Usability: Goals, Guidelines and Principles

At the end of this lecture you should:

• Understand the major usability principles which may be employed when designing and evaluating a system; and

• Appreciate the role of standards and design guidelines in promoting usability.

Background reading
Dix et al, Chapter 4

Usability Goals

• General aims and objectives of system design.

• Agreed upon early in the SW development lifecycle.

• "Formal" usability specifications are identified later on in design and early implementation stages, including a specification of,
  - The method used in measuring the usability attribute, e.g. number of explicit user actions required to end a program,
  - The criteria by which the measuring method is determined, e.g. number of commands used and the time taken to accomplish task, etc.
Usability Goals

- High level usability goals include those related to system:
  - Effective
  - Efficient
  - Safe
  - Have good utility
  - Easy to remember how to use
- As well as those related to user experience in using the system:
  - Fun
  - Satisfying
  - Motivating
  - ...

Usability Goals

- Effectiveness: how good a system is at doing what it is supposed to do.
  - Is the system capable of allowing people to learn well, carry out their work efficiently, access the information they need, ...?

- Efficiency: the way a system supports users in carrying out their tasks.
  - Once users have learned how to use a system to carry out their tasks, can they sustain a high level of productivity?
Usability Goals

• Safety: protecting the user from dangerous conditions and undesirable situations.
  - Does the system prevent users from making serious errors, and if they do make an error, does it permit them to recover easily?

• Utility: the extent to which the system provides the right kind of functionality so that users can do what they need or want to do.
  - Does the system provide an appropriate set of functions that enable users to carry out all their tasks in the way they want to do them?

Usability Goals

• Learnability: how easy a system is to learn to use.
  - How easy is it and how long does it take (i) to get started using a system to perform core tasks, and (ii) to learn the range of operations to perform a wider set of tasks?

• Memorability: how easy a system is to remember how to use, once learned.
  - What kinds of interface support have been provided to help users remember how to carry out tasks, especially for systems and operations that are used infrequently?
User experience goals

• Less clearly defined, e.g.
  - Fun,
  - Satisfying,
  - Emotionally fullfilling,
  - Rewarding, aesthetically pleasing
  - Motivating
  - Helpful
  - Enjoyable,
  - Entertaining

Examples

• What are the key usability goals and user experience goals for each of the following:

  - A mobile device that allows young children to communicate with each other and play collaborative games
    • Easy to use, effective, efficient, easy to learn and use, fun and entertaining

  - A CAD system for architects and engineers
    • Easy to learn, easy to remember, have good utility, be safe, efficient, effective, support creativity and be aesthetically pleasing
Design and Usability Principles

- Derived from a mix of theory-based knowledge, experience and common sense.
- Prescriptive: what to provide and what to avoid.
- Do not specify design detail, but act as reminders.
- Provide a framework for heuristic evaluation.
- We will consider two examples:
  - Nielsen’s usability heuristics
  - Dix et al’s usability principles

Usability principles (Nielsen 2001)


1. Visibility of system status
   Feedback should not be restricted to error messages. System should be constantly informing the user of what it is doing and how it is interpreting user input.

2. Match between system and the real world
   Terminology should match users’ and be consistent with their expectation.

3. User control and freedom
   Provide clearly marked exits

4. Consistency and standards
   Same command should have same effect. Same type of information displayed in the same location on different screens.
Usability principles (Nielsen 2001)

5. Help users recognize, diagnose and recover from errors
   Provide good error messages; multi-layered help.

6. Error prevention
   Use of selection rather than data entry

7. Recognition rather than recall
   Minimise user's memory load

8. Flexibility and efficiency of use
   Provide shortcuts for experienced users; macros, scripts, interaction histories for command reuse and defaults

Usability principles (Nielsen 2001)

9. Aesthetic and minimalist design
   Keep it simple. Interface should match the user's tasks and task sequences, and present the user with the info they need when they need it.

10. Help and documentation
    Ideally online help should be context sensitive and paper manuals should provide task-oriented access to information.
Dix et al’s Principles to support usability

A structured presentation of general principles to apply during design of an interactive system.

**Learnability**
How easy is it to attain effective use of the system?

**Flexibility**
How much scope is there for exchanging information in multiple, different ways?

**Robustness**
How easy is it to evaluate whether our goals have been achieved?
Learnability

Predictability

• Can user determine effect of future actions based on past interaction history?
  • What are the limits of knowledge requirement placed on user?

• Can user easily determine what operations are currently visible?

Learnability

Synthesizability

• Can user see the results of his/her actions?

Honesty of interface: ability of interface to provide an observable and informative account of its state.

Immediate vs. eventual honesty
Learnability

Familiarity

• On fist acquaintance can user perceive system in terms with which he/she is familiar?

Use of metaphor enhances guessability;

Affordance: intrinsic properties of visual objects suggest how they can be manipulated.

Learnability

Generalizability

• How easy is it to determine how to perform new tasks, given user’s current experience of the system?

Occur within one application or across applications
Learnability

**Consistency**

In similar situations, can we achieve our ends in similar ways?

(File and Edit menus in MS windows)

Flexibility

**Dialogue initiative**

*Can user take initiative in interaction with system?*

*system vs. user pre-emptiveness*
Flexibility

Multithreading

Can user perform more than one task at the same time?

- concurrent vs. interleaving;
  - Concurrent allows simultaneous communication of info. pertaining to separate tasks
  - Interleaved permits temporal overlap between separate tasks, but dialog is restricted to a single task at a time

- Multimodality allow multithreading
  - Several modalities (interaction devices or objects) used for a single input or output expression, e.g. double clicking or using a shortcut; visible as well as audible feedback, etc.

Flexibility

Task migratability

Can balance of control pass between user and system, as appropriate?
Flexibility

Substitutivity

*Can equivalent values be substituted for each other?*

Applied on input and output expressions

Flexibility

Customizability

*Can the User Interface be modified to suit the user?*

By the user (adaptability), e.g. redefine command names, macros

By the system (adaptivity), e.g. learning from user’s behaviour
Robustness

Observability

• Can user determine internal state of system from what s(he) can see?

Persistence: duration of effect of communication act and the ability of user to make use of that effect. (audible warning, combined with persistent visible clues)

Robustness

Recoverability

Are mistakes final in effect? (Desirable to have Undo, especially for actions such as erase *.*!)

Reachability: avoid blocking the user from getting to a desired state from some undesired one,

Commensurate effort: If it is difficult to undo a given effect on the state, then it should have been difficult to do in the first place
Robustness

Responsiveness

How long does the user need to wait?

Even if the result isn’t instantaneous, there should be some feedback, e.g. progress bar

Response time stability is the stability of the duration for identical or similar computational tasks.

Robustness

Task conformance

Does system do everything user wants, in the way (s)he wants?

task completeness or coverage
Design rules — guidelines

• Design rules: rules which designer can follow to (hopefully) ensure usability.

• Guidelines: General advice on how to attain good usability.

Guidelines

• Shneiderman is a wonderful source for these, but not the sole focus of this course. 2 examples:

  Display guidelines (p. 315, extracts only)
  • Display data to users in directly usable form
  • Use affirmative statements rather than negative statements
  • Left-justify columns of alphabetic data to permit rapid scanning
Guidelines (ctd)

Colour (p. 325, extracts only)
- Use colour conservatively
- Recognise power of colour as a coding technique (e.g. red for warning/unsatisfactory state; green for normal/satisfactory state)
- Design for monochrome first (approx. 8% of men and 1% of women have some form of colour blindness)

Summary

- Design principles and guidelines are collections of usability pointers to guide interaction design.
- Rules are more prescriptive.
- Both are used to:
  - Promote consistency among members of design team,
  - Embody practical experience,
  - Impose a house style
  - Promote reuse
  - Provide a common terminology
  - Avoid pitfalls of intuitive design and personal preference