

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

James Tam

Visual Affordances

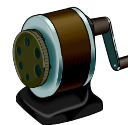
How something looks indicates how it's to be used

- 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
- Their usage should be obvious based upon their appearance



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Visual Affordances: Computer Audio

Needs Familiar Idiom And Metaphor To Work

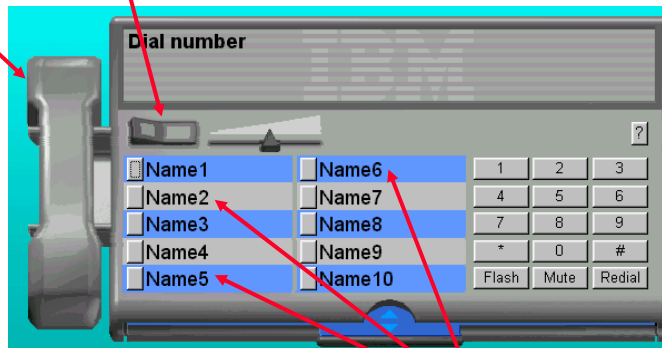


Visual Affordances: Telephony

Is this a graphic or a control?

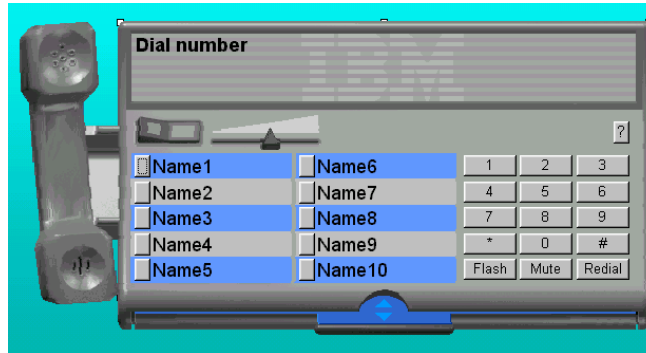
A button is for pressing, but what does this one do?

Visual affordances for window controls are missing!



Visual Affordances: Telephony

A non-obvious affordance



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Visual Affordances: Multi-Media

Handles are for lifting, but these are for scrolling

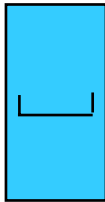
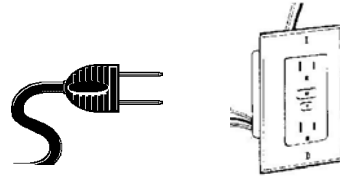
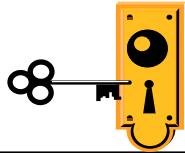


From *AudioRack 32*, a multimedia application

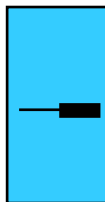
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Visual Constraints

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



Which side?



Push or pull?

Which way does it open?

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Visual Constraints: Calendar Controls

Form1

Date:

Month Day Year

May 22 1997
Month Day Year

May 22 1997

Appointment

General Attendees Notes Planner

When

Start: 8:30AM Wed 5 /14 /97

End: 4:30PM Wed 5 /14 /97 All day

Description:

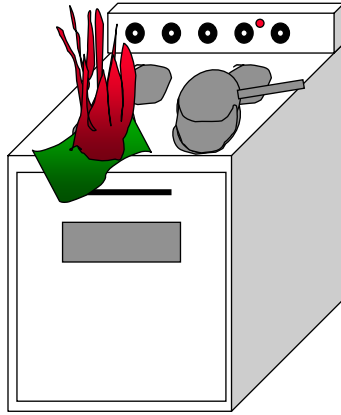
Smart Technology Sen

Where:

May 1997						
S	M	T	W	T	F	S
27	28	29	30	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31
1	2	3	4	5	6	7

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Mappings



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Mappings



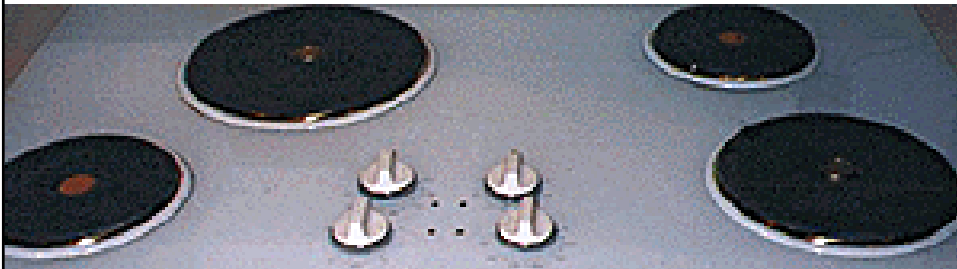
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Mappings



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Mappings



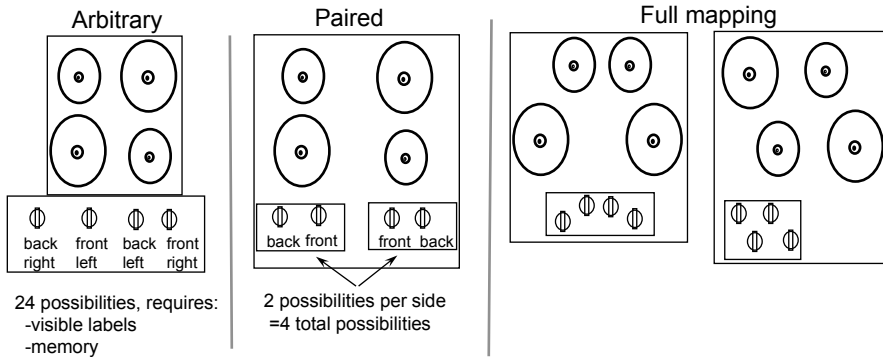
From www.baddesigns.com

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Mappings

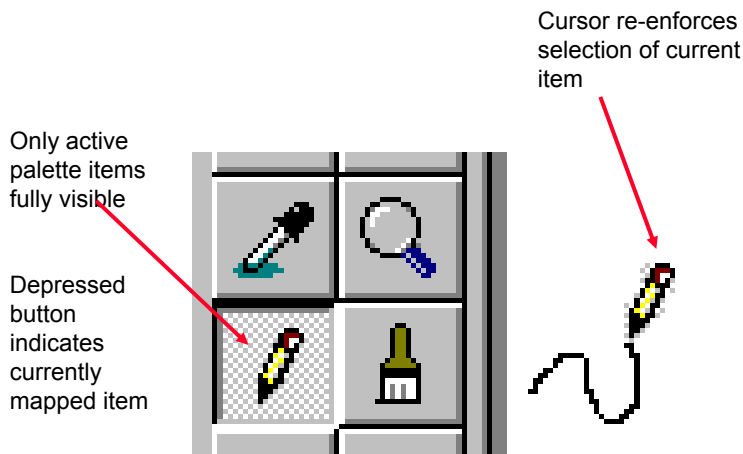
The set of possible relations between objects:

- 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.



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Mappings: Drawing Tools



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Causality

The thing that happens right after an action is assumed to be caused by that action

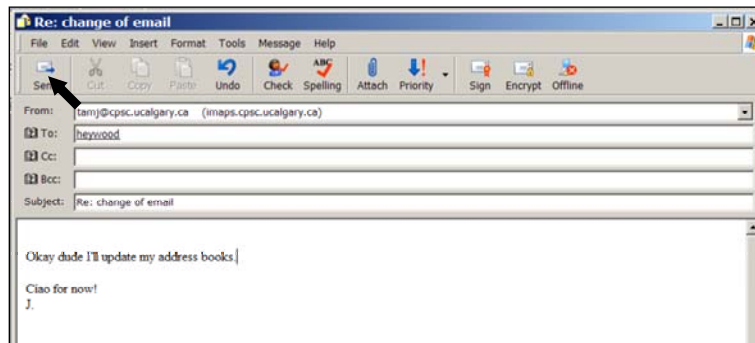
- Interpretation of “feedback”
- False causality
 - Incorrect effect



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Causality

- Invisible effect



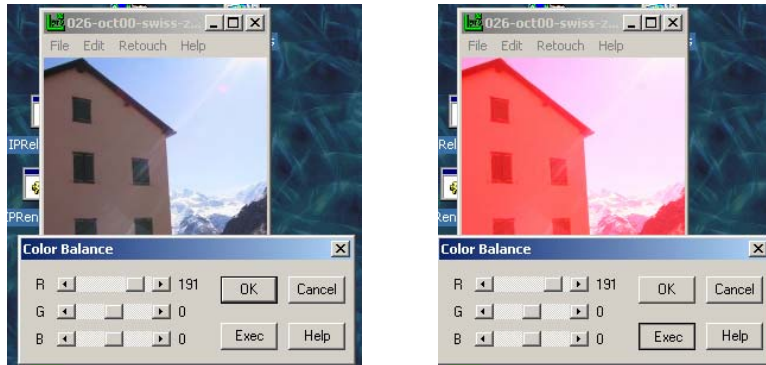
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Lack Of Causality

No apparent cause-effect relation

- Effects visible only after Exec button is pressed
- Ok does nothing!

Awkward to find appropriate color level

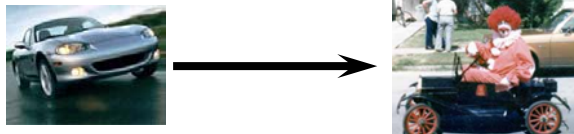


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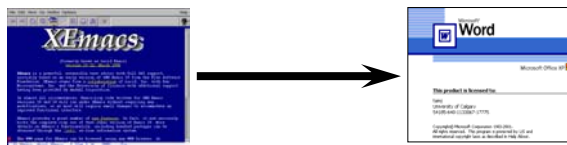
Transfer Effects

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

- Positive transfer

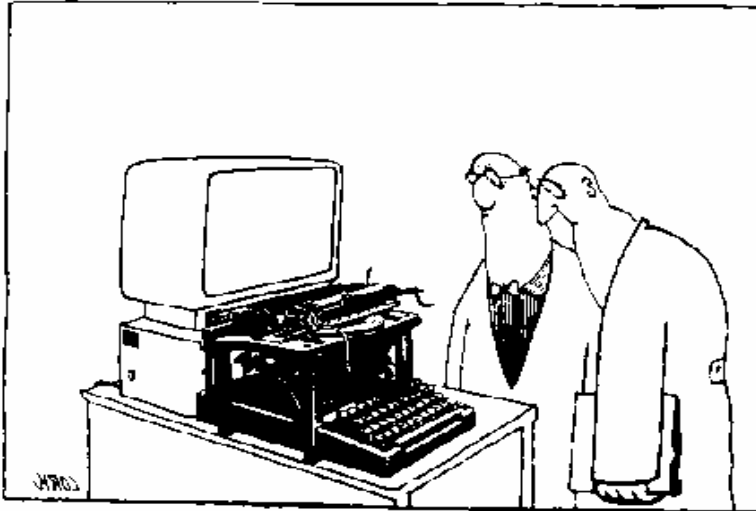


- Negative transfer



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Transfer Effects



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Population Stereotypes

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
 - Britain: down is on
 - Faucets
 - America: Counter-clockwise on
 - Britain: Counter-clockwise off

- Ignoring/changing stereotypes?
 - Home handyman: light switches installed upside down
 - 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:



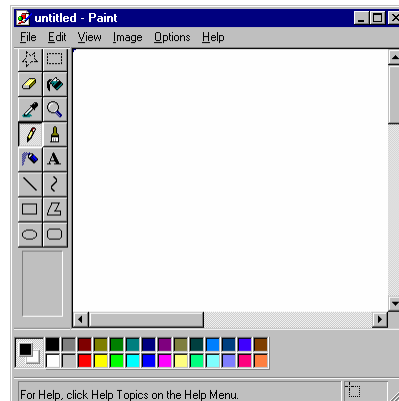
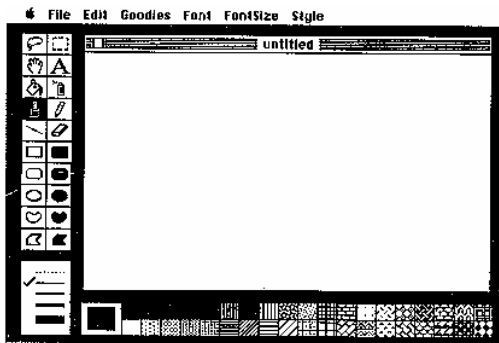
Sun found their email icon problematic for some American urban dwellers who are unfamiliar with rural mail boxes.



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Cultural Associations

A Mac user finds a Windows system only somewhat familiar



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Conceptual Models

People have “mental models” of how things work

Conceptual models built from:

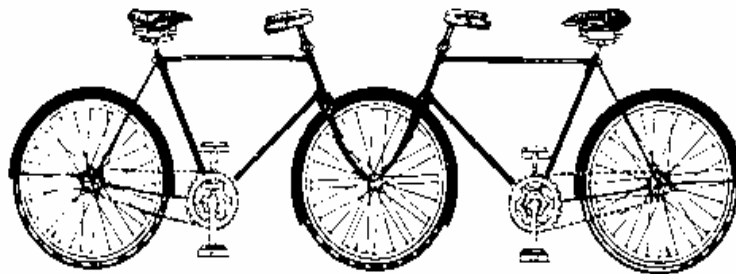
- Affordances and constraints
- Mappings and causality
- Transfer effects
- Population stereotypes/cultural standards
- Instructions
- Interactions

Models may be wrong, particularly if above attributes are misleading

Models allows people to mentally simulate operation of device

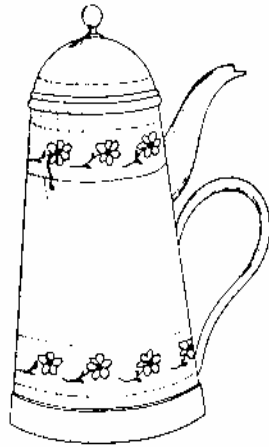
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Conceptual Models



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Conceptual Models



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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



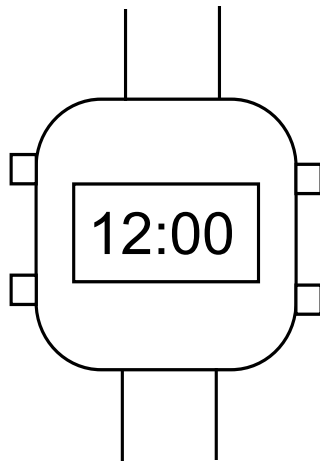
Together all these things indicate what can be done and how to do it

An Example Of Good Design



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Example Of A Bad Design: Digital Watches



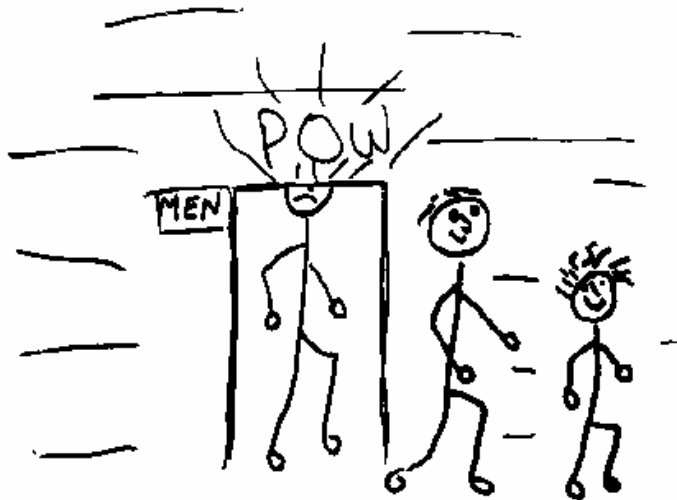
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Individual Differences: Who Do You Design For?



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Individual Differences: Who Do You Design For?



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Individual Differences: Who Do You Design For?

People are different

It is rarely possible to accommodate all people perfectly

Rule of thumb:

- Design should cater for 95% of audience (ie for 5th or 95th percentile)
 - But means 5% of population may be (seriously!) compromised
- Designing for the average is a mistake
 - May exclude half the audience

Examples:

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

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Individual Differences: Who Do You Design For

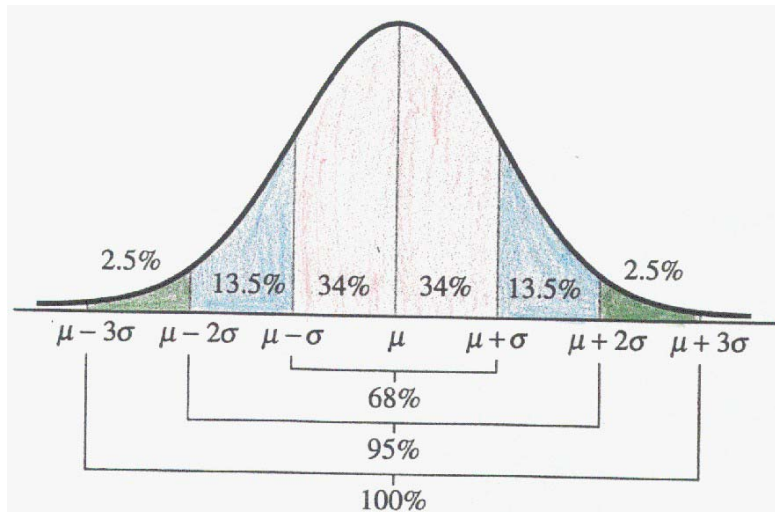


Diagram by Kathryn Schulte <http://www.clc.mnscu.edu/kschulte/>

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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

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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
- Casual *Standard idioms*
Recognition (visual affordances) over recall
Reference guides
- Intermediate *Advanced idioms*
Complex controls
Reminders and tips
- Expert *Shortcuts for power users*
Interface affords full task customization

most kiosk +
internet
systems

most shrink-
wrapped
systems

custom
software

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Why Design Is Hard

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

1950's – 1970's



1990's – 2000's



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Why Design Is Hard (2)

- 2) **Displays are sometimes overly abstract**
 - Red lights in car indicate problems vs. flames for fire
- 3) **Feedback can be more complex, subtle, and less natural**
 - Is your digital watch alarm on and set correctly?
- 4) **Errors increasing serious and/or costly**
 - Airplane crashes, losing days of work...

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Why Design Is Hard (3)

...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 (4)

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



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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

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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!”

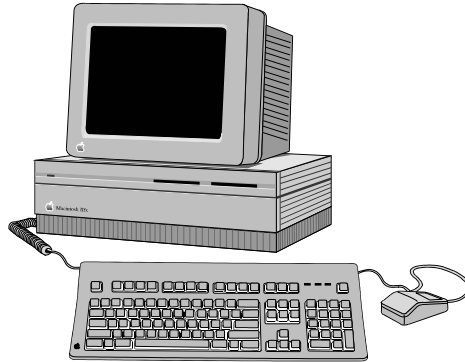


From “The Simpsons”

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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

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Interface Design and Usability Engineering

