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

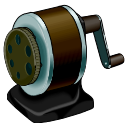
Visual Affordances

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

Buttons for pressing (Is this a button?)

Dials for turning

What's this button do?

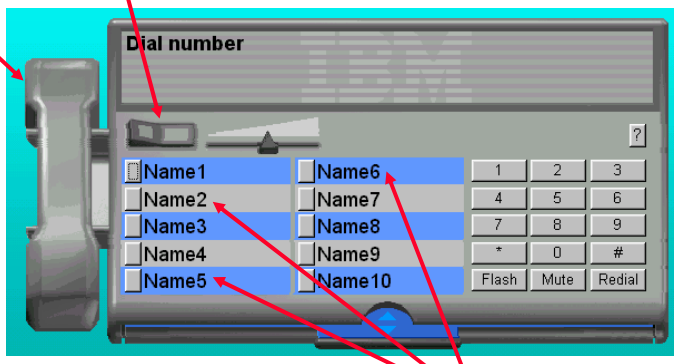
James Tam

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

James Tam

Visual Affordances: Multi-Media

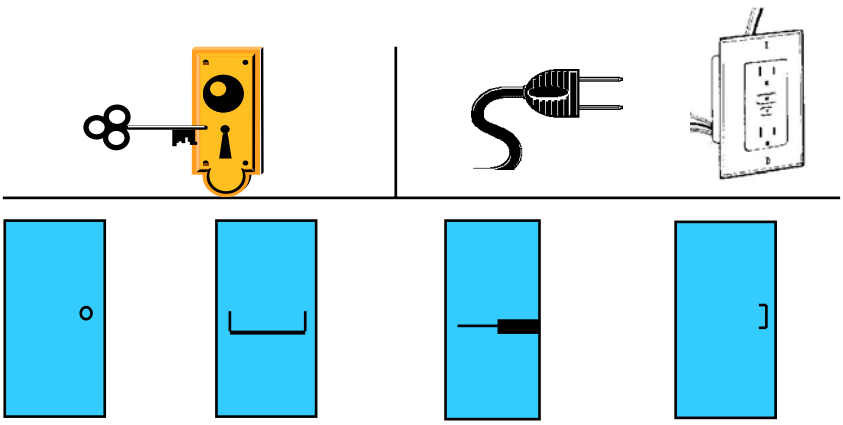
Handles are for lifting but
these are for scrolling!

From *AudioRack 32*, a multimedia application

James Tam

Visual Constraints

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



Push or pull?

Which side?

Push or pull?

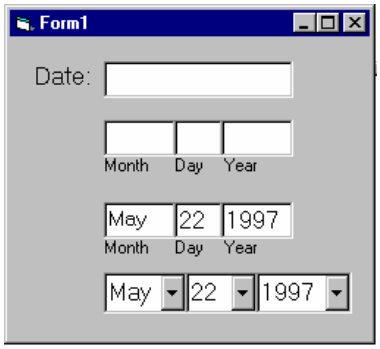
Which side?

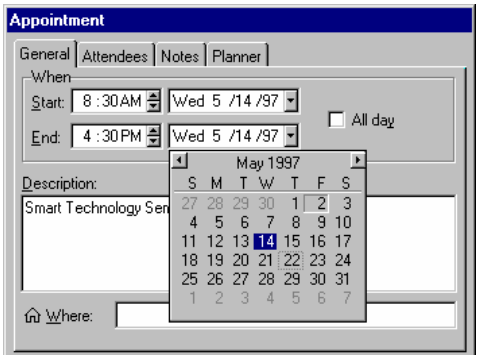
Push or pull?

Which side?

James Tam

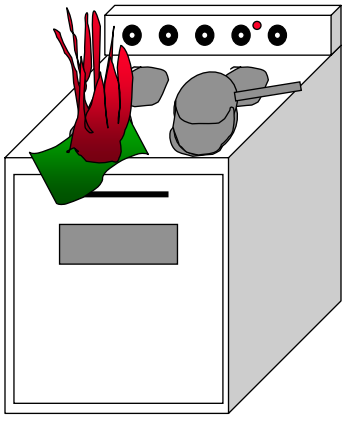
Visual Constraints: Calendar Controls





James Tam

Mappings



James Tam

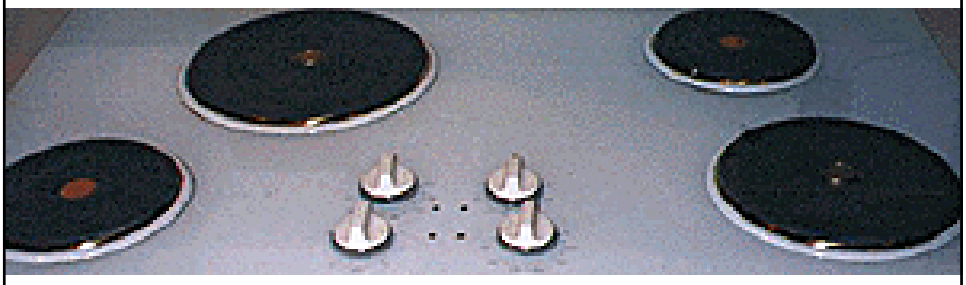
Mappings

James Tam

Mappings

James Tam

Mappings



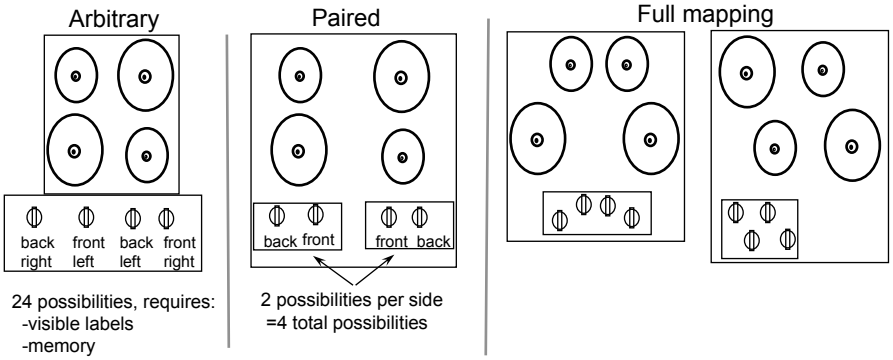
From www.baddesigns.com

James Tam

Mappings

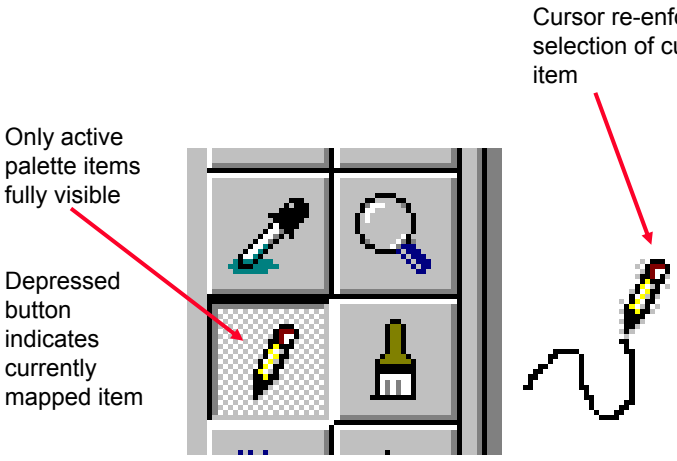
The set of possible relations between objects:

- 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.



James Tam

Mappings: Drawing Tools



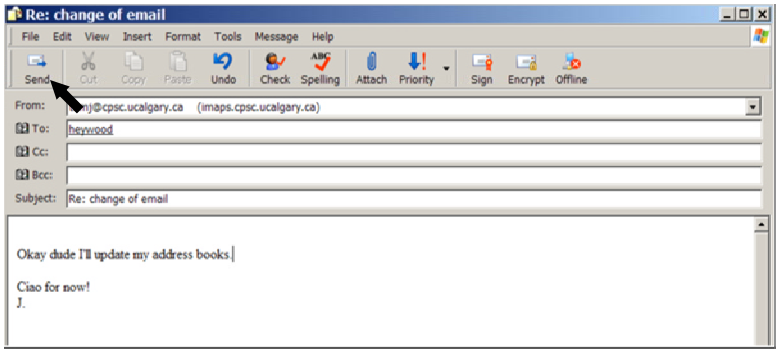
Causality

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

- Interpretation of "feedback"
- False causality
  - Incorrect effect

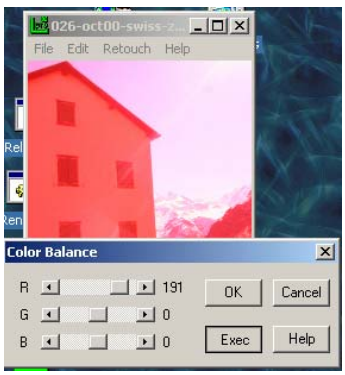
Causality

- 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**



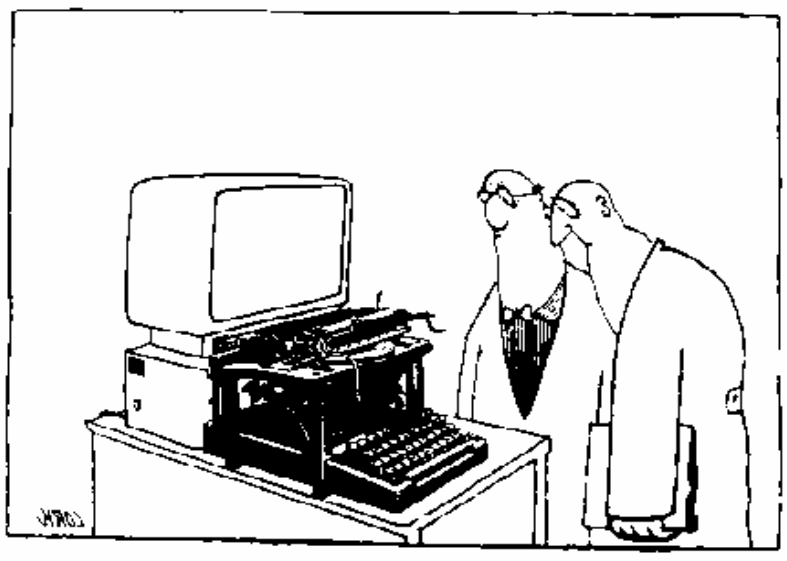
Transfer Effects

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
    - 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

Cultural Associations And Icon Design

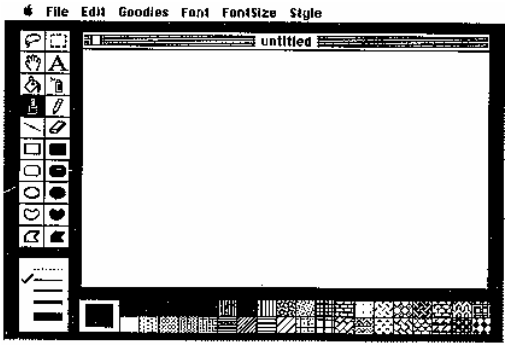
Because a trashcan in Thailand may look like this:

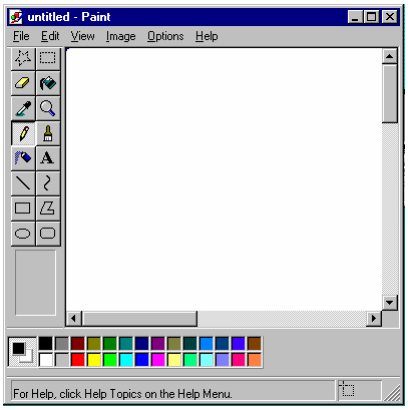
A Thai user is likely to be confused by this image popular in Apple interfaces:

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

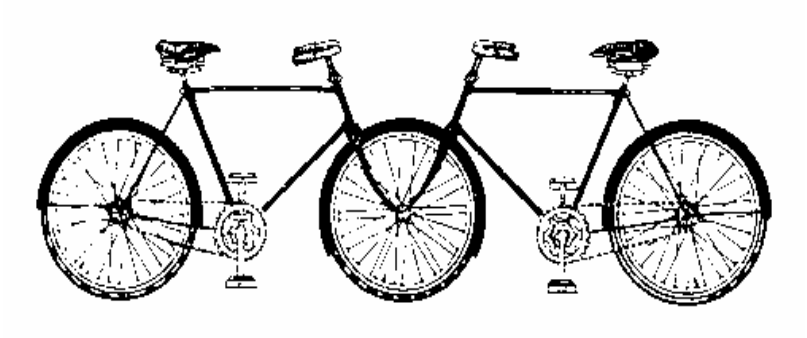
Conceptual models built from:

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

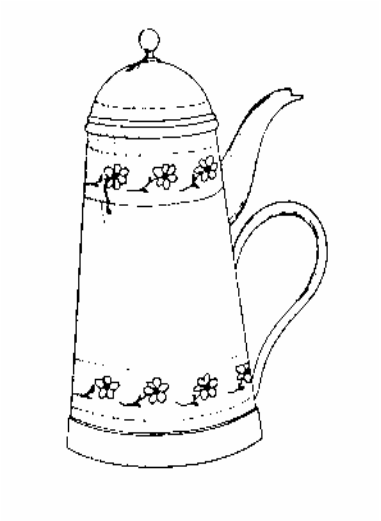
Models may be wrong, particularly if the above attributes are misleading

Models allows people to mentally simulate operation of device

Conceptual Models



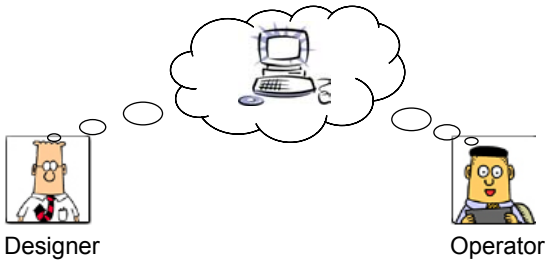
Conceptual Models



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



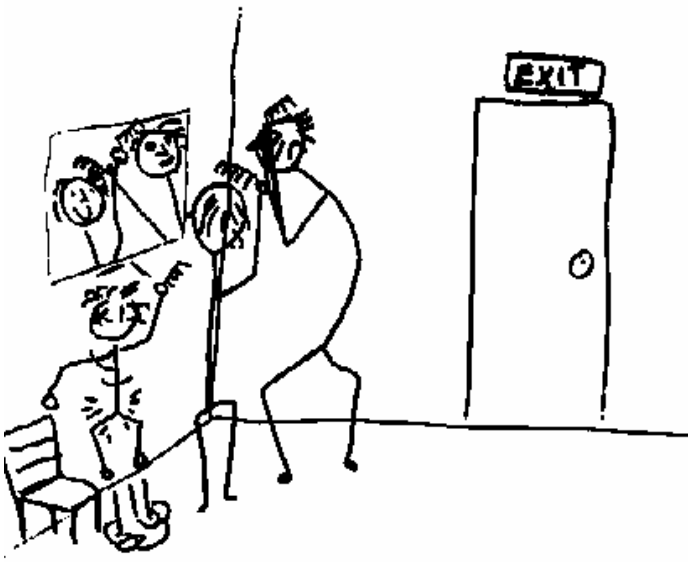
Together all these things indicate what can be done and how to do it

An Example Of Good Design: Scissors

Example Of A Bad Design: My Office Phone!

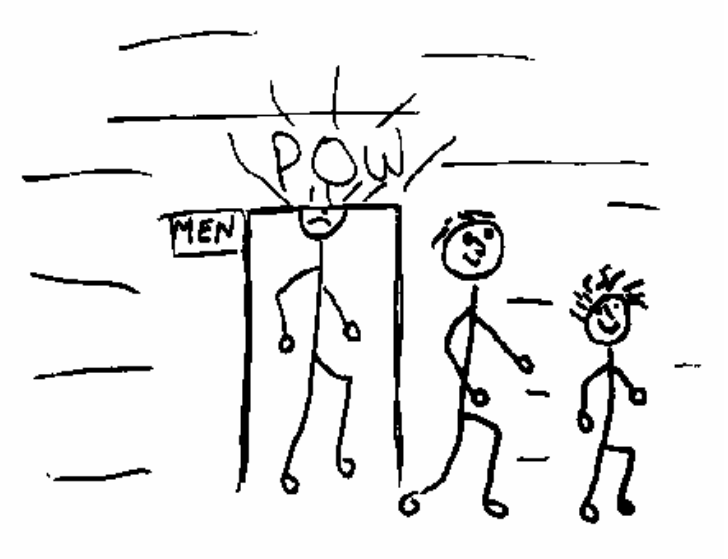
James Tam

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

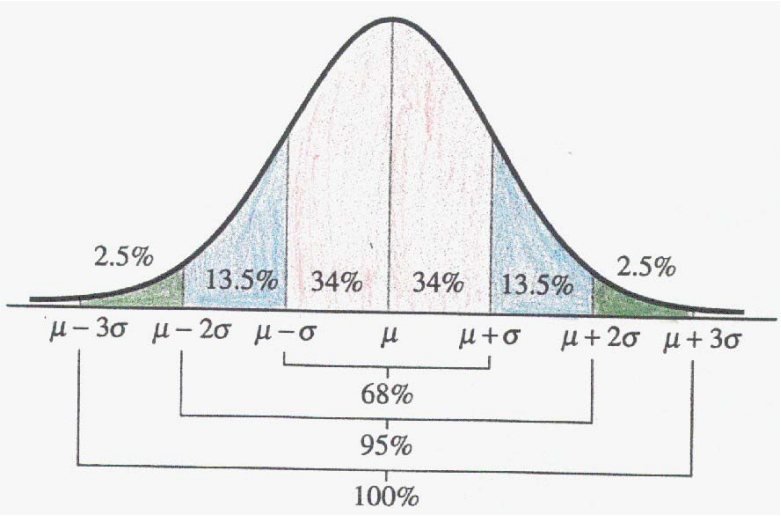


Diagram by Kathryn Schulte http://www.clc.mnscu.edu/kschulte/

James Tam

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.

James Tam

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

Why Design Is Hard

1) The number of things to control has increased dramatically

1950's – 1970's

1990's – 2000's

Why Design Is Hard (2)

2) Displays are sometimes overly abstract

- Red lights in car indicate problems vs. flames for fire

James Tam

Why Design Is Hard (3)

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

- Is the phone in call forwarding mode?
- Is your digital watch alarm on and set correctly?

- What is wrong with my printer?

James Tam

Why Design Is Hard (4)

What Do The Buttons/Lights Do/Mean?

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

Why Design Is Hard (6)

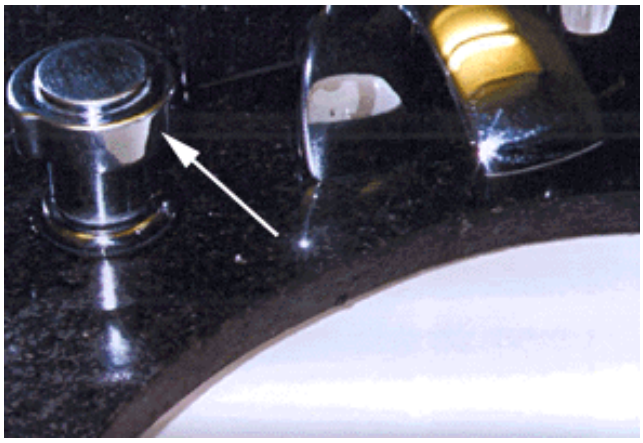
5) Marketplace pressures

- 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

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



www.baddesigns.com

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

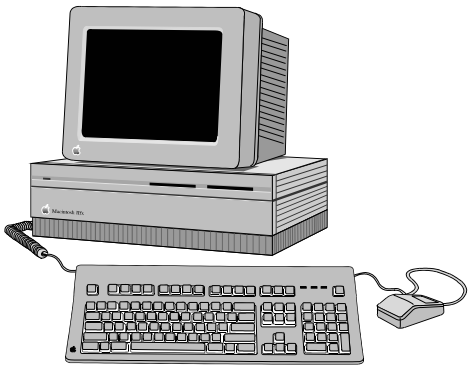
- "I was never very good with machines"
- "I knew I should have read the manual!"
- "Look at what I did! Do I feel stupid!"

From "The Simspons"

James Tam

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

James Tam

What You Now Know

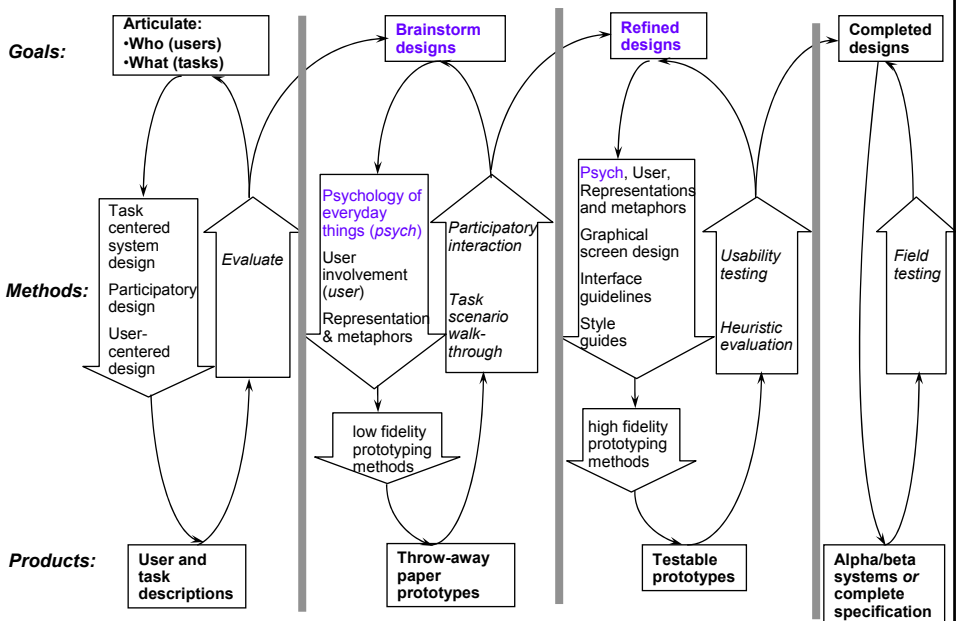
Many so-called human errors are actually errors in design
- Don't blame the user!

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



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