

Design Psychology

Understanding the mind of the user rather than trying to change it to fit ours...

People open these incorrectly! ...or do they?



<https://medium.muz.li/a-design-lesson-from-a-sugar-stick-9ef86f756412>

Award-Winning Light Switch???



Cool or Crazy?



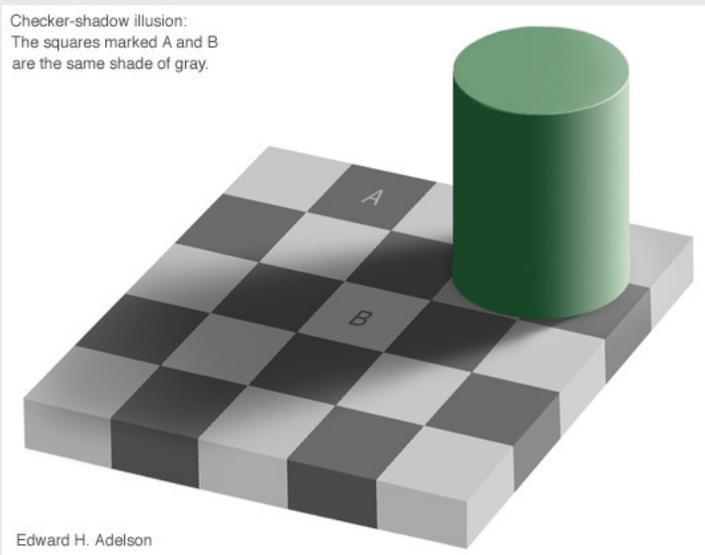
The Psychology of Everyday Things

Don Norman - POET

There are several basic cognitive principles to be aware of while designing interfaces:

- **Affordances (Visibility helps this)**
- **Constraints**
- **Mappings**
- **Causality (providing quick Feedback helps this)**
- **Transfer effects**
- **Consistency / Cultural standards**
- **Mental Models / Conceptual Models**
- **Comfort (allowing for Undo helps this)**

Understand How the Brain Works (I)



Go ahead – print it out – cut out the “B” box and move it over the “A” box!

<http://persci.mit.edu/gallery/checkershadow>

Understand How the Brain Works (II)

post hoc ergo propter hoc

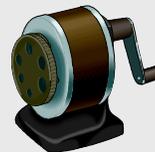
after this therefore because of this

Logical Fallacy known as “Coincidental Correlation”

Making things work: Visual Structure (I)

Visual Affordances

- the perceived and actual fundamental properties of the object that determine how it could possibly be used
- appearance indicates how the object should be used
 - chair for sitting
 - table for placing things on
 - knobs for turning
 - slots for inserting things into
 - buttons for pushing
 - computers for ???



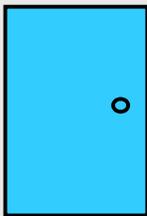
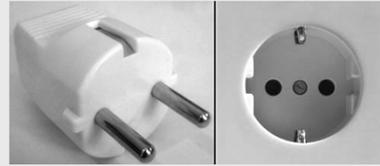
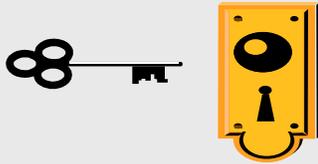
- complex things may need explaining, but simple things should not
 - when simple things need pictures, labels, instructions, then design has failed

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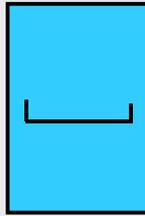
Making things work: Visual Structure (II)

Visible Constraints: limitations of the actions possible, perceived from object's appearance

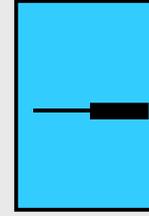
- provides people with a range of usage possibilities



Push or pull?



Which side?



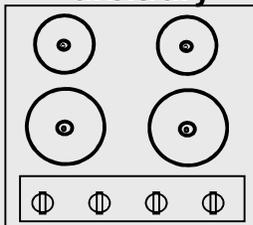
Can only push, side to push clearly visible

Making things work: Visual Structure (III)

Mappings: the set of possible relations between objects

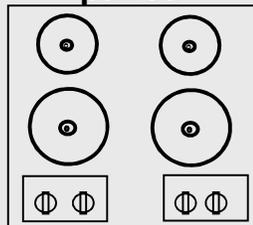
- the natural relationship between two things
 - eg control-display compatibility
 - visible mapping and mimic diagrams: stove and controls
 - cause and effect: steering wheel-turn right, car turns right

arbitrary



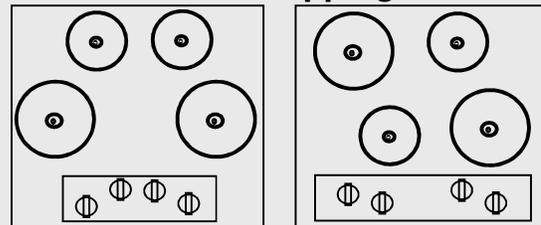
24 possibilities,
requires visible
labels or memory

paired



2 possibilities per
side so 4 total
possibilities

full mapping



Visual Structure: Real World Example

Do these seem to have a very nice mapping?
Why did I not like the design of this stove top?



HINT: It was an electric stove.

Making things work: Understandable action (I)

Causality

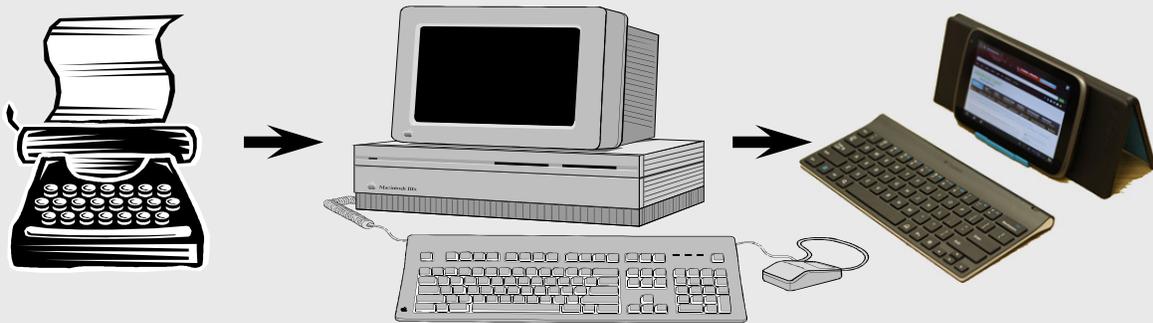
- the thing that happens right after an action is assumed by people to be caused by that action
- interpretation of “feedback”
- false causality
 - incorrect effect
 - starting up an unfamiliar application just as computer crashes
 - causes “superstitious” behaviors
 - invisible effect
 - command with no apparent result often re-entered repeatedly
 - e.g., mouse click to raise menu on unresponsive system

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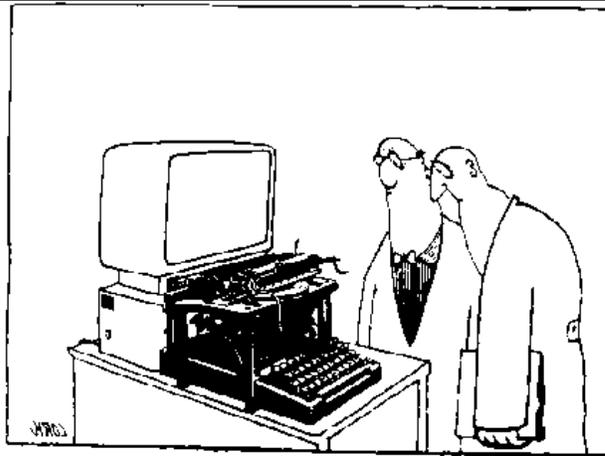
Making things work: Understandable action (II)

Transfer effects

- people transfer their learning/expectations of similar objects
- to the current objects
 - positive transfer: previous learning's also apply to new situation
 - negative transfer: previous learning's conflict with the new situation



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Cultural Standards (I)

Populations learn idioms that work in a certain way

- red means danger
- green means safe

But idioms vary in different cultures!

- Light switches

America: down is off **BUT** Britain: down is on

- Faucets

America: anti-clockwise on **BUT** Britain: anti-clockwise off

Cultural Standards (II)

Ignoring standards or ‘standards’ that change?

- home handyman: light switches installed upside down
- calculators vs. phone number pads: which should computer keypads follow?

Difficulty of changing standards even if desired?

- Qwerty keyboard: designed to prevent jamming of keyboard?
- Dvorak keyboard ('30s): provably faster to use but not as fast as some think...

Cultural Standards (III)

Because a trashcan in Thailand may look like this:



might a Thai user be confused by the “trash can” in some operating systems?



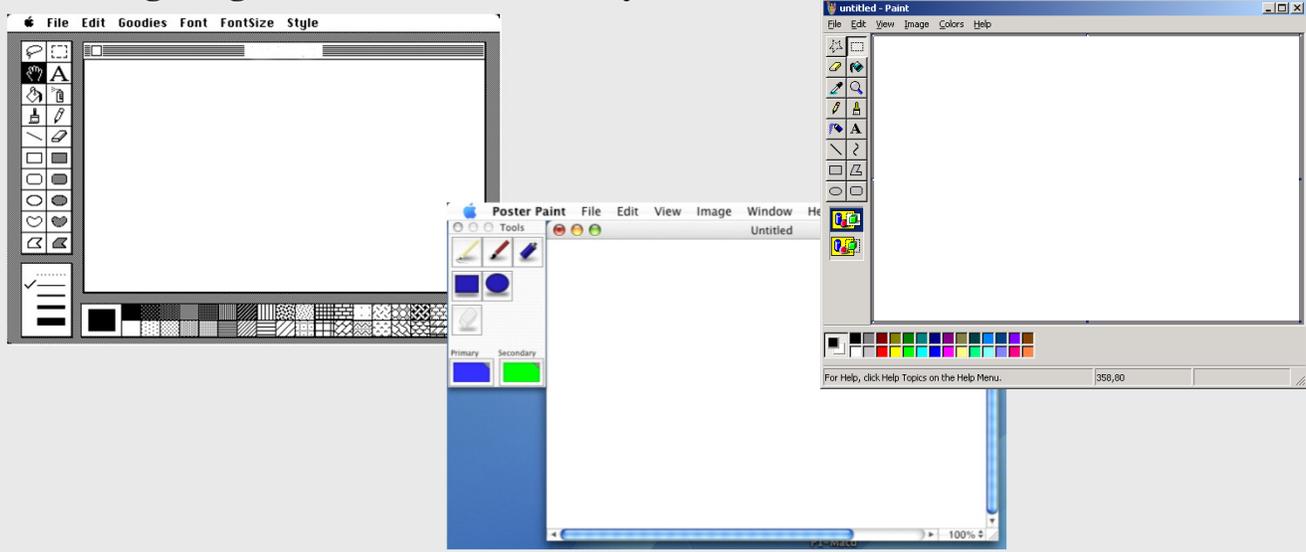
Years ago, Sun found their email icon problematic for some American urban dwellers who were unfamiliar with rural mail boxes.



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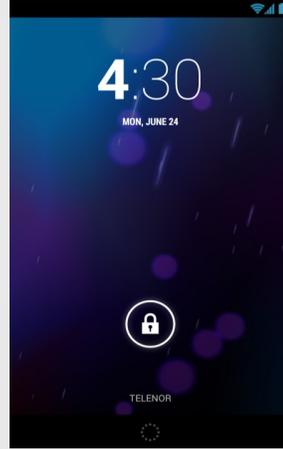
Cultural Standards (IV)

A Mac user might find a Windows system only somewhat familiar. A pre-OS X Mac user might find an OS X Mac system only somewhat familiar. Similar things might work in different ways...



Cultural Standards (V)

Pocket watches, to wrist watches, back to pocket watches, back to wrist watches?



Conceptual model

People have “mental models” of how things work with conceptual models built from:

- affordances
- causality
- constraints
- mapping
- positive transfer
- population stereotypes/cultural standards
- instructions
- interactions
- familiarity with similar devices (positive transfer)

Models may be wrong, particularly if these attributes are misleading...

Good models allow people to mentally simulate operation of device...

[From The Design of Everyday Things](#)

What are your initial impressions of these items?



[Comfort / Learning the Technology](#)

People can still be intimidated by technology (or by certain technologies). Users are often afraid of breaking the system or losing data (and are sometimes quite justified in this fear).

Given these two issues, how do people learn the technology?

Examples:

- Support rapid, incremental, reversible actions
- Don't use dialogs to report normalcy
- If it's worth asking the user, it's worth the program remembering

Can be implemented using “Direct Manipulation” or at least provide an “Undo” option that really undoes things.

This can encourage experimentation and increase comfort...

Example of Good: Scissors

affordances:

holes for something to be inserted

constraints:

big hole for several fingers, small hole for thumb

mapping:

between holes and fingers suggested and constrained by appearance

positive transfer and cultural idioms

learnt when young
constant mechanism

conceptual model:

implications clear of how the operating parts work



Example of Bad: Some digital watches

affordances:

four push buttons to push, but not clear what they will do
can add text as a “crutch” but can still be non-obvious

constraints and mapping being unknown:

no visible relation between button positions, actions, and end result

transfer of training:

little relation to analog watches when these were introduced to “on-board”

cultural idiom effects?

age range might define “cultural sub-group” rather than geography for watches...

conceptual model:

must be taught/learned



Will the current wave of “smart watches” make this better or worse?

Real or Fake? iPhone adapter for SLR lenses



Two guidelines for design

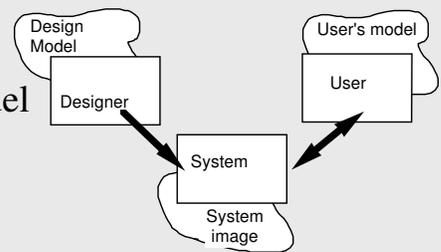
1. Provide a good conceptual model

allows user to predict the effects of our actions

potential problem:

- designer's conceptual model communicated to user through system image: appearance, written instructions, system behavior through interaction, transfer, idioms and stereotypes

- if system image does not make model clear and consistent, user will develop wrong conceptual model



Two guidelines for design (continued)

2. Make things visible

Relations between user's intentions, required actions, and results are

- sensible
- non arbitrary
- meaningful

Use visible affordances, mappings, and constraints.

Use visible cultural idioms when appropriate/available.

These remind a person of what can be done and how to do it...

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For whom do you design?



The person of medium height is able to see the mirror.

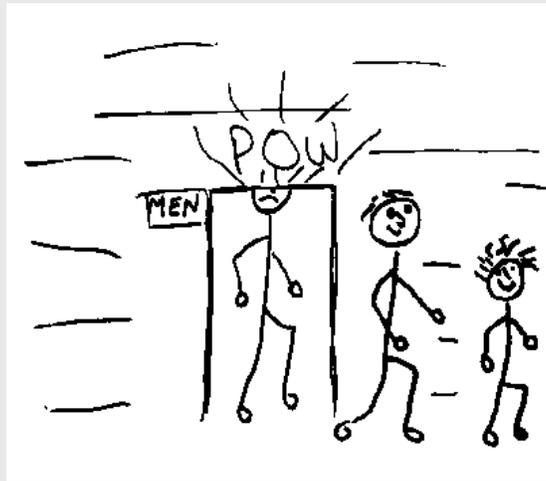
The taller person must slouch.

The shorter person is out of luck.

WHAT WOULD YOU DO????

Evan Golub / Ben Bederson / Saul Greenberg

For whom do you design?



The person of medium height is easily able to walk through.
The taller person better slouch.
The shorter person is easily able to walk through.

WHAT WOULD YOU DO????

Evan Golub / Ben Bederson / Saul Greenberg

For whom do you design?

People are different – give options to customize if possible. It is rarely possible to accommodate all people perfectly...

Design is often a compromise (8' ceiling but Sultan Kösen is 8' 3")

Rule of thumb?

Design should cater for at least 95% of audience, realizing that this means 5% of population may be (seriously!) compromised.

– Designing *specifically* for the average is generally a mistake (miss 50%?)

Examples:

Cars and human height: headroom, seat size, safety

Computers and visibility:

– font size, line thickness, color choice for color blind people?

Why design is hard (I)

Over the last century the number of things to control on a single device has increased dramatically

- car “radio” could have AM, FM, pre-sets, station selection, CD, MP3 player, Bluetooth, balance, fader, bass, treble, fast forward and reverse, etc. all while potentially driving at night or being a part of the same control panel as AC/fuel efficiency...

Displays are increasingly artificial

- various lights on a car dashboard to indicate problems don’t look like the thing they represent and/or are very vague

Why design is hard (II)

Feedback is more complex, subtle, and less natural

- is your alarm on and set correctly?
- a button has a “feel” when you use it, what about a touchscreen?

Errors can lead to serious injury and/or be very costly

- airplane crashes, car crashes, losing days of work...

not a new thing, eg: <http://hcil.cs.umd.edu/trs/2004-12/2004-12.pdf>

Why design is hard (III)

Marketplace pressures

Adding software-based functionality (complexity) seen as easy and cheap (think computers, smartphones, cameras, tablets, etc.) but adding physical controls/feedback as costly.

- physical buttons, LEDs, display resolution
- menus, descriptions, feedback consume screen real estate

Design often requires several iterations before success

- hardware products might be pulled (or just quietly put out to pasture) if not immediately successful, especially if redesign would need physical changes

Why design is hard (IV)

Consumer Tastes

People often consider cost and/or appearance and/or feature list over human factors design.

- user demands and expectations keep changing too

Design is an art - usability testing does not replace design!

What might “joy-centered” computing entail?

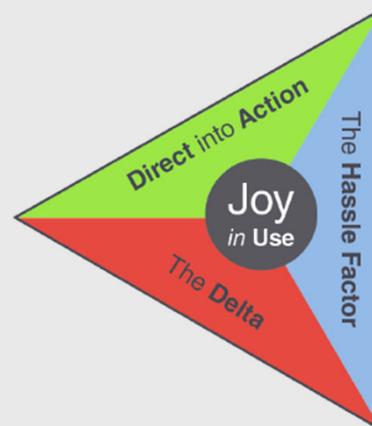
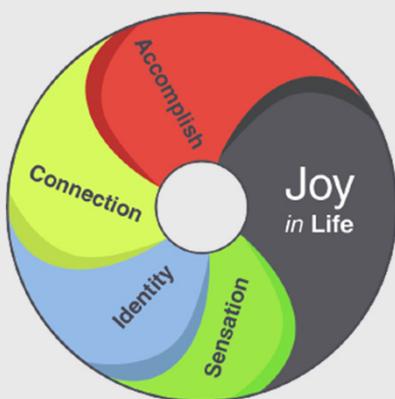
Things like the smartphone and social networking sites aren’t “joy in a vacuum” but perhaps rather allow people to accomplish things that can bring some sense of satisfaction to their life.

Fewer clicks might not instantly lead to joy, but what if we find joyful things have a common property of requiring fewer clicks?

The real challenge might be making it so that doing the things we need to do is a more joyful experience, or at least a more joyful experience than our current one (even if there is not explicit joy, is the thought of going back to the old way repulsive?).

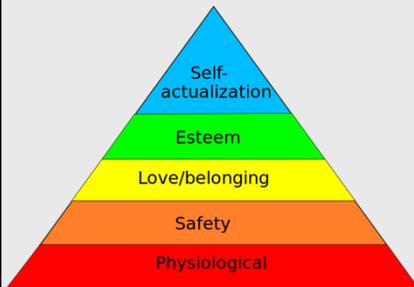
“The Cool Project”

User-centered project that looked to learn what users thought made products “cool” to use (that then turned into a business service it seems).

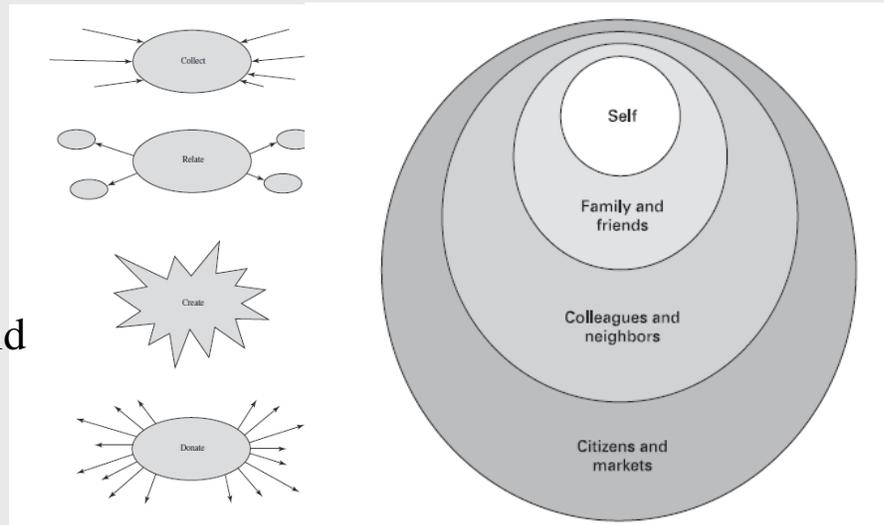


<http://www.incontextdesign.com/chi-2011-the-design-of-cool/>

Needs, Activities, and Relationships



Maslow's Needs Pyramid



Shneiderman's Stages of Human Activities and Circles of Relationships

What you now know about...

There are several basic cognitive principles to be aware of while designing interfaces:

- **Affordances**
- **Constraints**
- **Mappings**
- **Causality**
- **Transfer effects**
- **Consistency / Cultural standards**
- **Mental Models / Conceptual Models**
- **Comfort**

Designing for user happiness can be a subtle and interesting challenge...

Readings...

Technology Affordances by Gaver (Required on ELMS)

Chapter 5 of “Leonardo’s Laptop” and the article “What Makes Things Cool?” (Optional on ELMS)