HUMAN COMPUTER INTERACTION

3. USABILITY AND CONCEPTUAL MODEL

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"One most unfortunate product is the type of engineer who does not realize that in order to apply the fruits of science for the benefit of mankind, he must not only grasp the principles of science, but must also know the needs and aspirations, the possibilities and the frailties, of those whom he would serve."

-- Vannevar Bush

Reference and many slides courtesy of
• James Landay, CS, UC Berkeley, "User Interface Design, Prototyping, and Evaluation"
• Terry Winograd, CS, Stanford, "Introduction to Human Computer Interaction Design"
User-centered Iterative Design

- Developers working with target users
- Think of the world in users’ terms
- Identify **usability** and **user experience goals**
- Understanding work process
- **Not** technology-centered/feature driven

- Iterate at every stage
Objectives of Usability Chapter

• The goals of interaction design

• Understand when and how design tradeoffs are made

• Have a first-level knowledge of the major concepts in usability and their associated guidelines
Usability Goals

• Effective to use (effectiveness)
  • General goals

• Efficient to use (efficiency)
  • E.g. number of steps, one-click option...

• Safe to use (safety)
  • Preventing users from serious errors.
  • Recovery functions [e.g. undo...]
Select ringtones format
What type of ringtones do you want to get?

Select your phone vendor and model and then pick ringtone format that best fits your phone. If you didn't find your phone in the list choose "Not listed" and choose ringtone format manually.

Your phone vendor: Motorola
Phone model: RAZR V3

Ringtone format:
- Medium quality WAV
- High quality WAV
- **Medium quality MP3**
- High quality MP3
- Yamaha SMAF (MMF)
Usability Goals (cont.)

• Have good utility (utility)
  • With powerful tools

• Easy to learn (learnability)
  • E.g. Tutorials ...
  • 10-minute rules (Nelson, 1980)
  • Dependent on frequency of usages, complexity of tasks, etc.
Maya interfaces, http://www.pixtur.de
Usability Goals (cont.)

• Easy to remember how to use (memorability)
  • E.g. meaningful icons, command names,…

These goals can be in conflict with one another!
User Experience Goals

• Satisfying
• Enjoyable
• Fun
• Entertaining
• Helpful
• Motivating
• Aesthetically pleasing
• Supportive of creativity
• Rewarding
• Emotionally fulfilling

These can be hard to evaluate!

Some combinations will also be incompatible
Heuristics

"Eight Golden Rules of Interface Design" [Shneiderman]

1. Strive for consistency.
2. Enable frequent users to use shortcuts.
3. Offer informative feedback.
4. Design dialog to yield closure.
5. Offer simple error handling.
6. Permit easy reversal of actions.
7. Support internal locus of control.
10 Usability Principles [Nielsen]

1. Visibility of system status

2. Match between system and the real world
   • Speak the users’ language

3. User control and freedom
   • “Emergency exits”?!?

4. Consistency and standards

Tabbed dialog for setting options in MS Web Studio
• Inconsistent display of possible tabs
10 Usability Principles [Nielsen]

5. Help users recognize, diagnose, and recover from errors
   • Good error messages

6. Error prevention

7. Recognition rather than recall

8. Flexibility and efficiency of use
   • Invisible to novice users but for experienced users
   • E.g. shortcuts
10 Usability Principles [Nielsen]

9. Aesthetic and minimalist design
   • Avoid irrelevant information

10. Help and documentation
Principles for Transforming Difficult Tasks into Simple Ones [Norman]

1. Use both knowledge in the world and knowledge in the head
2. Simplify the structure of tasks
3. Make things visible
4. Get the mappings right
Principles for Transforming Difficult Tasks into Simple Ones [Norman]

5. Exploit the power of constraints
6. Design for error
7. When all else fails, standardize
Design Tradeoffs

• How can dimensions be evaluated together?
  • Defined in context of users and tasks
  • Require clear consensus on priorities

• Can we violate one to satisfy another?
  • e.g., Consistency/efficiency
Design Guidelines Meet the Real World

- Design organizations and their cultures
- Different assumptions about users and goals
- History and legacy
- Conflicting priorities
- External constraints and regulations

Don’t be so quick to assume that “bad” designs are the result of ignorance or stupidity
Usability & Our Project 1

- Interactive games usually have to fulfill user experience goals.

- Usability goals are also important in initiation, game stages, etc.
Objectives of Ch. Conceptual Model

- Conceptualize interaction design before trying to build anything.
- Understand the need for a clear conceptual model in interface design
- Be able to analyze and create appropriate models for specific applications.
- Understand the use of metaphors in designing interfaces
- Be able to choose them appropriately
Conceptual Models

• In interacting with any system (software or others), a person has a concept of what the system is: what its components are, what properties they have, and what interactions they can enter into...

• This conceptual model underlies the more specific aspects of interface, such as screen representations and command structures.
Conceptual Models based on Activities (Instructing)

1. Instructing
   - E.g. Commands in DOS or Unix.
   - E.g. Control keys, menu options in windows.
   - Benefits: quick and efficient for repetitive actions.
   - Have to avoid remembering a large set of command names.
Conceptual Models based on Activities (Conversing)

2. Conversing
   - E.g. help facilities, search engines, etc.
   - E.g. Voice or natural language based system
   - Benefits: friendly for novices
   - Drawbacks:
     - Misunderstanding (for NLP)
     - Repetition and inefficiency (e.g. phone-based systems)
     - Too much expectation (e.g. intelligent or animated agents.)
3. Manipulation and navigation
   • Exploiting users’ knowledge of how they do this in the physical world.
   • Properties
     • Continuous representation of objects and actions.
     • Immediate feedback.
     • Physical actions instead of issuing commands.

Virtual Sculpting, CMLab
3. Manipulation and navigation
   • Benefits:
     • Learning basic functions rapidly
     • Easily remembering how to use
     • Usually no error messages
     • Immediate responses
     • Users feel in control
   • Drawbacks:
     • Expecting reactions like the physical ones.
4. Exploring and browsing (based on activities)
   • E.g. CD-ROMs, web pages, etc.

   • Conceptual Models based on objects
     • Focusing on a particular objects.
     • E.g. spreadsheet (Excel)
Conceptual Models

- Mental representation of how object works & how interface controls affect it

- People have preconceived models that you may not be able to change
  - dragging to trash?
    - deletes (eject disk a bad idea!)
  - Visual Clues (affordances)
Design Model & User’s Model

Customers get model from experience & usage through system image
Design Guides

• Provide good conceptual model
  • customers want to understand how UI controls impact object

• Make things visible
  • if object has function, interface should show it

• Map interface controls to customer’s model
  • infix -vs- postfix calculator -- whose model?

• Provide feedback
  • what you see is what you get!
Metaphors

• A metaphor implies many elements of the model to a user who is familiar with the metaphorical object (e.g., a physical desktop)

• In general a model requires more learning without metaphors to which users can anchor it to their previous experience.
Example Metaphors
Misused Metaphors

• Direct translations
  • Software CD player that requires turning volume knob with the mouse
  • Software telephony solution that requires the user to dial a number by clicking on a simulated keypad
  • Airline web site that simulates a ticket counter!
Quicktime 4.0

The player includes a large fixed border, much like that found on a Sony Watchman or similar device. Overall, the player space dominates the application, not the movie which is the intended user target.

The volume control is in the form of a thumbwheel (rather than the traditional slider) and originally required difficult rotary mouse motion to operate. (Later versions of the player allowed vertical mouse motion).

The channel drawer can only be accessed by manually dragging the tab out; a user cannot simply click on the tab to expand the window.

The brushed steel appearance dominates all controls. This causes the play and pause controls (and others) to appear disabled (grayed out) whether or not their function is available.

Figure 3-4: Too Real: The Imbalance of Form, Substance and Context
Conceptual Models & Our Project 1

- Game stages should belong to direct manipulation.
  - Continuous & immediate response, etc.
- Conceptualizing the interaction.

Eyetoy games, PS2