Evaluating Interfaces with Users

Why evaluation is crucial to interface design

General approaches and tradeoffs in evaluation

The role of ethics

Why Bother?

Tied to the usability engineering lifecycle

- Pre-design
  - investing in new expensive systems requires proof of viability

- Initial design stages
  - develop and evaluate initial design ideas with the user

- Iterative design
  - does system behaviour match the user’s task requirements?
  - are there specific problems with the design?
  - can users provide feedback to modify design?

- Acceptance testing
  - verify that human/computer system meets expected performance criteria
  - ease of learning, usability, user’s attitude, performance criteria
  - e.g., a first time user will take 1-3 minutes to learn how to withdraw $50 from the automatic teller
What Defines Success?

We want a “usable” system. What are some metrics that can be used to measure whether a system is usable?

- Time to learn
- Speed of performance
- Rate of errors by users
- Retention over time
- Subjective Satisfaction

Often, there will be tradeoffs between these goals.

Approaches: Naturalistic/Qualitative

Naturalistic:

- describes an ongoing process as it evolves over time
- observation occurs in realistic setting
  - ecologically valid
- “real life”

External validity

- degree to which research results applies to real situations
**Approaches: Experimental/Quantitative**

**Experimental**
- study relations by manipulating one or more *independent* variables
  - experimenter controls all environmental factors
- observe effect on one or more *dependent* variables

**Internal validity**
- confidence that we have in our explanation of experimental results

**Trade-off: Natural vs Experimental**
- precision and direct control over experimental design *versus*
- desire for maximum generalizability in real life situations

**Reliability Concerns**
Would the same results be achieved if the test were repeated?

**Problem: individual differences:**
- best user 10x faster than slowest
- best 25% of users ~2x faster than slowest 25%

**Partial Solution**
- reasonable number and range of users tested
- statistics provide confidence intervals of test results
  - 95% confident that mean time to perform task X is 4.5 +/- 0.2 minutes
  - means
    - 95% chance true mean is between 4.3 and 4.7, 5% chance it’s outside that
Validity Concerns

Does the test measure something of relevance to usability of real products in real use outside of lab?

- Some typical validity problems of testing vs real use
  - non-typical users tested
  - tasks are not typical tasks
  - physical environment different
    - quiet lab - vs - very noisy open offices vs interruptions
    - social influences different
    - motivation towards experimenter vs motivation towards boss

Partial Solution

- use real users
- tasks from task-centered system design
- environment similar to real situation
Ethics

Testing can be a distressing experience
- pressure to perform, errors inevitable
- feelings of inadequacy
- competition with other subjects

Golden rule
- subjects should always be treated with respect

Managing subjects in an ethical manner (I)

Before the test
- Don’t waste the user’s time
  - use pilot tests to debug experiments, questionnaires etc
  - have everything ready before the user shows up
- Make users feel comfortable
  - emphasize that it is the system that is being tested, not the user
  - acknowledge that the software may have problems
  - let users know they can stop at any time
- Maintain privacy
  - tell user that individual test results will be kept completely confidential
- Inform the user
  - explain any monitoring that is being used
  - answer all user’s questions (but avoid bias)
- Always let users stop the test
  - user must sign an informed consent form
Managing subjects in an ethical manner (II)
During the test

• don’t waste the user’s time  
  - never have the user perform unnecessary tasks

• make users comfortable  
  - try to give user an early success experience  
  - keep a relaxed atmosphere in the room  
  - coffee, breaks, etc  
  - hand out test tasks one at a time  
  - never indicate displeasure with the user’s performance  
  - avoid disruptions  
  - stop the test if it becomes too unpleasant

• maintain privacy  
  - do not allow the user’s management to observe the test  
  - if you are going to record the session, make sure you have their permission and try to conceal their identity  
  (note: we will discuss recording sessions in more detail next session)

Managing subjects in an ethical manner (III)

After the test

• make the users feel comfortable  
  - state that the user has helped you find areas of improvement

• inform the user  
  - answer particular questions about the experiment that could have biased the results before

• maintain privacy  
  - never report results in a way that individual users can be identified  
  - only show videotapes outside the research group with the user’s permission
**You know now**

Evaluation is crucial for designing, debugging, and verifying interfaces

There is a tradeoff in naturalistic *vs-* experimental approaches

• internal and external validity
• reliability
• precision
• generalizability

**Subjects must be treated with respect**

• ethical rules of behaviour

**Reading**

Shneiderman, Chapters 6, 7