Evaluating Interfaces with Users

Why evaluation is crucial to interface design

General approaches and tradeoffs in evaluation
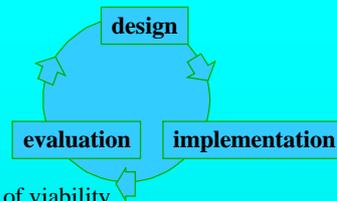
The role of ethics

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Why Bother?

Tied to the usability engineering lifecycle

design

evaluation   implementation

- Pre-design
  - investing in new expensive system 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

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Approaches: Naturalistic

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

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

Approaches: 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 its outside that

Approaches: Validity Concerns

Does the test measure something of relevance to usability of real products in real use outside of lab?
- Some typical reliability 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
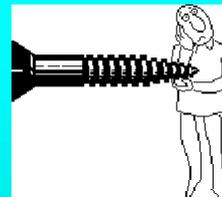- tasks from task-centered system design
- environment similar to real situation
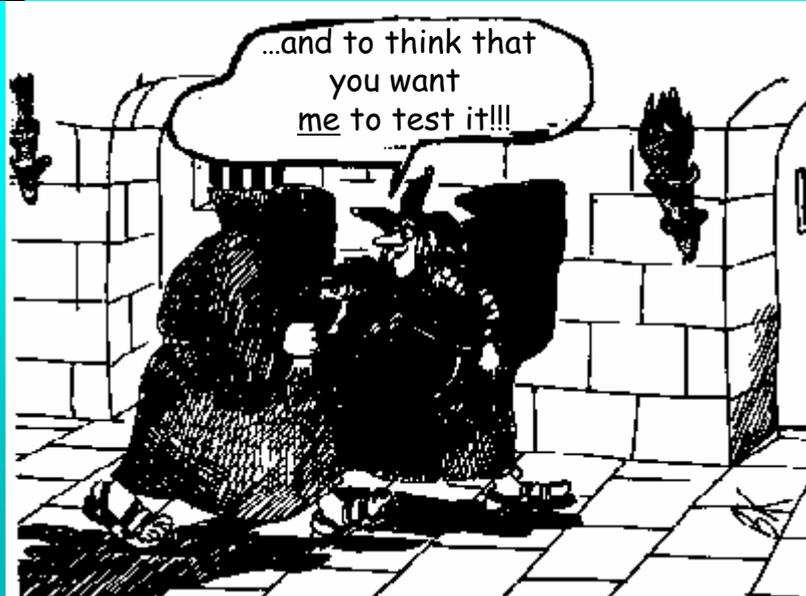
Ethics

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

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)

- only use volunteers
  - user must sign an informed consent form

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Managing subjects in an ethical manner

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

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Managing subjects in an ethical manner

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