Design principles

Unit 2
Learning outcomes

• Introduce concepts of usability and user experience
• Understand fundamental design principles
• Develop
  – awareness of how to apply them in design
  – Critical ability to evaluate other people’s design
Usability

• “Extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.”
Usability

• Usability is a **quality attribute** that assesses how easy user interfaces are to use.

• Five quality dimensions:
  - **Learnability**: How easy is it for users to accomplish basic tasks the first time they encounter the design?
  - **Efficiency**: Once users have learned the design, how quickly can they perform tasks?
  - **Memorability**: When users return to the design after a period of not using it, how easily can they reestablish proficiency?
  - **Errors**: How many errors do users make, how severe are these errors, and how easily can they recover from the errors?
  - **Satisfaction**: How pleasant is it to use the design?

  http://www.useit.com/
Usability

• Quality = absence of problems
  – discover usability problems and reduce their frequency and severity.
  – It can be measured
  – Objective data (performance data derived by behavioural data, user observations)
  – Subjective data (self-report, questionnaire or interview)
• Is usability all that matters here?
Hierarchy of consumer needs

- Jordan’s (2000)
  - Functionality = “a product will be useless if it does not contain appropriate functionality, a product cannot be usable if it does not contain the functions necessary to perform the tasks for which it is needed”.
  - Usability = “once people had become used to having appropriate functionality they then wanted products that were easy to use”.
  - Pleasure = “having become used to usable products, it seems inevitable that people will soon want something more: [...] products that bring not only functional benefits but also emotional ones”
User experience UX

• The User Experience (UX) is a complex response to the interaction with computing systems.

• This response is a consequence of
  – individual predispositions of the user (e.g., attitudes, motivations and needs)
  – characteristics of the interactive system (e.g., purpose, functionality and usability)
  – contextual dependencies (e.g., task and environment).
User Experience

INTERACTION

User

Product

Social factors
- values,
- emotions,
- expectations,
- prior experiences,
- physical characteristics,
- motor functions,
- personality,
- motivation,
- skills,
- age, etc.

Cultural factors
- time pressure,
- pressure of success and fail,
- explicit and implicit requirements, etc.

- sex, fashion,
- habits, norms, language,
- symbols, religion, etc.

Context of use
- usability,
- functions,
- size, weight,
- language, symbols,
- aesthetic characteristics,
- usefulness,
- reputation,
- adaptivity,
- mobility,
- etc.

- time, place,
- accompanying persons,
- temperature, etc.
User experience UX

• Positive
  – good design is more than absence of problems.
  – add “extra value” to design (emotion, fun, personal fulfillment)

• Holistic
  – Pragmatic qualities (traditional usability dimensions),
  – Hedonic qualities (non-task related, beauty, challenge, stimulation and self-expression)

• Subjective
  – Usability focuses performance and tasks: can be objectively measured
  – Hedonic attributes relate to the user’s self which is subject to deep variations among individuals.
User experience goals

- Satisfying
- Fun
- Enjoyable
- Entertaining
- Helpful
- Motivating
- Aesthetically pleasing
- Motivating
- Enhancing sociability

- rewarding
- support creativity
- emotionally fulfilling
...and more
Design metrics UX

• Usability
  – Easy of use and efficiency

• Aesthetics
  – Sensorial experience generated by the look and feel of the interface and to the extent to which this experience matches individual preferences and goals.

• Symbolism
  – Meanings and associations elicited by a system.
  – As opposed to aesthetics which can be ‘visceral’, symbolism requires cognitive processing (the individual recognizes a symbol and associate a meaning to it).
• Design principles
Design principles

• Generalizable abstractions for thinking about different aspects of design

• The do’s and don’ts of interaction design
  – Prescriptive statements

• What to provide and what not to provide at the interface

• Derived from a mix of theory-based knowledge, experience and common-sense
Design principles

- Visibility
- Feedback
- Constraint
- Mapping Consistency
- Affordance
Visibility

• This is a control panel for an elevator.
• How does it work?
• Push a button for the floor you want?

• Nothing happens. Push any other button? Still nothing. What do you need to do?

It is not visible as to what to do!

From:
www.baddesigns.com
...you need to insert your room card in the slot by the buttons to get the elevator to work!

How would you make this action more visible?

• make the card reader more obvious
• provide an auditory message, that says what to do (which language?)
• provide a big label next to the card reader that flashes when someone enters

• make relevant parts visible
• make what has to be done obvious
Transparency

- useful feedback
- easy to understand
- intuitive to use
- clear & easy to follow instructions
- appropriate online help
- context sensitive guidance of how to proceed when stuck
Feedback

- Sending information back to the user about what has been done
- Includes sound, highlighting, animation and combinations of these

- e.g. when screen button clicked on provides sound or red highlight feedback: “ccclichhk”
Constraints

• Restricting the possible actions that can be performed
• Helps prevent user from selecting incorrect options
• Three main types (Norman, 1999)
  – Physical
  – Cultural
  – Logical
Physical constraints

• Refer to the way physical objects restrict the movement of things
  – E.g. only one way you can insert a key into a lock
• How many ways can you insert a CD or DVD disk into a computer?
• How physically constraining is this action?
• How does it differ from the insertion of a floppy disk into a computer?
Affordances

• Refers to an attribute of an object that allows people to know how to use it
  – e.g. a mouse button invites pushing, a door handle affords pulling
• Norman (1988) used the term to discuss the design of everyday objects
  – Learned conventions of arbitrary mappings between action and effect at the interface
  – Some mappings are better than others
• Much popularised in interaction design to discuss how to design interface objects
  – e.g. scrollbars to afford moving up and down, icons to afford clicking on
Logical constraint

- Exploits people’s everyday common sense reasoning about the way the world works
  - Where do you plug the mouse?
  - Where do you plug the keyboard?
  - Top or bottom connector?
  - Do the colour coded icons help?

From: www.baddesigns.com
How to design them more logically

(i) A provides direct adjacent mapping between icon and connector
(ii) B provides color coding to associate the connectors with the labels

From: www.baddesigns.com
Example

(i) A provides direct adjacent mapping between icon and connector

(ii) B provides color coding to associate the connectors with the labels

From: www.baddesigns.com
Cultural constraints

• Learned arbitrary conventions like red triangles for warning

• Can be universal or culturally specific
Mapping

• Relationship between controls and their movements and the results in the world
Why is this a better design?
Consistency

• Design interfaces to have similar operations and use similar elements for similar tasks
• For example:
  – always use ctrl key plus first initial of the command for an operation – ctrl+C, ctrl+S, ctrl+O
• Main benefit is consistent interfaces are easier to learn and use
Internal and external consistency

• Internal consistency: designing operations to behave the same within an application
  – Difficult to achieve with complex interfaces
• External consistency: designing operations, interfaces to be the same across applications and devices
  – Very rarely the case, based on different designer’s preference - Brand Identity
Keypad numbers layout

- A case of external inconsistency

(a) phones, remote controls

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(b) calculators, computer keypads

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Usability principles

• Similar to design principles, except more prescriptive
• Used mainly as the basis for evaluating systems
• Provide a framework for heuristic evaluation
Usability principles (Nielsen 2001)

- Visibility of system status
- Match between system and the real world
- User control and freedom
- Consistency and standards
- Help users recognize, diagnose and recover from errors
- Error prevention
- Recognition rather than recall
- Flexibility and efficiency of use
- Aesthetic and minimalist design
- Help and documentation

http://www.useit.com/papers/heuristic/heuristic_list.html
http://designingwebinterfaces.com/6-tips-for-a-great-flex-ux-part-5
Recommended reading

• Sharp et al. Chapter 1
• More on design principles
  – Don Norman 1988 The design of everyday things
  – Usability: http://www.useit.com