

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 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.”
 - ISO 9241-11:1998 Ergonomic requirements for office work with visual display terminals (VDTs) -- Part 11: Guidance on usability.

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)

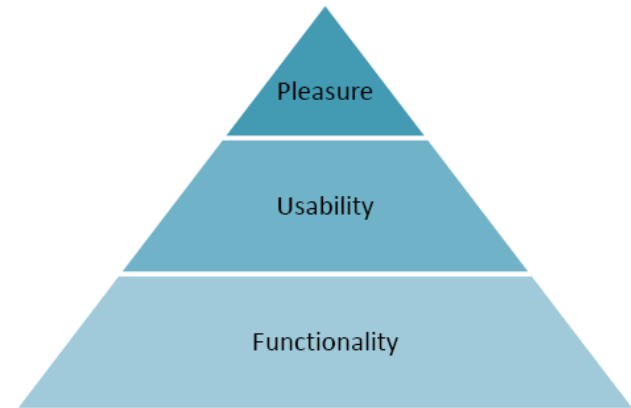
- Is usability all that matters here?





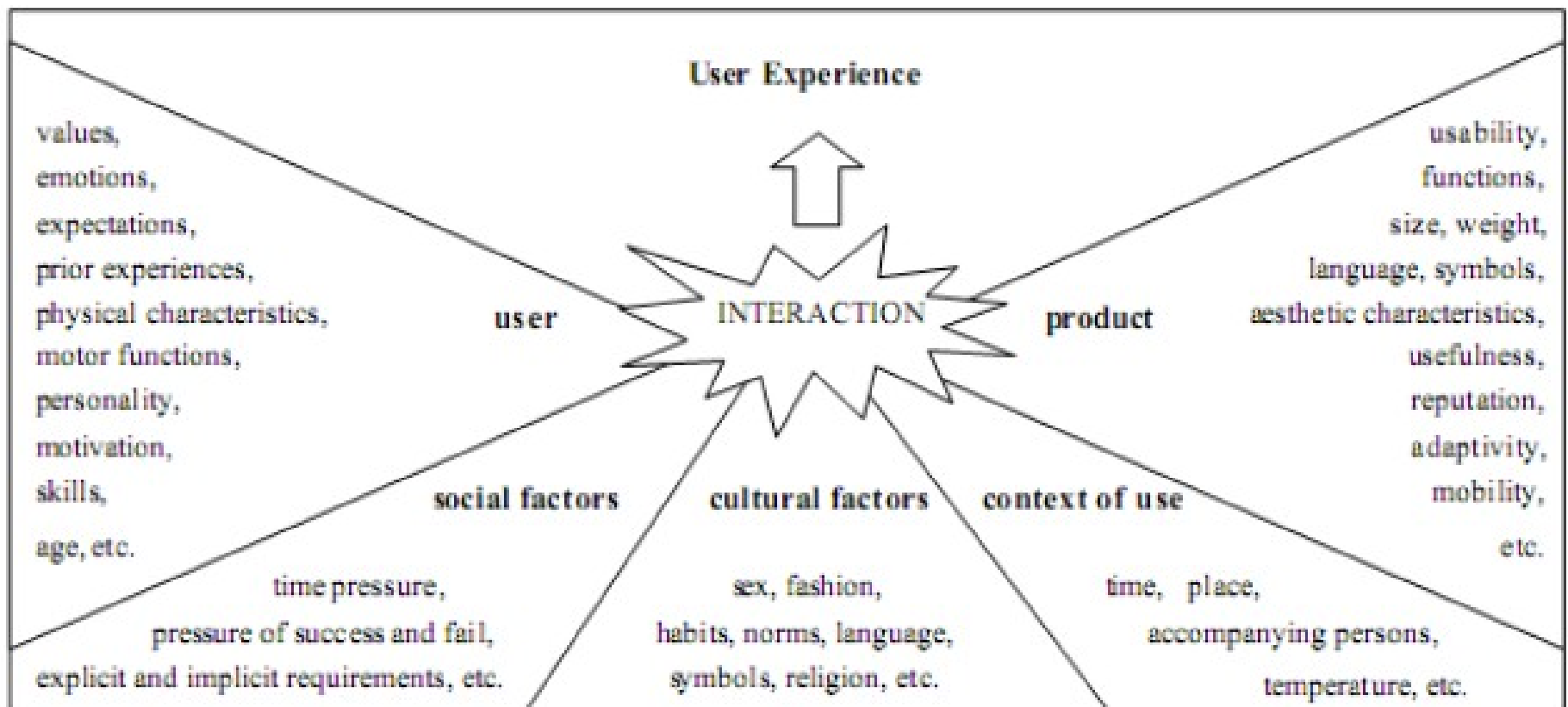
Hierarchy of consumer needs

- 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 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

Visibility



...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:

 → “ccclchhk”

 → 

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

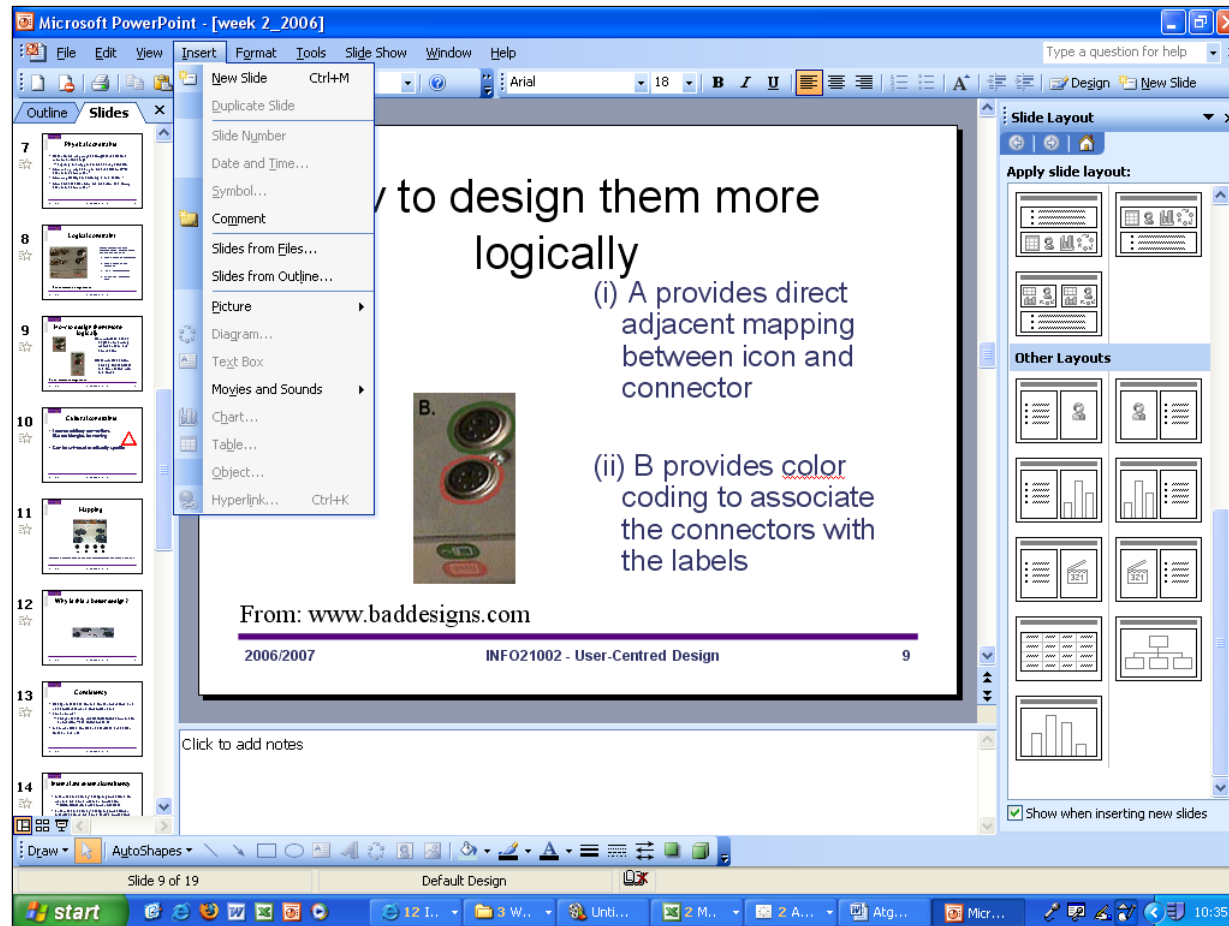
How to design them more logically



- (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



Cultural constraints

- Learned arbitrary conventions like red triangles for warning
- Can be universal or culturally specific



Mapping



A



B



C



D

- 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

1	2	3
4	5	6
7	8	9
	0	

(b) calculators, computer keypads

7	8	9
4	5	6
1	2	3
0		

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>