Chapter 2

The Psychology of Usable Things

“ When simple things need pictures, labels, or instructions, the design has failed. ”

[Don Norman, The Design of Everday Things, 1988 [Norman, 1988, page 9]]

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- Wikipedia; *Natural Mapping*; http://en.wikipedia.org/wiki/Natural_mapping

2.1 The Psychopathology of Everyday Things

Examples of where the design of everyday things went wrong.

Opening a Milk Carton

- Classic example from Austrian TV [ORF, 1987].
- Glass bottles were being replaced by new cartons.
- On live TV, a manager demonstrates how easy it is to open the new cartons...
- ...but everything goes rather wrong!
- The original was broadcast live on the program "wir", but was later rebroadcast in the outtake show "Hoppala" (hence the laughter over the original soundtrack).

Early Tractors

- Early tractors had a high centre of gravity and narrow wheel base.
- On rough, hilly surface → disaster!
- Used to be called "driver error".
- More probably "design error", since tractors today are designed with a low centre of gravity and wide wheel base.

The Frustrations of Everyday Life

Can you use all the functions of your:

- digital watch?
- mobile phone?
- washing machine?
- video recorder?

Figure 2.1: The most basic functionality of a video recorder, playing a tape, is easy to use. However, anything more advanced, such as programming a recording, can become rather difficult.

Figure 2.2: Some of the buttons on a VCR remote control are easy to understand, but others are unfathomable without the instruction manual.

Figure 2.12: The lever beneath this mini-van seat does not work as expected. Instead of allowing the seat to slide backward or forward, pulling the lever detaches the seat from the floor to make room for cargo! [Photograph courtesy of Baddesigns.Com [Darnell, 2010].]

Car Seat

- A seat in a mini-van (people carrier), see Figure 2.12.
- What do you think happens when you pull the lever under the seat?
- Most normal-thinking people would expect the seat to slide backward or forward.
- Not in this mini-van. Pulling the lever detaches the seat from the floor to make room for cargo!
- This example is from Baddesigns.Com [Darnell, 2010] `http://baddesigns.com/carseat.html`

2.2 The Psychology of Everyday Things

Perceived and Real Affordances

Affordances are the range of possible (physical) actions by a user on an artefact:

- *Perceived Affordances* are the actions a user perceives to be possible.
- *Real Affordances* are the actions which are actually possible.

See [Norman, 1999] for a discussion of affordances and perceived affordances.

Real World Affordances

For physical objects, there can be both real and perceived affordances (and the two sets are not necessarily the same).

- Appearance indicates how to use something:
  - A chair affords (suggests) sitting.
  - Knobs are for turning.
  - Slots are for inserting things.
  - A button affords pushing.
- When perceived affordances are taken advantage of, the user knows what to do just by looking.

Figures 2.13 and 2.14 illustrate the perceived affordances of door handles.

Figures 2.18 illustrates affordances of rubbish bin lids.

Labels

- "When simple things need pictures, labels, or instructions, the design has failed!" Norman [1992, page 9]
- See Figure 2.19.

GUI Affordances

For screen-based interfaces, the computer hardware already has built-in physical affordances:

- Screen affords touching.
- Mouse affords pointing.
- Mouse buttons afford clicking.
- Keyboard affords typing.

Changing the shape of the cursor to indicate a clickable link is not an affordance (you can still click anywhere), but visual feedback.

Physically locking the mouse button on non-clickable areas is a real affordance.

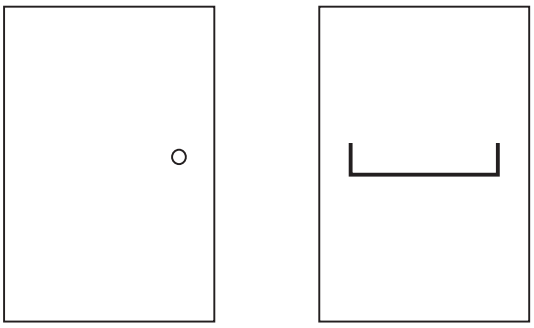

Figure 2.13: Ambiguous door designs. A knob affords turning, but do you push or pull? A horizontal bar affords pushing, but which side do you push on?

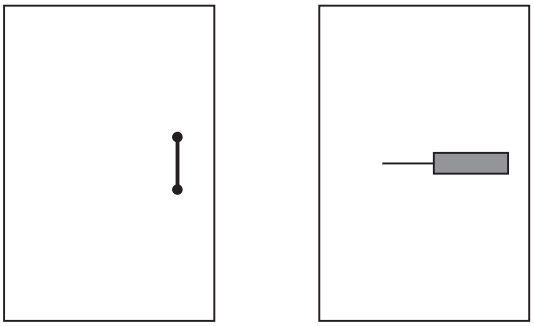

Figure 2.14: Good use of affordances in door designs. A vertical handle affords grasping and pulling. A flat panel affords pushing and the broadness indicates which side to push.

Figure 2.15: An example of ambiguous affordances in door design. The vertical handles mounted on both sides of the door suggest grasping and pulling. Unfortunately, from one side, the door has to be pushed! Note the signs above the handles.

Figure 2.16: Good use of affordances in the same hotel. This door is well designed. The vertical handle correctly suggests pulling, the flat bar correctly suggests pushing.

Figure 2.17: The affordances for this door seem reasonable within themselves. Context is everything. Hopefully, the door is kept locked!

Mappings

Mappings are the relationships between controls and their effects on a system.

Natural mappings take advantage of physical analogies and cultural standards.

Examples:

- Turn steering wheel clockwise to turn a car right. Actually, there are two mappings here:
  - which control affects steering,
  - which direction to turn it.
- Move a control up to move an object up.
- Use a louder sound to mean a greater amount.

Figure 2.18: Rubbish bin lid affordances. [Photograph taken at Hyatt Regency, Bellevue, WA, in Feb 2012. Used with kind permission of Karl Voit.]

Figure 2.19: A label as big as the control panel. [Photograph taken at TU Chemnitz, Germany in March 2008. Used with kind permission of Karl Voit.]

Mapping of Cooker Controls

How should one arrange the hot plate controls on a cooker?

- Arbitrary Mapping (see Figure 2.20).
- Paired Mapping (see Figure 2.21).
- Full Natural Mapping (see Figure 2.22).

Adapted from Norman, *The Design of Everyday Things*, Figures 3.3, 3.4, and 3.5 [Norman, 1988].

Constraints

The difficulty of dealing with a novel situation is directly related to the number of possibilities.

Constraints are physical, semantic, cultural, and logical limits on the number of possibilities.

- *Physical* constraints such as pegs and holes limit possible operations.
- *Semantic* constraints rely upon our knowledge of the situation and of the world.
- *Cultural* constraints rely upon accepted cultural conventions.
- *Logical* constraints exploit logical relationships. For example a natural mapping between the spatial layout of components and their controls.

Where affordances suggest the range of possibilities, constraints limit the number of alternatives.

Constraints in Lego Motorbike

Motorbike toy with 12 parts. Constraints make its construction simple, even for adults!

- *Physical:* Front wheel only fits in one place.
- *Semantic:* The rider sits on the seat facing forward.
- *Cultural:* Red is a rear light, yellow a front light.
- *Logical:* Two blue lights, two white pieces, probably go together.

See Figures 2.23 and 2.24.

Conventions

Conventions are cultural constraints. They are initially arbitrary, but evolve and become accepted over time.

They can however still vary enormously across different cultures, for example:

- Light switches:
  America down is off
  Britain down is on

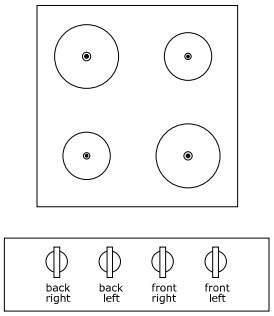

Figure 2.20: Arbitrary mapping of controls to hot plates. There are 24 possible arrangements, requiring the use of labels and memory.

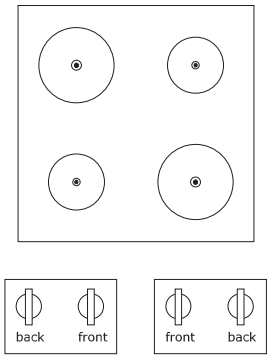

Figure 2.21: Paired cooker controls. Now there are only four possible arrangements, two on each side, but confusion can still occur.

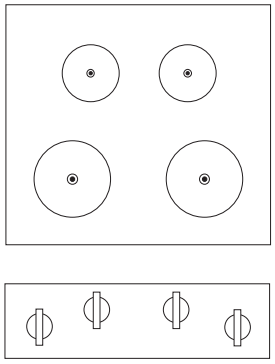

Figure 2.22: A full, natural mapping of cooker controls. There is no ambiguity, no need for learning or remembering, and no need for labels.

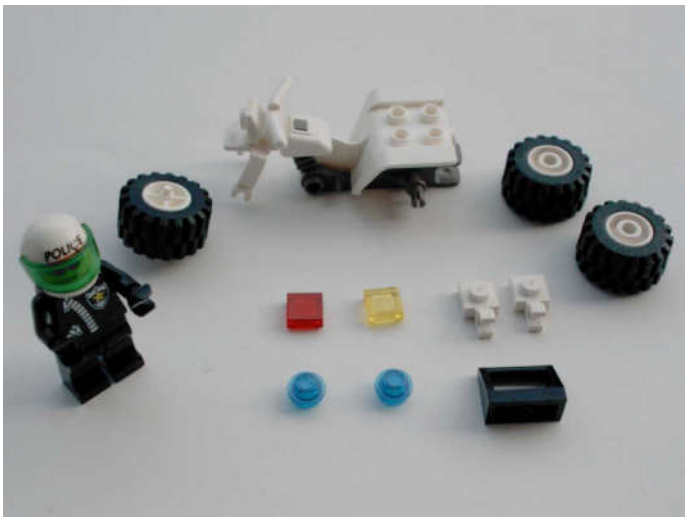

Figure 2.23: The design takes advantage of constraints to make its construction simple.

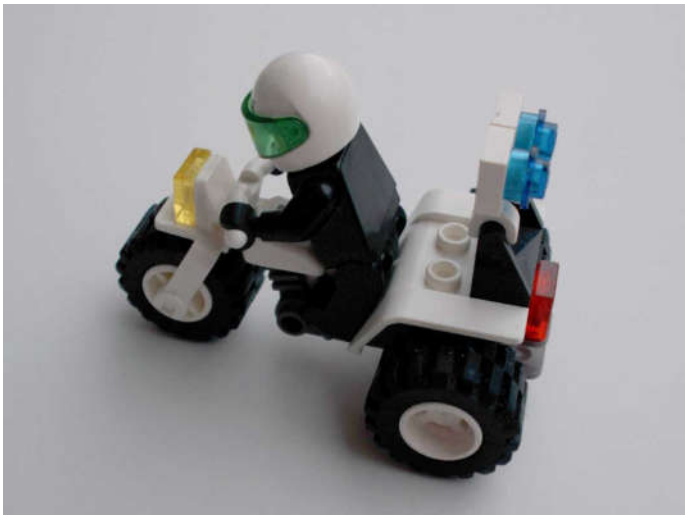

Figure 2.24: The assembled lego motorbike.

- Water taps:

America	anti-clockwise is on
Britain	anti-clockwise is off

- The colour red:

America	danger
Egypt	death
India	life
China	happiness