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)

Checker-shadow illusion:
The squares marked A and B
are the same shade of gray.
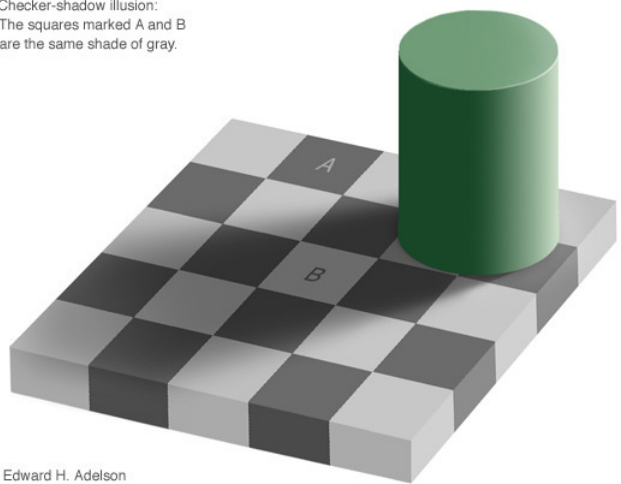
Edward H. Adelson

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

http://web.mit.edu/persci/people/adelson/checkershadow_illusion.html

## 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 possible 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
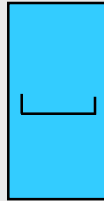 - when simple things need pictures, labels, instructions, then design has failed

Evan Golub / Ben Bederson / Saul Greenberg
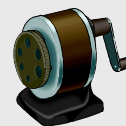
Making things work: Visual Structure (II)

Visible Constraints
- limitations of the actions possible, perceived from object's appearance
- provides people with a range of usage possibilities
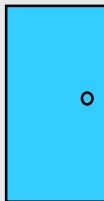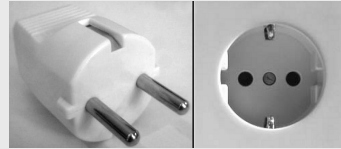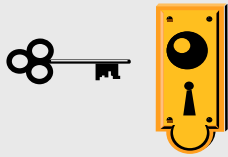
**Push or pull?**   **Which side?**   **Can only push, side to push clearly visible**

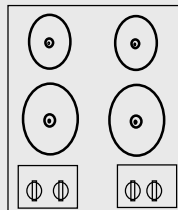## Making things work: Visual Structure (III)

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
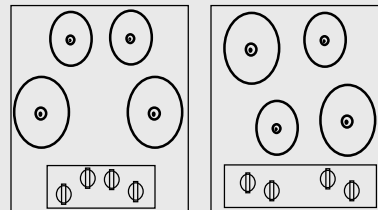
arbitrary   **paired**   **full mapping**
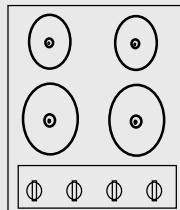
24 possibilities, requires:
 -visible labels
 -memory

2 possibilities per side so 4 total possibilities

Evan Golub / Ben Bederson / Saul Greenberg

**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.

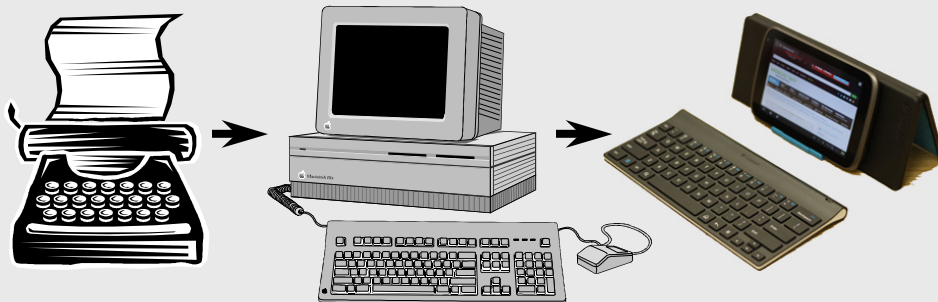## Making things work: Understandable action (I)

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

Evan Golub / Ben Bederson / Saul Greenberg

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

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

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…
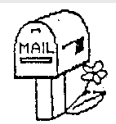

Cultural Standards (II)

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.

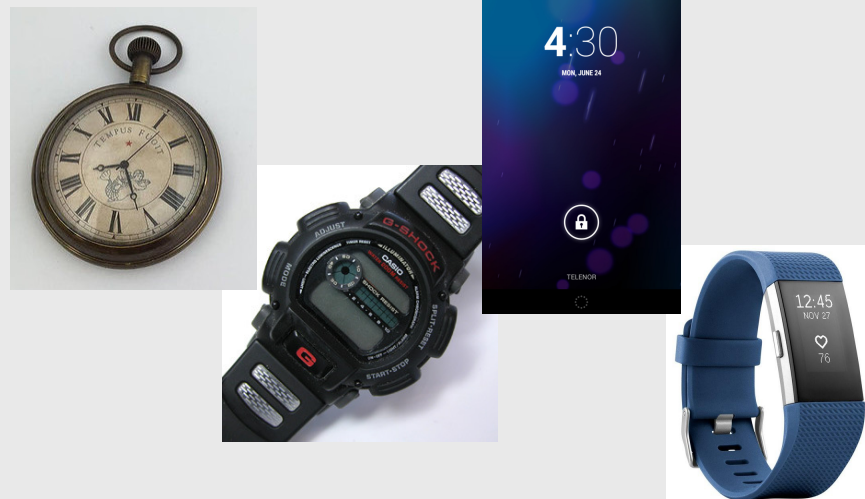Evan Golub / Ben Bederson / Saul Greenberg

Cultural Standards (III)

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…
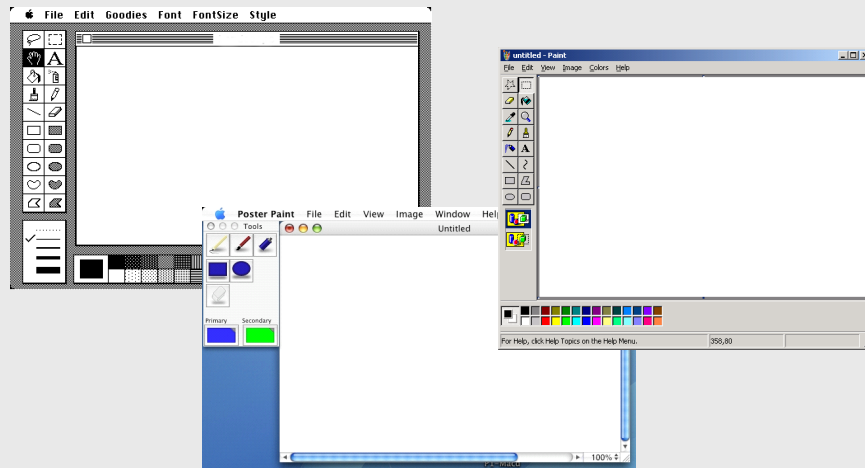
Cultural Standards (VI)

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

Conceptual model

People have "mental models" of how things work

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 above attributes are misleading

models allows people to mentally simulate operation of device

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

transfer of training
> little relation to analog watches

cultural idiom effects?
> age range might define "cultural sub-group" rather than geography for watches…

conceptual model:
> must be taught

Will the current wave of "smart watches" that seems to be coming 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

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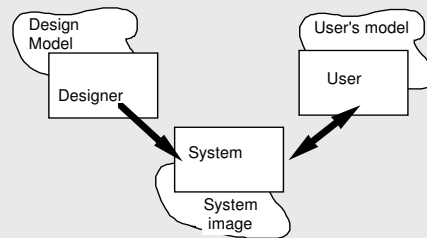
Two guidelines for design (continued)

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.

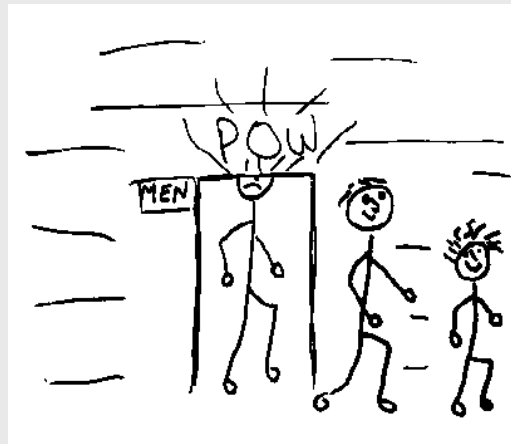These remind a person of what can be done and how to do it…

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????

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????

For whom do you design?

People are different – give options to customize if possible.

It is rarely possible to accommodate all people perfectly…
Design often a compromise
– Maybe your ceiling height is 8' but the tallest human is 8' 11"!

Rule of thumb:
Design should cater for at least 95% of audience (ie for 5th or 95th percentile)
– but means 5% of population may be (seriously!) compromised
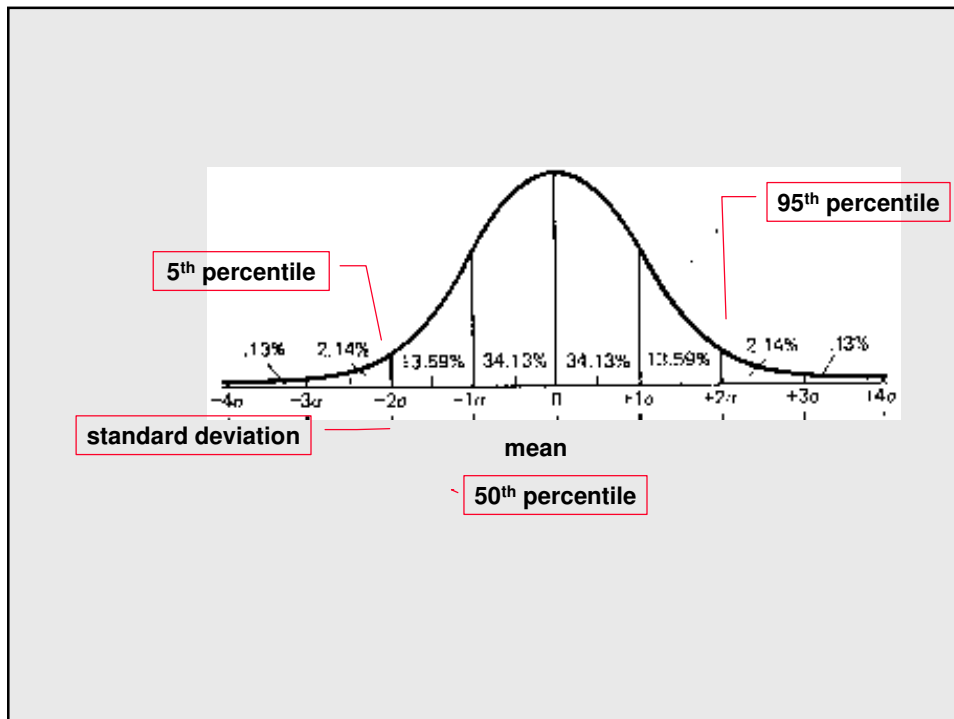Designing *specifically* for the average is generally a mistake
– may exclude half the audience

Examples:
Cars and human height: headroom, seat size, safety
Computers and visibility:
– font size, line thickness, color 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, 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

Feedback is more complex, subtle, and less natural
– is your alarm on and set correctly?

Errors increasing serious and/or costly
–airplane crashes, car crashes, losing days of work...
eg: http://hcil.cs.umd.edu/trs/2004-12/2004-12.pdf

Why design is hard (II)

Marketplace pressures

Adding functionality (complexity) now seen as easy and cheap
– computers, cell phones, cameras, tablets, etc.

Samsung's MM-A800

Adding physical controls/feedback expensive
– physical buttons, LEDs, display resolution
– menus, descriptions, feedback consume screen real estate

Design often requires several iterations before success
– product might be pulled if not immediately successful (see HP)

People often consider cost and/or appearance and/or feature list over human factors design.
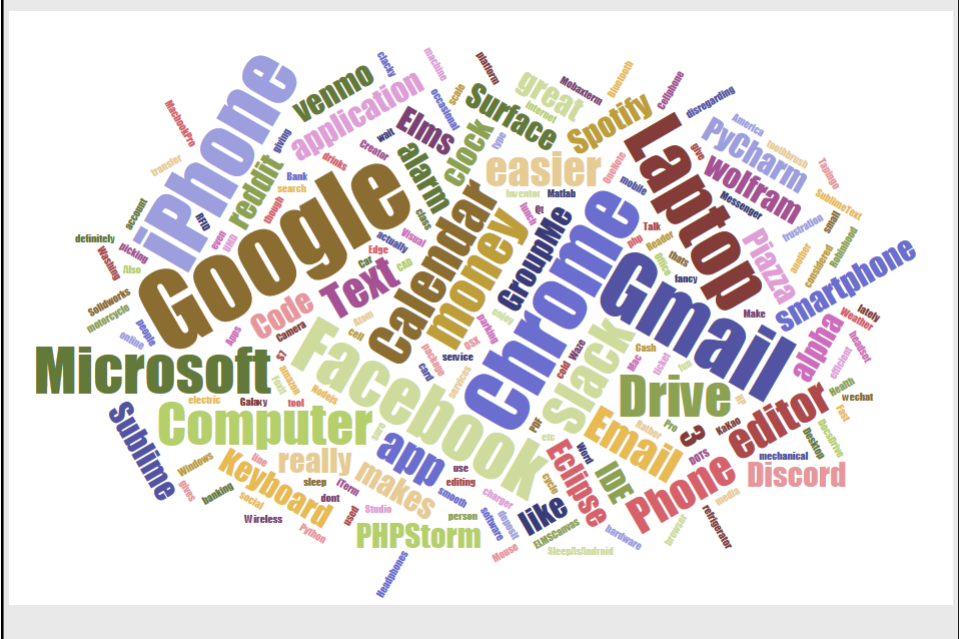– user demands and expectations keep changing too

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

No "productive" purpose, but "makes your day better"...
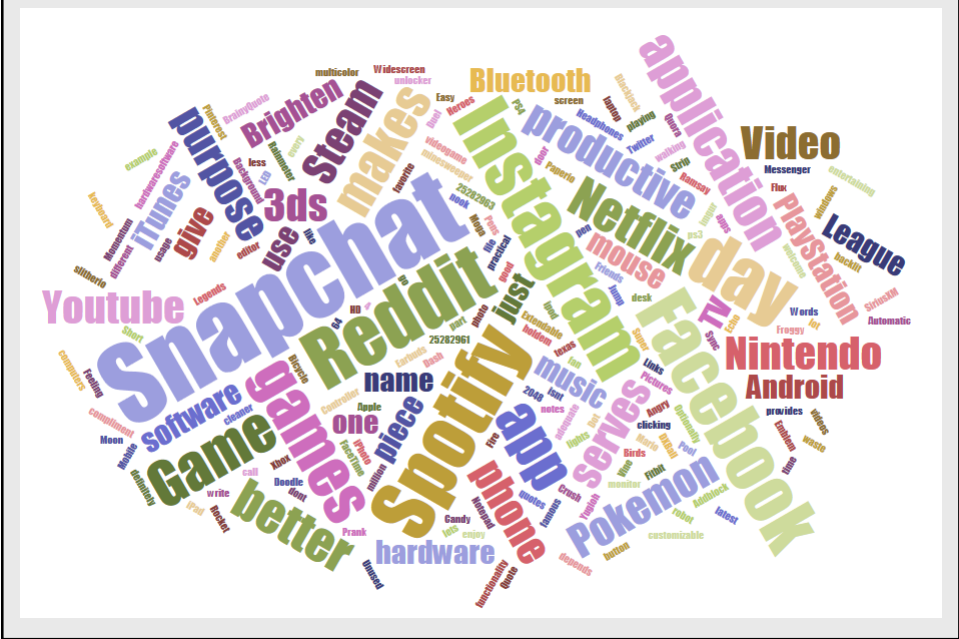
Something you need to use, and that you enjoy using...

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).
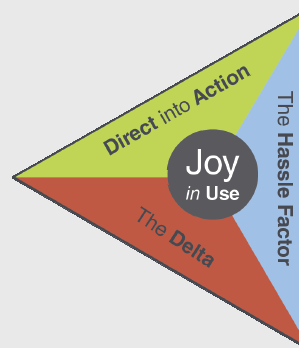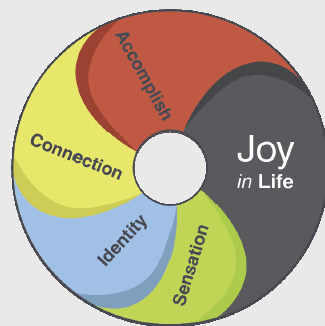
Needs, Activities, and Relationships
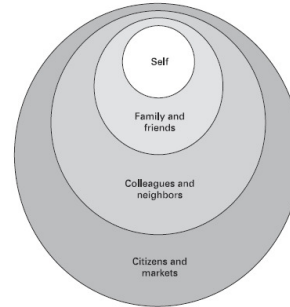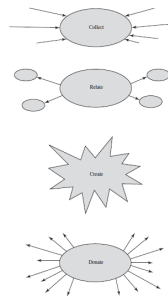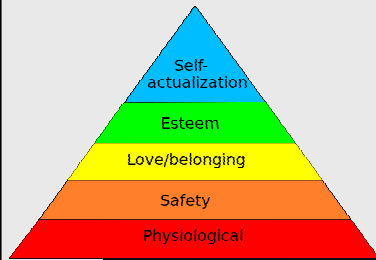
Maslow's Needs Pyramid

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)