Lecture 1 – Cognitive limitations and cognitive design

Introductory information

All information, assignments, articles and hand-outs will be posted to course website. Visit it regularly!

http://www.lucs.lu.se/education/extf76/

Cognitive design

From a cognitive perspective, good design is design that makes the object easy to use/navigate

Design principles

➤ Provide a good conceptual model

A conceptual model is our understanding of how an object functions and what its underlying mechanism is. We use our conceptual model to both plan our use of the object as well as to simulate its use in our minds.

Conceptual models are learnt, but by making the system image – the outward appearance of the object – as close to the intended conceptual model as possible, designers can maximise the chance that users will adopt the intended conceptual model from the first interaction. The remaining design principles are ways to achieve this goal.

➤ Make things visible

When we talk about visibility we usually separate affordances from constraints.

Affordances are perceived or actual properties of the object making intended uses visible. Examples, buttons are for pressing, pads on doors to indicate pushing and so on.

Constraints serve to limit how an object is interacted with, by blocking choices or making certain uses less probable. Example, USB-connectors which can only be inserted one way.

Affordances and constraints are learnt and culturally transmitted. Example, red traffic lights.

➤ Use natural mapping

Mappings refer to relations between actions and outcomes in an object. Natural mapping occurs when for example increasing a quantity (such as volume) involves turning a lever upwards. Similarly, actions that are supposed to be performed in a sequence, for example, when using a ticket machine, should be placed left-to-right in order of execution.
Hence, what is a ‘natural’ mapping is also highly cultural!

- Provide feedback
  Feedback allows users to know that their actions have had an effect on the object. Feedback can be both positive and negative. For learning to occur from the feedback, it must be timely and placed so that it will be noticed (for example indicator lights close to buttons).

**Cognitive limitations or Why do the cognitive design principles work?**

*General cognitive limitations*

Human attention is narrow and context-dependent. We do not always see what we look at, nor do we always notice salient changes in the environment. If not instructed to be on the lookout for changes, we rarely notice them. Example, change blindness.

What we see and perceive is context dependent. Context can be influenced top-down through instructions (interpret I3 as number or symbol), but also bottom-up (recall the dot-grid).

When we take in different sources of information, such as both visual and auditory information, the contents of these will influence each other. For example, what we hear can depend on what we see.

Accessing information from memory and performing mental tasks (such as rotation of a tetris shape) is taxing.

*Cognitive outsourcing*

Human cognition works very well despite these cognitive limitations. One reason for this is that we live in very stable environments. The natural world is full of signals (such as the colour of berries) which we can rely on. Our actions in the world also shape it (such as paths).

The extended mind hypothesis states that the human cognitive system cannot be understood in isolation from the environment in which it normally operates. Our mobile phones or notebooks become as much part of our memory systems as the neurons in our brain. Whether or not this is literally true, it provides an important metaphor for cognitive analysis and for understanding why design matters.