

The Psychology Of Everyday Things

Visual affordances and constraints

Causality and other mappings

Transfer effects

Population stereotypes and cultural associations

Conceptual models

Individual differences

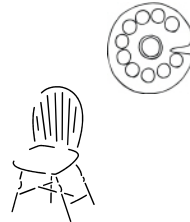
Why design is hard

James Tam

Visual Affordances

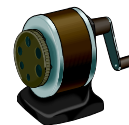
How something looks indicates how it's can be used

- 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



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Visual Affordances: Computer Audio

Uses a familiar idiom and metaphor

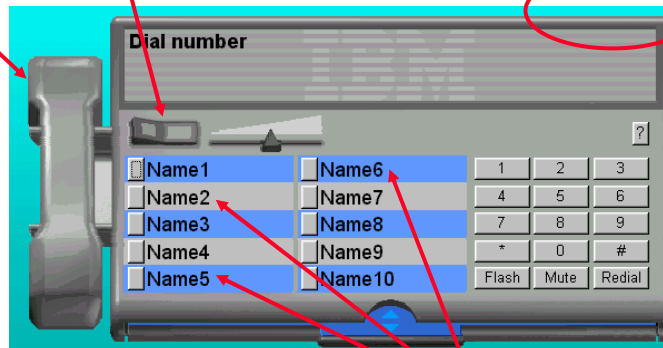


Visual Affordances: Telephony

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!



Perceived Vs. Actual Affordances

- **Perceived affordance:** clues about how to use an object based on its visual appearance.
- **Actual affordance:** the actual way in which an object actually should be used.
- **If the perceived affordances aren't the same as the actual affordances then there's a problem!**

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Perceived Vs. Actual Affordances (2)

Perceived affordance of handles...lifting!



Actual affordance of these handles...scrolling!

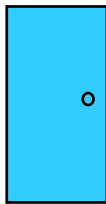
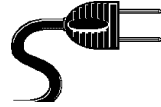
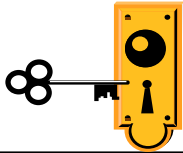


From *AudioRack 32*, a multimedia application

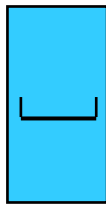
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Visual Constraints

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



Push or pull?



Which side?



Push or pull?

Which side?



Push or pull?

Which side?

James Tam

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 Ser

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

W/here:

James Tam

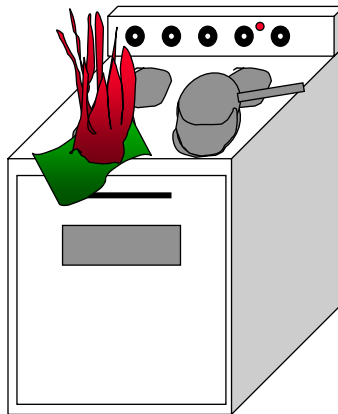
Visual Affordances And Visual Constraints In Computer Interaction

These design principles (and the ones that follow) should guide the designer's choices in the method of interaction.

- e.g., Determining the minimum and maximum prices for buying a house
- What if you used text input?
- What if you used combo boxes?
- What if you tried a different control?

James Tam

Mappings



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Mappings



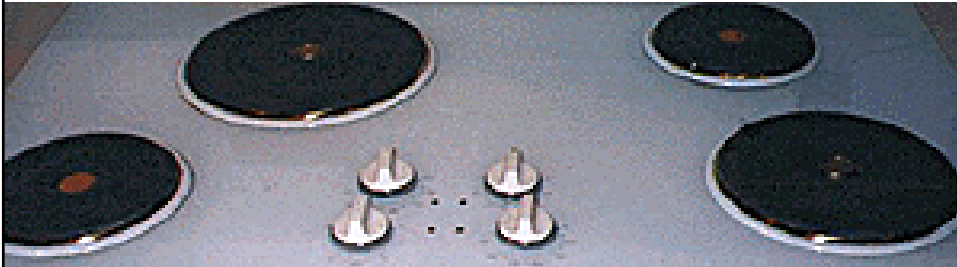
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Mappings



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Mappings



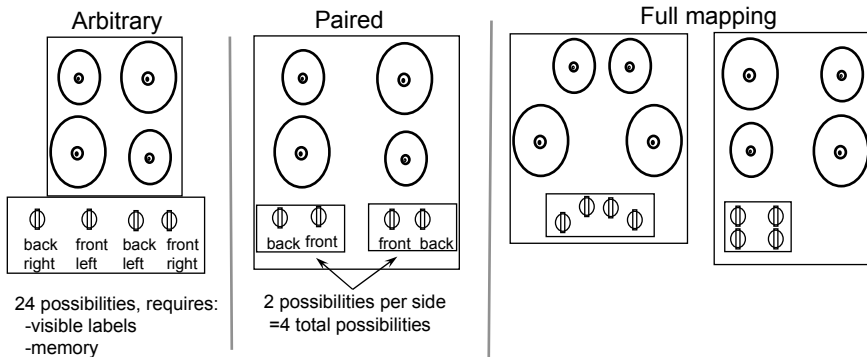
From www.baddesigns.com

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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.

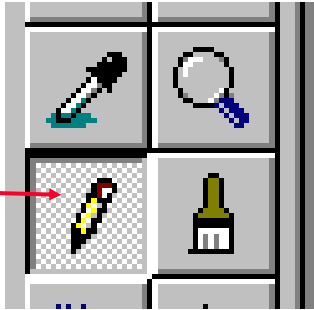


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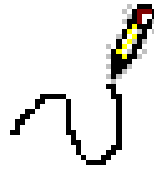
Mappings: Drawing Tools

Only active
palette items
fully visible

Depressed
button
indicates
currently
mapped item



Cursor re-enforces
selection of current
item



MS-Paint

James Tam

Mappings: Input Devices

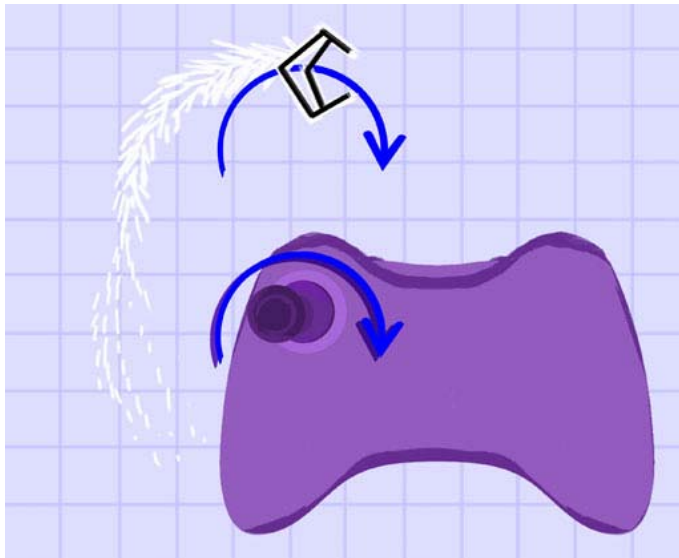


Image from: www.steveswink.com

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Mappings

“If a design depends upon labels, it may be faulty. Labels are important and often necessary, but the appropriate use of natural mappings can minimize the need for them. Wherever labels seem necessary, consider another design.” – Don Norman

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Causality

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

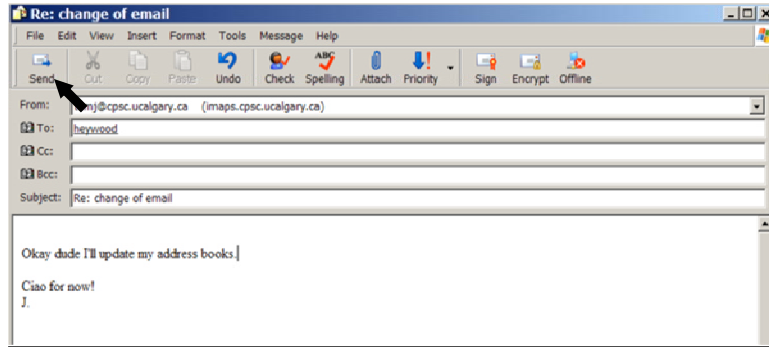
- Interpretation of “feedback”
- False causality
 - Incorrect effect



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Causality

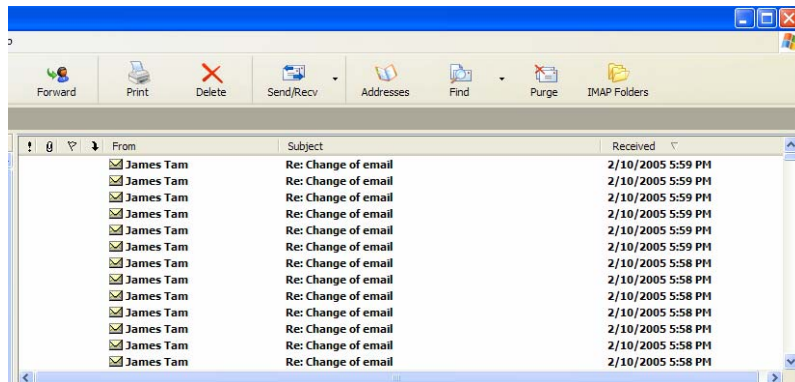
- Invisible effect



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Causality

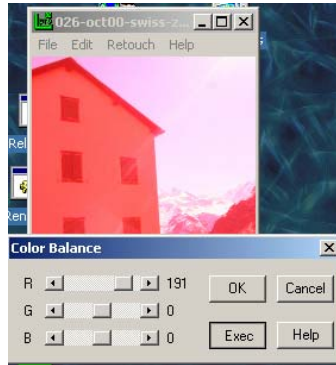
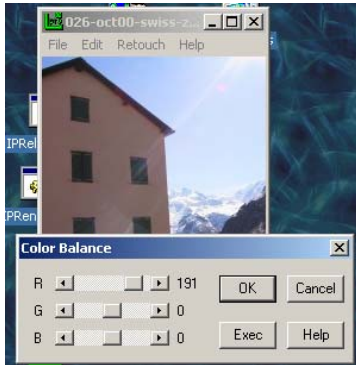
- The effect on the recipient



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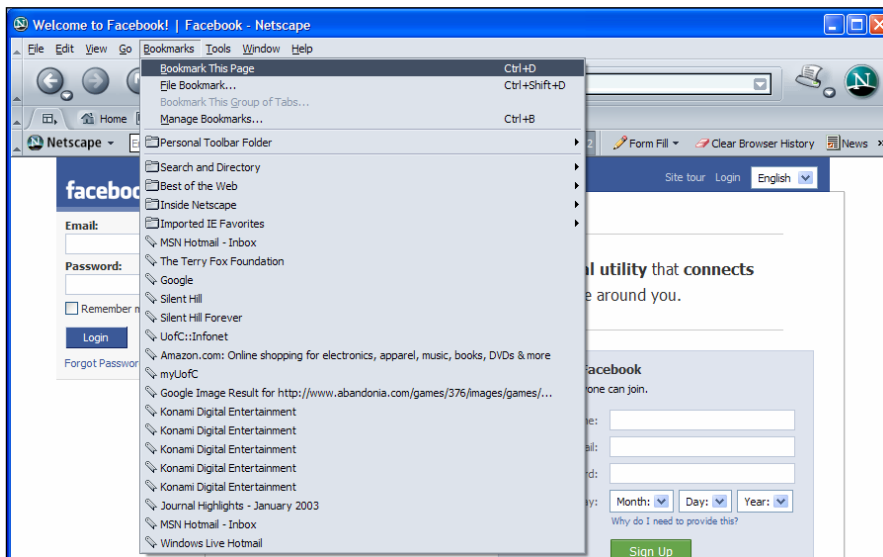
Lack Of Causality

- **No apparent cause-effect relation**
 - O.k. does nothing!
 - Effects visible only after the “exe” button is pressed
- **Awkward to find the appropriate color level**



James Tam

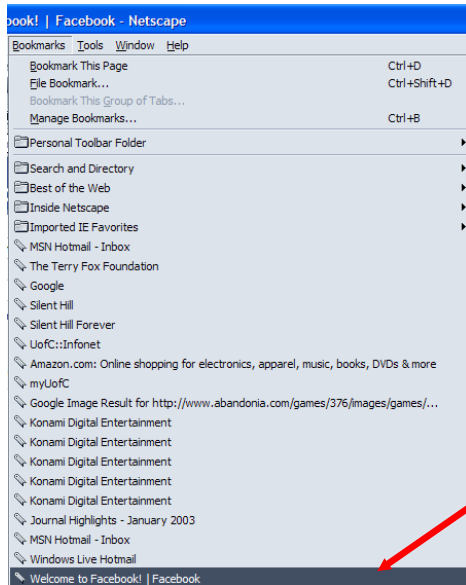
Lack Of Causality



Netscape version 7.2

James Tam

Lack Of Causality



Having a long list of bookmarks can make this somewhat tedious

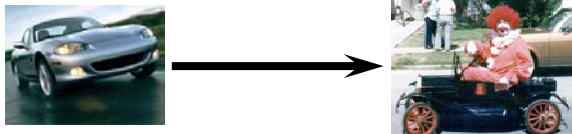
Netscape version 7.2

James Tam

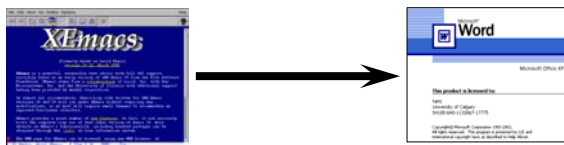
Transfer Effects

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

- Positive transfer

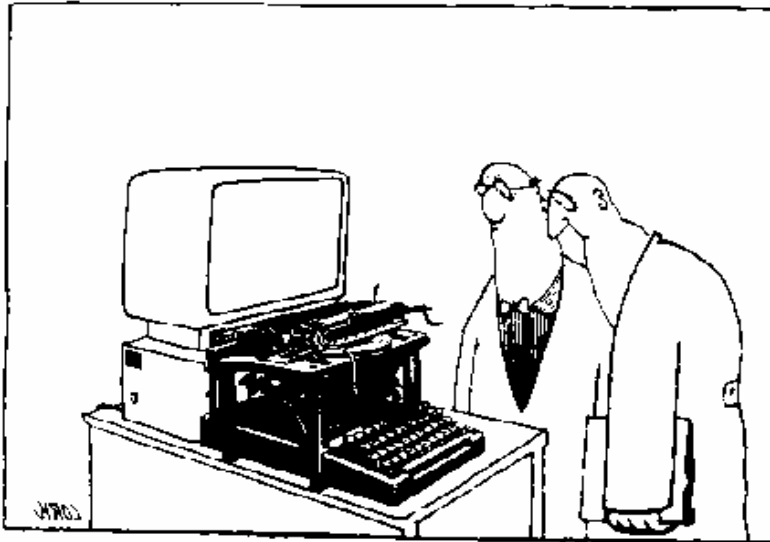


- Negative transfer



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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!
 - Driving
 - North America: drive on the right side of the road
 - England: 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:



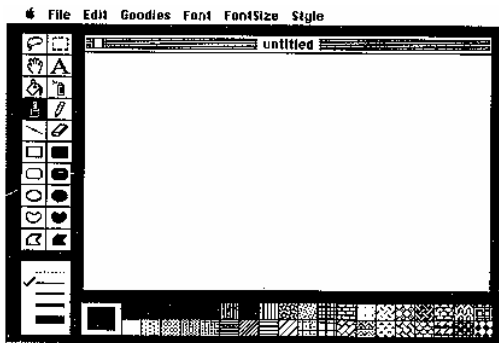
Sun found their email icon problematic for some American urban dwellers who are unfamiliar with rural mail boxes



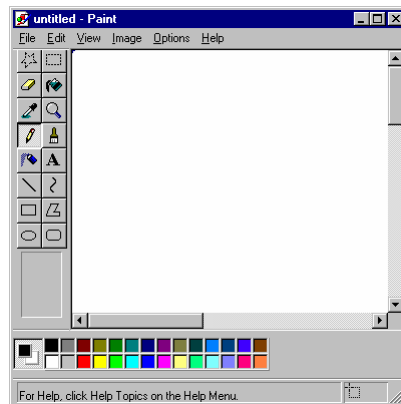
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Cultural Associations

A Mac user finds a Windows system only somewhat familiar



MacPaint



MS-Paint

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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 the above attributes are misleading

Models allows people to mentally simulate operation of device

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Conceptual Models

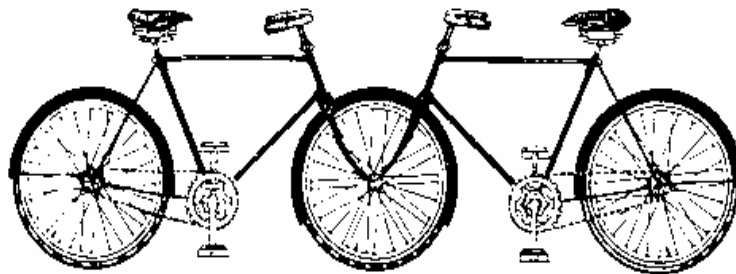


Image from “The Psychology of Everyday Things” by Don Norman

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Conceptual Models

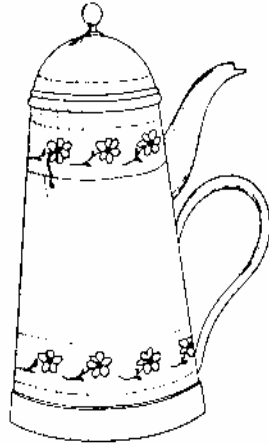


Image from "The Psychology of Everyday Things" by Don Norman

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The Conceptual Model Should Be Consistent

	Title	Length	Rating	Contributing Artist	Album
1	Lost Carol	0:38	☆☆☆☆☆	Akira Yamaoka	Silent Hill 3
2	You're Not Here	3:46	☆☆☆☆☆	Silent Hill 3	Silent Hill 3
25	I Want Love (Studio Mix)	4:39	☆☆☆☆☆	Akira Yamaoka	Silent Hill 3

Ah! Play lists can be changed via drag and drop without a special mode.

	Title	Length	Rating	Contributing Artist	Album
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	Lost Carol	0:38	☆☆☆☆☆	Akira Yamaoka	Silent Hill 3

Windows Media Player 11

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The Conceptual Model Should Be Consistent

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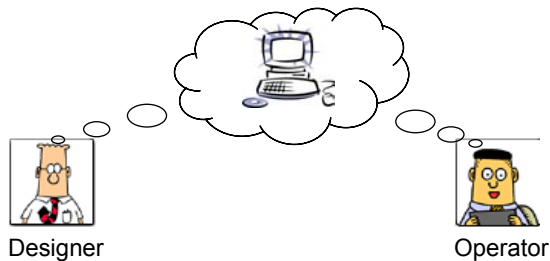
Adding to the list requires a special mode

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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: Scissors



Affordances?

Constraints?

Mapping?

Positive transfer and cultural idioms?

Conceptual model?

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Example Of A Bad Design: My Office Phone!



Affordances?

Constraints?

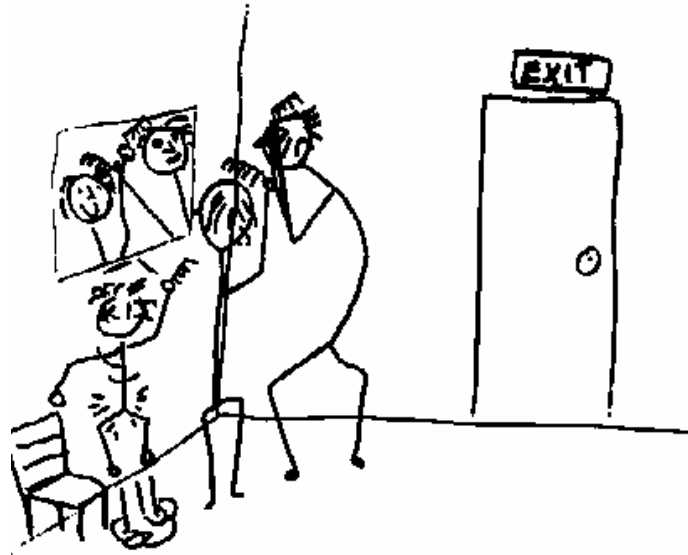
Mapping?

Positive transfer and cultural idioms?

Conceptual model?

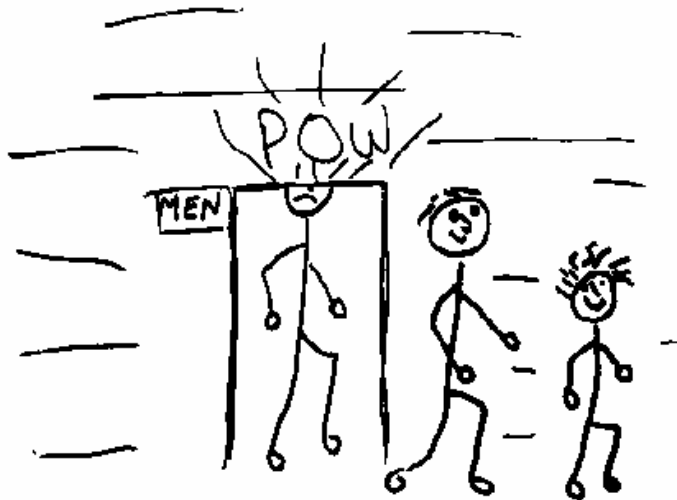
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Individual Differences: Who Do You Design For?



James Tam

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:

- 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?

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Individual Differences: Who Do You Design For

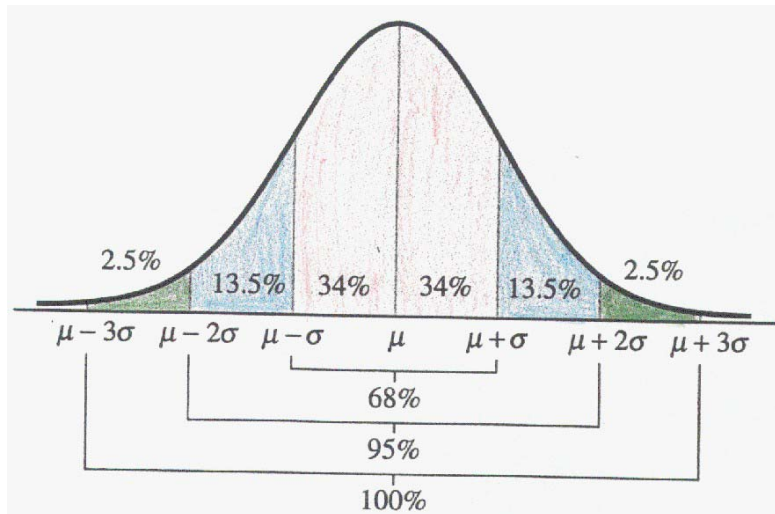


Diagram by Kathryn Schulte <http://www.clc.mnscu.edu/kschulte/>

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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

- E.g., Car radios:

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
- Is your digital watch alarm on and set correctly?



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Why Design Is Hard (3)

3. Feedback can be more complex, subtle, and less natural

- Is the phone in call forwarding mode?



- What is wrong with my printer?



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Why Design Is Hard (4)

What Do The Buttons/Lights Do/Mean?



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Why Design Is Hard (5)

4) Errors increasingly serious and/or costly

- Airplane crashes, losing days of work...
- 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 Washington Times January 9 2004

James Tam

Why Design Is Hard (6)

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 (7)

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

- Bad design not always visible or obvious or it is not given priority



www.baddesigns.com

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Why Design Is Hard (8)

...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 easily 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!”

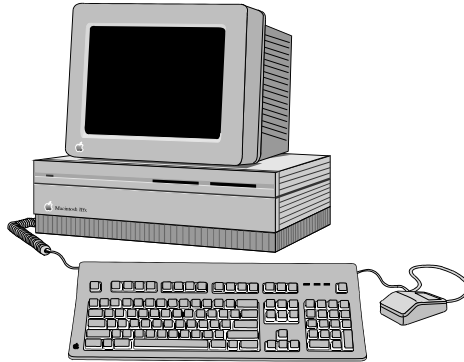


From “The Simpsons”

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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

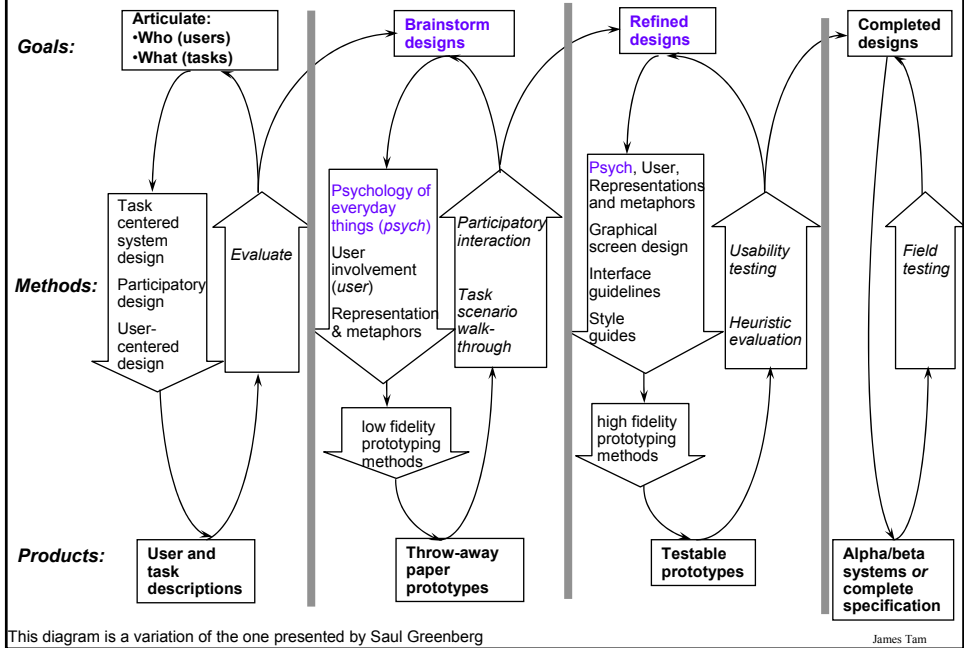
Design to accommodate individual differences

- Decide on the range of users

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

James Tam

Interface Design And Usability Engineering



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

James Tam