CTT534 – Thiết Kế Giao Diện

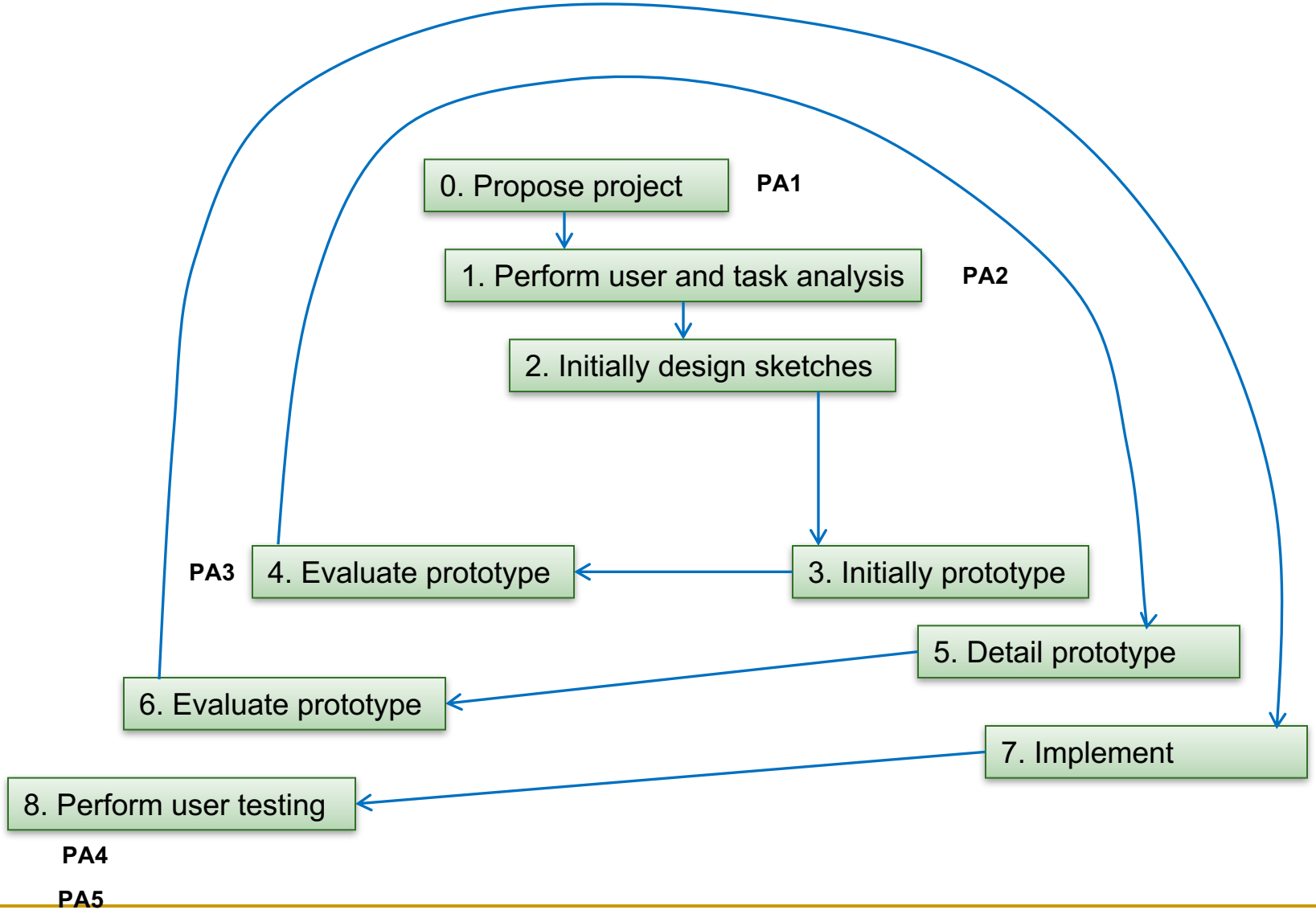
UI Design Evaluation

Some slides adapted from MIT CS Course 6.813/6.831 and USC's CSCI 588

Outline

- Overview of user interface design evaluation
- UI evaluation methods
  - Expert
    - Heuristic evaluation
  - User
    - Field studies
    - Controlled experiment
    - Formative evaluation

Process for Projects in This Class



Why, what, where, when to evaluate

- Iterative design and evaluation is a continuous process that examines
  - Why
    - check that users can use the product and that they like it
  - What
    - a conceptual design, early prototypes and later, more complete prototypes
  - Where
    - in natural and team settings
  - When
    - throughout design process; finished products can be evaluated to collect information to inform new products

Throughout the Usability Engineering Lifecycle

- Conceptual design
  - evaluating initial concept design ideas with the users
- Early prototype design
  - evaluating with the users
    - does system behavior match the user's task requirements?
    - are there specific problems with the design?
- Complete prototype design
  - acceptance testing to verify the system meets expected user performance criteria

Purpose of evaluation

- Identify specific problems in UI
  - mismatches between design and final product
  - mismatches between design and real users' behaviors
- Assess the effect of interaction
  - usability and user satisfaction
- Explore and understand system's functionality
  - understand real users' interactions

Methods of evaluation

- Heuristic evaluation
  - Done by experts
- User tests: done by users
  - Field studies
  - Controlled experiment
  - Formative evaluation

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Usability heuristics/guidelines

- Many heuristics to base on
  - Nielsen's 10 heuristics
  - Norman's rules from Design of Everyday Things
  - Shneiderman's Eight Golden Rules

- Heuristics help
  - Designers to choose design alternatives
  - Help evaluators find problems and assess interfaces (hence Heuristics Evaluation)

UI design principles we've studied

- Learnability/Memorability – L for short
- Visibility – V
- Simplicity – S
- User control – UC
- Error handling – ER
- Efficiency – E
- Graphic design – GD

Nielsen's heuristics

- Match the real world (L)
- Consistency and standards (L)
- Help and documentation (L)
- User control and freedom (UC)
- Visibility of system status (V)
- Flexible and efficiency (EF)
- Error prevention (ER)
- Recognition, not recall (ER)
- Error reporting, diagnosis, and recovery (ER)
- Aesthetic and minimalist design (GD)

Norman's rules

- Affordances (L)
- Natural mapping (L)
- Visibility (V)
- Feedback (S)

Shneiderman's eight golden rules

1. Consistency (L)
2. Shortcuts (EF)
3. Feedback (V)
4. Dialog closure (V)
5. Simple error handling (ER)
6. Reversible actions (UC)
7. Put users in control (UC)
8. Reduce short-term memory load (ER)

Heuristic evaluation

- Invented and evaluated by Jakob Nielsen
  - Cheaper and more effective than alternative methods
- An inspection technique
- Often done by experts

- Basic steps
  - Review/inspect UI
  - Compare it against certain heuristics
  - Document usability problems
  - Explain and justify problems against heuristics

Guidelines for heuristic evaluation-1

- Justify every problem with heuristics (one or many)
  - "Dialog A has button 'Hủy' while the same button on dialog B is labeled 'Đóng'" (Consistency)
  - Don't just say "I don't like the layout"
- List every problem
- Go through the interface multiple times
- Don't have to limit to the 10 Nielsen's heuristics
  - Also, not all heuristics are applicable for a user interface

Guidelines for heuristic evaluation-2

- Use multiple evaluators
  - More people find more and different problems than one person
  - Problems can be duplicated
  - Nielsen recommends 3-5 evaluators
- Use heuristic evaluation in addition to user testing
  - Each method finds different problems
  - Heuristic evaluation is cheaper

Evaluating prototypes

- Heuristic evaluation can also be used to evaluate
  - Sketches
  - Paper/computer prototypes
  - Demo code
- Certain heuristics are not applicable
  - Feedback
  - “Missing-element” problems
  - Help and documentation

Formal evaluation process

- Training
  - Meeting to introduce the application and its user interface
  - Explain user population, domain, scenarios
- Evaluation
  - Evaluators work independent to record problems and generate report
- Severity rating
  - Evaluators provide severity levels for problems found
- Briefing
  - Evaluators and design team discuss results and suggest solutions

Severity level

- Different scales can be provided, such as
  - Cosmetic or trivial: not important, low priority
  - Minor: not serious, low priority
  - Major: quite serious, high priority
  - Critical: serious, high priority
- Factors to consider for rating
  - Frequency: how common the problem is found?
  - Impact: hard to resolve?
  - Persistence: repeated?

Writing heuristic evaluations - 1

- Evaluators must provide clear descriptions of problems
  - To reduce time for both designers and evaluators
- Include both positive comments and criticisms
  - Emphasize more on criticisms and recommendations
- Don’t be unnecessarily tough
- Be specific
  - Not specific: “text is unreadable”
  - Specific: “text has poor contrast”

Writing heuristic evaluations - 2

- Evaluation report can include
  - Problem title
  - Problem description
  - Heuristic
  - Severity
  - Recommendations and screenshots (if any)

Cognitive walkthrough

- Is an inspection technique that focuses on learnability
- Inputs
  - Prototype
  - Task
  - Sequence of actions
  - User analysis
- Evaluator asks questions while following sequence of actions
  - Will user find the action on the interface?
  - Will user know what to do?
  - Etc.

Exercise

- Form groups of 5 students each
- Each group will do the following tasks
  - Examine the homepage for Univ of Technology (Bach Khoa)
  - Decide heuristics to evaluate this homepage
  - Review it using the heuristics
  - Document the review
- Time
  - Review: 30 minutes
  - Report: 10 minutes for two teams


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Thư Viện | Đại học | Sau Đại học | ĐT Quốc tế | MSM-MBA | P.KHCN | Site map | Liên hệ | Email
Missing Plug-in
GIỚI THIỆU | BẢN TIN | TUYỂN SINH ĐH-CĐ | SINH VIÊN | VIÊN CHỨC
TIÊU ĐIỂM
Tổng quan về thành tựu kiểm định chất lượng của Trường Đại học Bách Khoa
Trường Đại học Bách Khoa tham gia kiểm định cấp trường theo HCERES
Tầm nhìn - Sứ mạng
Kiểm định Chất lượng
Tra cứu Văn bằng
Quy chế công khai thông tin nhà trường
CÁC ĐƠN VỊ TRỰC THUỘC
KHOA - TRUNG TÂM ĐÀO TẠO
PHÒNG - BAN CHỨC NĂNG
TRUNG TÂM KHOA HỌC - CÔNG NGHỆ
CÁC DỊCH VỤ HỖ TRỢ
Hỗ trợ công tác giảng dạy
Xem thu nhập cá nhân
TRƯỜNG ĐẠI HỌC BÁCH KHOA
PHÒNG ĐÀO TẠO SAU ĐẠI HỌC
MBA MSM
STEP TO MBA
TUYỂN SINH SAU ĐẠI HỌC NĂM 2017
30 ngành Tiến sĩ
38 ngành Thạc sỹ
14 ngành đào tạo SĐH Quốc tế
Hình thức tuyển sinh: Thi tuyển & Xét tuyển
Thời gian tuyển sinh: tháng 3/2017 (đợt 1) & tháng 8/2017 (đợt 2)
Xem thêm thông tin chi tiết về ngành đào tạo, môn thi, bố túc kiến thức... tại Website
http://www.pgs.hcmut.edu.vn/ hoặc http://www.sdhbk.edu.vn/
Chi tiết >>
BẢN TIN BÁCH KHOA
Khoa Cơ khí ký kết hợp tác với công ty NAMILUX
Sáng 26/04/2017, Khoa Cơ khí trường ĐH Bách Khoa tổ chức Lễ ký kết hợp tác với công ty CP Thiết bị Nhà bếp Vi Na...
Chi tiết
Cơ hội việc làm cho sinh viên ĐHBK tại Suntory Pepsico
Tiếp và làm việc với đại diện trường ĐH College of Southeastern Norway, Na Uy
Bế mạc cuộc thi Olympic Toán học SV, HS toàn quốc năm 2017
LƯỢT TRUY CẬP
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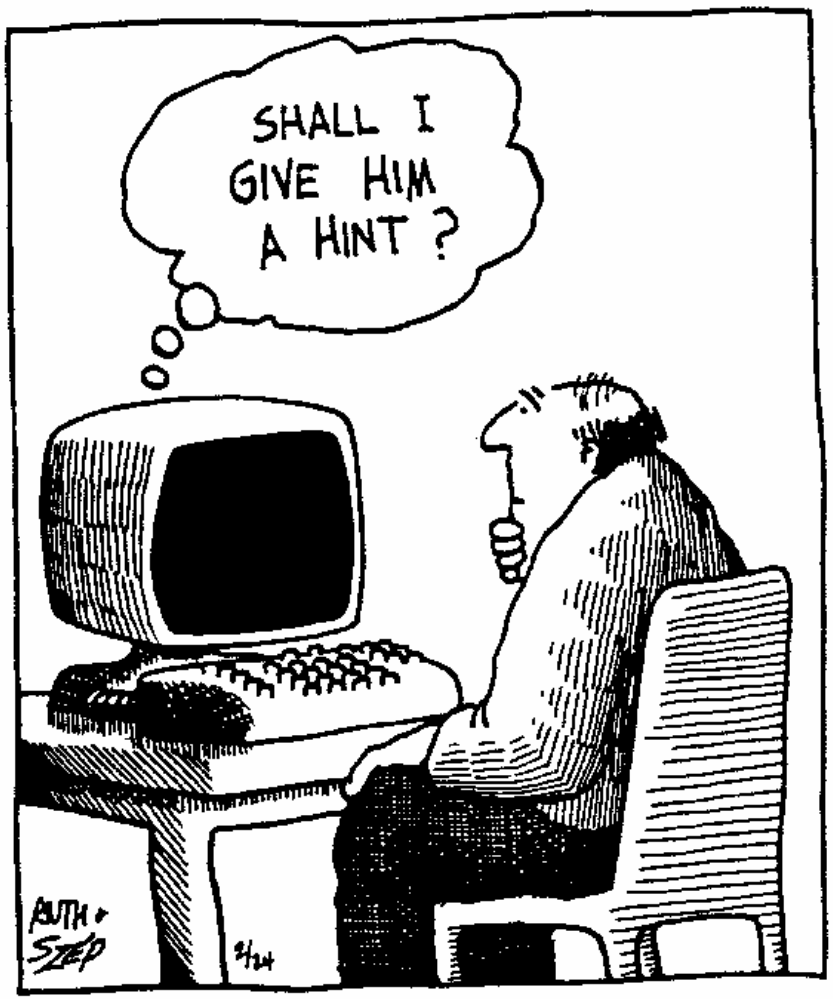
Các trang liên kết:
© Bản quyền 2011. Đại Học Bách Khoa Thành Phố Hồ Chí Minh.


SHALL I
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  - User
    - **Field studies**
    - Formative evaluation
    - Controlled experiment

Field studies

- Real use environments
  - Observe effect occurs in realistic setting
  - Can't tell how good UI is until the users use the products and that they satisfy
  - Hard to predict what real users will do
    - problems identified are those that are really raised when the user uses the software
  - Usability could be measured during the test by calculating the user performance

Field studies (cont'd)

- Problems
  - cost/time consuming
  - may not generalize

Procedure

1. Prepare test proposal
2. Choose participants
3. Select properties to be tested
4. Perform the tests
5. Measure the test results

1. Prepare test proposal

- Test proposal
  - test objective
  - test participants
  - test environment and materials
  - test methodology to be used
    - detailed descriptions of systems/tasks/properties being tested
  - test measures
    - test data to be collected and analyzed

2. Choose participants

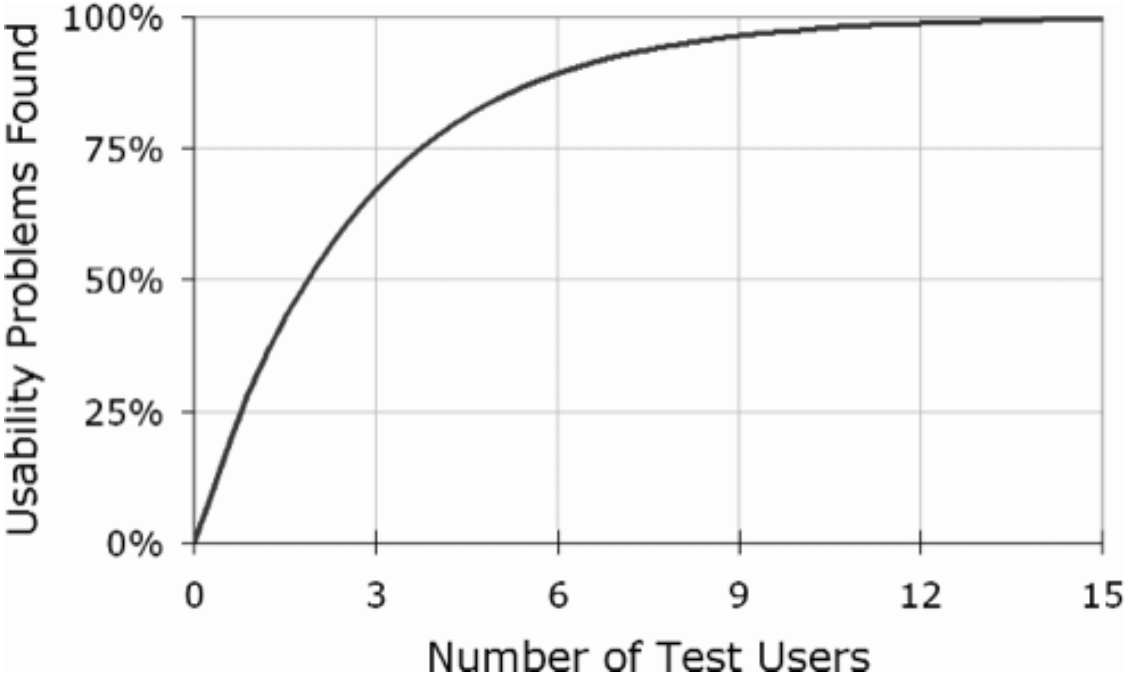
- Representative of target users
  - The users must be those targeted by the evaluated product
  - Relevant tasks, job-specific knowledge
- Approximate if needed
  - system intended for doctors?
    - get medical students
  - system intended for engineers?
    - get engineering students

2. Choose participants (cont'd)

- How many users are enough?
  - Too many users?
    - Cost issue - observing many users is time/cost consuming
  - Too few users
    - High variation
    - Subjective issue - individual differences matter
- Partial solution
  - reasonable number of users
    - big problems usually detected with handful of users
    - small problems and fine measures need many users

2. Choose participants (cont'd)

- How many users are enough?
  - J. Nielsen has shown that tests performed with 5 users raise at least 80% of the usability problems
  - 3 tests with 5 users is better than 1 test with 15 users



Ethical considerations

- Users are human beings!
- Testing can be a distressing experience
  - pressure to perform, errors inevitable
  - feelings of inadequacy
- You have a responsibility to alleviate:
  - make voluntary testers with informed consent
  - make them feel comfortable, avoid pressure
  - let them know they can stop at any time
  - stress that you are testing the system, not them
  - make collected data as anonymous as possible
- Law often requires to get human subjects approval

Ethical considerations (cont'd)

- The objective of test is to identify usability problem, not to measure user's capability

3. Select properties to be tested

- Define a precise objective for each test
  - Well-defined test instructions and objectives → test results are easy to interpret
- Test objective should reflect real tasks
- Avoid bending tasks in direction of what your design best supports
- Don't choose tasks that are too fragmented

- The objective is to evaluate the software, not the user!

4. Perform the tests

- Evaluation methods
  - Inspection
  - Direct observation
  - Query techniques
    - Interview/questionnaires/surveys

Inspection

- Try system/prototype
  - does the system “feel right”?
- Benefits
  - can catch some major problems in early versions
  - often help the task centered walkthroughs
- Problems
  - not reliable as completely subjective

- Analytics: detailed in next class
  - Record user events automatically

Direct observation

- Evaluator observes/records users interacting with systems
- In usability laboratory
  - user completes set of pre-determined tasks
- In fields
  - user goes through normal duties
- Benefits
  - excellent at identifying gross design/interface problems
  - validity depends on how the situation is controlled

Query techniques

- Evaluator asks user about opinion of the system
- The most common methods include
  - Interview
  - Questionnaire / surveys

"We also have some part-time positions available for people who only want to work 60 or 80 hours a week."

Query techniques: Interview

- Evaluator questions user (on one-to-one basis)
  - based on prepared questions
    - Structured, unstructured, or both
  - informal, subjective and relatively cheap
- Good for pursuing specific issues with user
- Flexible as evaluator can probe more deeply into interesting issues that arise

Interview (cont'd)

- Prepared a set of central questions
  - a few good questions gets things started
- Could be based on results of user observations
  - post-observation interview
- Let user responses lead follow-up questions
  - avoid user leading the test

Interview (cont'd)

- Post-observation Interview
  - have the users perform an observational test
  - create a video record of the test
  - interview the users with the video record
    - users comment on the events that occurred during system use
      - – e.g. I used this button is because…
    - users often offer concrete suggestions
      - – e.g. you should make this button smaller…

Interview (cont'd)

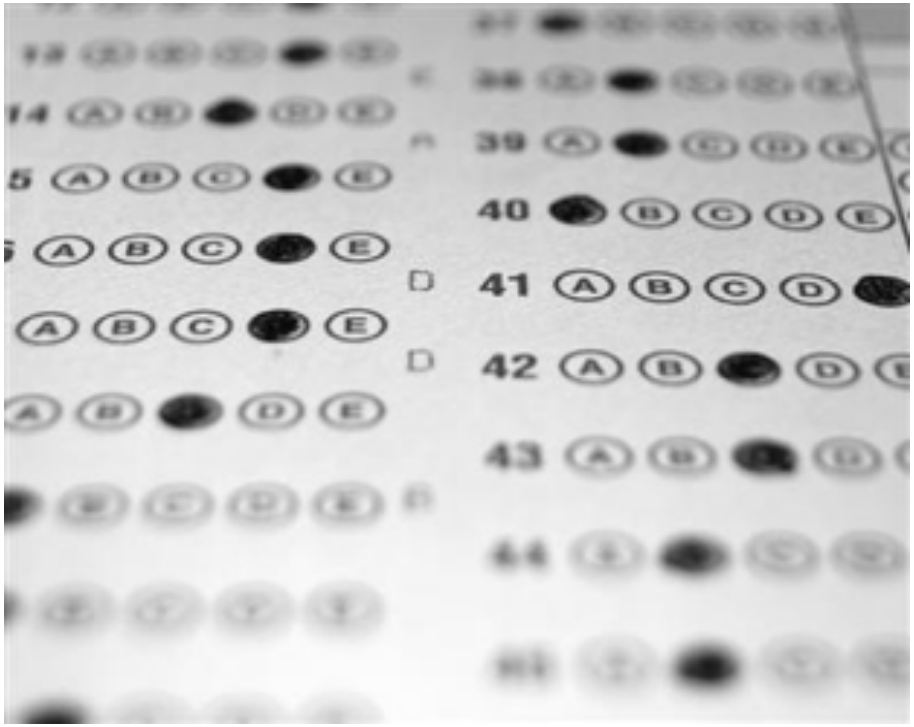
- Advantages
  - can be varied to suit context
  - issues can be explored more fully
  - can elicit user views and identify unanticipated problems
- Disadvantages
  - very subjective
  - time consuming

Query techniques: Survey

- Prepare a set of fixed questions given to users
  - Need careful design
- Expensive preparation, but cheap administration
  - Use cheap methods: e.g. phone, mail, email, online form
  - Does not require presence of evaluator
- Results can be quantified

Survey (cont'd)

- Survey question types
  - Open-ended
  - Rating scalar
  - Multi-choice
  - Ranked



Survey (cont'd)

- **Open-ended questions**
  - Asks for unprompted opinions
    - can you suggest any improvements to the systems?
  - Don't restrict answers to evaluators' expectations
  - Good for general subjective information
    - but difficult to analyze rigorously

Survey (cont'd)

- **Rating scalar questions**
  - Ask user to judge a specific statement on a numeric scale

    "The system is easy to recover from mistakes"

    Disagree 1 2 3 4 5 Agree

  - Scale usually corresponds with agreement or disagreement with a statement
    - typically 5 or 7 scale measuring agreement/disagreement with statements
  - Easily to analysis, but needs careful design

Survey (cont'd)

- **Multi-choice questions**
  - Respondent offered a choice of explicit responses

"Is there a clear way to return to a starting point or main menu?"

A. Yes, it's very clear

B. Maybe, but it's hard to navigate

C. No, I cannot find

Survey (cont'd)

- **Ranked questions**
  - Respondent places an ordering on items in a list
  - Useful to indicate a user's preferences
  - Forced choice

Please rank the usefulness of these methods for text input on mobile device

(1. most useful, 2. next most useful, …, 0 if not useful)

__ keypad

__ QWERTY keyboard

__ touch screen with virtual keyboard

Survey (cont'd)

- Advantages
  - quick and reaches large user group
  - does not require presence of evaluator
    - potential to automate administration and analysis
  - can be analyzed more rigorously
    - results can be quantified
- Disadvantages
  - preparation can be expensive
  - limited quality of feedback
- Depends on having right questions

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    - **Formative evaluation**
    - Controlled experiment

Formative evaluation

- Basic steps similar to field studies
- But different
  - Users are assigned to certain tasks rather than natural
  - Evaluators
    - Choose participants
    - Assign each participant some tasks
    - Watch participants to perform tasks
- “Think aloud”

Think aloud

- The goal is to know what the users are thinking, not just what they are doing
- First, ask the users to talk their thoughts while doing the task, example:
  - *what they are trying to do*
  - *why they took an action*
  - *how they interpret what the system did*
- Prompt the user to keep talking
  - – “tell me what you are thinking”
- Make a recording the thoughts
  - using note pad, audio or video tape

Think aloud (cont'd)

- Widely used evaluation method in industry

- Advantages
  - simplicity - requires little expertise
  - can provide useful insight into the user's thinking
  - can show how system is actually use
- Disadvantages
  - subjective
  - selective
  - act of describing may alter task performance

Example

- http://www.youtube.com/watch?v=Aa-svs5mQD8&feature=related

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Controlled experiment

- A preferred traditional scientific method
- Clear convincing result on specific issues
- Benchmark tests
- Allows system comparison, fine-tuning of details

Controlled experiment (cont'd)

- Can deal with a practical problem and use the scientific method and theoretical framework

- Theory-driven, hypothesis testing
  - Study relations by manipulating **independent variables**
  - Observe effect on one or more **dependent variables**
    - Modify independent variables → measure dependent variables

Controlled experiment (cont'd)

- Procedure
  - Prepare proposal
  - Prepare environments
  - Choose participants
  - Determine forms and properties to be used
  - Determine evaluation strategies

1. Prepare test proposal

- Test proposal
  - test objective
  - test participants
  - test environment and materials
  - test methodology to be used
    - detailed descriptions of systems/tasks/properties being tested
  - test measures
    - test data to be collected and analyzed

2. Prepare environments

- Usability testing labs
- Equipment
  - Computers
  - Video cameras
  - Internet access

- Video:

  http://www.youtube.com/watch?v=XtXYchttqQ4&feature=related

3. Choose participants

- Participants should be chosen to represent the intended user communities, considering:
  - background, experience with the task, motivation, education, etc.
- Participation should always be voluntary and informed

4. Determine forms and properties

- Different forms
  - Paper mockups
  - Special usability testing
  - Remote usability testing
  - Etc.
- Videotaping participants performing tasks is often valuable

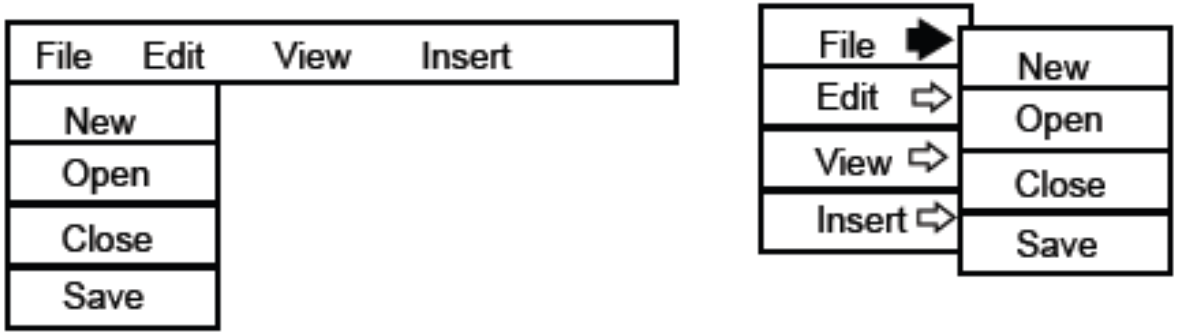
5. Evaluation strategies

- The scientific method applied to HCI include major tasks:
  - A. state lucid and testable hypothesis
  - B. identify independent variables that are to be manipulated
  - C. choose dependent variables that will be measured
  - D. select subjects and assign subjects to groups
  - E. control for biasing factors
  - F. apply statistical methods to data analysis
  - G. interpret experimental results

5. Evaluation strategies (cont'd)

- **Hypothesis**
  - Example, testing menu

    There is no difference in user performance (time and error rate) when selecting a single item from a pop-up or a pull down menu of 4 items, regardless of the subject's previous expertise in using a mouse or using the different menu types



5. Evaluation strategies (cont'd)

- **Independent variables**
  - things you control **independent** of a subject's behavior
  - Example, in the menu testing example:

    "There is no difference in user performance (time and error rate) when selecting a single item from a pop-up or a pull down menu of 4 items, regardless of the subject's previous expertise in using a mouse or using the different menu types"

    Independent variables:

    - Menu type: pop-up and full-down
    - Subject: expert and novice

5. Evaluation strategies (cont'd)

- **Dependent variables**
  - variables dependent on the subject' behavior / reaction to the independent variable
  - the specific things you set out to quantitatively measure / observe
  - Example, in the menu testing example:

    Dependent variables:
    - Speed: time to select an item
    - Error rate: # of errors made
    - Easy to learn: time to learn to use menu thoroughly

5. Evaluation strategies (cont'd)

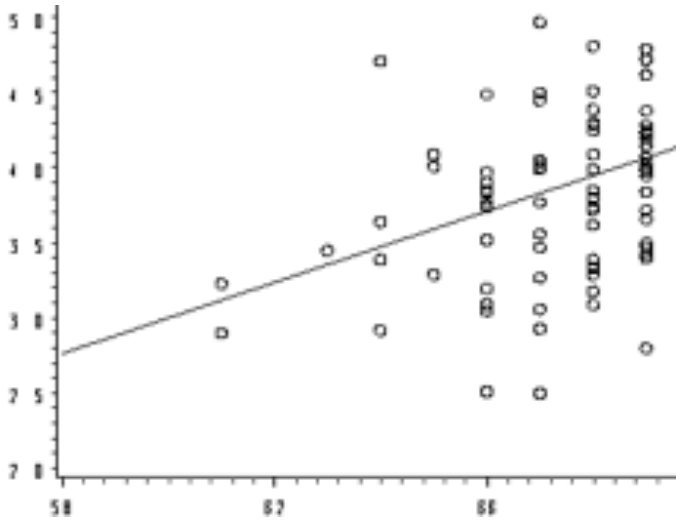
- **Subjects**
  - Those who perform tasks
  - Carefully select ***subjects*** and assign subjects to groups

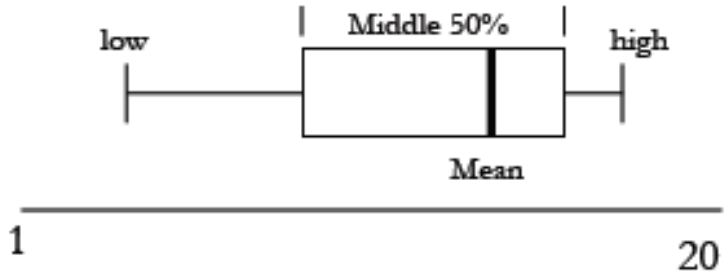
5. Evaluation strategies (cont'd)

- **Statistical data analysis**
  - applying statistical methods to data analysis
  - Simple analysis
    - Determine means and medians
    - Compare values of means and medians between methods
    - Using hypothesis testing methods (e.g., student t-test, ANOVA)

5. Evaluation strategies (cont'd)

- **Statistical data analysis**
  - Presentation using charts, tables, graphs





5. Evaluation strategies (cont'd)

- **Interpreting experimental results**
  - what you believe the results really mean
  - their implications to your design
  - how generalizable the results are
  - limitations and critique

Summary

- Overview of UI evaluation
  - Performed through the entire usability design lifecycle
- Field study (user testing) procedure
  - Preparing test proposal
  - Choosing participants
  - Selecting properties to be tested
  - Performing the tests. Techniques:
    - Inspection
    - Direct observation
    - Query techniques
  - Measuring the test results

Summary (cont'd)

- Formative evaluation
  - Think aloud
- Controlled experiment
  - Major tasks of controlled experiments
    - Defining hypothesis
    - Determining independent and dependent variables
    - Selecting subjects
    - Performing statistical analysis
    - Interpreting results