Design principles

- Generalizable abstractions for thinking about different aspects of design
- The do's and don'ts of interaction design
- 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

- see The Design of Everyday Things and 1.6 in ID

Design principles

- Visibility
- Feedback
- Constraints
  - Physical
  - Semantic
  - Cultural
  - Logical

Visibility

- helps the user understand what to do with the system
- the visual design provides clues about how to interact with the system

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 eg. light up slot or make it physically stand out
  - make what has to be done obvious

Feedback

- related to visibility
- the way that the system reacts to the user input, sending a "signal" back to the user
- if I turn this knob, this part moves in the same direction
- when I press on a touch screen, the button icon depresses and a click is audible

Constraints

- how many different ways could an operation be possibly carried out?
- if there is more than one way to do something then it is easier for people to get it wrong, not remember the sequence, ...
- constraints limit the possibilities - which can be a good thing for the user

Physical constraints

- this shape key goes into this lock
- this handle is about the right size for my hand to hold
- the plastics and cans recycling bin has a round hole, I can't put in my lunch container

Semantic constraints

- Semantics - the meaning of things
  - some things just don't make sense!
  - requires that we have knowledge of the real world and that we understanding and share the same "meanings"
  - you would expect that a driver of a car faces the road ahead

Cultural constraints

- socially acceptable behaviour in one culture could differ from another culture
- people learn the rules of their culture as they grow up, they also know how to react to certain events
- localised products might work in a particular way eg. US indicators were/are connected to the brake light
- learned arbitrary conventions like red triangles for warning

Logical constraints

- logic / reasoning
- not physical, not cultural, not semantic
- exploits people's everyday common sense reasoning about the way the world works
- building a model and there are pieces left over
- An example: the logical relationship between physical layout of a device and the way it works as the next slide illustrates

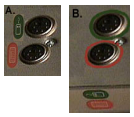
Logical or ambiguous design?

- Where do you plug the mouse?
- Where do you plug the keyboard?
- top or bottom connector?
- Do the color coded icons help?

From: www.huddesigns.com

How to design them more logically

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



From: www.huddesigns.com

Norman's Lego Example

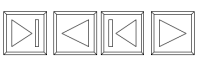
- constructing a toy lego police motor cycle

Natural Mappings

- Spatial relationship between the controls and the outcome
- Example: Light switches, cook tops

Mapping

- Relationship between controls and their movements and the results in the world
- Why is this a poor mapping of control buttons?



Mapping

- Why is this a better mapping?

- The control buttons are mapped better onto the sequence of actions of fast rewind, rewind, play and fast forward

Activity on mappings

Which controls go with which rings (burners)?

Why is this a better design?

- see www.baddesigns.com

Usability principles

- originally referred to as "heuristics"
- Similar to design principles, except more prescriptive
- Used mainly as the basis for evaluating systems
- Provide a framework for heuristic evaluation (see 15.2 Interaction Design)

Usability principles

- Visibility of system status
- Match between system and the real world
- User control and freedom
- Consistency and standards
- Help and documentation

Usability principles

- Help users recognize, diagnose and recover from errors
- Error prevention
- Recognition rather than recall
- Flexibility and efficiency of use
- Aesthetic and minimalist design

Usability principles

- There have been variations to the list of principles since Nielsen's 2001 proposal
- More recent lists focus on newer products such as mobile devices, digital toys, online communities, new web services, etc
- See Box 15.1 p508 (ID 3rd ed) for some Web focused heuristics

Visibility of System Status

- Feedback
- What is the system doing now?
- Keep the user informed
- Show status with minimal delay
- Make the feedback appropriate, meaningful

Visibility of System Status

- System should continuously inform the user about what the system is doing and how it's interpreting the user's input!
- < .1 sec – no special feedback required
- > 1 sec – provide feedback (e.g., hourglass)
- > 10 sec – allow user to do other tasks simultaneously

Nielsen, Designing Web Usability, p42-44

Match between system and the real world

- Familiar concepts to the target audience
- "Speak the user's language"
- Avoid system-oriented jargon
- Use metaphors wisely
  - understandable, applicable, translatable
- Workflow is reflected in the system

Match between system and the real world

Looks like a real calculator

User control and freedom

- The user needs to feel that they are in control of the interaction
- Actions are not taking place in unpredictable, automatic ways
- It is obvious for the user to find an exit if they have traversed into an area of the application that they were not expecting

Consistency and standards

- Consistency helps users understand what they could do since they can build on knowledge they have acquired elsewhere (internal or external)
- Terminology means the same thing
- Actions or sequences of actions a conducted in the same manner

Help and Documentation

- Information that can be easily searched
- Provides help in a series of concrete steps that are easily followed

Help users recognize, diagnose and recover from errors

- Error messages are presented using plain language that the user can understand
- They can comprehend that they have encountered an error
- The error is described
- There is a suggested solution to recover from the error that is also in plain language

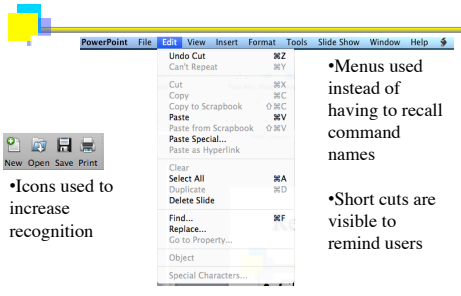
Error prevention

- Stop errors from occurring in the first place
- Proximity of controls to each other
- Providing clear labelling or meaningful terminology
- Examples along side where input needs to be made

Recognition rather than recall

- Humans are better at recognising from a range of options than trying to ask them to recall what the options might be
- Make things visible so the user can decide from options presented to them rather than remembering what the (non-displayed) options are

Recognition rather than recall



•Icons used to increase recognition

•Menus used instead of having to recall command names

•Short cuts are visible to remind users

Flexibility and efficiency of use

- Experienced users want to carry out their tasks efficiently and quickly
- Provide alternative ways/paths through an application that can cater for inexperienced and experienced users
- Accelerators not visible to the novice user but provide efficiency for the expert

Aesthetic and minimalist design

- Avoid providing information that is irrelevant or rarely needed
- How many steps does it take to achieve a task? Do you have any unnecessary steps?
- "Designed to give pleasure through beauty" Oxford American Dictionary

Aesthetic and minimalist design

Criteria

- Note that Nielsen's list is not the only set of principles used in interface evaluation
- There are other lists of design principles
- Some principles may not apply in all situations
- You may need to synthesize something more relevant depending on the context

Web heuristics (from Budd 2007)

- Clarity
- Minimize unnecessary complexity & cognitive load
- Provide users with context
- Promote positive & pleasurable user experience

See idbook.com or Box 15.1 in ID

Using the Frameworks

- Usability Goals
- User Experience Goals
- Design Principles (Norman's)
- Usability Principles (Nielsen's)
- Affordance
- Natural Mappings

Not Opinion

- Develop some "questions" to ask for each of the frameworks and attributes
  - Is this easy to remember?
  - What mistakes could be made?

Not Opinion

- Look at various systems (physical or online)
- Ask the question and review the system against these principles
- Your learning objective is to be able to use these frameworks to assess (and design) user interfaces and experiences