Review Slides

Outline

- Process of Interaction Design (Ch. 6)
  - Overview
  - Lifecycle Models
- Identifying Needs & Requirements (Ch. 7)
  - Types of Requirements
  - Data Gathering
    - Ethnography, Participatory (cooperative) Design
- Prototyping (Ch. 8)
- Physical Design (Menus)
- Methods for Analysis, Evaluation, Modeling
  - Human Subjects; Interviews & Questionnaires; Observing Users; User Modeling; Design Analysis
- Case Studies

Process of Interaction Design

Chapter 6

Design Process

- Basic Activities
  1. Identify needs and establish requirements
  2. Develop alternative designs
  3. Build interactive versions of designs
  4. Evaluate Designs
- Key Characteristics of process
  1. Focus on users
  2. Identify and focus on specific usability and user experience goals
  3. Iteration is inevitable

Identify Needs & Establish Requirements

- Who are the users/stakeholders?
- User Capabilities
- Needs

Registration Webpages
- Stakeholders
  - Students
  - Registrars office
  - Faculty
  - Finance office?
- User capabilities
  - Visually impaired?
- Needs
  - Register for class
  - Review courses
  - Drop

Develop Alternative Designs

- Consider alternate mental models and representational systems
- Consider alternate conceptual models
  - Instructing, Conversing, Manipulating and Navigating, Exploring and Browsing, Objects
- Borrow for analogous interaction designs
  - Either online or not
- Talk to other people
- Be creative

Choose among alternative designs

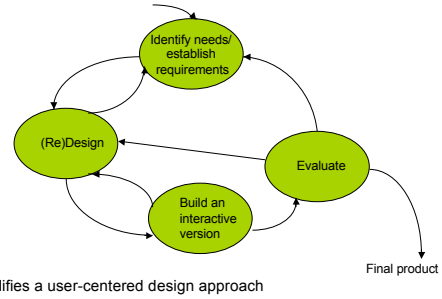
- Mental model? Representations?
- Interface work
- Usability goals
  - Effective, efficient, safety, utility, learnability, memorability
- Experience goals
  - Satisfying, enjoyable, fun, entertaining helpful, motivating, aesthetically pleasing, supportive of creativity, rewarding emotionally fulfilling
- Technical feasible?
- Ask others

Choose among alternative designs (continued)

- Design criteria (e.g., Shneiderman's)
  - Consistency, shortcuts, informative feedback, closure, error prevention and handling, reversal of actions, locus of control, reduce short-term memory load
- For collaborative virtual environments
  - Conversation and coordination mechanisms, social protocols and conventions, awareness info

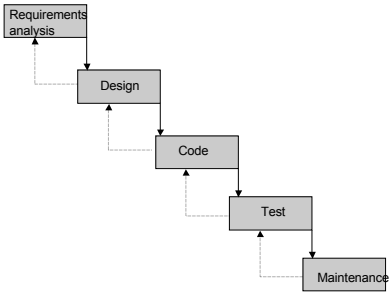
Lifecycle Models

A simple interaction design model

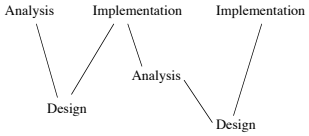


Exemplifies a user-centered design approach

Traditional 'waterfall' lifecycle

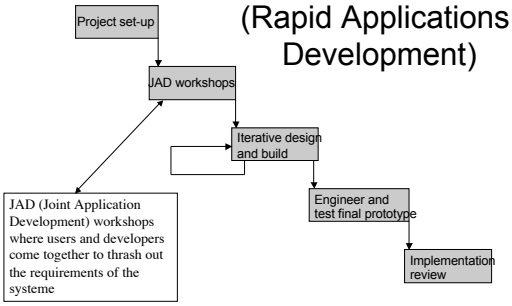


W Model

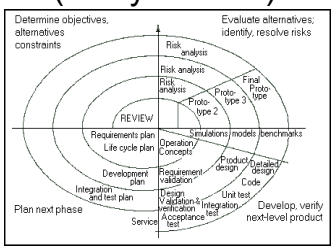


A single 'design in miniature' is undertaken and tested. Following this, the requirements are fixed and a traditional approach to development is undertaken. The advantage of this is that it is less expensive than the spiral approach since only on iteration is undertaken. It also helps with identifying accurately user requirements

A Lifecycle for RAD (Rapid Applications Development)

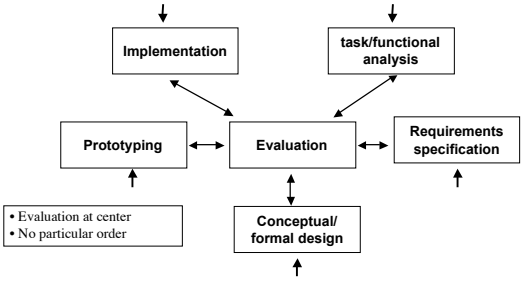


Spiral Lifecycle model (Barry Boehm)



From cctr.umkc.edu/~kennethjuwng/spiral.htm

The Star Model (Hartson and Hix, 1989)



Basic Methodology

(For Re-engineering the Rep. Sys.)

- Online practice is grounded in the representational system provided by a groupware system.
- Transcripts are collected of online user behavior.
- Identify weak spots in the representational system
  - Coordination work & cognitive load
- Re-engineer the representational system

- Initially applied to VesselWorld
  - Work done with Landsman, Feinman, Introne

Identifying Needs & Establishing Requirements

Chapter 7

Overview of Slides

- Requirements
- Data Gathering
- Data interpretation and analysis
- Ethnography
  - Video Tape (Analyze workplace before introducing new technology)
  - Online Collaboration
    - Transcript, Replay, Analysis

Requirements

- "Statement about an intended product that specifies what is should do or how it should perform." p204
- Example using Volere template (p. 205)

Requirement #: ***75*** *Requirement type:* ***9*** *Event/use case #:****6***

Description: ***The product shall issue an alert if a weather station fails to transmit readings.***

Rationale: ***Failure to transmit readings might indicate that the weather station is faulty and needs maintenance, and that the data used to predict freezing roads may be incomplete.***

Source: ***Road Engineers***
Fit Criterion: ***For each weather station the product shall communicate to the user when the recorded number of each type of reading per hour is not within the manufacturer's specified range of the expected number of readings per hour.***

Customer Satisfaction: ***3*** *Customer Dissatisfaction:* ***5***
Dependencies: ***None*** *Conflicts:* ***None***
Supporting Materials: ***Specification of Rosa Weather station***
History: ***Raised by GBS, 28 July 99***

Kinds of Requirements

- Functional
  - What the product should do
- Data
  - Type, volatility, size/amount, persistence, accuracy and value of amounts of data
- Environmental
  - *Physical* (e.g.,need protective clothing?)
  - *Social* (e.g., does data need to be shared?)
  - *Organizational* (e.g, good user support available?)
- User Requirements
  - e.g., Expert? Novice?
- Usability
  - e.g., effectiveness, efficiency, safety, utility, …

Requirements

- System for use in a university's self-service cafeteria that allows users to pay for their food using a credit system

Functional: The system will calculate the total cost of purchases.

Data: Access to the price of products in cafeteria.

Environmental: Cafeteria users will be carrying a tray and will most likely be in a reasonable rush. Physical environment will be noisy and busy, and users mayb e talking with friends and colleagues while using system

User: Majority of users likely to be under 25 and comfortable with technology.

Usability: Easy, memorable, efficient, and deal easily with user errors

Requirements

- Control functioning of nuclear power plant

Functional: Monitor temperature of the reactors.

Data: Need access to temperature readings.

Environmental: Physical environment uncluttered. Protective clothing?

User: Well-trained engineer or scientist who is competent to handle technology

Usability: Outputs from the system, especially warning signals and guages, must be clear and unambiguous.

Requirements

- System to support distributed design team, e.g., for car design.

Functional: Communicate info between remote sites

Data: Must have access to design info that will be captured in a common file format (such as AutoCAD)

Environmental: Physically distributed over a wide area. Files and other electronic media need to be shared. System must comply with available communication protocols and be compatible with network technologies.

User: Profession designers, who are likely to spend time learning to use the system. Design team may be multi-lingual.

Usability: High priority to keep error rate low.

Data-Gathering

- Questionnaires
- Interviews
- Focus groups and workshops
- Naturalistic observation
- Studying documentation

Basic guidelines for data-gathering

- Involve all the stakeholder groups
- Involve more than one representative of each stakeholder group
- Use combination of data gathering techniques
- Support the data-gathering sessions with suitable props, such as task descriptions and prototypes (if available)
- Run a pilot session if possible to ensure that your data-gathering session is likely to go as planned.
- Design data-capture exercise to collect the data you want
- How the data is recorded is very important.

Data Gathering: Ethnography

- Video Tape Technology
  - Analyze workplace before introducing new technology
- Online Collaboration
  - Transcript, Replay, Analysis
  - VesselWorld as an example

Ethnography

- Relation between developing a descriptive understanding of human behavior and design artifacts that ostensible support the activities described.
- Ethnography emphasizes "natives' point-of-view", holism, and natural setting
  - Period of field work where ethnographer becomes immersed in activities of people studied
    - Either: Fly-on-the-wall or full participant
  - Involves observation, informal interviewing, and participation in the ongoing events of community
  - Through extensive contact develop descriptive understanding of observed behaviors
    - Includes interpretation of meaning of activities

Principles of Ethnography

- *Natural setting*
  - Study behavior in natural settings (field work)
- *Holism*
  - Behavior can only be understand in larger social context
- *Descriptive*
  - How people behavior not how they ought to behave
- *Members point of view*
  - Study behavior from point of view of those studied

Data-gathering: Ethnography and video tape

Understanding Practice: Video as a Medium for Reflection and Design

Lucy A. Suchman and Randall H. Trigg

Design at Work: Cooperative Design of Computer Systems, LEA 1991

Work as Situated Activity

- Work in particular times, in particular places, and in relation to specific social and technological circumstances
  - From this perspective, the organization of work is a complex, ongoing interaction of people with each other and with technologies that are available to them.
- Development of artifacts and work practices go hand-in-hand

Design and Use

- Where technologies are designed at a distance from the situation of their use, as most are, there is an inevitable gap between scenarios of use and users' actual circumstances
- What we see consistently is that the closeness of designers to those who use an artifact (including the possibility that designer and user are one and the same) directly determines the artifact's appropriateness to its situation of use.

Ethnographic and Interaction Analysis (p. 210)

- Ethnography involves the careful study of activities and relations between them in a complex social setting.
- Interaction analysis is concerned with detailed investigations of interaction of people with each other and with the material environment
- Identify routine practices, problems, and possibilities for development within a gi9ven activity or setting.
  - Ideal is naturally occuring occasions of work activity
- Video-based interaction analysis affords a powerful corrective to our tendency to see in a scene what we expect to see (p. 212)

What to record

- Setting-oriented record
- Person-oriented record
- Object-oriented record
- Task-oriented record

How they work

- Content log of entire video tape
- Identify issues
- Transcribing of talk of interesting segments of tape
- Collections: instances of interaction that one wants to see as a class
- Who participates (multiple perspectives): designers, people who know about interaction analysis, people who know intricacies of practice in a given domain (domain expert)

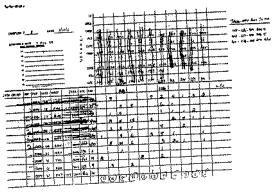
Airline Operations Room

- Complexes: periods lasting approximately an hour, when all of the gates belonging to the airline fill with incoming plans, transfers are made between the gates, and then all of the planes depart. (8 per day)
- Info needed to coordinate this work is on a paper document called "complex sheet"
- Example of breakdown
  - Complex sheet not designed to show the movement of aircraft (from one gate to another)
  - Complex sheet only covers one complex at a time

Design of artifact for task environment: Complex Sheet

(Suchman and Trigg, 1991)
(Goodwin & Goodwin, 1996)

- Reproducible representation
- A template
- A medium
- An enduring record
- Stands in for situations out on the ramp
- Shared object for communication between people during the course of their complex activities



Coordinating Representation

Breakdown revisited (p. 209)

- Have to make changes to complex sheet after it has been copied and distributred to ramp and gate crews.
  - Difficult to do, so wait to last minute before distributing complex sheet
- The complex sheet must be changed to represent a state of affairs unanticipated in its orginal design.

Cooperative Design: Techniques and experiences from the Scandinavian Scene

Susanne Bødker, Kay Gronbaek Morton Kyng, In Pariticipatory Dewsign: principles and practices. (Editors) D. Schuler & A. Namioka, LEA 1993

Ideology

- (p57) "This chapter is based on a vision, an ideal, of what system development should achieve and how it should take place. First of all, we see the ideal project as one that encourages the users-to-be in an organization, I.e., all the involved groups and individuals, to decide themselves how to develop their work by means of new computer support."

Computer Applications (more ideology)

- When computer applications are brought into a workplace, they should enhance workplace skills rather than degrade them.
- Computer applications should be viewed as tools, and designed to be under the control of the people using them. They should support work activities, not make them more rigid
- The introduction of computer applications changes the organization of work around them. The interplay between the computer application and work organizational issues should be a specific focus of the design and introduction of computer applications into organizations.
- Although computer applications are generally ordered to increase productivity, they also need to be looked at as a means to increase the quality of the results

Design Process (more ideology)

- The design process, as any process taking place in an organization, is a political one and leads to conflict.
  - Managers who order an application see things differently from the workers who will use it.
  - Different groups of users will need different things from the application, and system designers often pursue their own interests.
  - Conflicts are inherent in the process.
  - If they are ignored the solution may be less useful and continue to create problems.
- Computer applications that are created for the workplace need to be designed with full participation from the users --- both from a democratic point-of-view and to insure that competencies central to the design are represented in the design group.
  - Full participation, of course, requires training and active cooperation, not just toke representation in meetings or on committees.
  - We use the term *cooperative design* to designate such cooperation between users and designers.

- Encouraging user participation and designing for skill means paying attention to things that are often left out of the formal specification, like tacit knowledge or shared knowledge and communication.
  - When users participate in actual design activities it is necessary to use tools that are familiar to them.
  - Traditional tools such as flowcharts, dataflow diagrams, and programming languages are insufficient (or even useless) as means for cooperating with users.
- To enable users to contribute with their tacit knowledge we in design, it is important to simulate future work situations, creating the illusion of actually working with the projected system.
  - In this way changes in the use practice can, to some extent, be predicted and evaluated

Methodology (overview)

1. Designers learn about work situation
2. *Future workshops*: Compilation of an inventory of existing problems with, and new ideas for, work organization and computer support
3. *Organization games*: Play with design and effects it will have on roles, commitments, and workflow.

Methodology (more detail)

1. Designers learn about work situation
   - Workplace visits with interviews and demos by workers of work practices
2. Future workshops: Compilation of an inventory of existing problems with, and new ideas for, work organization and computer support
   - Critique phase: structured brainstorming that focuses on current problems at work and organizes them into themes
   - Fantasy phase: Themes are used a guidelines for positive change.
   - Implementation phase: Some themes developed into working outlines

Methodology (continued)

3. Organization games (2.5 days)
   - Prologue explains rules.
     - Act 1: Playground and *situation cards* designed to focus on problems that had surface during critique phase
       - During later phase participants create and play own situation cards
     - Act 2: Focus on possible new pieces of technology to be applied in the organization
       - Illustrate new technology by means of mock-ups and prototypes
     - Act 3: Focus on changes of roles and new commitments with new technology.
       - Apply *scenarios* rather than situation cards

Prototyping

What is a prototype

- Series of screen sketches
- A storyboard
- A powerpoint slide show
- Video simulating use of sysem
- Cardboard mock-up
- Piece of software with limited functionality

Why prototype?

- Evaluation and feedback centranl to interaction design
- Stakeholders can see, hold, interact with a prototype more easily than a document or a drawing.
- Team members can communicate effectively
- Test ideas yourself
- Encourages reflection
- Answers questions and supports designers in choosing between alternatives.

What to prototype?

- Technical issues
- Work flow, task design
- Screen layouts and info display
- Difficult, controversial, critical areas

Low versus High-Fidelity Prototyping

- Low-fidelity
  - Paper cardboard
  - Quick, cheap, easily changed
  - E.g., sketches, post-it notes, storyboards, wizard of oz
- High-fidelity
  - Use materials expect to see in final product
  - Looks more like final system
  - Tools: Macromedia director, visual basic, and small talk

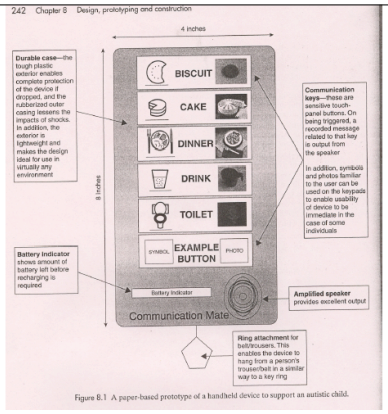


Figure 8.1 A paper-based prototype of a handheld device to support an autistic child.

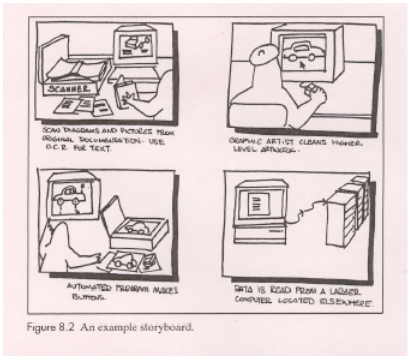


Figure 8.2 An example storyboard.

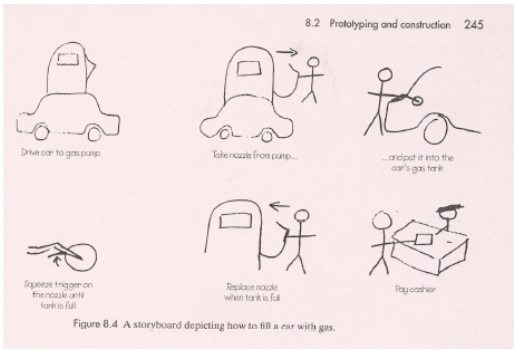
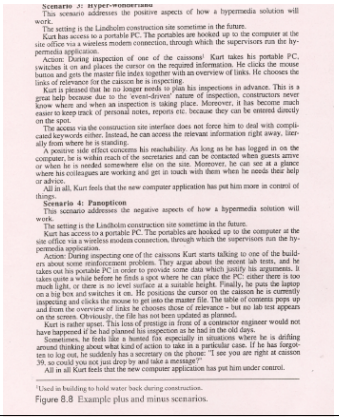


Figure 8.4 A storyboard depicting how to fill a car with gas.


Scenario 3: Hyper-Wonderful
This scenario addresses the positive aspects of how a hypermedia solution will work.
The setting is the Lindholm construction site sometime in the future.
Kurt has access to a portable PC. The portables are hooked up to the computer at the site office via a wireless modem connection, through which the supervisors run the hypermedia application.
Action: During inspection of one of the caissons[1] Kurt takes his portable PC, switches it on and places the cursor on the required information. He clicks the mouse button and gets the master file index together with an overview of links. He chooses the links of relevance for the caisson he is inspecting.
Kurt is pleased that he no longer needs to plan his inspections in advance. This is a great help because due to the 'event-driven' nature of inspection, constructors never know where and when an inspection is taking place. Moreover, it has become much easier to keep track of personal notes, reports etc. because they can be entered directly on the spot.
The access via the construction site interface does not force him to deal with complicated keywords either. Instead, he can access the relevant information right away, literally from where he is standing.
A positive side effect concerns his reachability. As long as he has logged in on the computer, he is within reach of the secretaries and can be contacted when guests arrive or when he is needed somewhere else on the site. Moreover, he can see at a glance where his colleagues are working and get in touch with them when he needs their help or advice.
All in all, Kurt feels that the new computer application has put him more in control of things.
Scenario 4: Panopticon
This scenario addresses the negative aspects of how a hypermedia solution will work.
The setting is the Lindholm construction site sometime in the future.
Kurt has access to a portable PC. The portables are hooked up to the computer at the site office via a wireless modem connection, through which the supervisors run the hypermedia application.
Action: During inspecting one of the caissons Kurt starts talking to one of the builders about some reinforcement problems. They argue about the recent lab tests, and he takes out his portable PC in order to provide some data which justify his arguments. It takes quite a while before he finds a spot where he can place the PC: either there is too much light, or there is no level surface at a suitable height. Finally, he puts the laptop on a big box and switches it on. He positions the cursor on the caisson he is currently inspecting and clicks the mouse to get into the master file. The table of contents pops up and from the overview of links he chooses those of relevance - but no lab test appears on the screen. Obviously, the file has not been updated as planned.
Kurt is rather upset. This loss of prestige in front of a contractor engineer would not have happened if he had planned his inspection as he had in the old days.
Sometimes, he feels like a heated fish especially in situations where he is drifting around thinking about what kind of action to take in a particular case. If he has forgotten to log out, he suddenly has a secretary on the phone: "I see you are right at caisson 39, so could you not just drop by and take a message?"
All in all Kurt feels that the new computer application has put him under control.
[1]Used in building to hold water back during construction.
Figure 8.8 Example plus and minus scenarios.

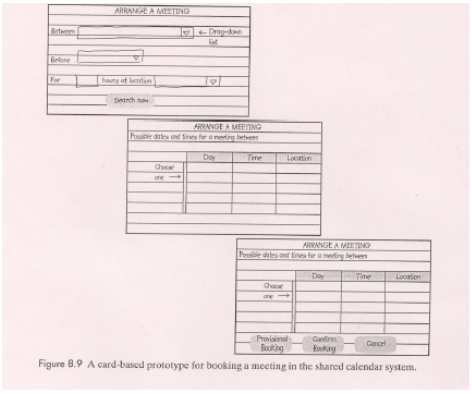


Figure 8.9 A card-based prototype for booking a meeting in the shared calendar system.

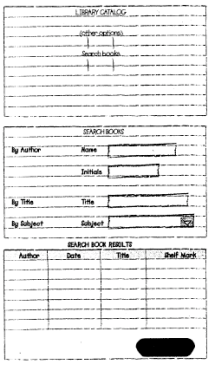


Figure 8.10 A card-based prototype for borrowing a book in the library catalog system.

Physical Design

Menus

See chapter 7 of Shneiderman, Designing for the interface for additional reading.

Menu Layout

- *Positional constancy* is an important principle of pull down menus
- Be consistent about layout of the following items:
  - Titles; item placement; instruction; error messages; status reports
- Principles for task-related groups of menu items
  - Create groups of logically similar items
  - Form groups that cover all possibilities
  - Make sure items are non-overlapping
  - Use familiar terminology, but ensure that items are distinct from one another

Tree-structured menus

- Depth (number of levels)
  Breadth (items per level)
- Breadth is preferred over depth
- Limit depth to 3 levels
  - When depth goes to 4 or 5, there is a good chance of users becoming lost or disoriented
  - When users are stressed, they make 98% more errors and took 16% longer with a 2x6 tree versus a 4x3 tree.

- A simple function of number of items on the screen will predict the time T for a selection
  - T= k + c * log b
    b is breadth at each level
    k & c are empirically determined constants for scanning screen
- Total time to traverse the menu tree depends on only the depth, D
  - D = log*bN*, where N is the total number of items in the tree
  - When N=4096 target items and a branching factor of b=16, the depth D=3, and the total time is
    - 3*(k+c*log16).

Experimental evidence

- Card, 1982
  - Subjects had to find command in menu
    Menus sequenced in one of three ways (mean times)
    - Alphabetically (.81)
    - Function groups (1.28)
    - Randomly (3.23)
- But functional would be more appealing if didn't know command name.
- If replace single with definition advantage of alphabetic disappeared (McDonald, 1983)
- Evidence for split menu strategy
  - Extract 3 or 4 of the most frequently selected items and put them on the top, while preserving the order of remaining items.

Response time & Display rate

(Delays on www have revived topic)

- Response time: time it takes the system to begin displaying info
- Display rate: speed at which menus are displayed
- If *response time* is *long* place **more** items on each menu to reduce the number of items necessary.
- If *display rate* is *slow*, then place **fewer** items on each menu to reduce display time
- If the *response time is long* and *display rate is low*
  - menu selection is unappealing and command-language strategies become more attractive.
- With *short response times* and *rapid display rates*
  - menu selection is attractive for frequent and knowledgeable users.
  - User performance and preference improves with broader and shallower menus
  - Increase size of menu is preferred, in general, if it reduces number of menus

Fast movement through menus

- Frequent menu users may become annoyed if they must make several menu selections to complete a simple tasks.
- There is an advantage to reducing the number of items per menu, but this strategy may not be sufficient.
- As response times lengthen and display rates decrease, the need for shortcuts increases. Three approaches to accommodate expert and frequent users:
  - *typeahead* for known menu choices,
  - *assign names* to menus to allow direct access, and
  - create menu macros that *allows users to assign names* to frequently used menu sequences

- Typahead:
  - The user does not have to wait to see the menus before choosing the items, but can type a string of letters or numbers when presented with main menu.
  - This is good idea when response time and display rates are slow and menus are familiar.
  - Acronyms are a good way to do typahead (this is referred to as the BLT approach).
    - In the BLT appraoch learning can be incremental: users can apply one-,two-, or three-letter typeahead, and then explore the less familiar menus. If users forget part of the tree, they simply revert to menu usage.
- Menu names or Bookmarks:
  - This strategy is useful if there is only a small number of destinations that each user needs to remember.
  - If users need to access many different portions of the menu tree, they will have difficulty keeping track of the destination names.
  - A list of the current destination names is necessary to ensure that designers create unique names for new entries.
  - Bookmarks are more learnable than typahead.

- Menu macros, custom toolbars, and style sheets:
  - A user can invoke the macro or customization facility, traverse the menu structure, and then assign a name or icon.
  - When the name or icon is invoked, the traversal is executed automatically.

Methods for Analysis, Modeling, Evaluation (Chapter 10-13)

- Overview
- Human Subjects
- Interviews & Questionnaires
- Observing Users
- User modeling
  - GOMS
- Design Analysis
  - Cognitive Walkthrough, Shneiderman's 8 Golden Rules, Nielsen's Usability Principles, Screen Layouts

Two main types of evaluation

- **Formative evaluation** is done at different stages of development to check that the product meets users' needs.
- **Summative evaluation** assesses the quality of a finished product.

Our focus is on formative evaluation

What to evaluate

Iterative design & evaluation is a continuous process that examines:

- Early ideas for conceptual model
- Early prototypes of the new system
- Later, more complete prototypes

Designers need to check that they understand users' requirements.

When to evaluate

- Throughout design
- From the first descriptions, sketches etc. of users needs through to the final product
- Design proceeds through iterative cycles of 'design-test-redesign'
- Evaluation is a key ingredient for a successful design.

Evaluation Techniques

Observing Users	Asking users	Asking Experts	User Testing	Modeling users' task performance
Transcript & Replay	Interviews	Inspection: Shneiderman's 8 Golden Rules Nielsen's 10 Design Principles Guidelines for web page layout	Testing typical users doing typical tasks in laboratory setting	GOMS Fahrenheit ←→ Celsius
Video Taping	Questionnaires	Cognitive Walkthrough	Try to destroy it sessions	
Users talk aloud as they use interface				

Human Subjects

USE OF HUMAN SUBJECTS IN RESEARCH
Project Review Cover Sheet

Project Title: Groupware-Mediated Cooperative Programming: Teaching Web Technology to Non-Scientists

Principal Investigator:
Name: Richard Alterman and Tim Hickey
Department: Computer Science **Phone:** (781) 736-2703
Faculty x **Non-Faculty** ☐
If Non-Faculty:
Undergraduate ☐ **Graduate** ☐ **Other:** _____
Faculty Sponsor: _____
Master's Thesis ☐ **Dissertation** ☐ **Class Project** ☐

Brandeis Mailbox or Mailstop No. (or other address to which approval and other correspondence should be sent): **Computer Science Department Office**

Project Start Date (approx.): September 2000 **Project End Date** (approx.): August 2003

Funding Source(s) and Application Deadline(s) (if applicable): ITR program of NSF
Pending x **Active** ☐ **Agency or Brandeis Account No:** _____

Please respond to ALL of the following questions:

1. Describe general procedures to be used and overall objectives or long-term goals of the proposed research.

Our proposal is to build, deploy, and experimentally test, a same time/ different place groupware system that supports collaborative learning of web-development and applet programming for a general service course that is routinely taken by students at Brandeis (including large numbers of students in the social sciences, humanities, and fine arts). The system we intend to build will be easily deployable across the network. It will also include tools that facilitate the study of social interaction and collaborative learning.

During the early parts of the project, we will pay undergraduates to "hang" on the system in order to help us debug both the groupware system and programming assignments. This will also help us to identify coordination issues that come up in the use of the system and do some performance evaluation.

During the second and third years of the project, we will introduce a few groupware assignments into COSI2a (the introduction to computing course) and collect data. We will compare the performance of students who completed an assignment by themselves to those who used the groupware system. *Names will be removed from recorded data and programs.*

2. Describe the characteristics of the subject populations, such as their anticipated number, age ranges, sex, ethnic background, and health status. Identify the criteria for inclusion. Explain the rationale for the use of special classes of subjects, such as fetuses, pregnant women, children, institutionalized mentally disabled, prisoners, or others who are likely to be vulnerable.

The subjects will be a mix of undergraduates who have taken (or are taking) COSCI2a.

3. Identify the sources of research material obtained from individually identifiable living human subjects in the form of specimens, records, or data. Indicate whether the material or data will be obtained specifically for research purposes or whether use will be made of existing specimens, records, or data.

The data we collect will be both a record of the students' interaction with the system and the programs that are constructed. Names will automatically be stripped from the data and programs.

4. Describe plans for the recruitment of subjects and the consent procedures to be followed, including the circumstances under which consent will be sought and obtained, who will seek it, the nature of the information to be provided to prospective subjects and the method of documenting consent. Attach copy of consent form.

We will recruit students from the COSCI 2a class. Any student who does not want to participate does not have to.

5. Describe any potential risks -- physical, psychological, social, legal, or other -- and assess their likelihood and seriousness. Where appropriate, describe alternative treatments and procedures that might be advantageous to the subjects.

There are no potential risks to subjects.

6. Describe the procedures for protecting against or minimizing any risks, including risks to confidentiality, and assess their likely effectiveness. Where appropriate, discuss provisions for insuring necessary medical or professional intervention in the event of adverse effects to the subjects. Also, where appropriate, describe the provisions for monitoring the data collected to insure the safety of subjects.

Names will be removed from all data automatically. Students will be graded independently of whether they participate in the experiment or not.

7. Discuss why the risks to subjects are reasonable in relation to the anticipated benefits to subjects and in relation to the importance of the knowledge that may reasonably be expected to result.

The goal of the project is to develop collaborative technology that facilitates learning. Our hypothesis is that collaboration will benefit the students acquisition of programming competence and style. A second benefit is that the students will be exposed to usage of a significant kind of office technology (the groupware system).

Brandeis University Informed Consent
(Expedited & Full Board Review)

BRANDEIS UNIVERSITY

CONSENT TO ACT AS A HUMAN RESEARCH SUBJECT

Title of Study: Groupware-Mediated Cooperative Programming: Teaching Web Technology to Non-Scientists

Principal Investigator(s): Richard Alterman & Tim Hickey
Department: Computer Science
Phone No: (781) 736-2793 **Fax No:** (781) 736-2741

Subject's Name: _____

PURPOSE OF STUDY:

_____

I have been asked to participate in a research project designed to:

_____The purpose of the project is to build, deploy, and experimentally test, a same time/ different place groupware system that supports collaborative learning of web-development and applet programming for a general service course that is routinely taken by students at Brandeis (including large numbers of students in the social sciences, humanities, and fine arts). The system we intend to build will be easily deployable across the network. It will also include tools that facilitate the study of social interaction and collaborative learning.

PROCEDURES:

_____

If I agree to participate, the following will occur:
A group of subjects will use a groupware system to build an applet or servlet

RISKS:
None.

BENEFITS:
The goal of the project is to experimentally explore computer-mediated collaboration as a method for teaching and learning how to develop applets and servlets.

COST/COMPENSATION:
$10/hour

OTHER CONSIDERATIONS:
n/a

If, during the course of this study, significant new information which has been developed during the study becomes available, which may relate to my willingness to continue to participate, this information will be provided to me by the investigator.

I consent to participate in this study.

I understand that any information derived from this research project which personally identifies me will not be voluntarily released or disclosed without my separate consent, except as specifically required by law.

I have read this consent form and have been given a copy of it and Part II to keep. I consent to participate.

[Above is Part I of II - See "CONSENT FORM - PART II" before signing below.]

SIGNATURE OF SUBJECT (age 7 and older) DATE

SIGNATURE OF PARENT/GUARDIAN DATE

SIGNATURE OF WITNESS DATE

Questionnaires and Interviews

Chapter 13
Interaction Design

Questionnaires

- Used on their own or in conjunction with other methods
- One advantage can be distributed to large number of people
- Design
  - Demographic info
  - Specific question that contribute to evaluation goal
    - Can be subdivided into topics

Checklist

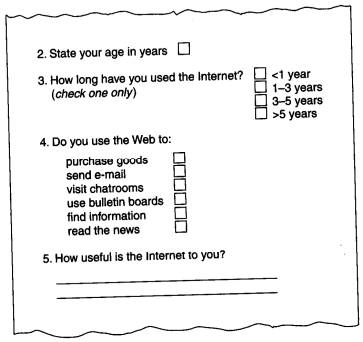
- Make questions clear and specific
- When possible, ask closed questions and offer a range of answers
- Consider including “no-opinion”
- Think about the ordering
- Avoid complex multiple questions
- When scales are used, make sure the range is appropriate and does not overlap

Checklist
(continued)

- Make sure ordering is consistent and intuitive
  - 1 is low; 2 is high
  - Positive and Negative questions ?
- Avoid jargon
  - (different versions of question for different populations)
- Provide clear instructions on how to complete the questionnaire
- Long questionnaires cost more and deter participation
  - But white space makes it easier to read

Questions and Response Format

- 15-20, 20-25 (What’s wrong)
- Does interval always have to be same size?
  - NO, under 21, over 65
- Two example scales
  - Likert
  - Semantic Differential



2. State your age in years ☐

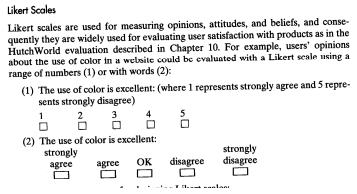
3. How long have you used the Internet? (*check one only*)
☐ <1 year
☐ 1–3 years
☐ 3–5 years
☐ >5 years

4. Do you use the Web to:
purchase goods ☐
send e-mail ☐
visit chatrooms ☐
use bulletin boards ☐
find information ☐
read the news ☐

5. How useful is the Internet to you?

Likert Scale

- Gather a pool of short statements about features of the product that are to be evaluated (brainstorming session)
- Divide the items into groups with about the same number of positive and negative statements in each group
- Decide on a scale
  - 9,7,5,3 point scales
- Select items for the final questionnaire and reword as necessary to make them clear.



Likert Scales

Likert scales are used for measuring opinions, attitudes, and beliefs, and consequently they are widely used for evaluating user satisfaction with products as in the HutchWorld evaluation described in Chapter 10. For example, users' opinions about the use of color in a website could be evaluated with a Likert scale using a range of numbers (1) or with words (2):

(1) The use of color is excellent: (where 1 represents strongly agree and 5 represents strongly disagree)

1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

(2) The use of color is excellent:

strongly agree ☐ agree ☐ OK ☐ disagree ☐ strongly disagree ☐

QUIS, Questionnaire for user interaction satisfaction

- System experience (i.e., time spent on this system)
- Past experience (i.e., experience with other systems)
- Overall user reaction
- Screen design
- Terminology and system info
- Learning to operate system
- System capabilities (i.e., time it takes to perform operations)
- Technical manuals and online help
- Online tutorials
- Multimedia
- Teleconferencing
- Software installation

QUIS, Questionnaire for user interaction satisfaction

- System experience (i.e., time spent on this system)
- Past experience (i.e., experience with other systems)
- Overall user reaction
- Screen design
- Terminology and system info
- Learning to operate system

QUIS, Questionnaire for user interaction satisfaction

- System capabilities (i.e., time it takes to perform operations)
- Technical manuals and online help
- Online tutorials
- Multimedia
- Teleconferencing
- Software installation

Semantic differential scale

- Explore a range of bipolar attitudes about a particular item
- Each pair represented as pair of attitudes
- Participant places cross in a position
- Sum the scores for each bipolar pair

Instructions: for each pair of adjectives, place a cross at the point between them that reflects the extent to which you believe the adjectives describe the home page. You should place *only one cross* between the marks on each line.

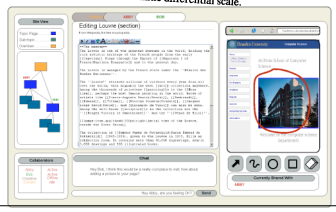
Attractive	Ugly
Clear	Confusing
Dull	Colorful
Exciting	Boring
Annoying	Pleasing
Helpful	Unhelpful
Poor	Well designed

Figure 13.2 An example of a semantic differential scale.

Instructions: for each pair of adjectives, place a cross at the point between them that reflects the extent to which you believe the adjectives describe the home page. You should place *only one cross* between the marks on each line.

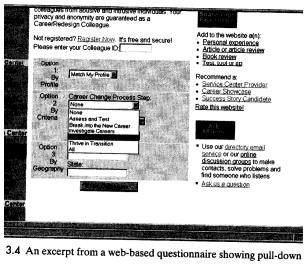
Attractive	Ugly
Clear	Confusing
Dull	Colorful
Exciting	Boring
Annoying	Pleasing
Helpful	Unhelpful
Poor	Well designed

Figure 13.2 An example of a semantic differential scale.



Online Questionnaires

- Produce error-free interactive electronic version from the original paper-based one
- Make accessible from all common browsers and readable on different size monitors
- Make sure of confidentiality
- User-test the survey with pilot studies.



3.4 An excerpt from a web-based questionnaire showing pull-down

Interviews

- Four types of interviews
  - Differ by how much structure interviewer imposes via *predetermined set of questions*
- Open-ended or Unstructured
  - Both interviewer and interviewee have control of conversation
  - Interviewee may discuss issues interviewer did not consider
- Structured
  - Interviewer has specific issues to be addressed
  - Typically questions require precise answers
- Semi-structured (combine first two)
  - Starts with pre-planned questions
  - Silences & Probes
    - *Probe: "Use seem to like this use of color …"*
- Group Interviews (e.g., focus groups)
  - Participants are selected to provide representative sample
  - Address diverse and sensitive issues

Rules of Thumb

- Interview Questions
  - Short, straightforward, avoid asking too many questions
  - Avoid long questions
  - Avoid compound sentences
  - Avoid jargon or language interviewee may not understand
  - Avoid leading questions
  - Be alert to unconscious biases
- Conducting an interview
  - Dress in a manner similar to interviewees
  - Prepare an informed consent form
  - If recording interview make sure equipment works
  - Record answers exactly

Structure of interview

- Introduction
  - Interviewer introduces self and explains goal
  - Addresses ethical issues
  - Asks if ok to record
- Warm-up
  - Easy non-threatening questions
    - Demographic questions like "Where to do you live"
- Main
  - Questions are presented in logical sequence
  - Closed Questions: Predetermined answer format (Yes/No)
  - Open Questions
- Cool-Off
  - Defuse any tension by asking a few more easy questions
- Closing
  - Thanks interviewee
  - Switch off recorder, close notebook

Part of Interview Script

- Have you seen Ananova before? (Explore previous knowledge)
  Interviewer checks box ☐ *Yes* ☐ *No* ☐ *Don't remember/know*
- Would you like to receive news from Ananova? (Explore initial reaction, then explore the response)
  Interviewer checks box ☐ *Yes* ☐ *No* ☐ *Don't know*
- Why?
  If response is "Yes" or "No," interviewer says, "Which of the following statements represents your feelings best?"
  For "Yes," Interviewer checks the box
  ☐ *I don't like typing*
  ☐ *This is fun/cool*
  ☐ *I've never seen a system like this before*
  ☐ *It's going to be the way of the future*
  ☐ *Another reason (Interviewer notes the reason)*
  For "No," Interviewer checks the box
  ☐ *I don't like speech systems*
  ☐ *I don't like systems that pretend to be people*
  ☐ *It's faster to read*
  ☐ *I can't control the pace of presentation*
  ☐ *I can't be bothered to download the software*
  ☐ *Another reason (Interviewer notes the reason)*
- In your opinion, does Ananova look like a real person?
  Interviewer checks box
  ☐ *Yes, she looks like a real person*
  ☐ *No, she doesn't look like a real person*

Observing users

Chapter 12

Observation

- Why? Get information on..
  - Context, technology, interaction
- Where?
  - Controlled environments
  - In the field (where the product is used)
- Observer:
  - outsider
  - participant
  - ethnographers

Frameworks to guide observation

- - *The person.* Who?
  - *The place.* Where?
  - *The thing.* What?
- The Goetz and LeCompte (1984) framework:
  - *Who* is present?
  - What is their role?
  - *What* is happening?
  - *When* does the activity occur?
  - *Where* is it happening?
  - *Why* is it happening?
  - *How* is the activity organized?
- Checklist can also help (p. 369).

Data collection

- Notes:
  - not technical, writing speed may be a factor, hard to observe and write at the same time, laptop is faster but intrusive and cumbersome, two people work better than one.
- Still camera:
  - images are easily collected, allows evaluators to be mobile.

Data collection cont.

- Audio:
  - less intrusive than video, allows evaluators to be mobile, inexpensive, lack of visual records, hard to transcribe data.
- Video:
  - both visual and audio data, can be intrusive, can be inexpensive with small cameras, can allow evaluators to be mobile, attention is focused on what is seen through the lens, analysis can be time consuming.

Data collection cont.

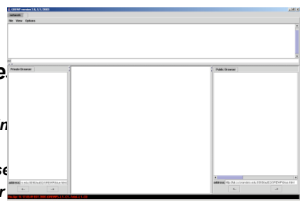
- Interaction logging (transcripts & replay):
  - logs everything you do in the system, easy to generate detailed analysis, transparent to the user, facial expression etc. is not logged.
  - CS111 example using GREWP tool.
- Techniques may be used individually or combined => requires coordination.

Data analysis

- *Qualitative data - interpreted* & used to tell the 'story' about what was observed.
- *Qualitative data - categorized* using techniques such as content analysis.
- *Quantitative data* - collected from interaction & video logs. Presented as values, tables, charts, graphs and treated statistically.

CS111 Experiment

- Create a presentation of a world country and its culture.
- ***GREWP tool provide users with:***
  - ***a shared workspace onlin***
  - ***chat to communicate,***
  - ***public and private browse***
  - ***Generates transcripts for replay***

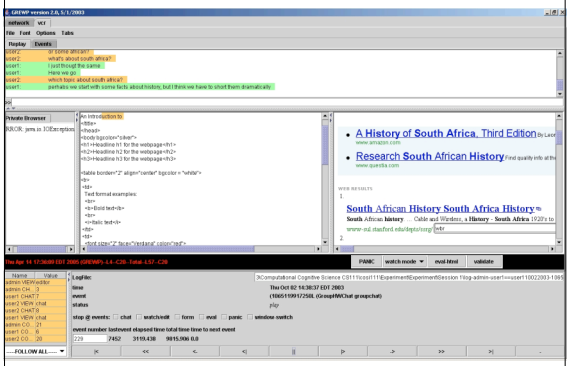


Observing the users

- Where was the study performed:
  - Controlled environment
    - We had everything set up before participants arrived
    - Tested the software
    - etc.
- Data collection:
  - Note taking: Important issues noted on paper and coordinated with transcripts later.
  - Replayed transcripts that the tool generated.

Analyzing the data

- Coordinated notes with transcripts
- Replayed the transcripts
  - Qualitative data (Categorization)
    - Looking for incidents or patterns.
    - How was a certain task completed?
    - How did the users use a certain component in the system?
    - One user frequently got stuck in the HTML coding. Why is that?
    - Analyzing the discourse (Alex Feinman)



Redesign

user2: look where I'm in the screen
user2: title is only in the head
user2: not in the normal text
---
user2: look how I to a table
user2: you only put title only in the head

- Proposal 1:
- ***Automatically add reference to a line in the code window to the chat.***
- ***Help users stay coordinated***

Redesign

user2: how is the work?
user2: how far is your table??
---
user1: where are you now?
user1: are you finished with the food?

- Proposal 2:
- **Provide a way to write down a plan and review or modify it visually.**
- **Helps users be aware of each others work.**
- **Automatic update of the plan as work progresses.**

User Modeling

GOMS

The Humane Interface

(Chapter 4)

Jef Raskin, Addison-Wesley, 2000.

Requirements

- Hal works at a computer, typing reports
- Occasionally interrupted by another researcher in the room and is asked to convert a temperature reading from degrees
  - Fahrenheit (F) => Celsius (C)
  - Or C => F

GOMS
(Card, Moran, and Newell, 1983)

- H --- move hand from keyboard to mouse
  - 0.4 seconds
- P --- point to position on display
  - 1.1 seconds
- K --- Time to tap a button
  - 0.2 seconds
- M --- Mentally prepare for the next step
  - 1.35 seconds
- R --- Time a user must wait for a computer to respond to input

Design Solution 1

- Move hand to the graphical input device: H
- Point to desired radio button: P
- Click on the radio button: K
- Need to click on radio button
  - Move hands back to keyboard: H
  - Type 4 characters: KKKK
  - Tap enter: K
  - TOTAL:
    - H M P K H M K K K K M K
    - 4+1.35+ …. =7.15 sec
- Correct conversion already selected
  - M K K K K M K = 3.7 sec
- Average Time
  - (7.15 + 3.7) / 2 = 5.4 sec

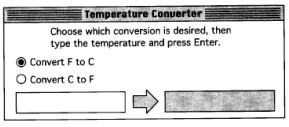


Figure 4.2. A dialog box solution with radio buttons.

Design Solution 2
(Click and Drag)

- Move hand to mouse: H
- Point to desired arrow: P
- Select arrow: K
- Move arrow: P
- Release arrow: K
- Total
  - H M P K M P K = 5.7 secs

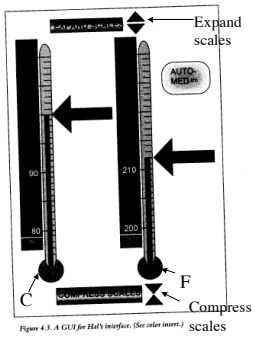


Figure 4.3. A GUI for Hal's interface. (See color insert.)

Design Solution 2
(Suppose you have to expand scales)

- S = scrolling times
  - 3 sec or longer
- To change scale
  - P M P K S K
- To change range
  - One for each range
  - P M P K S K * 2
- Total
  - H + 3(M+P +K+S+K)+M+P+K+K
  - = 20.8 seconds

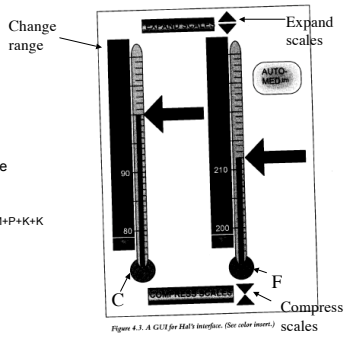


Figure 4.3. A GUI for Hal's interface. (See color insert.)

Design Solution 3

- GOMS Analysis
  - Keying in temp
  - M K K K K K M K
  - 3.9 secs
- 100% keystroke efficiency

To convert temp:

1. Type C or F.
2. Type numeric temp
3. Press enter key

Design Solution 4

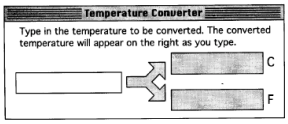
- GOMS Analysis
  - Keying in temp
  - M K K K K M K
  - 3.7 secs
- 100 percent keystroke efficiency

To convert temp:

1. Type numeric temp
2. Type C or F
3. *{don't need to hit enter}*

Design Solution 5

- GOMS analysis
  - M K K K K
  - 2.15 seconds
  - Theoretical minimun
- 100% info efficiency



Design Analysis

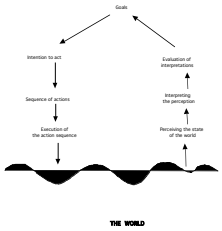
Cognitive Walkthrough
Shneiderman's * Golden Rules
Nielsen's Usability Principles
Screen layout

The Cognitive Walkthrough Method

(C. Wharton, J. Rieman, C. Lewis, P. Polson
In J Nielson and R. Mack (eds) Usability inspection methods, John Wiley and Sons, 1994.)

Usability inspection method that focuses on evaluating a design for each of learning, particularly by exploration.

Execution: Does the system provide actions that correspond to the intentions of the person?
Evaluation: Does the system provide a physical representation that can be directly perceived and this directly interpretable in terms of the intentions and expectations of the person?



Method

1. Define inputs to walkthrough:
   - ID the users
   - Action sequences for completing tasks
   - Description of implementation of interface
2. Convene analysts

The walkthrough

Walk through action sequences for each task and consider:

1. Will user try to achieve right effect?
   - Maybe task is to print a document, but the first thing they have to do is select a printer. Will they know that they should be trying to get a printer selected?
   - Fix:
     - Eliminate action
     - Provide prompt
     - Change some other part of action so user sees need
2. Will the user notice that the correct action is available?
   1. If the action is to select from a visible menul, there is not problem. But if it's to triple-click on the printer icond, the users may never think of it
   2. Fix: If your user has right goal, assign action to more obvious control

3. Will the user associate the correct action with the effect that the user is trying to achieve?
   - If there's a menu item that says, "select printer," things will go smoothly; not so if the menu says "SysP."
   - Fix: designer provides labels and descriptions for actions that will include words that users are likely to use in describing their tasks.
4. If the correct action is performed, will the user see that progress is being made toward solution to task?
   - If after selecting the printer a dialog box states that the "Printer is Laser in Room 105," great. The worst case is not feedback.
   - Fix: any feedback is better than none. Also use terms (or graphics) that relate to the user's description for the task. Note that in simple situations, the interface may forego feedback per se in favor of prompting for the next action

Record Critical Info

- User knowledge requirements
- Assumptions about the user population
- Notes about side issues and design changes
- The credible success story

8 Golden Rules (Shneiderman)

- Strive for consistency
  - Identical Terminology (unifying metaphor) in prompts, menus, and help screens
  - Consistency in color, layout, capitalization, fonts
- Enable frequent users to use shortcuts
  - Abbreviations; Special keys; Hidden commands; Macro facilities
- Offer informative feedback
- Design dialogs to yield closure
  - Sequences of actions should be organized into groups
  - Beginning, middle, and an end
- Offer error prevention and simple error handling
- Permit easy reversal of actions
- Support internal locus of control
- Reduce short-term memory load

Usability Principles (Nielsen, 2001)

1. Visibility of system status
2. Match between system and the real world
3. User control and freedom
4. Consistency and Standards
5. Help users recognize, diagnose, and recover from errors
6. Error Prevention
7. Recognize rather than recall
8. Flexibility and efficiency of use
9. Aesthetic and minimalist design
10. Help and documentation

Screen layouts

http://www.grc.nasa.gov/WWW/usability/layoutcss.html
http://usability.gov/guidelines/layout.html
http://www.sapdesignguild.org/resources/Web_Guidelines/AREAS.HTM

Case Studies

Olympic Messaging System (OMS)
Air Traffic Controller
Hutchworld
GrewpTool
Cedar

Olympic Messaging System Gould et al, 1987

- Olympic Messaging system developed in order to provide a message service (voice mail) and other support for the 10,000 athletes who attended the 1984 Olympic game in LA
- Kiosks were place around the Olympic village that allowed the athletes to send and receive voice messages among themselves. People from around the world could also send messages of congratulations, commiserations or encouragement to the athletes and officials.

Design Process

1. Initial analysis of the requirements for the system
2. Printed scenarios of the user interface
3. Comments collected from designers, management and prospective users. (Some system function altered or dropped entirely)
4. Design team produced user guides
   - Tested on main user groups (Olympians, family, friends)
   - Developed iteratively (over 200 slightly modified version were produced)

Design Process (continued)

4. Early simulations of of messaging system were also constructed and evaluated for the purpose of designing help messages
   - These were also tested with users
   - Revealed, for example, that an 'undo' or 'backup' key was required so that the users could retrieve a previous position if they made a mistake (e.g. entering a valid but incorrect country code)
5. Many other methods were used to collect info about what was needed
   - Tours of Olympic village sites; Early demos of the system; Interviews with the different people involved in the Olympics; Discussion with an experienced ex-Olympian who was part of the design team; Prototype developed that was tested on different user groups and resulted in many more iterations and retesting; Hallway method – collecting opinions on the height and layout of the prototype kiosk from people who happened to be walking past; Try-to-destroy-it tests in which CS students were invited to test the robustness of the system by trying to "crash" it.

Evaluating the 1984 OMS

- Early tests of printed scenarios & user guides
- Early simulations of telephone keypad
- An Olympian joined team to provide feedback
- Interviews & demos with Olympians outside US
- Overseas interface tests with friends and family.
- Free coffee and donut tests
- Usability tests with 100 participants.
- A 'try to destroy it' test
- Pre-Olympic field-test at an international event
- Reliability of the system with heavy traffic

Air Traffic Control System

- Safety for all users of UK airspace
- Integrate disparate info systems that occupied desks of air traffic controllers
  - Give advice to pilots entering and leaving airspace
  - Large amounts of data, both dynamic and static
  - Info in variety of format
    - analogue and digital dials
    - closed circuit TV
    - Paper-based media (e.g. order books and temporary instructions)
  - Info located direct line of sight, ceiling mounting or only other control desks outside the normal visual scan of controller
- Goal Integrated data display system

Design Process

- Evaluation of controller's task
  - Demonstrated dangers of proliferation of data processing systems.
  - Controllers wanted key info in single workstation
- Initial System
  - Built for use at London City Airport
  - Later Heathrow to provide an initial evaluation
    - Modified info requirements; alternate layouts for different controllers; use of color to indicate exceptional situations and cater to different ambient lighting situations; ability to make up own pages for specific local conditions; simple editing facilities to allow rapid updates

Design Process (continued)

- Team established
  - Manage development from prototype to installation at 5 airports
  - Include reps of each airport
- Built new prototype
- Road-show to 5 airports
- System specification developed
- Built and installed system at Heathrow
- Updates system installed at other airports

Hutchworld

- Enables cancer patients, their caregivers, family, and friends to chat with one another
- tell their stories
- discuss their experiences and coping strategies
- Gain emotion and practical support
- Developed by Microsoft's Virtual Worlds Research group and librarians and clinicians at The Fred Hutchinson Cancer Research Center in Seattle, Washington

Early forms of data gathering

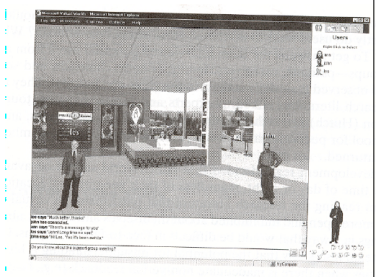
- Learn about patient experience
- Interviewed potential users
  - Patients, caregivers, family, friends, clinicians, and social support staff
- Also observed daily activity in clinic and hospital
- Read research literature, talked to experts, and former patients, …

Some initial ideas

- Hutchworld should be available any time of day or night regardless of geographical location
- Virtual communities
  - Participants more open and uninhibited
  - Potential for misunderstanding is higher
- But research showed, for example, women with breast cancer who received group therapy lived on average twice as long as those who did not

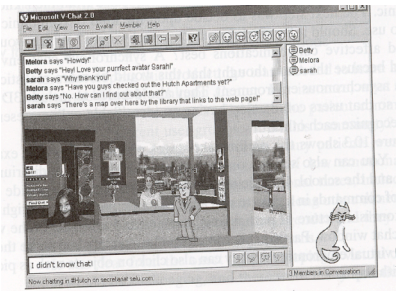
Early Prototype

- Avatars
- List of commands
- List of participants
- Textual chat
- Participants can move their avatars and make them gesture to tour the virtual environment
- Also can click on objects to interact with them



Second prototype

- Only lobby fully developed

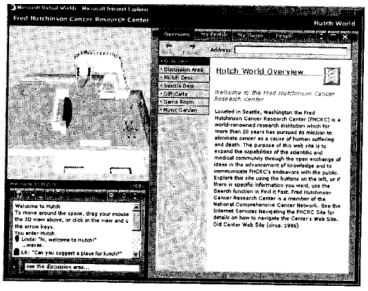


Test 1

- Early observations onsite
  - 6 computers set up
  - Simple scaled-back prototype of HutchWorld build using existing product, Microsoft V-Chat
  - Team observed the general usage of prototype
- What was learned?
  - No critical mass
  - Many patients didn't want simultaneous chatting
  - Computers also used to play games and search web for cancer sites
  - More unified site needed

Re-Design

- Support more asynchronous communication
- Second version functioned more as a portal to info-retrieval tools and communication tools, games, and other types of entertainment
- Also incorporated bulletin board, text-chat, and web page creation tool



Development of HutchWorld

- Many informal meetings with patients, carers & medical staff early in design
- Early prototype was informally tested on site
- Designers learned a lot e.g.
  - language of designers & users was different
  - asynchronous communication was also needed
- Redesigned to produce the portal version

Usability Tests

- Ran usability test in Microsoft usability labs
- 7 participants: 4 male, 3 female
- Subjects worked independently and provided running commentary
  - Commentary recorded on video and so were screens
- Microsoft evaluator watch through one-way mirror
  - Participants and evaluator interacted via microphone and speakers

Usability testing

- 5-minute exploration period then subjects asked to complete a series of *structured tasks*
  - How users' identify was represented
  - Communication
  - information searching
  - entertainment
- User satisfaction questionnaire
  - What did you like about HutchWorld?
  - What did you not like about HutchWorld?
  - What did you find confusing or difficult to use in HutchWorld?
  - How would you suggest improving HutchWorld?
- Triangulation to get different perspectives

Task #1: Explore HutchWorld

Your first task is to spend five minutes exploring HutchWorld.

A. First, open HutchWorld.
B. Now, explore!

Remember, tell us what you are looking at and what you are thinking about as you are exploring HutchWorld.

Task #2: All about Your Identity in HutchWorld

A. Point to the 3 dimensional (3D) view of HutchWorld.
B. Point at yourself in the 3D view of HutchWorld.
C. Get a map view in the 3D view of HutchWorld.
D. Walk around in the 3D view: go forward, turn left and turn right.
E. Change the color of your shirt.
F. Change some information about yourself, such as where you are from.

Task #3: All about Communicating with Others

A. Send someone an email.
B. Read a message on the HutchWorld Bulletin Board.
C. Post a message on the HutchWorld Bulletin Board.
D. Check to see who is currently in HutchWorld.
E. Find out where the other person in HutchWorld is from.
F. Make the other person in HutchWorld a friend.
G. Chat with the other person in HutchWorld
H. Wave to the other person in HutchWorld.
I. Whisper to the other person in HutchWorld.

Task #4: All about Getting Information

A. Imagine you have never been to Seattle before. Your task is to find something to do.
B. Find out how to get to the Fred Hutchinson Cancer Research Center.
C. Go to your favorite website. [Or go to Yahoo: www.yahoo.com]
D. Once you have found a website, resize the screen so you can see the whole web page.

Findings from the usability test

- The back button didn't always work
- Users didn't pay attention to navigation buttons
- Users expected all objects in the 3-D view to be clickable.
- Users did not realize that there could be others in the 3-D world with whom to chat,
- Users tried to chat to the participant list.

Participant number:	1	2	3	4	5	6	7	Average
Background Information								
Sex	F	F	M	M	F	M	M	3F, 4M
Age	37	41	43	54	46	44	21	40.9
years of college	4	2	4	4	4	1	2	3.0
hours of chat use in past year	0	3	0	0	365	200	170	105.4
hours of web use in past year	9	11	36	208	391	571	771	285.3
Structured Tasks								
Identify 3D view	1	1	1	1	1	1	1	1.0
Identity self in 3D view	1	2	1	1	1	1	1	1.1
Get a map view of 3D view	1	2	2	1	2	**3**	1	1.7
Walk in 3D view	1	3	2	1	**3**	2	1	1.9
Change color of shirt	1	1	**3**	**3**	2	3	2	2.1
Change where self is from	1	1	**3**	1	1	3	1	1.6
Find place to send email	1	**3**	3	1	3	2	2	2.1
Read a bulletin board message	2	1	**3**	1	1	1	--	1.5
Post a bulletin board message	1	**3**	3	3	2	2	--	2.3
Check to see who is currently on	1	3	1	**3**	2	3	2	2.1
Find out where the other person is from	1	1	2	1	1	3	2	1.6
Make the other person a friend	1	1	3	1	1	2	1	1.4
Chat with the other person	**3**	1	**3**	1	1	**3**	1	1.9
Wave to the other person	1	1	1	1	1	1	1	1.0
Whisper to the other person	1	**3**	2	2	1	2	1	1.7
Find something to do in Seattle	2	1	2	1	1	1	2	1.4
Find out how to get to FHCRC	1	3	3	2	1	1	2	1.9
Go to a website	1	**3**	2	**3**	**3**	1	1	2.0
Resize web screen	1	**3**	2	2	2	**3**	1	2.0
Find a game to play	1	1	2	1	1	1	2	1.3
Send self a gift	1	**3**	**3**	**3**	**3**	**3**	3	2.7
Open gift	**3**	1	2	3	**3**	**3**	**3**	2.6

1 -- easy
2 -- ok
3 -- difficult
bold -- needed help

Issue#	Issue Priority	Issue	Recommendation
1	high	Back button sometimes not working.	Fix back button.
2	high	People are not paying attention to navigation buttons.	Make navigation buttons more prominent.
3	low	Fonts too small, hard to read for some people.	Make it possibl to change fon Make the font colors more dist from the background color.
4	low	When navigating, people were not aware overview button would take them back to the main page.	Change the overview button to home button, change the wordi of the overview page according
5	medium	"Virtual worlds" wording in login screen confusing.	Change wording to "HutchWor
6	high	People frequently clicking on objects in 3D view expecting something to happen.	Make the 3D view have links to web pages. For example, when people click on the help desk th browser area should show the h desk information.
7	low	People do not readily find map view button.	Make the icon on the map view button more map-like.
8	medium	Moving avatar with mouse took some getting used to.	Encourage the use of the keyboard. Mention clicking and dragging the avatar in the welcome.
9	low	People wanted to turn around in 3D view, but it was awkward to do so.	Make one of the chat buttons a button that lets you turn around.
10	medium	Confusion about the real world/virtual world distinction.	Change wording of overview description, to make clear Hutch World is a "virtual" place made t "ressemble" the FHCRC, and is a place where anybody can go.
11	high	People do not initially recognize that other real people could be in HutchWorld, that they can talk to them and see them.	Change wording of overview description, to make clear Hutch-World is a place to "chat" with others who are "currently in" the virtual HutchWorld.
12	high	People not seeing/finding the chat window. Trying to chat to people from the people list where other chat-like features are (whisper, etc.)	Make chat window more prominent. Somehow link chat- like features of navigation list to t chat window. Change wording of chat window. Instead of type to speak here, type to chat here.

Key points

- Evaluation & design are closely integrated in user-centered design.
- Some of the same techniques are used in evaluation & requirements but they are used differently
  (e.g., interviews & questionnaires)
- Triangulation involves using a combination of techniques to gain different perspectives
- Dealing with constraints is an important skill for evaluators to develop.

GrewpTool

- Re-Engineering a Representational System

Representational System

1. A set of representational media available to the participants.
2. A set of internal or external, private or shared, representations
3. A set of procedures for communicating, recording, modifying, transcribing, and aligning multiple, partial representations of the shared context.

Classroom

1. Chalkboard, books, student notebooks, laptops,
2. What is on the chalkboard versus what is in the notebook
3. Students take notes; power point slides are posted on class website

Basic Methodology
(For Re-engineering the Rep. Sys.)

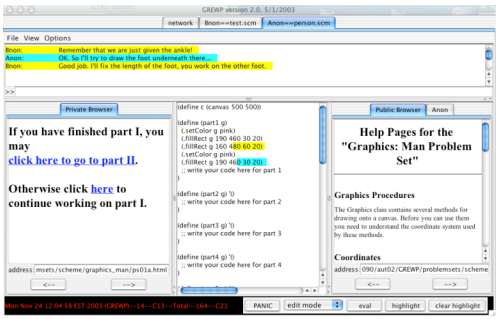
- Online practice is grounded in the representational system provided by a groupware system.
- Transcripts are collected of online user behavior.
- Identify weak spots in the representational system
  - Coordination work & cognitive load
- Re-engineer the representational system

- Initially applied to VesselWorld
  - Work done with Landsman, Feinman, Introne

Engineering Representational System
(Evaluation / Development Plan)

- Requirements gathering
- Iteratively build prototype
  - Simple & generic, but provides replay
  - Read literature
  - Group design evaluation sessions
  - Inspection & Cognitive Walkthrough
  - Pounding within group; pounding by outsiders
- Pilot Study to collect transcript data
- Analysis & Re-Design of Representational System

GrewpTool



Iteratively Designing the Prototype

- In previous HCI class two groups of students had done term project for TA's to tutor students online
- VesselWorld, replay
- Interest in collaborative learning
- Initial designs the interaction between students were more structured
  - Read through literature on collaborative editing Why? Mine for good design ideas to start with

Example of a collaborative editor

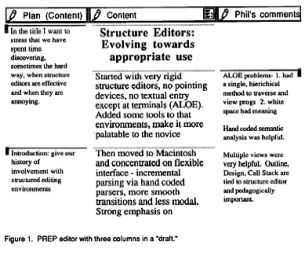


Figure 1. PREP editor with three columns in a "draft."

Initial Version of GrewpTool

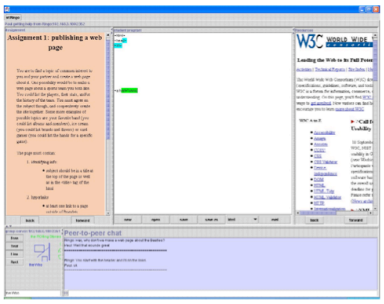


Figure 1: View of the GHT

Pilot study evaluation

- 6 students used GHT in pairs
  - Place in individual terminals out of each other's sight
  - Two sessions per pair; each lasting two hours
    - Session 1: Code webpage using HTML
    - Session 2: Simple application using Jscheme
- We were able to replay all the sessions

Evaluation

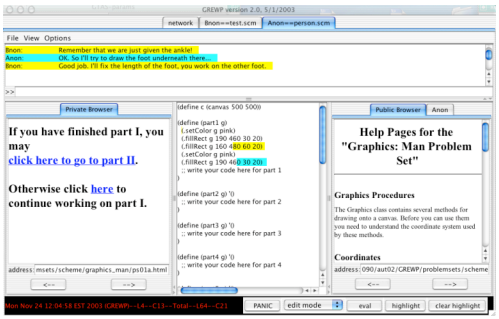
Issues

- Co-browsing was hard; typed URLs into chat window
- Whiteboard never used
- Students wanted to be able to more easily see what their partners were up doing.
- Needed to be able to capture the attention of their partners

Design Changes

- Watch versus edit mode
- Co-Browsing Tabs
- Removed whiteboard
- Added panic button

GrewpTool

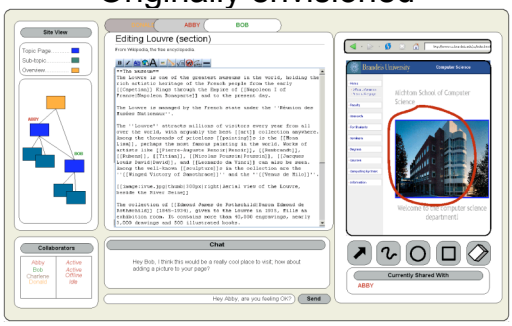


Development & Evaluation Plan for Cedar

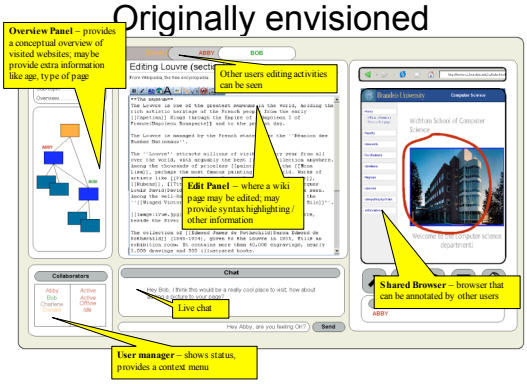
Cedar

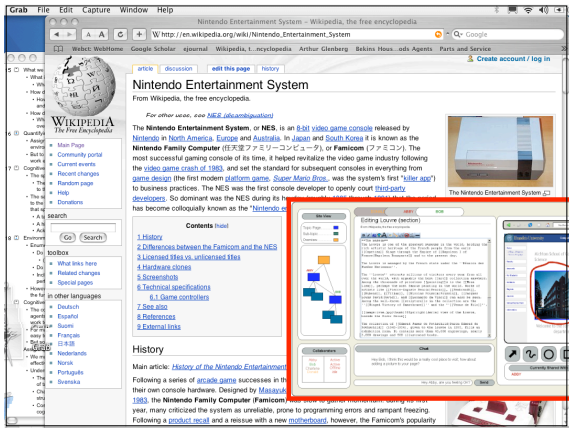
- A platform for studying online collaboration
  - Both same time / different place & different time / different place
  - Support code writing, website construction
  - An application wrapper around a Wiki web, that provides additional collaborative tools (e.g., Wikipedia)
  - Use Thyme & Sage toolkits to construct
- Also use in classroom
  - Computational Cognitive Science (data)
  - Internet & Society (website construction)
  - COSI 11: Intro to java coding
- With Johann Larusson, Josh Introne

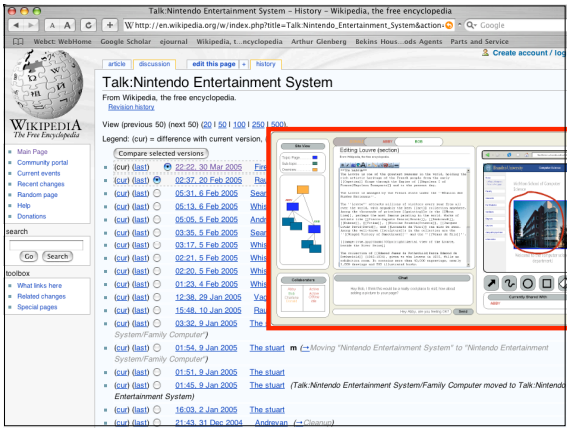
Originally envisioned



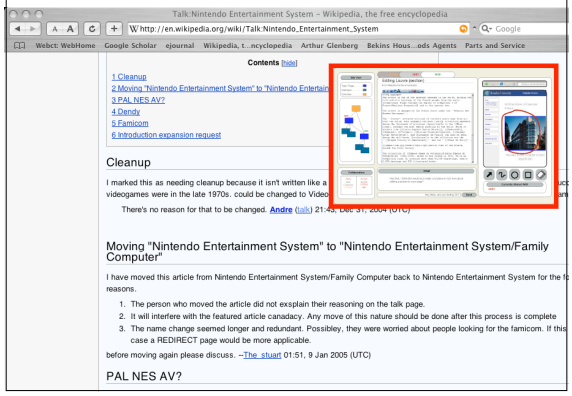
Originally envisioned







Discussion



Computational Cognitive Science (COSI 111)

- Teams of students use Cedar as shell to develop an application (e.g., trip planner)
  - Collect replayable data of subjects using application
  - Last time, same time / different place
- Analysis of data
  - Last time emphasize coordination issues and referential structure of discourse
  - Re-Design

Internet & Society (COSI 33b)

- Construct personal homepage to play with notions of online identity
  - Not necessarily for yourself
- Term project (teams): Develop website on some topic
  - Create list of related website and evaluate them in terms of content & design
  - Each member of team does a term paper on some part of their topic
  - Term papers are organized as part of website

Research Issue: Rebuilding Shared Context

- Collaboration on longer tasks
- Asynchronous/synchronous
  - Need to integrate separate work
  - Must rebuild context for each synchronous collaboration period
- How can we better facilitate this (for software developers)?
- Initially developed with Mike Head

Context Integration

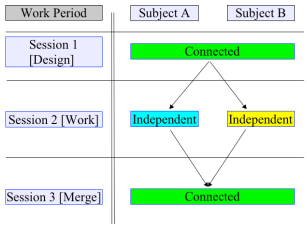
- Merging the work done separately
- Understanding of completed work so far
- Understanding of the assigned task
- Collaborators plan for future work
- ...

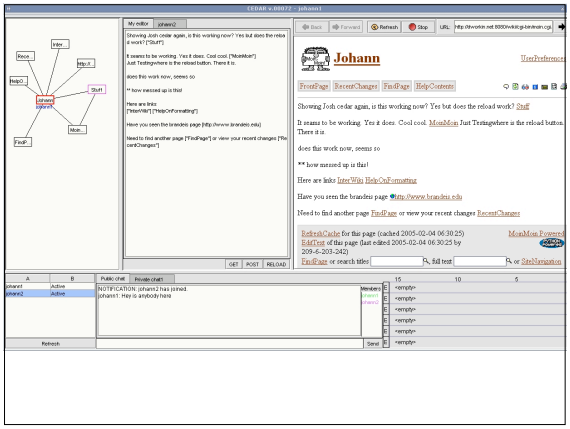
Context integration as paired programming

- Distributed Pair Programming
- Planning is like programming [merging in particular]
- Two (possibly more) programmers
- Working on the same file
- Synchronously/ Asynchronously
- Remotely

Experiment

- Two programmers
  - Work remotely on an assigned task in three phases
    1) Synchronous design and analysis
       - Reading the problem dividing up the work
    2) Asynchronous work
       - Coding separately
    3) Synchronous integration
       - Pull together the separate pieces of work





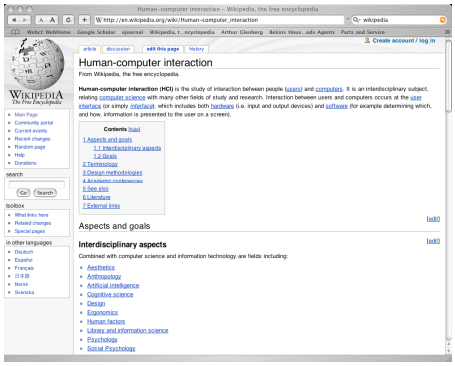
Evaluation/ Re-Design Plan???

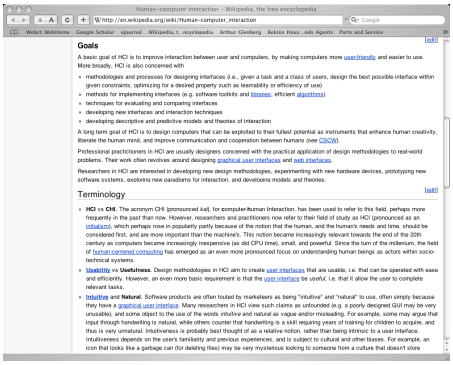
- Evaluation so far:
  - Inspection
  - Group hack sessions
  - COSI 125 survey critique
  - Walkthrough with walk-bys
- Is Cedar within edit distance of sample class projects and research tasks?
  - Design representative task(s) for evaluation
- By early May: Pounding session
  - Make sure replay works
  - ID major problems
  - What else?
- To be continued

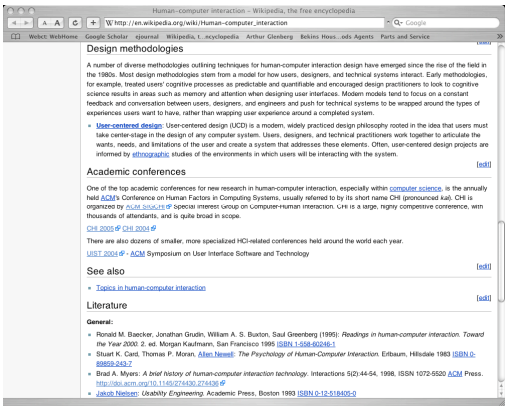
Observing Users	Asking users	Asking Experts	User Testing	Modeling users' task performance
Transcript & Replay	Interviews	Inspection: Shneiderman's 8 Golden Rules Nielsen's 10 Design Principles Guidelines for web page layout	Testing typical users doing typical tasks in laboratory setting	GOMS Fahrenheit ↔ Celsius
Video Taping	Questionnaires	Cognitive Walkthrough	Try to destroy it sessions	
Users talk aloud as they use interface				

Test Interface

- Want replay
- Design task to test various features
  - Both asynchronous & synchronous
- Two tests of interface???

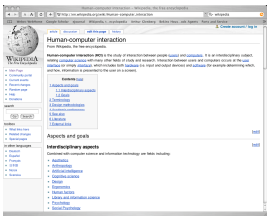






Task for users???

- Update article by adding info on …
- Re-design webpage using guidelines
- Both synchronous & asynchronous



Tasks

- Edit file
- View webpage you are editing in browser
- Save changes
- Chat
- Look at a page your partner is editing
- Navigate in browser
- …..

QUIS, Questionnaire for user interaction satisfaction

- System experience (i.e., time spent on this system)
- Past experience (i.e., experience with other systems)
- Overall user reaction
- Screen design
- Terminology and system info
- Learning to operate system

QUIS, Questionnaire for user interaction satisfaction

- System capabilities (i.e., time it takes to perform operations)
- Technical manuals and online help
- Online tutorials
- Multimedia
- Teleconferencing
- Software installation

Interviews for Cedar

- Open question to probe how easy it was to coordinate with partner
- Closed question to probe how easy it was to coordinate with partner
- Write and debug a semi-structured interview script