CS 315 – Intro to Human Computer Interaction (HCI)

What objects have you brought today?

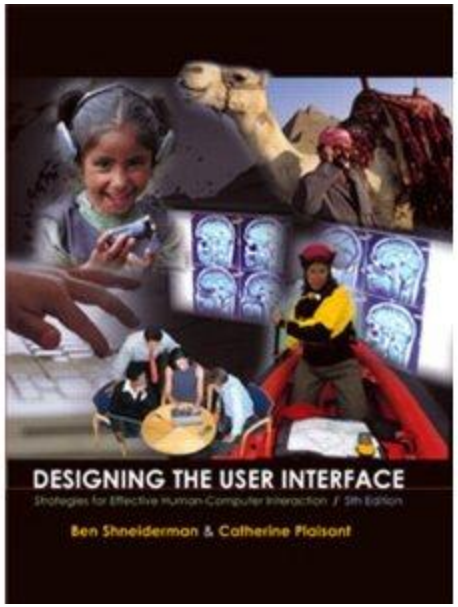
Research Paper Partnerships

- Let's form the partnerships

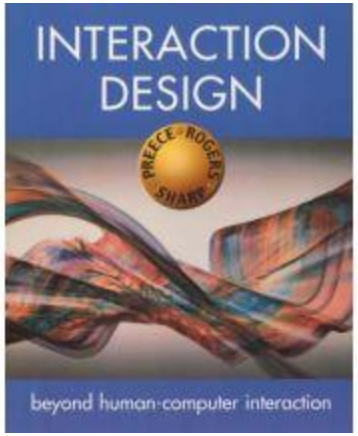
- Example paper titles:
  - Teenagers and Their Virtual Possessions: Design Opportunities and Issues
  - The Design of a Persuasive Technology Promoting Healthy Behavior and Ideal Weight
  - Placing a Value on Aesthetics in Online Casual Games

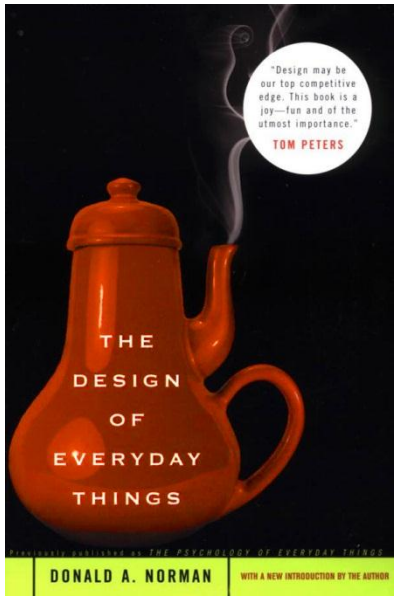
Designing the User Interface

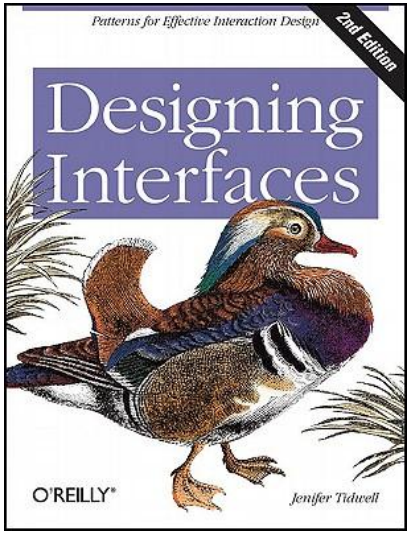
Shneiderman & Plaisant

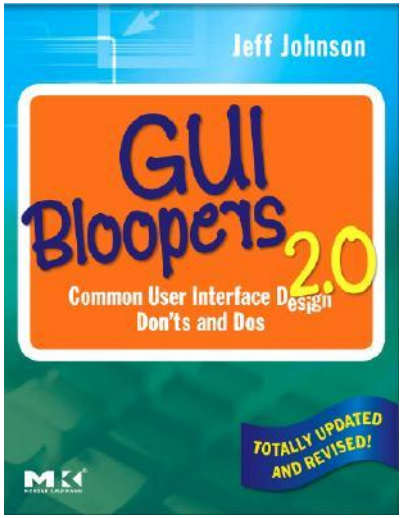


Other Useful Titles









User Interface Ramifications

- Success Stories: Microsoft, Linux, Amazon.com, Google
- Competition: Netscape vs. Internet Explorer
- Copyright Infringement Suits - Apple vs. Microsoft (Windows)
- Mergers: AOL and Time Warner
- Corporate Takeovers: IBM's seizure of Lotus
- Privacy and Security issues: identification theft, medical information, viruses, spam, pornography, national security

Introduction (continued)

- Individual User Level
  - Routine processes: tax return preparation
  - Decision support: a doctor's diagnosis and treatment
  - Education and training: encyclopedias, drill-and-practice exercises, simulations
  - Leisure: music and sports information

Introduction (continued)

- Communities
  - Business use: financial planning, publishing applications
  - Industries and professions: web resources for journals, and career opportunities
  - Family use: entertainment and communication
  - Globalization: language and culture

What does “usability” mean?

Usability requirements

- Synonyms for “user-friendly” in Microsoft Word 2002 are easy to use; accessible; comprehensible; intelligible; idiot proof; available; and ready
- But a “friend” also seeks to help and be valuable. A friend is not only understandable, but understands. A friend is reliable and doesn’t hurt. A friend is pleasant to be with.
- These measures are still subjective and vague, so a systematic process is necessary to develop usable systems for specific users in a specific context

Usability requirements (cont.)

- The U.S. Military Standard for Human Engineering Design Criteria (1999) states these purposes:
  - Achieve required performance by operator, control, and maintenance personnel
  - Minimize skill and personnel requirements and training time
  - Achieve required reliability of personnel-equipment/software combinations
  - Foster design standardization within and among systems
- Should improving the user's quality of life and the community also be objectives?
- Usability requires project management and careful attention to requirements analysis and testing for clearly defined objectives

What can be done to achieve usability?

Goals for requirements analysis

- **Ascertain the user's needs**
  - Determine what tasks and subtasks must be carried out
  - Include tasks which are only performed occasionally. Common tasks are easy to identify
  - Functionality must match need or else users will reject or underutilize the product

Goals for requirements analysis

- **Ensure reliability**
  - Actions must function as specified
  - Database data displayed must reflect the actual database
  - Appease the user's sense of mistrust
  - The system should be available as often as possible
  - The system must not introduce errors
  - Ensure the user's privacy and data security by protecting against unwarranted access, destruction of data, and malicious tampering

Goals for requirements analysis

- **Promote standardization, integration, consistency, and portability**
  - *Standardization*: use pre-existing industry standards where they exist to aid learning and avoid errors (e.g. the W3C and ISO standards)
  - *Integration*: the product should be able to run across different software tools and packages (e.g. Unix)
  - *Consistency*:
    - compatibility across different product versions
    - compatibility with related paper and other non-computer based systems
    - use common action sequences, terms, units, colors, etc. within the program
  - *Portability*: allow for the user to convert data across multiple software and hardware environments

Goals for requirements analysis

- ***Complete projects on time and within budget***
  Late or over budget products can create serious pressure within a company and potentially mean dissatisfied customers and loss of business to competitors

How can we know that usability has been achieved?

Usability measures

- Define the target user community and class of tasks associated with the interface
- 5 human factors central to community evaluation:
  - ***Time to learn***
    How long does it take for typical members of the community to learn relevant task?
  - ***Speed of performance***
    How long does it take to perform relevant benchmarks?
  - ***Rate of errors by users***
    How many and what kinds of errors are made during benchmark tasks?
  - ***Retention over time***
    Frequency of use and ease of learning help make for better user retention
  - ***Subjective satisfaction***
    Allow for user feedback via interviews, free-form comments and satisfaction scales

Usability measures (cont.)

- Trade-offs
  - Changes to the interface in a new version may create consistency problems with the previous version
  - But the changes may improve the interface in other ways or introduce new needed functionality.
- Design alternatives can be evaluated by designers and users
  - mockups or high-fidelity prototypes.
  - Feedback early and perhaps less expensively in the development process
  - Feedback late and having a more authentic interface evaluated.

Why do we want usability?

Usability motivations

Many interfaces are poorly designed and this is true across domains:

- Life-critical systems
  - Air traffic control, nuclear reactors, power utilities, police & fire dispatch systems
    1. Time to learn:
    2. Speed of performance:
    3. Rate of errors by users:
    4. Retention over time:
    5. Subjective satisfaction:

Usability motivations (cont.)

- Industrial and commercial uses
  - Banking, insurance, order entry, inventory management, reservation, billing, and point-of-sales systems
    1. Time to learn:
    2. Speed of performance:
    3. Rate of errors by users:
    4. Retention over time:
    5. Subjective satisfaction:

Usability motivations (cont.)

- Office, home, and entertainment applications
  - Word processing, electronic mail, computer conferencing, and video game systems, educational packages, search engines, mobile device, etc.
    1. Time to learn:
    2. Speed of performance:
    3. Rate of errors by users:
    4. Retention over time:
    5. Subjective satisfaction:

Usability motivations (cont.)

- Exploratory, creative, and cooperative systems
  - Web browsing, search engines, artist toolkits, architectural design, software development, music composition, and scientific modeling systems
    1. Time to learn:
    2. Speed of performance:
    3. Rate of errors by users:
    4. Retention over time:
    5. Subjective satisfaction:

Usability motivations (cont.)

- Social-technical systems
  - Complex systems that involve many people over long time periods
  - Voting, health support, identity verification, crime reporting
    1. Time to learn:
    2. Speed of performance:
    3. Rate of errors by users:
    4. Retention over time:
    5. Subjective satisfaction:

Who is usability for?

Why do we get these problems?

- Programmers aren't users
  - Different goals and personalities
    - Programmers are problem solving, techno-geeks
  - Different levels of knowledge
    - Programmers think in system details
  - Programmers know the inside
    - UI reflects their choices, so of course they understand it
- Design process is flawed
  - Programmer, technology centered design
  - HCI is expensive, not budgeted or understood (fluff!)
  - HCI is hard, good intentions no protection

Universal Usability

- It is for everybody!
  - Computer savvy or not
  - Young-old
  - Disabled
  - Different personalities
- It is hard to design things that are for everybody…
  - Challenge
  - Useful things that originate from one person can be useful for others as well

Universal Usability Example: Curb Cuts

Universal Usability

- **Physical abilities and physical workplaces**
  - Basic data about human dimensions comes from research in *anthropometry*
  - There is no average user, either compromises must be made or multiple versions of a system must be created
  - Physical measurement of human dimensions are not enough, take into account dynamic measures such as reach, strength or speed

Universal Usability (cont.)

- Screen-brightness preferences vary substantially, designers customarily provide a knob to enable user control
- Account for variances of the user population's sense perception
  - Vision: depth, contrast, color blindness, and motion sensitivity
  - Touch: keyboard and touchscreen sensitivity
  - Hearing: audio clues must be distinct

Universal Usability (cont.)

- Cognitive and perceptual abilities
  - The human ability to interpret sensory input rapidly and to initiate complex actions makes modern computer systems possible
  - The journal *Ergonomics Abstracts* offers this classification of human cognitive processes:
    - Long-term and semantic memory
    - Short-term and working memory
    - Problem solving and reasoning
    - Decision making and risk assessment
    - Language communication and comprehension
    - Search, imagery, and sensory memory
    - Learning, skill development, knowledge acquisition and concept attainment

Universal Usability (cont.)

- They also suggest this set of factors affecting perceptual and motor performance:
  - Arousal and vigilance
  - Fatigue and sleep deprivation
  - Perceptual (mental) load
  - Knowledge of results and feedback
  - Monotony and boredom
  - Sensory deprivation
  - Nutrition and diet
  - Fear, anxiety, mood, and emotion
  - Drugs, smoking, and alcohol
  - Physiological rhythms
- But note, in any application, background experience and knowledge in the task domain and the interface domain play key roles in learning and performance

Universal Usability (cont.)

- **Personality differences**
  - There is no set taxonomy for identifying user personality types
  - Designers must be aware that populations are subdivided and that these subdivisions have various responses to different stimuli
  - Myers-Briggs Type Indicator (MBTI)
    - extroversion versus introversion
    - sensing versus intuition
    - perceptive versus judging
    - feeling versus thinking

Universal Usability (cont.)

- **Cultural and international diversity**
  - Characters, numerals, special characters, and diacriticals
  - Left-to-right versus right-to-left versus vertical input and reading
  - Date and time formats
  - Numeric and currency formats
  - Weights and measures
  - Telephone numbers and addresses
  - Names and titles (Mr., Ms., Mme.)
  - Social-security, national identification, and passport numbers
  - Capitalization and punctuation
  - Sorting sequences
  - Icons, buttons, colors
  - Pluralization, grammar, spelling
  - Etiquette, policies, tone, formality, metaphors

Universal Usability (cont.)

- **Users with disabilities**
  - Designers must plan early to accommodate users with disabilities
  - Early planning is more cost efficient than adding on later
  - Businesses must comply with the "Americans With Disabilities" Act for some applications
- **Elderly Users**
  - Including the elderly is fairly easy, designers should allow for variability within their applications via settings for sound, color, brightness, font sizes, etc.

What should we do?

What should we do?

- Should not ignore the users' needs
- Create user-centric systems

What projects could you work on?

Example Project Ideas

- Scheduling Application
- Flight Reservation System
- Car Navigation System
- ebook Reader for the Elderly
- An App for Tracking Diet and Exercise
- Trip Journaling Application