Chapter 2

The Psychology of Usable Things

> *“ When simple things need pictures, labels, or instructions, the design has failed. ”*
>
> [Don Norman, The Psychology of Everyday Things, 1988 [Norman 1988, page 9]]

This chapter is based around Don Norman’s classic book, The Psychology of Everyday Things [Norman 1988].

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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 1989]. [Video: https://youtu.be/2-p8YpR7rJc]

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.

- 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?

Zeiss Slide Projector

- Only one button to control the slide advance, see Figure 2.3.

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

- During lectures, sometimes the slides go forwards, sometimes they go backwards . . .
- If you can find an instruction manual:
  Short press = forward, long press = backward.
- What an elegant design, two functions with just one button!
- But how should first-time users know what to do?

The Louis-Laird Amphitheatre in the Sorbonne

- Magnificent murals on the ceiling.
  - But only the right way up for the lecturer.
- Electric projection screen.
  - Has to be lowered from a back room up a short flight of stairs, out of sight.

Could Someone Please Turn the Lights Down

- Figure 2.4 shows the control panel for the lecturer at the front of the old lecture theatre HS EDV.
- I often had to assist guest speakers in turning the lights down (but not completely off).
- The problem is that four (!) separate controls are mapped to the single green button (Deckenlicht):
  - Depressing and releasing the green button either turns the lights completely on or completely off, depending on whether they are currently on or off.

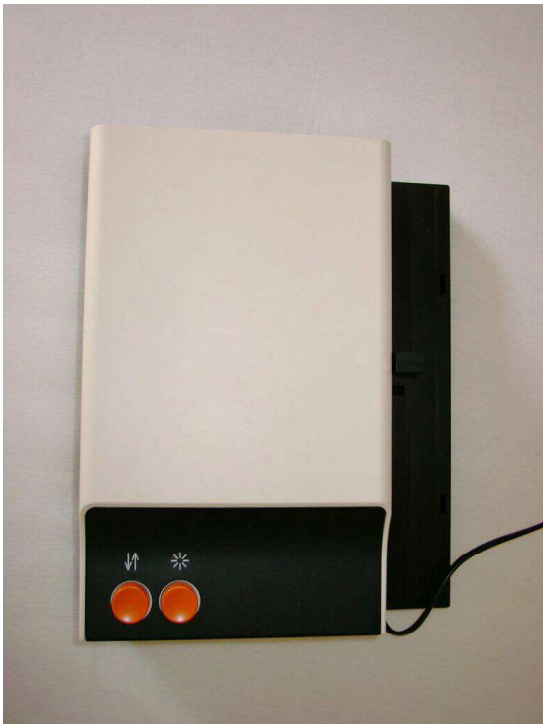

Figure 2.3: The Zeiss Ikon Perkeo 511 slide projector. A short press advances to the next slide, a long press moves back one slide, but how should first-time users know this? [Thanks to Horst Ortmann for providing the photograph.]

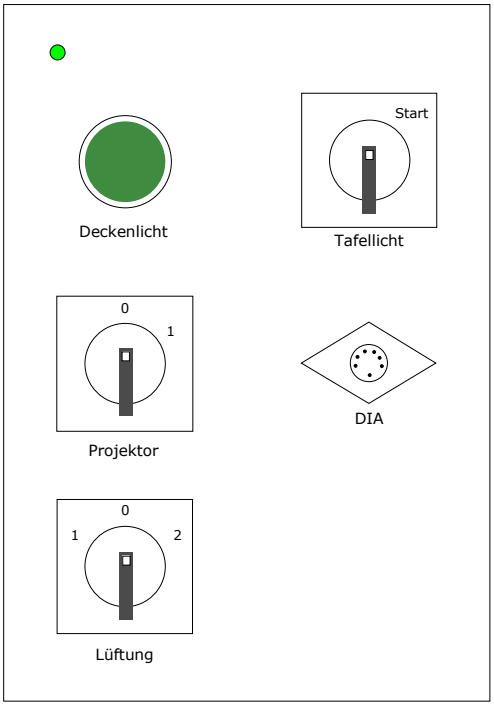

Figure 2.4: The control panel for the lecturer in the old lecture theatre HS EDV of Graz University of Technology.

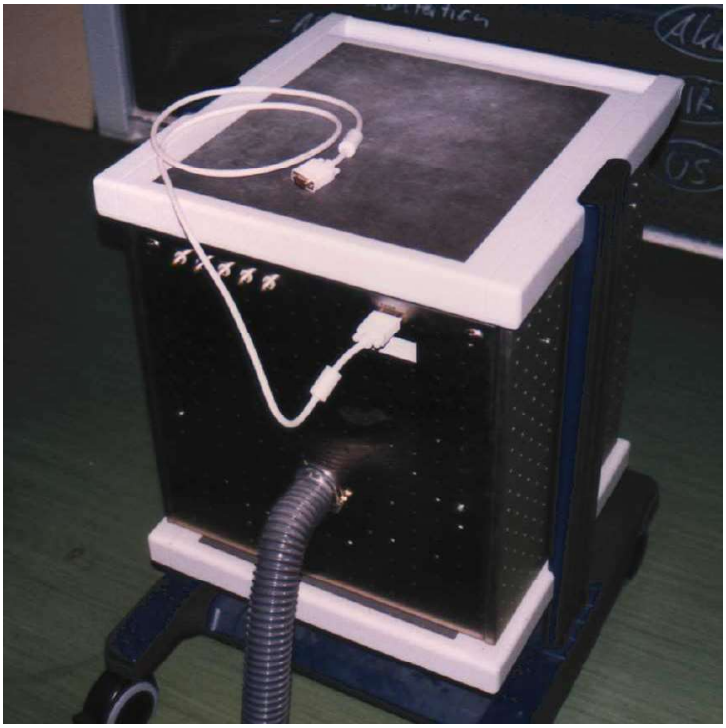

Figure 2.5: The audiovisual trolley in lecture theatre HS EDV has input connectors at the rear. Unfortunately, unscrewing the external connector causes the internal connector to fall with a clunk somewhere inside the trolley!

  - Holding the green button down either dims or increases lighting, depending on whether it was last dimmed or increased.

- The air conditioning control (Lüftung) is also problematic: 0 is off, 1 is on, and 2 is off (!).

Clunky Connector

- The audiovisual control trolley (see Figure 2.5) at the front of lecture theatre HS EDV also caused me a major problem.
- Intending to hook up my laptop to the ceiling mounted projector, I unwittingly unscrewed the monitor cable connector from the outside of the trolley.
- This resulted in a dull clunking sound from inside the trolley.
- Unfortunately, the internal connector had only been secured by virtue of its being attached to the external connector!
- It took three days for a technician to arrive, disassemble the trolley, and reconnect everything.
- To remind myself and to warn others, I resorted to the last ditch technique of providing the label shown in Figure 2.6.

Where is the Toilet Paper?

- Fancy hotel, nice bathrooms, see Figure 2.7.

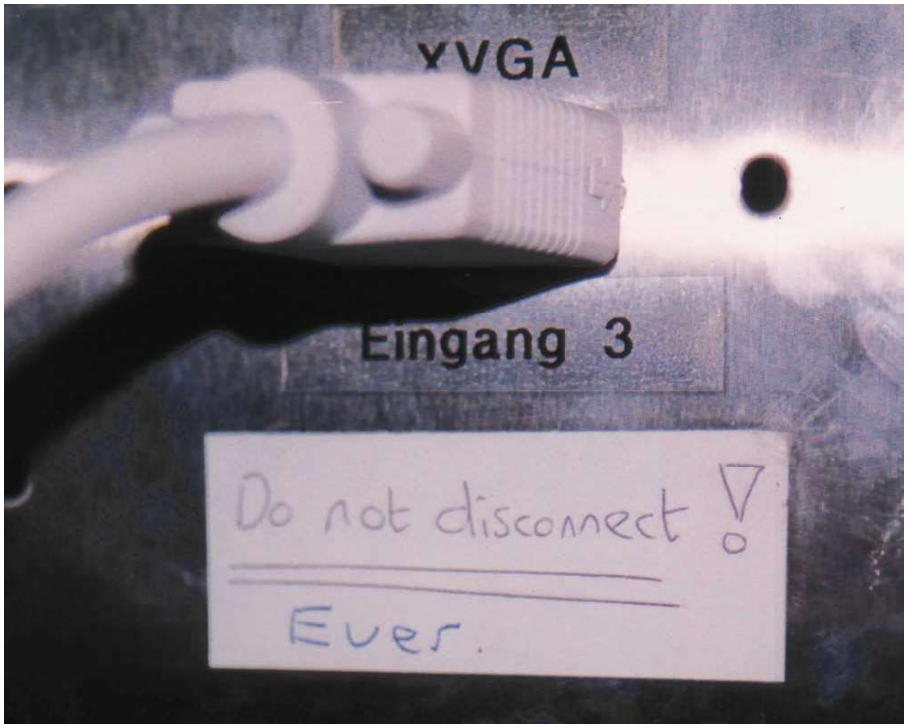

Figure 2.6: I provided this label as a warning to myself and others.

- Having sat down and done the business, where the heck is the toilet paper?
- Ah, there it is! Well-hidden, see Figure 2.8.
- At least it was still in reaching distance, see Figure 2.9.

This is a Mop Sink

- A picture from the men's toilet of a restaurant in Santa Barbara, see Figure 2.10.
- There is no urinal in the toilet.
- Where do you think most men relieve themselves?
- The label says "This is a Mop Sink", see Figure 2.11.
- The mop sink looks enough like a urinal to be used as one.
- This example is from Baddesigns.Com [Darnell 2010] `http://baddesigns.com/mopsnk.html`

This is a Measuring Device

- A photo from the restroom of a doctor's surgery in Graz, Austria, see Figure 2.12.
- Are there two toilets?
- The "toilet" on the left has a label on it and a sign above it. The label reads "Measuring device, not toilet", see Figure 2.13.
- I guess experience showed the label was necessary. . .

Figure 2.7: Can you see where the toilet paper is in this hotel bathroom?

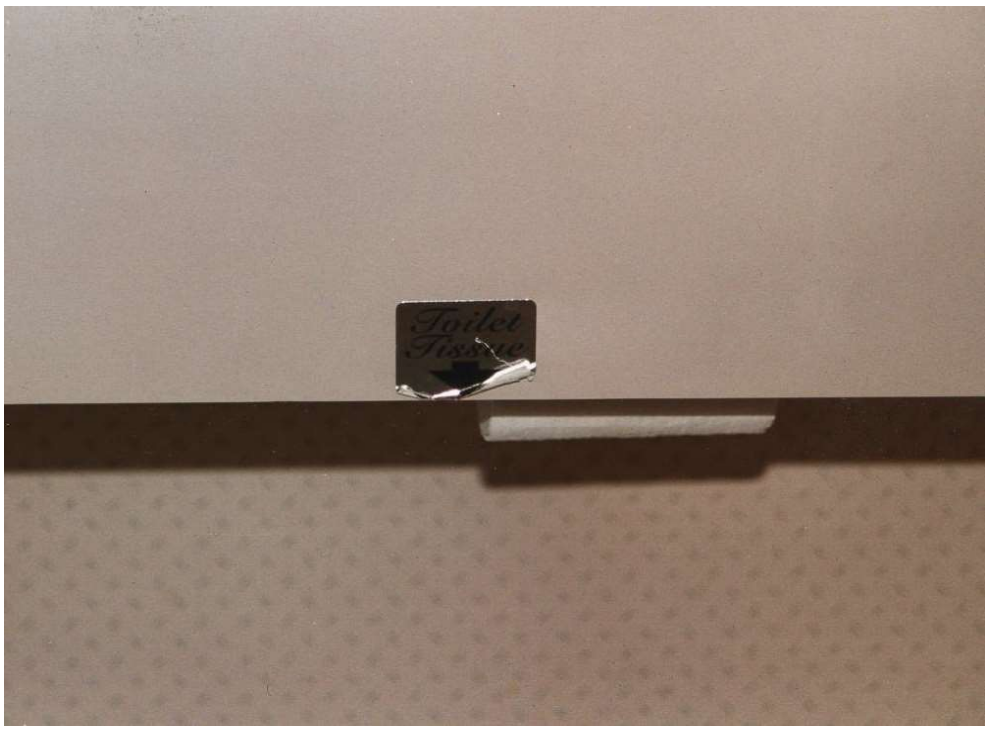

Figure 2.8: The toilet paper is well-hidden under the ledge, and is impossible to find without the sign.

Figure 2.9: The toilet paper here is easy to see, but a little too far away. . . [Image placed in the public domain by my former student.]

Figure 2.10: The men's toilet in a restaurant in Santa Barbara. The fixture in the corner affords a certain activity. It is, however, not a urinal but a mop sink. [Photograph courtesy of Baddesigns.Com [Darnell 2010].]

Figure 2.11: A close-up of the label. It reads "This is a Mop Sink". [Photograph courtesy of Baddesigns.Com [Darnell 2010].]

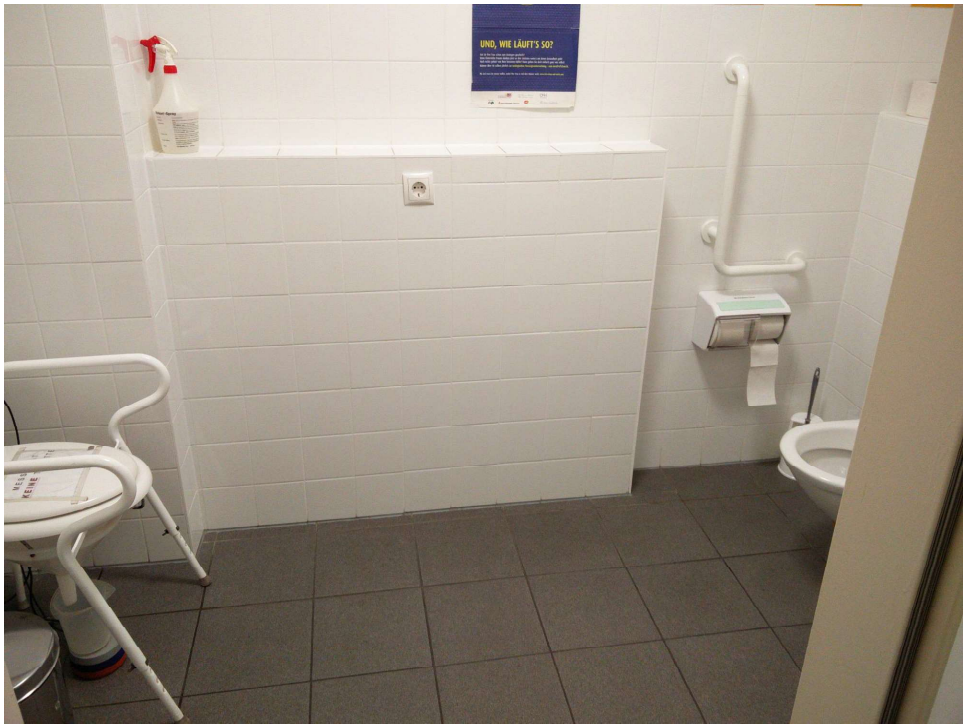

Figure 2.12: The restroom of a doctor's surgery in Graz. Are there two toilets in the room?

Shower Control

- Shower control: water either goes into the bath out of the faucet or comes out of the shower. See Figure 2.14.
- Sticker with instructions on the faucet.
- How do you make the water come out of the shower instead of the faucet?
- You have to reach *under* the faucet and pull the knob down!
- This example is from Baddesigns.Com [Darnell 2010] `http://baddesigns.com/shower1.html`

Car Seat

- A seat in a mini-van (people carrier), see Figure 2.15.

Figure 2.13: The "toilet" on the left has a label and a sign above it. The label reads "Measuring device, not toilet".

Figure 2.14: Hidden shower control. To divert water to the shower, you have to pull down on the knob beneath the faucet. [Photograph courtesy of Baddesigns.Com [Darnell 2010].]

Figure 2.15: 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].]

- 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.
- Figure 2.16 illustrates good affordances of rubbish bins. The shape of the slot affords the type of rubbish which should be inserted.

Norman Doors

- Badly designed doors are sometimes called "Norman doors" after Don Norman.
- "A door where the design tells you to do the opposite of what you're actually supposed to do." [Posner 2016, 01:39].
- Figures 2.17, 2.18, 2.19, and 2.20 illustrate the perceived affordances of door handles.
- Video by Joe Posner [Posner 2016]. [Video: `https://youtu.be/yY96hTb8WgI`]

Labels

- "When simple things need pictures, labels, or instructions, the design has failed!" Norman [1992, page 9]
- See Figure 2.22.

GUI Affordances

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

Figure 2.16: Good use of affordances for rubbish bins. [Photograph taken at Hyatt Regency, Bellevue, WA, in Feb 2012. Used with kind permission of Karl Voit.]

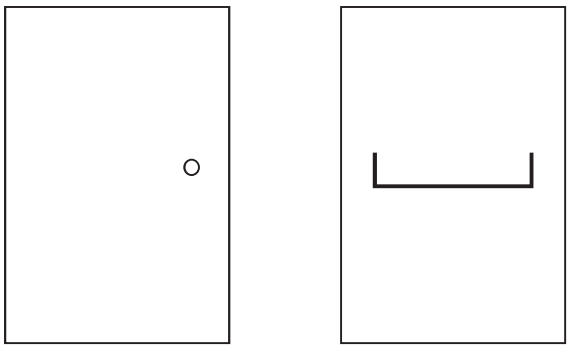

Figure 2.17: Ambiguous door designs. A knob affords turning, but do you push or pull? A horizontal bar affords pushing, but which side do you push on?

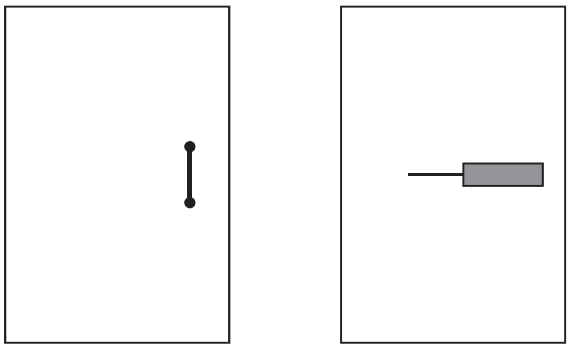

Figure 2.18: Good use of affordances in door designs. A vertical handle affords grasping and pulling. A flat panel affords pushing and the broadness indicates which side to push.


Figure 2.19: 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 2.20: 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 2.21: The affordances for this door seem reasonable within themselves. Context is everything. Hopefully, the door is kept locked!

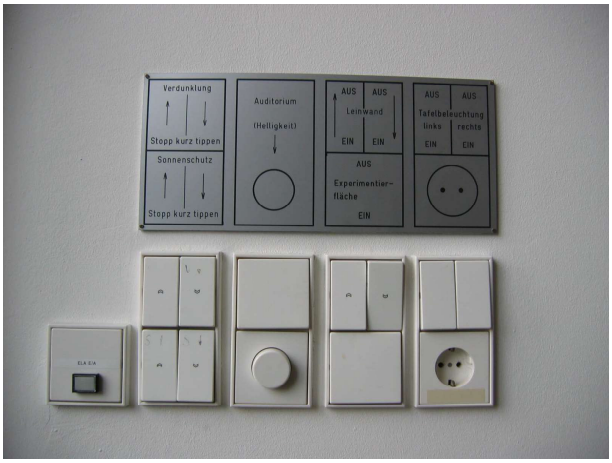

Figure 2.22: A label as big as the control panel. [Photograph taken at TU Chemnitz, Germany in March 2008. Used with kind permission of Karl Voit.]

- 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 visual feedback not an affordance (you can still click anywhere).

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

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.

Mapping of Cooker Controls

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

- Arbitrary Mapping (see Figure 2.23).
- Paired Mapping (see Figure 2.24).

- Full Natural Mapping (see Figure 2.25).

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 2.26 and 2.27.

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
- Water taps:
  America anti-clockwise is on
  Britain anti-clockwise is off
- The colour red:
  America danger
  Egypt death
  India life
  China happiness

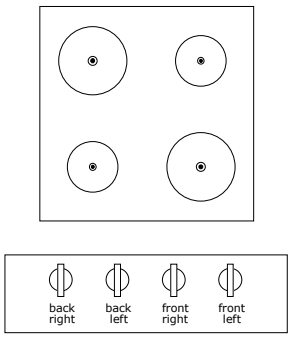

Figure 2.23: Arbitrary mapping of controls to hot plates. There are 24 possible arrangements, requiring the use of labels and memory.

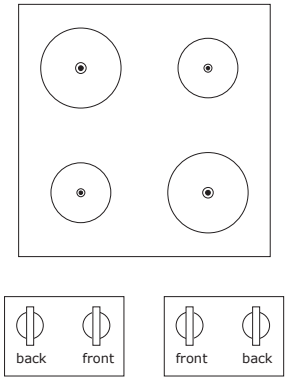

Figure 2.24: Paired cooker controls. Now there are only four possible arrangements, two on each side, but confusion can still occur.

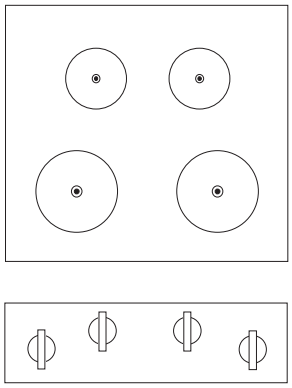

Figure 2.25: A full, natural mapping of cooker controls. There is no ambiguity, no need for learning or remembering, and no need for labels.

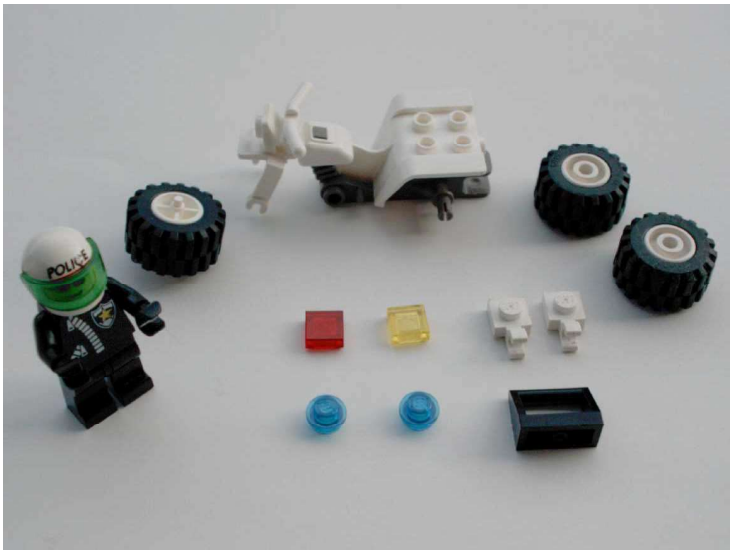

Figure 2.26: The design takes advantage of constraints to make its construction simple.

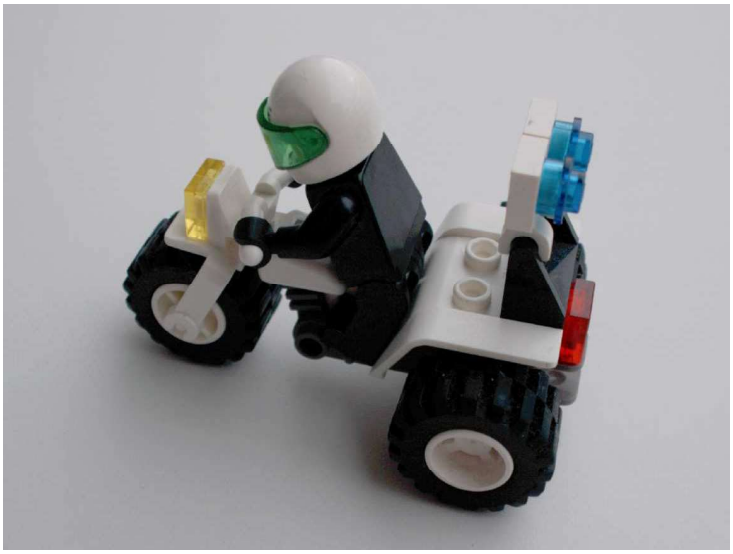

Figure 2.27: The assembled lego motorbike.

Breakout: Affordances, Mappings, and Constraints

1. I will put you into breakout sessions in your student groups.
2. For 10 minutes:
   - Take a look around your current environment.
   - Which objects have which affordances?
   - Find an object which has particularly good or particularly bad affordances, mappings, or constraints and take a photo of it.
   - Transfer the photo to your PC (or possibly the cloud) in a way such that you can share/show it in Webex with/to your group colleagues, and later potentially in the main session.

3. For 6 minutes:
   - Show/share your photo with your group colleagues in the breakout session.
   - Discuss which is the best / most interesting of the objects gathered in your group.
   - What are its affordances, mappings, or constraints?
4. I will then call everyone back to the main session, and ask some of the groups to share their results.

The Principle of Causality

Causality is the relation between two events, cause and effect, where the second occurs as a consequence of the first.

Apparent causality is when something which happens immediately after an action, *appears* to have been caused by that action. We associate the effect with the *apparent* cause.

There are two kinds of *false* causality:

- Coincidental effects lead to superstition:
  - Touch a computer terminal just before it fails, and you are apt to believe you caused the failure.
  - Start an unfamiliar application, just before the computer crashes.
- Invisible effects lead to confusion:
  - When an action has no apparent result, you may conclude it was ineffective (and repeat it).
  - For example, repeatedly clicking the "Stop" button when the system is unresponsive.

  → There is a need for feedback!

The Structure of Human Memory

Short-Term Memory (STM)

Short-term memory is the memory of the present, used as working or temporary memory:

- Information is retained in STM automatically and can be retrieved without effort.
- However, the amount of information in STM is extremely limited: 7 ± 2 items [Miller 1956]
- STM is extremely fragile – the slightest distraction and its contents are gone.

For example, STM can hold a seven digit phone number from the time you look it up until the time you use it, as long as no distractions occur.

Long Term Memory (LTM)

Long-term memory is the memory of the past:

- It takes time to put stuff into LTM and time and effort to get stuff out.
- Capacity of LTM is estimated at about 10^9 bits or around 100 million items, according to Norman [1988, page 67] referring to Landauer [1986].

Figure 2.28: The intranet server at Graz University of Technology, TUGrazOnline, provides an example of the expected date format (TTMMJJJJ) in the interface next to the input field. Users do not have to remember the required format.

Knowledge in the Head and in the World

Not all of the knowledge required for precise behaviour has to be in the head. It can be distributed:

- partly in the head
- partly in the world
- and partly in the constraints of the world.

Placing Knowledge in the World

Having knowledge in the world reduces the load on human memory:

- An example of the input format can be provided in the interface:

  Please enter the date (yyyy/mm/dd):

  See Figure 2.28 for an example.

- Previously entered values can be used as defaults, so users do not have to remember items between screens.
- It is better if the designers of an interface place knowledge in the world.
- However, sometimes, users have to place knowledge in the world themselves to fix a broken interface.

Wherever possible, also allow expert users to internalise knowledge for faster and more efficient performance (say by learning to type a date in a particular format, rather than having to use the provided calendar widget).

Superimposing Knowledge onto Control Panels

Control-room operators at nuclear power plants felt it necessary to adapt and superimpose knowledge onto their control panels in various ways [Seminara et al. 1976]:

- Using sticky labels to label controls.
- Using tape to visually group related elements.

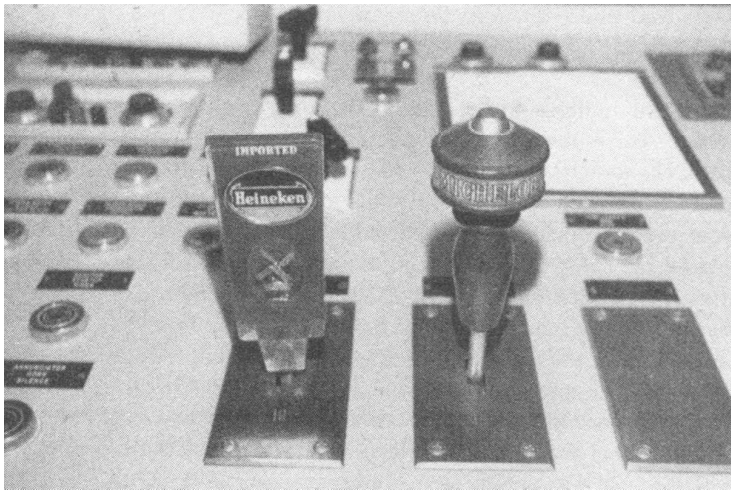

Figure 2.29: Beer tap handles mounted atop similar-looking knobs in the control room of a nuclear power plant to help operators distinguish between them. [Original photograph by Joseph Seminara [Seminara et al. 1976, page 1-22], scanned from Norman [1988, page 95] with kind permission from Don Norman.]

- Fixing beer-tap handles to similar-looking knobs, so as to better distinguish between them. See Figure 2.29.

Shape Coding for Aircraft Control Knobs

- During the first years of World War 2, there were dozens of gear-up accidents when landing B-17, B-25, and P-47 aircraft [Koonce 2002, page 95].
- Pilots frequently retracted the landing gear instead of the flaps after landing. See Figure 2.30.
- In 1943, Lt. Alphonse Chapanis was ordered to investigate and noticed that C-47 transport (DC3 Dakota) pilots suffered no such accidents [Roscoe 1997, page 3].
- In the B-17, the control knobs for flaps and landing gear were identical and located close to one another, as shown in Figures 2.31, 2.32, and 2.33.
- In the C-47, the flaps control was totally separate and was activated like a modern car handbrake.
- Chapanis realised that so-called “pilot errors” were really “designer errors” [Chapanis 1999, page 16].
- As a quick fix, a small rubber wheel was attached to the end of the landing gear control and a wedge shape to the flap control.
- The gear-up landings ceased.
- After the war, the shape-coded wheel and flap controls were standardised and are still used today [CFR 2008, pages 253–254], as shown in Figure 2.34.

To Err is Human

- People make errors routinely, you must design for error.
- Assume that any error, that can be made, will be made!

Figure 2.30: The B17 Flying Fortress. [From Emgonzalez [2005], the image was placed in the public domain by the photographer.]

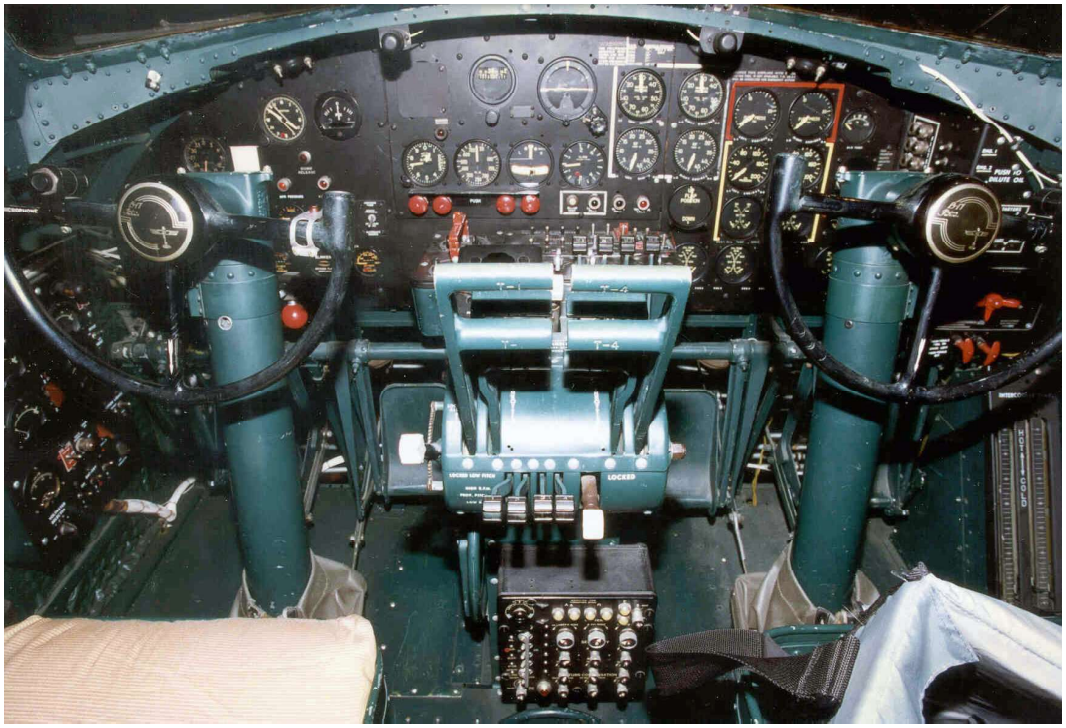

Figure 2.31: The cockpit of a B17G Flying Fortress. The landing gear and flaps control knobs are identical and are very close to one another. [From USAF [2006], image believed to be in the public domain.]

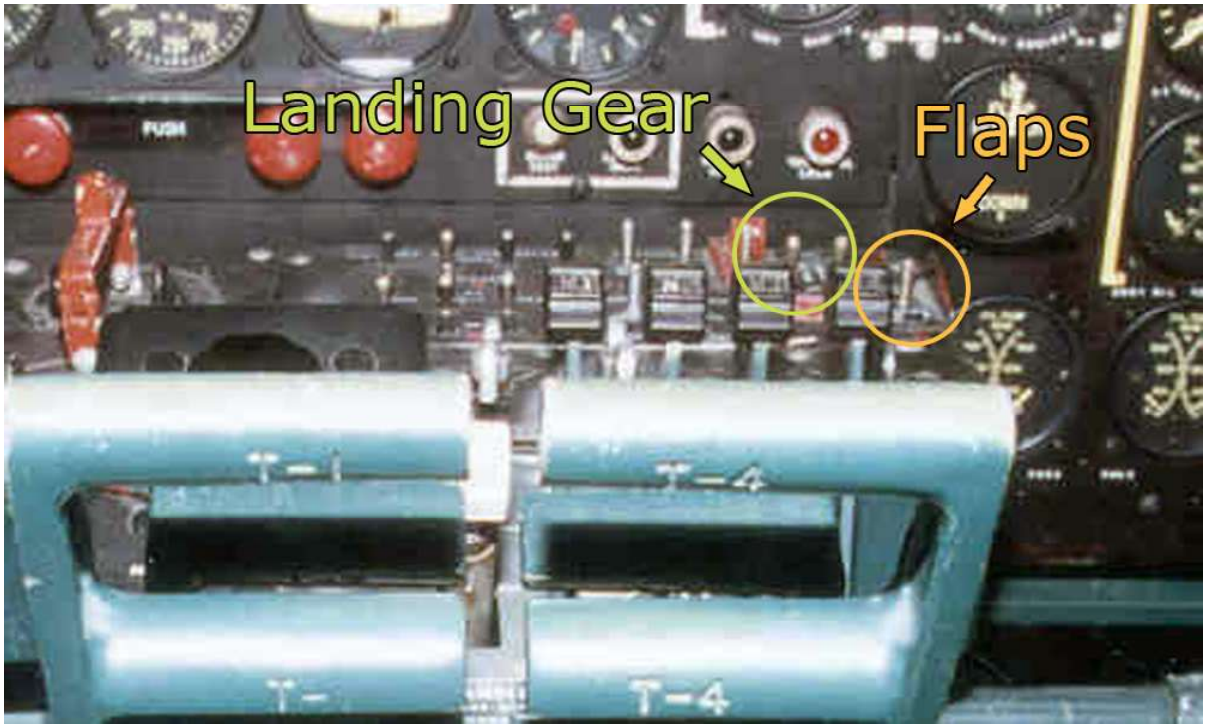

Figure 2.32: Close-up of the cockpit control knobs of a B17G Flying Fortress. The landing gear and flaps control knobs are identical and are very close to one another. [From USAF [2006], image believed to be in the public domain.]

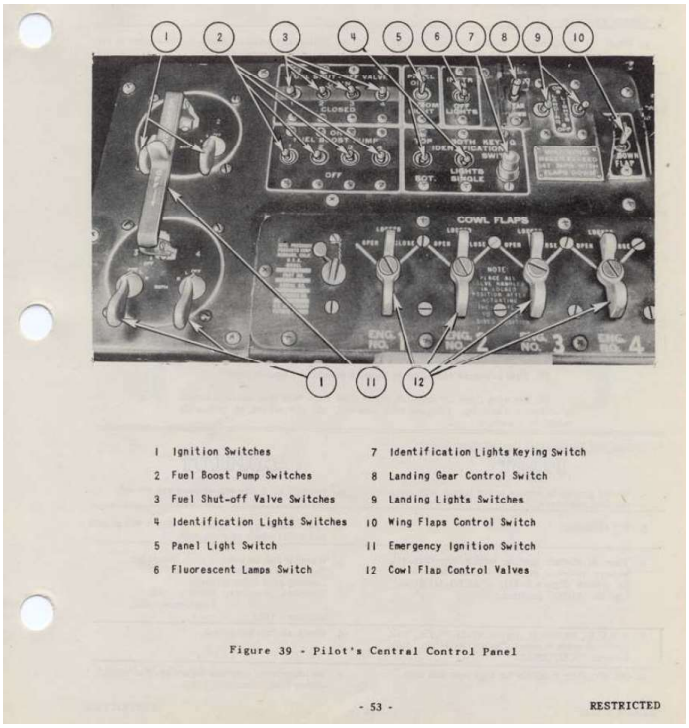

Figure 2.33: Page 53 from the B-17F Airplane Pilot's Flight Operating Instructions. Item 8 is the landing gear control switch and item 10 is the flap control. [From USAF [1942].]

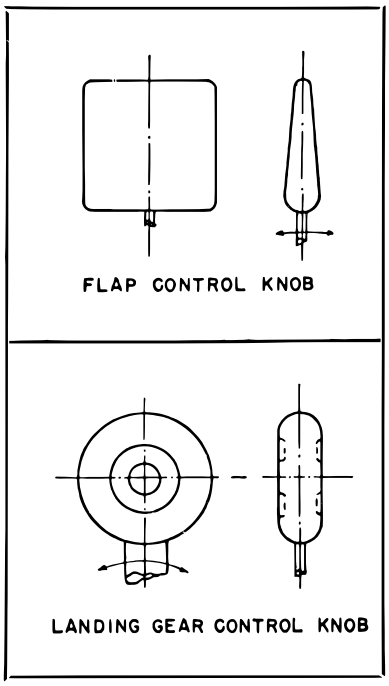

Figure 2.34: After WW2, the shape coding for landing gear and flaps control knobs was standardised. The landing gear control resembles a wheel and the flaps control resembles a flap. [From CFR [2008, page 254].]

- You can never anticipate all the ways which users will (attempt to) use your interface.
  [People sometimes use(d) the mouse is many unexpected ways. . . [Mantei 1990].]
- Design explorable systems, where operations are easy to reverse.

Categories of Error

Two fundamental categories of error:

- *Slips* result from automatic behaviour, when subconscious actions toward a correct goal go wrong.
- *Mistakes* result from conscious deliberations, which formed an inappropriate goal.

Conceptual Models

A *conceptual model* is a mental model of how something works, which is formed inside a person's head.

A user's conceptual model is built up and influenced by numerous factors, including:

- familiarity with similar devices (transfer of previous experience)
- affordances
- mapping
- constraints
- causality

Figure 2.35: The fridge freezer.

- instructions
- interacting with the device.

Conceptual models may be wrong, particularly if the above factors are misleading.

A Conceptual Model of a Fridge Freezer

A fridge-freezer with two compartments: the fridge for fresh food at the bottom and the freezer for frozen goods at the top, as shown in Figure 2.35:

- The two control dials (Figure 2.36) suggest a particular conceptual model (Figure 2.37) for operating the fridge freezer.
- Unfortunately, the apparent conceptual model does not match the way the fridge freezer actually works (Figure 2.38).

Adapted from [Norman 1988], pages 17–18.

Projecting a Correct Conceptual Model

- Designers have their own conceptual model of a system, the *design model*.
- The *system image* is the actual implementation or embodiment of the design (including documentation, instructions, and labels).
- The *user's model* is built through interaction with the system.

The designer expects the user's model to be the same as the design model, however all communication takes place through the system image.

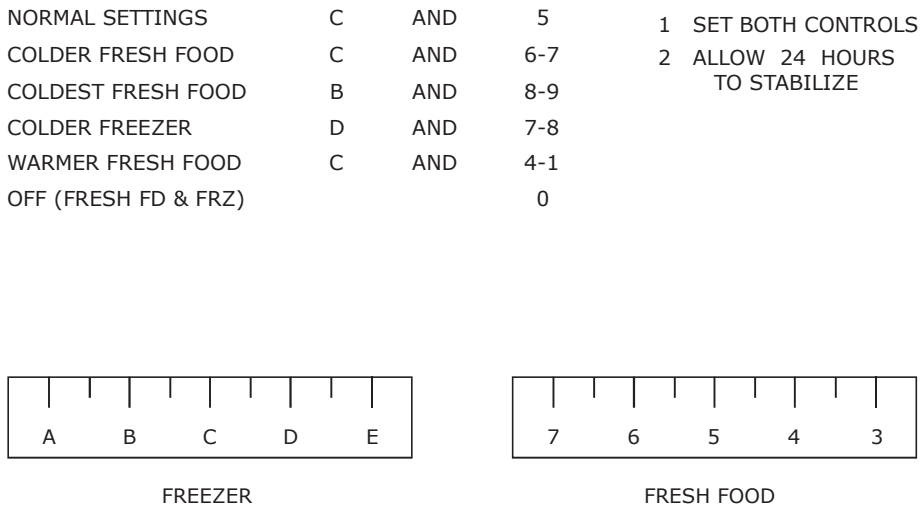

Figure 2.36: The fridge freezer controls and instructions.

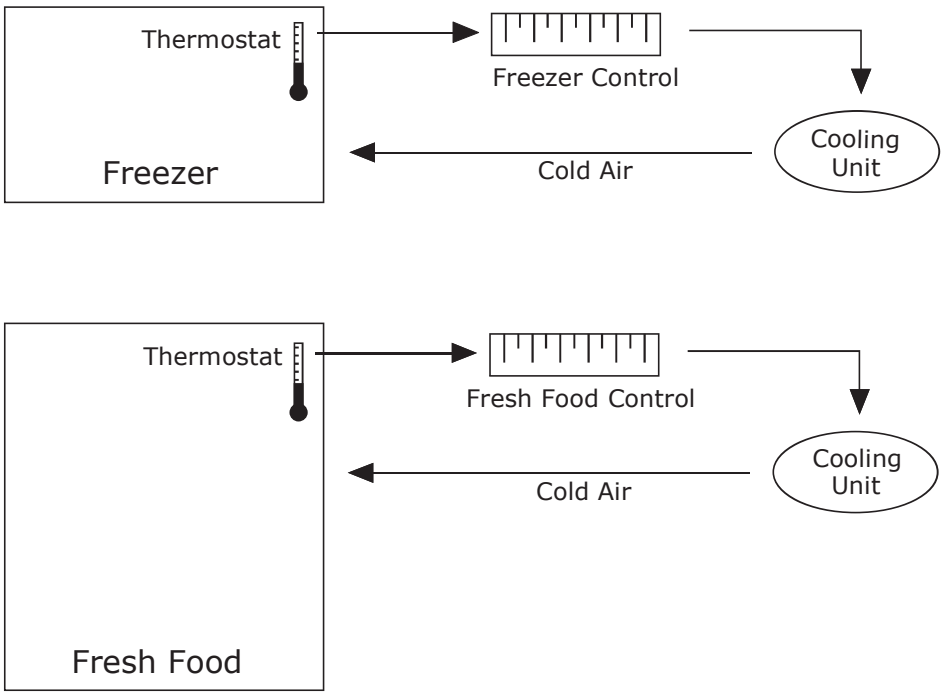

Figure 2.37: The apparent conceptual model for the fridge freezer, gleaned from the controls and instructions, is that each control is responsible for the temperature of the corresponding compartment.

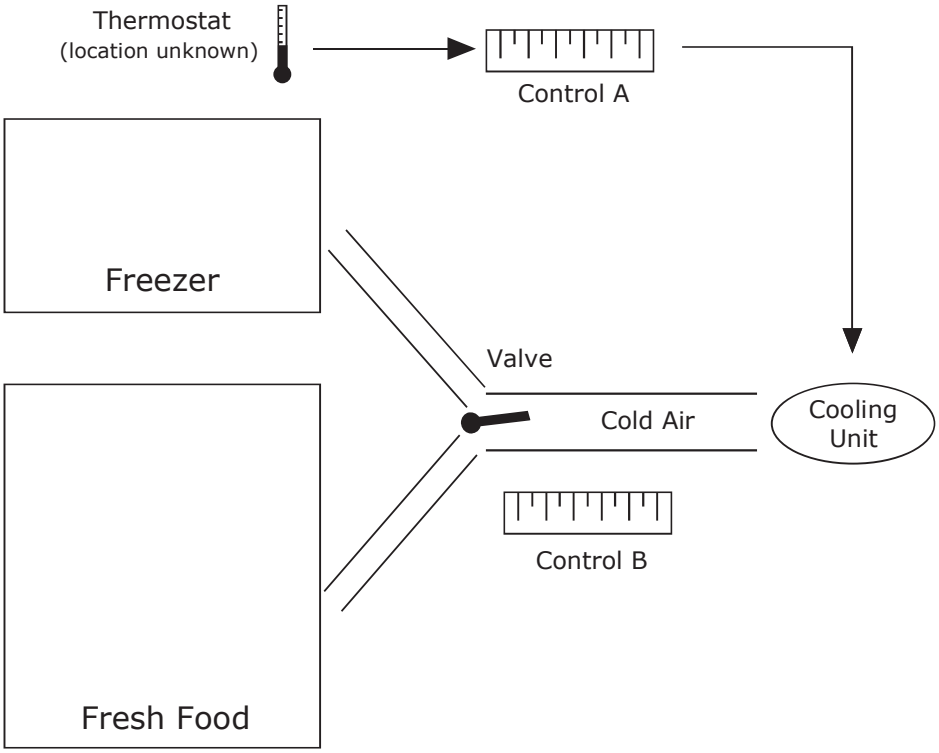

Figure 2.38: The actual conceptual model for the fridge freezer. In fact, there is only one thermostat and only one cooling unit. One control adjusts the thermostat setting, the other controls the relative proportion of cold air!

→ The system image should make the design model clear and consistent.

A Pair of Scissors Projects a Good Conceptual Model

- *Affordances*: holes for putting fingers in.
- *Constraints*: small hole for thumb, big hole for several fingers.
- *Mapping*: between holes and fingers suggested and constrained by appearance.
- *Conceptual Model*: operating parts are visible and their implications are clear.

A Digital Watch Projects No Visible Conceptual Model

- *Affordances*: four buttons to push – but what do they do?
- *Mapping*: no clear relationship between buttons and possible actions.
- *Transfer of Prior Knowledge*: little similarity to analog watches.
- *Conceptual Model*: must be learnt from instructions.

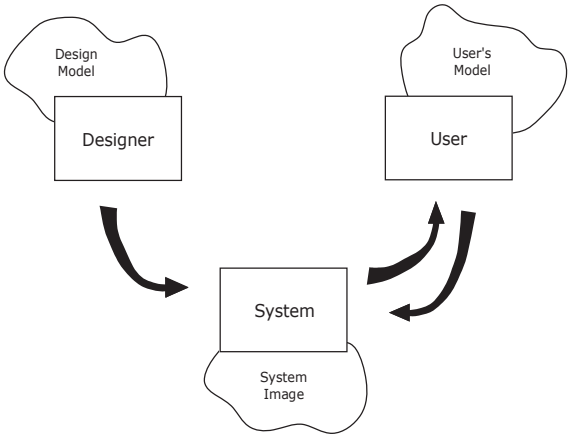

Figure 2.39: Projecting a correct conceptual model. Designers should take care to project an accurate conceptual model through the system image.

Figure 2.40: Scissors project a good conceptual model.

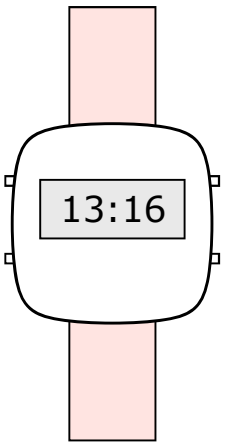

Figure 2.41: A digital watch provides no obvious conceptual model.

2.3 The Psychopathology of Computers

Usability "war stories" concerning computers . . .

The PC Cup Holder

A supposedly true story from a Novell NetWire SysOp:

Caller:	*"Hello, is this Tech Support?"*
Tech Rep:	"Yes, it is. How may I help you?"
Caller:	*"The cup holder on my PC is broken and I am within my warranty period. How do I go about getting that fixed?"*
Tech Rep:	"I'm sorry, but did you say a cup holder?"
Caller:	*"Yes, it's attached to the front of my computer."*
Tech Rep:	"Please excuse me if I seem a bit stumped, it's because I am. Did you receive this as part of a promotional, at a trade show? How did you get this cup holder? Does it have any trademark on it?"
Caller:	*"It came with my computer, I don't know anything about a promotional. It just has '4X' on it."*

At this point the Tech Rep had to mute the caller, because he couldn't stand it. The caller had been using the load drawer of the CD-ROM drive as a cup holder, and snapped it off the drive.

This story was found at Greenberg 1997 and is attributed there to George Wagner `g.wagner@sylvania.sev.org`.

Dangerous Command Names

A widely used text editor (ed) used the character '.' to select the current line of text, and ',' to select the entire document for an operation.

- These two keys are adjacent on the keyboard → highly likely they will sometimes be mistaken.
- Intending to change one line

  "A heavy poll is expected . . . "

  to

  "A heavy turnout is expected . . . "

  can easily change 'poll' to 'turnout' throughout the entire document.
- Such a case was reported in the British press: all the election documents of a candidate named Pollack were printed with the name Turnoutack.
- A "computer failure" was blamed.

This story is taken from [Newman and Lamming 1995], pages 8–9.

Beware Unix Commands

- Intend to type: `rm *~` to remove Emacs backup files.
- Actually type: `rm * ~` which removes everything!
- And there is no undo . . .

The Terminal is Dead

Reported in the *Human Factors Society Bulletin*, 1981:

- The manager of a system installation for police departments reported that one day he received the call "your terminal is dead. Come and get it."
- He suggested that the repair service should be contacted, but the caller insisted.
- The terminal had two bullet holes in it.
- Apparently, an officer got a "Do not understand" message on the screen once too often.

Phobos 1 Never Made it to Mars

From *Science* magazine, 1989, and reported by Norman in *CACM*, Jan. 1990 [Norman 1990]:

> *"not long after the launch, a ground controller omitted a single letter in a series of digital commands sent to the spacecraft. And by malignant bad luck, that omission caused the code to be mistranslated in such a way as to trigger the test sequence"*

- The test sequence, stored in ROM, was intended to be used only when checking the spacecraft on the ground.
- Phobos 1 went into a tumble from which it never recovered.
- The controller was moved to other duties.

Iran Air 655

Reported in [L. Lee 1992]:

- In 1988, the USS *Vincennes* shot down an Iran Air A-300 Airbus with 290 people aboard.
- The Aegis weapons system aboard the *Vincennes* had sophisticated software for identifying and tracking potential targets.
- However, the large-screen display did not show altitude information – altitude had to be read from separate consoles.
- The Airbus which had levelled off at 12 500 feet, was taken to be an F-14 fighter descending from 9 000 feet.
- Ironically, an escort ship with older equipment was able to read the plane's altitude quite correctly, but could not intervene in time.

Lessons

- Most failures of human-machine systems are due to poor designs which do not take account of peoples' capabilities and fallibilities.
- These are often labelled as "computer failure" or "human error" rather than design failure.

Figure 2.42: Internet Explorer 4.0 cache settings panel.

2.4 Interface Hall of Shame

Examples of interface design mistakes.

- Many are taken from the Interface Hall of Shame, which used to be available at `http://www.iarchitect.com/shame.htm` but went offline in 2002.
- A partial mirror is available at the Internet Archive: `https://web.archive.org/web/20021105045514/http://www.iarchitect.com/shame.htm`
- Thanks to Brian Hayes from Isys Information Architects Inc. for permission to use them here.

Smallest Setting is 1%

- The Internet Explorer 4.0 cache size can only be set in increments of 1% of the size of the hard disk, as shown in Figure 2.42.
- To quote from user Ross Cormier:

> *"The smallest setting is 1%. I have a 4 Gig drive, and don't need 40 MB of cache thank you."*

Horizontal Scrolling

- Humans can scan written material faster from top to bottom rather than left to right.
- Vertically scrolling lists support single-item scrolling.
- The Internet Explorer 4.0 certificate authority selection panel uses horizontal scrolling, as shown in Figure 2.43.

Figure 2.43: Internet Explorer 4.0 certificate authority selection panel.

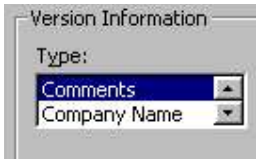

Figure 2.44: A two-item list box in Visual Basic 5.0.

Two Item List Box

- Visual Basic 5.0 uses a two (!) item list box.
- A drop down list or radio buttons would be much better.

Two Thousand Item List Box

- Do not put hundreds or thousands of items into a list box, either (see Figure 2.45).
- The following message, posted in a Visual Basic programmers forum on 11th December 1996, is typical:

> *"I want to fill a list box with 2000 items ... This takes incredibly long ... over 20 minutes. Any ideas?"*

Multi-Row Property Sheets

- Single-row property sheets (tab controls) are among the best user interface elements ever devised.

Figure 2.45: A two thousand item list box. Putting too many items into a list box is bad.

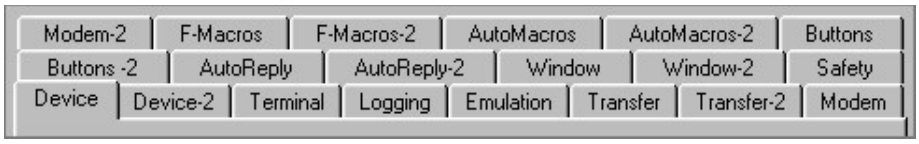

Figure 2.46: Zoc uses multi-row tab controls.

- Multi-row tab controls are perhaps one of the worst interface elements ever!
- Clicking one of the tabs other than from the bottom row, causes a major reorganisation of the complete set of tabs.

Figure 2.46 shows an example from Zoc, a communications program.

Stupid Error Messages

- Roy Child writes: *"I came across this message when trying to delete files from a nearly-full hard drive in Windows 95."*

Avoid Breaking a Metaphor

- Originally introduced in the Xerox Star, the trashcan icon was later used on the Apple Mac in combination with drag-and-drop to provide a very intuitive way for users to delete files and folders.
- Unfortunately, the Mac designers then extended the trashcan metaphor to include the completely counterintuitive function of ejecting diskettes.
- To eject a diskette, the user had to drag the diskette icon and drop it into the trash! See Figure 2.48.
- Later versions of the Mac keyboard have a dedicated eject button. See Figure 2.49.
- The interface was finally fixed in Mac OS X. When the user drags a diskette icon, the trash icon morphs into an eject icon. See Figure 2.50.

Figure 2.47: Deleting files from an almost full hard disk in Windows 95. OK, now I know what to do!

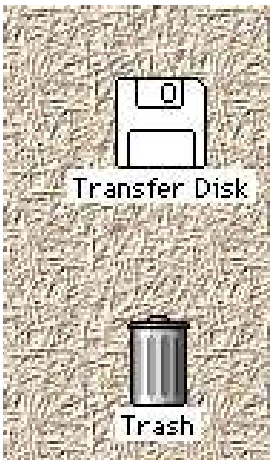

Figure 2.48: Ejecting a diskette on the Mac by throwing it into the trash unfortunately breaks the trash can metaphor.

Figure 2.49: Later versions of the Mac keyboard have a dedicated eject button.

Figure 2.50: Mac OS X retains the trash can metaphor, but when the user drags a diskette icon, the trash can morphs into an eject icon. [Thanks to Tanja Kolrus for the screen shots.]

2.5 User-Centered Design

Science Finds, Industry Applies, Man Conforms.	[Motto of 1933 Chicago World's Fair]
People Propose, Science Studies, Technology Conforms.	[Don Norman's person-centered motto for 21st century]

System-Centered Design

- What can be built easily on this platform?
- What can I create from the tools available?
- What do I as a developer find interesting to work on?
- What do I as a developer think users need?

User-Centered Design

User-Centered Design = Human-Centered Design.

The design is based upon a user's:

- abilities and needs
- context
- work
- tasks

Video: Simplicity Sells

- David Pogue; *Simplicity Sells*; TED 2006 talk, 21-minute video [Pogue 2006, 04:00-12:26]. [Video: `https://youtu.be/NEjZt0y6OOw?t=04m00s`]