ireland, Malaysia, Romania, and Vietnam, had an email discussion to get acquainted and identify key issues. Then on the day before the full conference, the CUU Fellows met with the organizers to prepare their conference presentation.

Their compelling presentation (to appear in SIGCHI Bulletin, http://???) was built around three stories. The first was Addie's shoes, which focused on the unanticipated, but simple changes a cobbler had to make in his custom shoes to accommodate the needs of an elderly client. The second was Deane's desire for independence, which told about how a man's disabling illness propelled him to find appropriate software to enable him to get a college degree. Deane and his wife had traveled from Australia to participate and won respect for their thoughtful contributions. The third was the Vietnamese fisherman's son, which discussed the difficulties in learning to use computers for citizens of developing nations whose culture is so different from the software designer's expectations.

White House senior economic advisor Tom Kalil made the conference opening speech titled "Creating Digital Opportunity." He reported on four admirable goals of the Clinton-Gore administration: Bridge digital divide domestically, make information technology more accessible for people with disabilities, address international issues (gaps between developed & developing countries), and increase federal investment in human-computer and information management.

Michael Burks of AT&T made his plenary talk on "Raising awareness of the economic advantages of universal design." He reported on four occasions when the high cost of universal usability was used to prevent efforts from proceeding. He called for press coverage to change public perceptions, education to inform corporate and legislative decision makers, and technical information to empower programmers in developing universally usable web sites and software.

One immediate outcome of the conference is the refinement of a proposal for universal usability statements (described in an accompanying article). These declarations by web site designers

describe the contents of a site, browser requirements, network requirements, and other characteristics that may influence its usability. Imagine the increase in successful web site visits if users know that it has been tested with their screen reader software, WebTV, or their mobile device, and that it does not require plug-ins or long downloads.

The sold-out crowd of 250 conference attendees included about 50% computing practitioners, 40% academics or students, and 10% government representatives. Everyone came away with a richer awareness of the problems and potential solutions. Some minds and hearts were changed. Some partnerships and collaborations were started.

The best indicator of this impassioned commitment to universal usability was that 30 volunteers made immediate offers to help organize another conference in 2002. You can contribute and join the organizing committee by contacting Marilyn Tremaine (ACM SIGCHI Chair, tremaine@acm.org). The CUU Proceedings, edited by Technical Program co-chairs Jean Scholtz and John Thomas, are available from ACM's Digital Library (http://www.acm.org/dl) or on paper (http://store.acm.org/acmstore/).

References
[1] Shneiderman, B., Universal Usability: Pushing human-computer interaction research to empower every citizen, *Communications of the ACM 43*, 5 (May 2000), 84-91.

[2] National Telecommunications and Information Administration, U. S. Dept. of Commerce, *Falling Through the Net: Defining the Digital Divide*, Washington, DC (July 1999), http://www.ntia.doc.gov/ntiahome/digitaldivide/

[3] Perlman, Gary, The FirstSearch user interface architecture: Universal access for any user, in many languages, on any platform. *Proceedings of the ACM Conference on Universal Usability,* ACM, New York, (2000), 1-8.

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- Computers and Society (SIGCAS)
- Computers and the Physically Handicapped (SIGCAPH)
- Documentation (SIGDOC)
- Computer Graphics and Interactive Techniques (SIGGRAPH)
- Information Retrieval (SIGIR)

A remarkable set of professional groups cooperated in organizing the conference by contributing suggestions and spreading the word within their organizations:

- American Library Association Office of Information Technology Policy
- American Society for Information Science
- AFIHM: Association Francophone d'Interaction Homme-Machine
- British HCI Group
- Computer Professionals for Social Responsibility
- Human Factors & Ergonomics Society
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- Usability Professionals Association