The Psychology Of Everyday Things

Visual affordances and constraints

Causality and other mappings

Transfer effects

Population stereotypes and cultural associations

Conceptual models

Individual differences

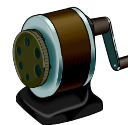**Why design is hard**

Visual Affordances

How something looks indicates how it's can be used
- Chair for sitting
- Table for placing things on
- Knobs for turning
- Slots for inserting things into
- Buttons for pushing

Complex things may need explaining, but simple things should not
- When simple things need pictures, labels, instructions, then design has failed
- Their usage should be obvious based upon their appearance

Visual Affordances: Computer Audio

Uses a familiar idiom and metaphor

Sliders for sliding

Dials for turning
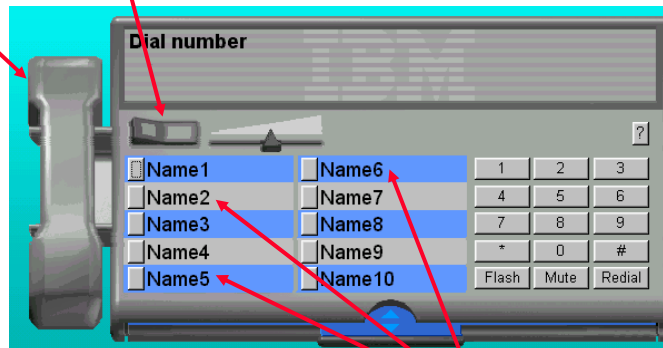
Buttons for pressing (Is this a button?)

What's this button do?

Visual Affordances: Telephony

Is this a graphic or a control?

A button is for pressing, but what does this one do?

Visual affordances for window controls are missing!

Text is for editing, but you can't do that here

Visual Affordances: Multi-Media

Handles are for lifting, but these are for scrolling

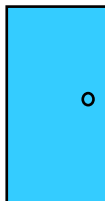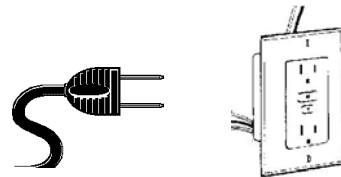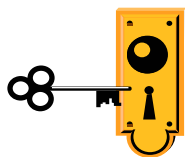
Rack Effect Control

MIXER

Volume Control

Click the left and right handle to scroll controls

Record
Effect

●Rever ●Choru ●3D Sp ●Trebl ●Bass

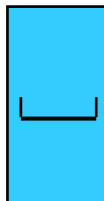From *AudioRack 32*, a multimedia application

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Visual Constraints

Limitations on the actions possible which are perceived from an object's appearance

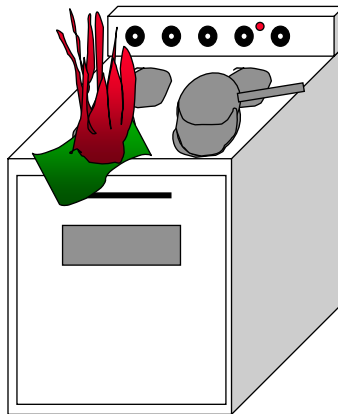| Push or pull?	Which side?	Push or pull?	Push or pull?
		Which side?	Which side?

Visual Constraints: Calendar Controls

James Tam

Mappings

James Tam

Mappings

James Tam

Mappings

James Tam

Mappings

From www.baddesigns.com

Mappings

The set of possible relations between objects:

- The relation between the control and what is being controlled e.g., relationship between the burners and the mimic diagrams on a stove
- Cause and effect relationships e.g., turn the car's steering wheel right and the car goes right.

Arbitrary	Paired	Full mapping

back right front left back left front right

back front   front back

24 possibilities, requires:
 -visible labels
 -memory

2 possibilities per side
=4 total possibilities
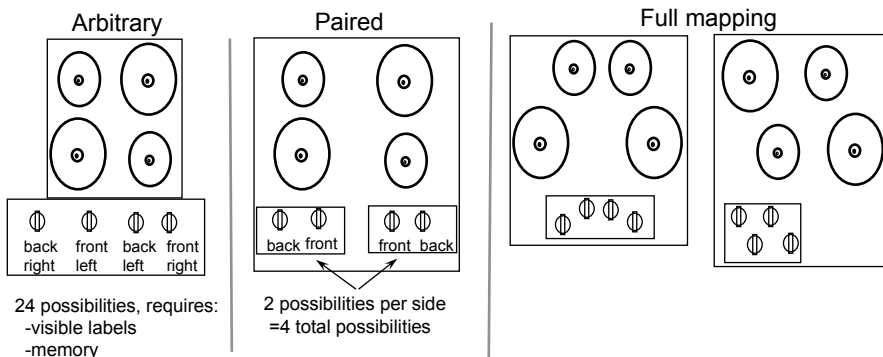
Mappings: Drawing Tools

Cursor re-enforces selection of current item

Only active palette items fully visible

Depressed button indicates currently mapped item

Causality

The thing that happens right after an action is assumed to be caused by that action
- Interpretation of "feedback"
- False causality
  - Incorrect effect

Causality

- Invisible effect
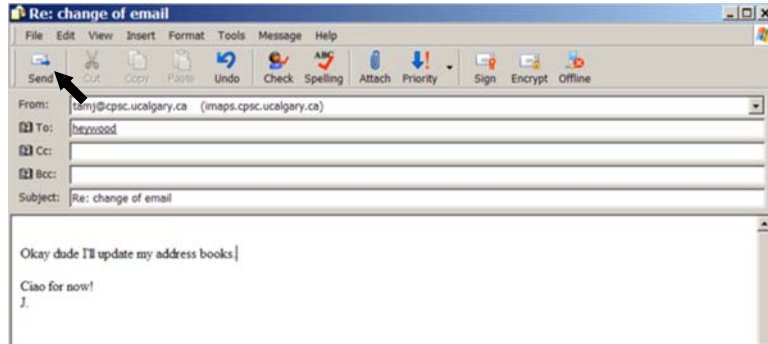
Lack Of Causality

•**No apparent cause-effect relation**
  •Ok does nothing!
  •Effects visible only after the "exe" button is pressed

•**Awkward to find appropriate color level**
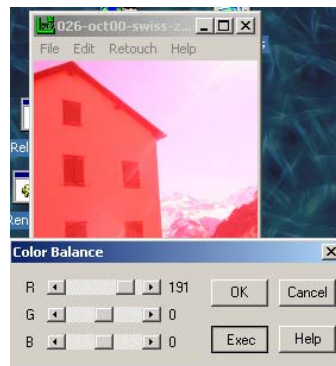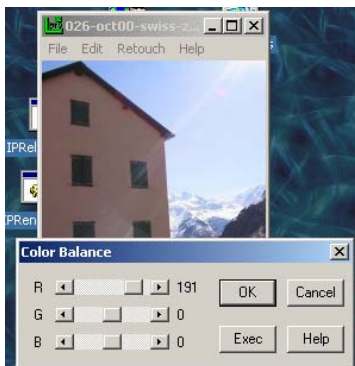
Transfer Effects

People transfer their learning/expectations of similar objects to the current object:

- Positive transfer
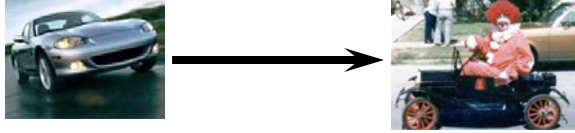
- Negative transfer

Transfer Effects
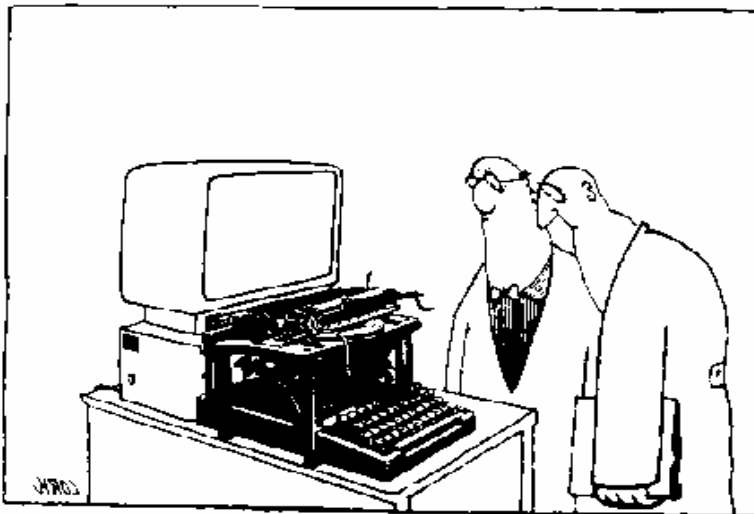
Population Stereotypes

Populations learn idioms that work in a certain way
- Red means danger
- Green means safe

• But idioms vary in different cultures!
- Driving
    - North America: drive on the right side of the road
    - Europe: drive on the left side of the road

• Ignoring/changing stereotypes?
- Calculators vs. phone number pads: which should computer keypads follow?

• Difficulty of changing stereotypes
- Qwerty keyboard: designed to prevent jamming of keyboard
- Dvorak keyboard ('30s): provably faster and more efficient to use

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Cultural Associations And Icon Design

Because a trashcan in Thailand may look like this:

A Thai user is likely to be confused by this image popular in Apple interfaces:

Sun found their email icon problematic for some American urban dwellers who are unfamiliar with rural mail boxes.

Cultural Associations

A Mac user finds a Windows system only somewhat familiar
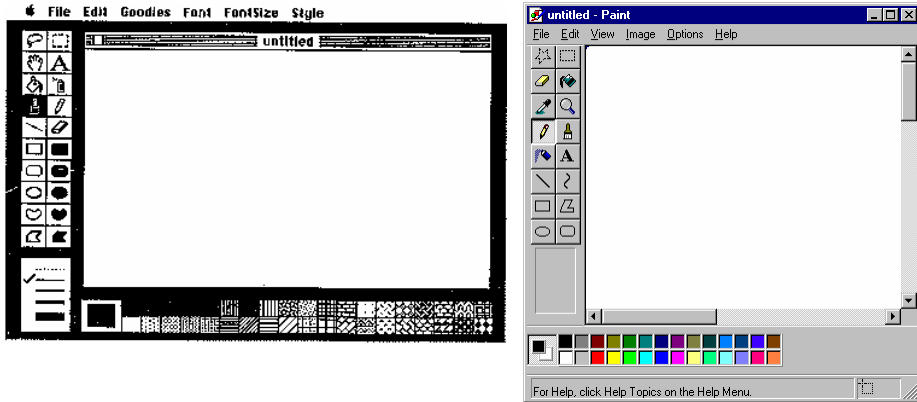
Conceptual Models

People have "mental models" of how things work

Conceptual models built from:
- Affordances and constraints
- Mappings and causality
- Transfer effects
- Population stereotypes/cultural standards
- Instructions
- Interactions

Models may be wrong, particularly if the above attributes are misleading

Models allows people to mentally simulate operation of device
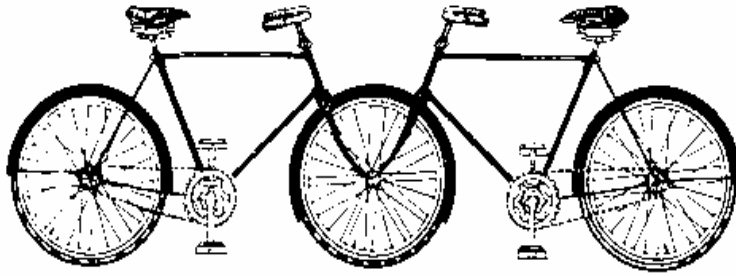
Conceptual Models
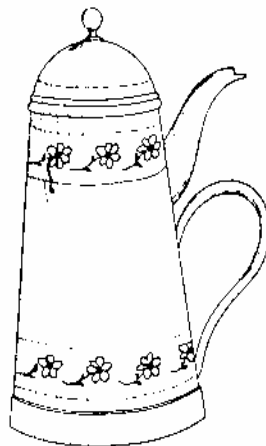
Conceptual Models

Designing A Good Conceptual Model

Communicate model through visual image
- Visible affordances and constraints
- Clear causality of interactions
- Consider cultural idioms, transfer effects
- Instructions augment visuals

Designer   Operator

Together all these things indicate what can be done and how to do it

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An Example Of Good Design: Scissors

Example Of A Bad Design: Digital Watches
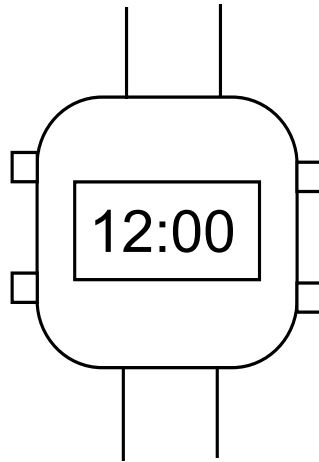
James Tam

Individual Differences: Who Do You Design For?
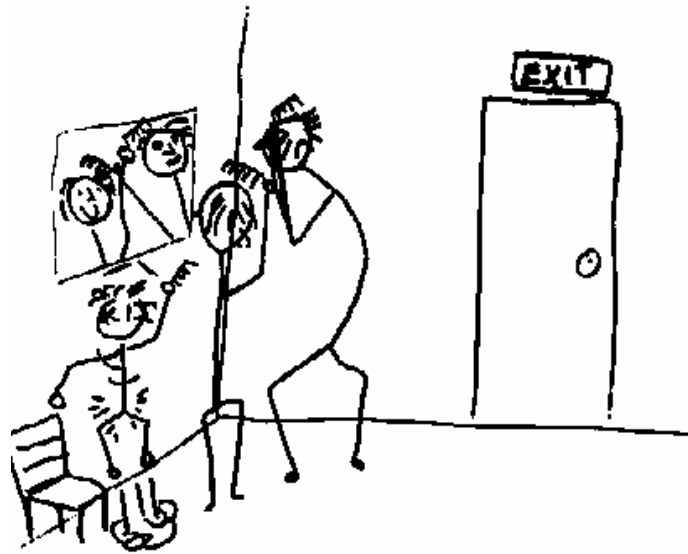
James Tam

Individual Differences: Who Do You Design For?
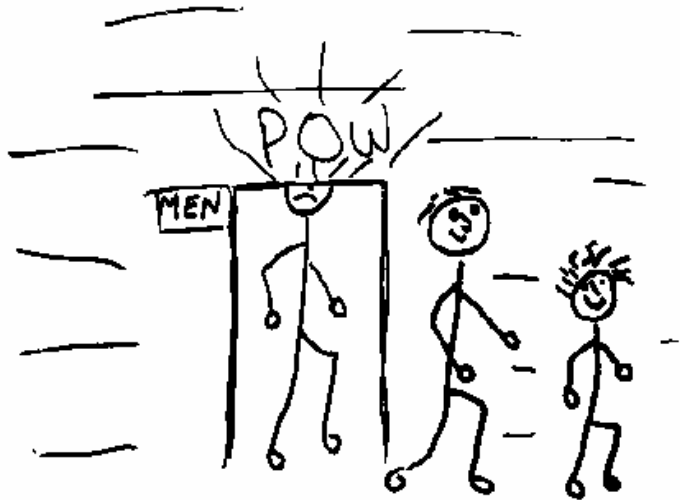
James Tam

Individual Differences: Who Do You Design For?

People are different

It is rarely possible to accommodate all people perfectly

Rule of thumb:
• Designing for the average is a mistake
  - May exclude half the audience

• Design should cater for 95% of audience (ie for 5th or 95th percentile)
  - But means 5% of population may be (seriously!) compromised

Examples:
• Cars and height: headroom, seat size
• Computers and visibility:
  - Font size, line thickness, alternatives to color for color blind people?

James Tam

Individual Differences: Who Do You Design For
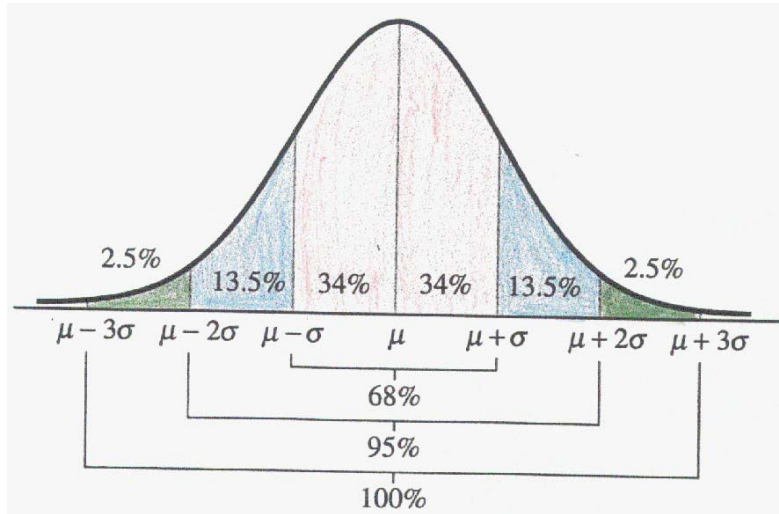
Diagram by Kathryn Schulte http://www.clc.mnscu.edu/kschulte/

Proverbs On Individual Differences

You do NOT necessarily represent a good representative user of equipment or systems you design.

Do not expect others to think and behave as you do, or as you might like them to.

People vary in thought and behaviour just as they do physically.

Who Do You Design For And Individual Differences

Computer users:

• Novices   *Walk up and use systems*
                Interface affords restricted set of tasks
                Introductory tutorials to more complex uses

most kiosk + internet systems

• Casual   *Standard idioms*
                Recognition (visual affordances) over recall
                Reference guides

most shrink-wrapped systems

• Intermediate *Advanced idioms*
                Complex controls
                Reminders and tips

custom software

• Expert   *Shortcuts for power users*
                Interface affords full task customization

James Tam

Why Design Is Hard

1) **The number of things to control has increased dramatically**

1950's – 1970's

1990's – 2000's

James Tam

Why Design Is Hard (2)

2) Displays are sometimes overly abstract
- Red lights in car indicate problems vs. flames for fire

Why Design Is Hard (3)

3) Feedback can be more complex, subtle, and less natural
- Is your digital watch alarm on and set correctly?
- Is the phone in call forwarding mode?

4) Errors increasingly serious and/or costly
- Airplane crashes, losing days of work...

Why Design Is Hard (4)

…Costly errors:

From InfoWorld, Dec '86

• "London—

An inexperienced computer operator pressed the wrong key on a terminal in early December, causing chaos at the London Stock Exchange. The error at [the stockbrokers office] led to systems staff working through the night in an attempt to cure the problem"

Image from the book "Wall Street" published by New York Distributors

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Why Design Is Hard (5)

5) Marketplace pressures

• Adding functionality (complexity) now easy and cheap
  - Computers

• Adding controls/feedback expensive
  - Physical buttons on calculators, microwave ovens
  - Widgets consume screen real estate

• Design usually requires several iterations before success
  - Product pulled if not immediately successful

Why Design Is Hard (5)

6) People often consider cost and appearance over designing with Human Factors in mind

- Bad design not always visible or obvious

www.baddesigns.com

Why Design Is Hard (6)

...Cost and appearance over Human Factors design

e.g., the wave of cheap telephones:
- Accidentally hangs up when button hit with chin
- Bad audio feedback
- Cheap pushbuttons—mis-dials common
- Trendy designs that are uncomfortable to hold
- Hangs up when dropped
- Functionality that can't be accessed (redial, mute, hold)

7) People tend to blame themselves when errors occur
- "I was never very good with machines"
- "I knew I should have read the manual!"
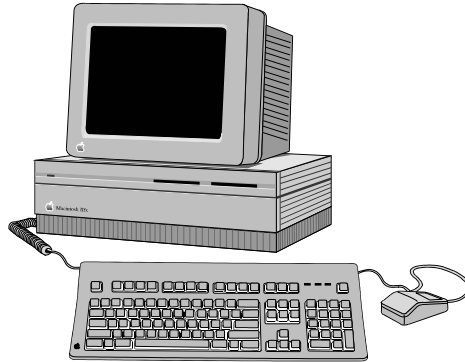- "Look at what I did! Do I feel stupid!"

From "The Simspons"

Human Factors In The Design Of Computers

What does this do?

- Computers are far more complex to control than most physical devices
- General purpose computer contains no natural conceptual model
- Completely up to the designer to present a good model to the user

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What You Now Know

Many so-called human errors are actually errors in design
- Don't blame the user!

Designers help make things easier to use by providing a good conceptual model
- Affordances
- Constraints
- Mapping and causality
- Positive transfer
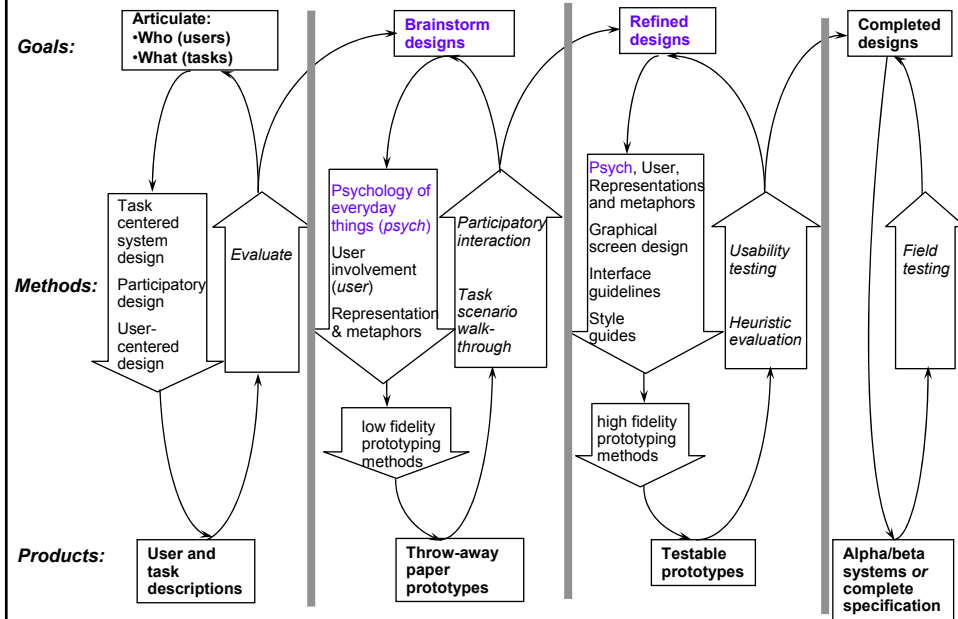- Population stereotypes and cultural associations

Design to accommodate individual differences
- Decide on the range of users

Good design is difficult for a variety of reasons that go beyond design-related issues

Interface Design And Usability Engineering

Goals:

Articulate:
- Who (users)
- What (tasks)

Brainstorm designs

Refined designs

Completed designs

Methods:

Task centered system design

Participatory design

User-centered design

Evaluate

Psychology of everyday things (*psych*)

User involvement (*user*)

Representation & metaphors

Participatory interaction

Task scenario walk-through

low fidelity prototyping methods

Psych, User, Representations and metaphors

Graphical screen design

Interface guidelines

Style guides

Usability testing

Heuristic evaluation

high fidelity prototyping methods

Field testing

Products:

User and task descriptions

Throw-away paper prototypes

Testable prototypes

Alpha/beta systems *or* complete specification

This diagram is a variation of the one presented by Saul Greenberg

James Tam