Psychology Of Everyday Things

You now know:

- many so-called human errors are actually errors in design
- human factors became important in WWII due to human performance limitations being reached when handling complex machinery

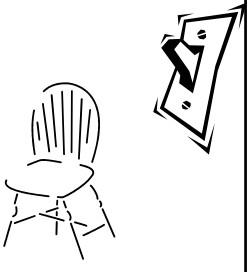
You will soon know these important concepts for designing everyday things

- affordances
- causality
- visible constraints
- mapping
- transfer effects
- population stereotypes
- conceptual models
- individual differences
- why design is hard

Making Things Work: Visual Structure

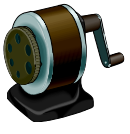
Visual Affordances

- 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



Low Level Affordances: Needs Familiar Idiom And Metaphor To Work

Sliders for sliding

Buttons for pressing (?)

Is this a button?

Dials for turning

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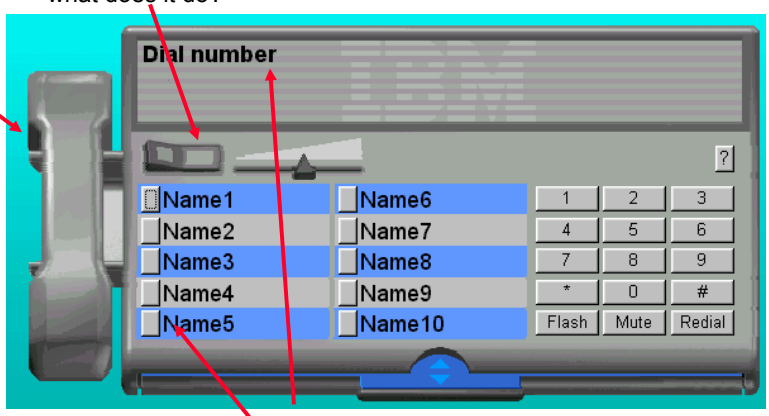
Some Non-Obvious Visual affordances

Is this a graphic or a control?

A button is for pressing, but what does it do?

Visual affordances for window controls are missing!



Text is for editing, but it doesn't do it.

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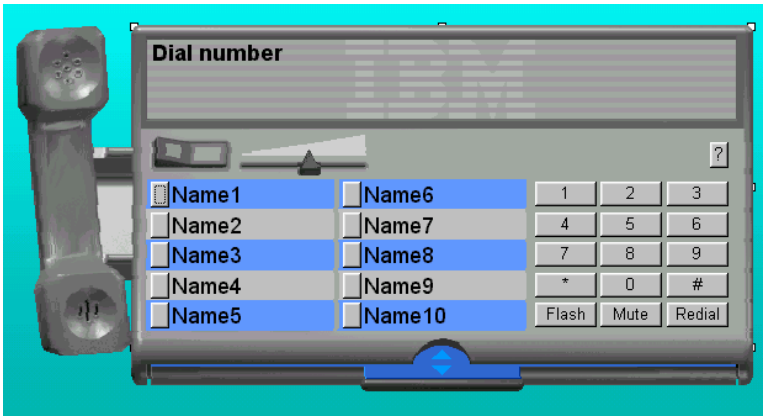
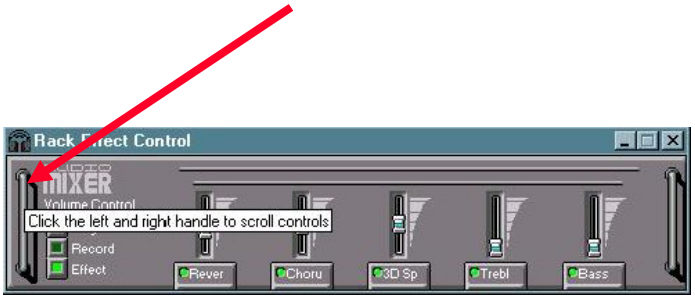
A Non-Obvious Visual Affordance



A Bad Affordance

Handles are for lifting, but these are for scrolling

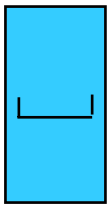


from *AudioRack 32*, a multimedia application

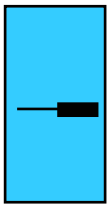
Making Things Work: Visual Structure (Continued)

Visible Constraints

- limitations of the actions possible perceived from object's appearance
- provides people with a range of usage possibilities



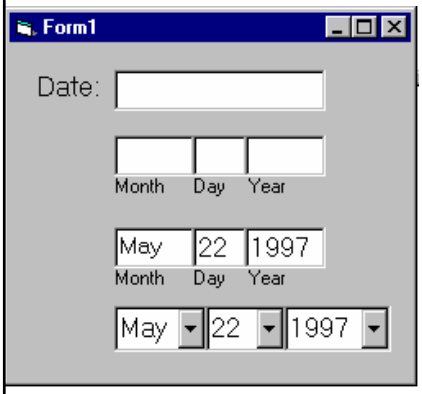
Which side?

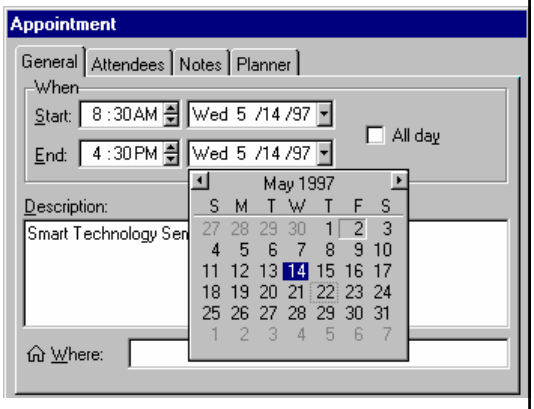


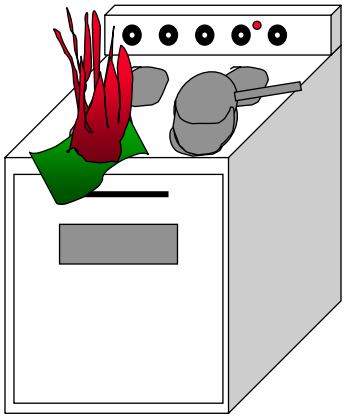
Push or pull?

Which way does it open?

A Progression of Visible Constraints To Enter A Date







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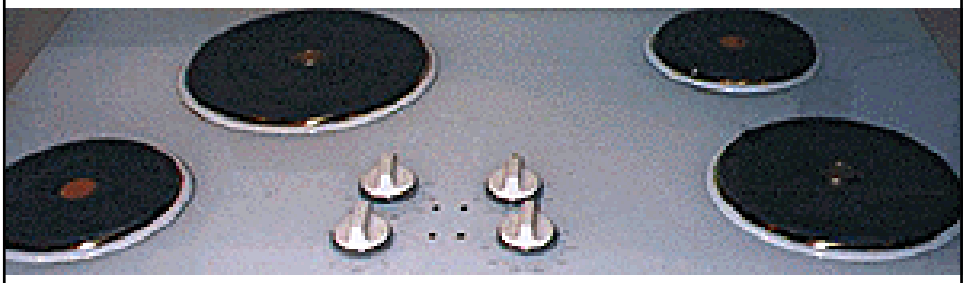
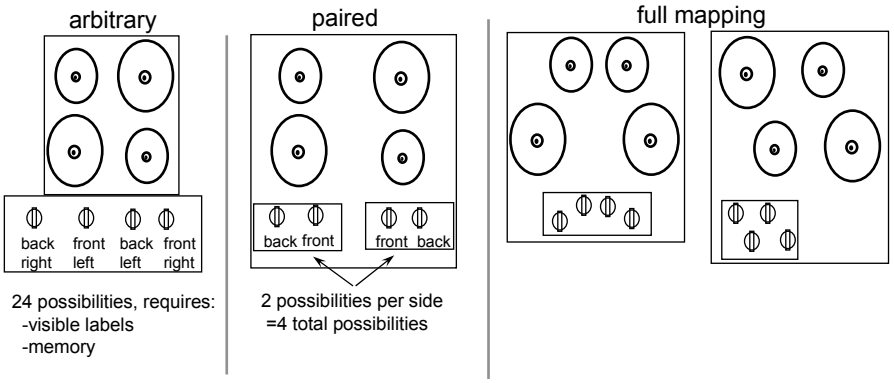


From www.baddesigns.com

Making Things Work: Visual Structure (Continued)

Mappings

- the set of possible relations between objects
- the natural relationship between two things
  -

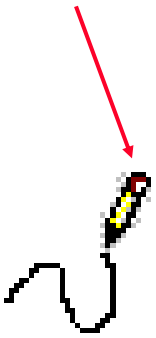


Mapping

Only active palette items visible

Depressed button indicates current mapped item

Cursor re-enforces selection of current item



Making Things Work: Understandable Action

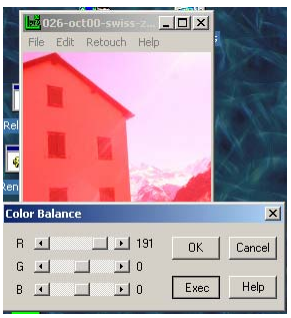
Causality

- 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
  - invisible effect

Lack Of Causality

Effects visible only after Exec button is pressed

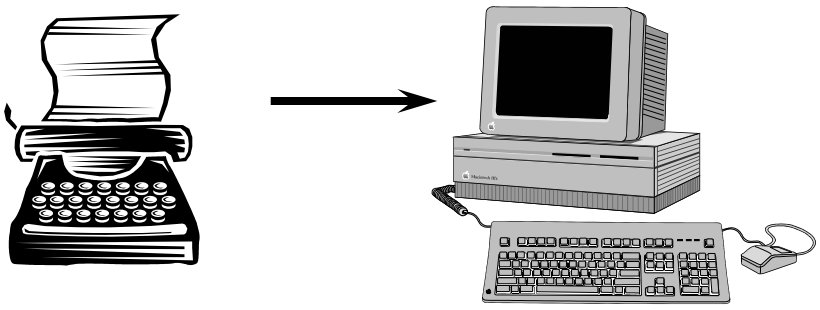
- *Ok does nothing!*
- *awkward to find appropriate color level*

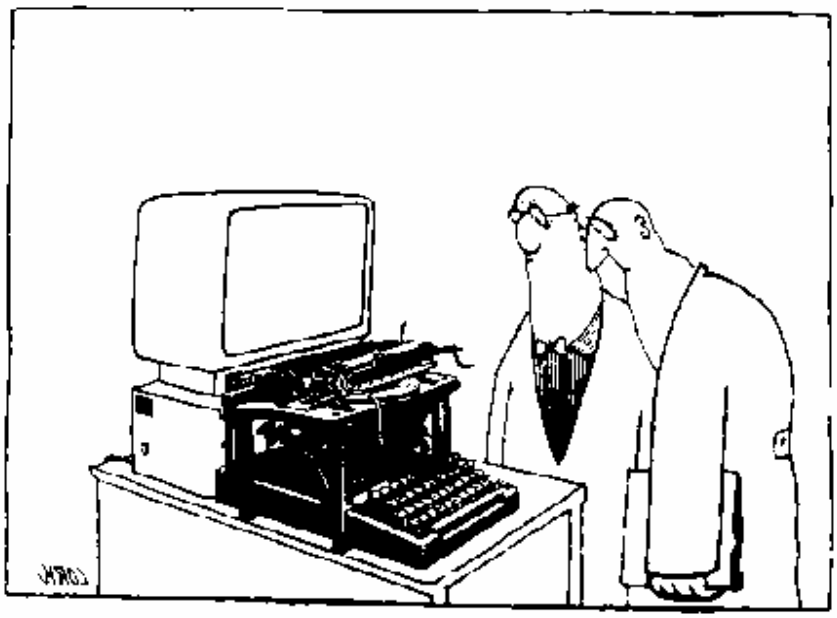


Making Things Work: Understandable Action

Transfer effects

- people transfer their learning/expectations of similar objects to the current objects (can be positive or negative)





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: anti-clockwise on
    - Britain: anti-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 to use

Cultural Associations

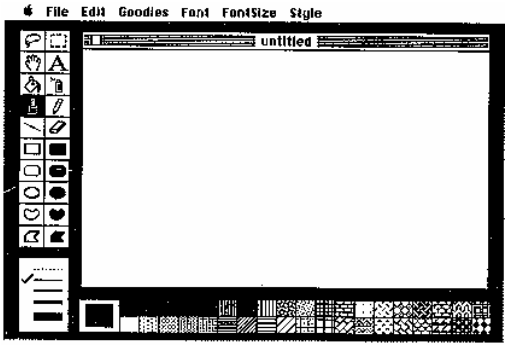
Because a trashcan in Thailand may look like this:

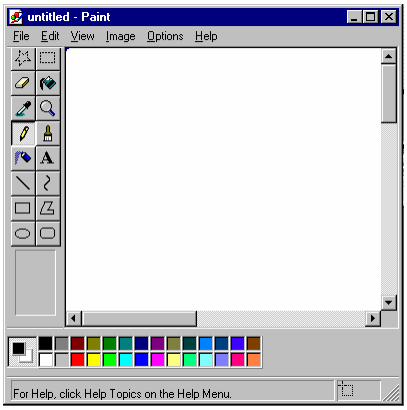
a Thai user is likely to be confused by this image popular in Apple interfaces:

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 Model

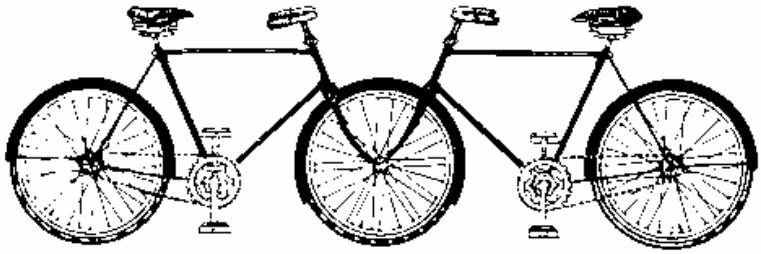
People have "mental models" of how things work

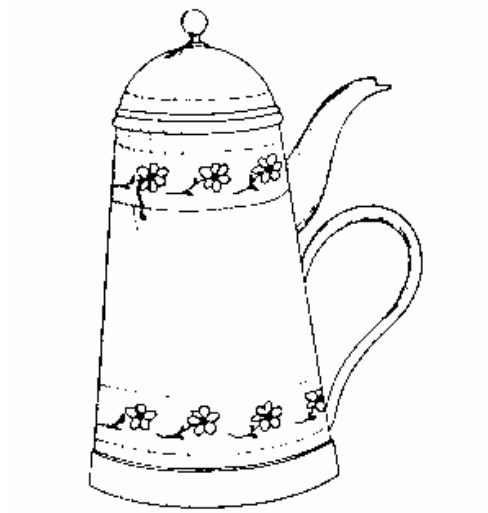
conceptual models built from:

- 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

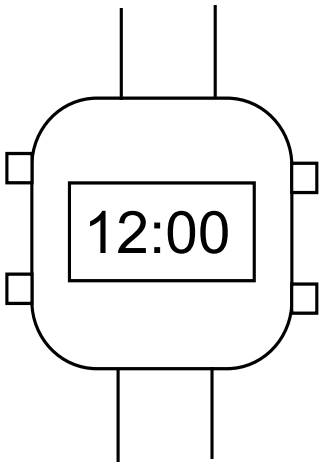
models allows people to mentally simulate operation of device





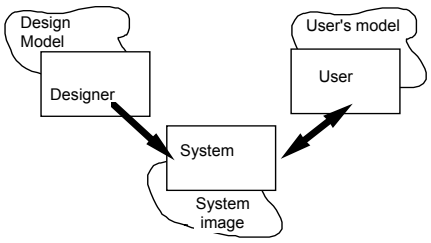
Example Of Good Design: Scissors

Example Of A Bad Design: Digital Watches



Two Guidelines For Design

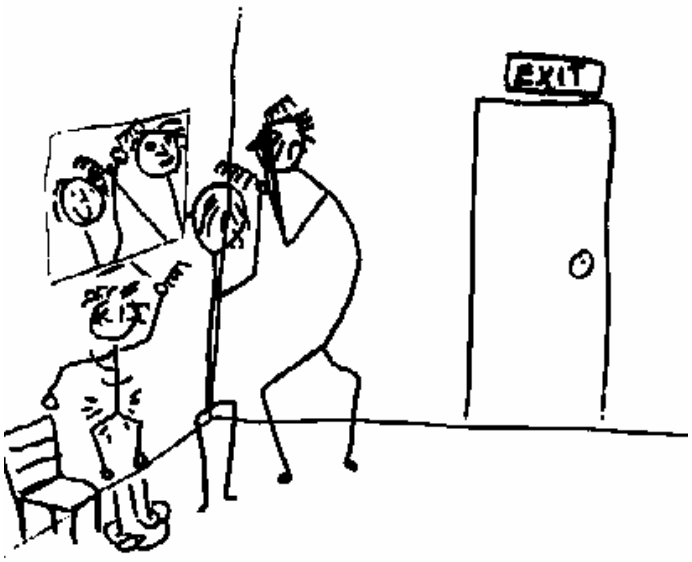
1. **Provide a good conceptual model**
   - Done through the system image



2. Make things visible
   - Provide affordances, constraints
   - Create good mappings

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

Who Do You Design For?



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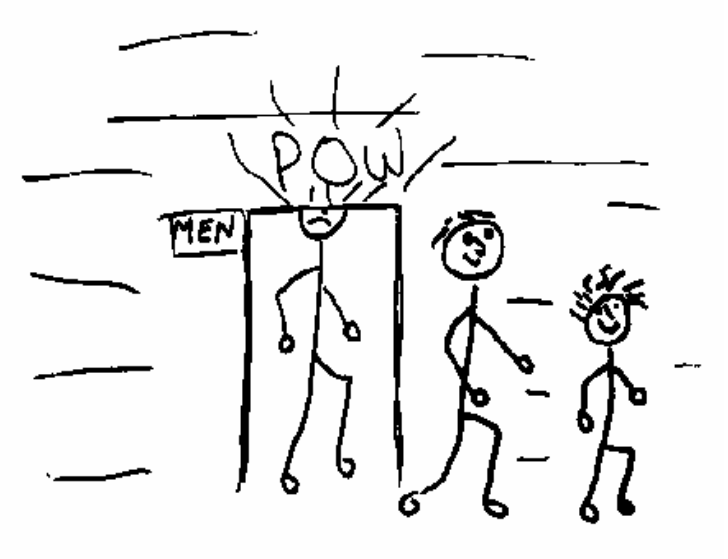


Who Do You Design For?

People are different

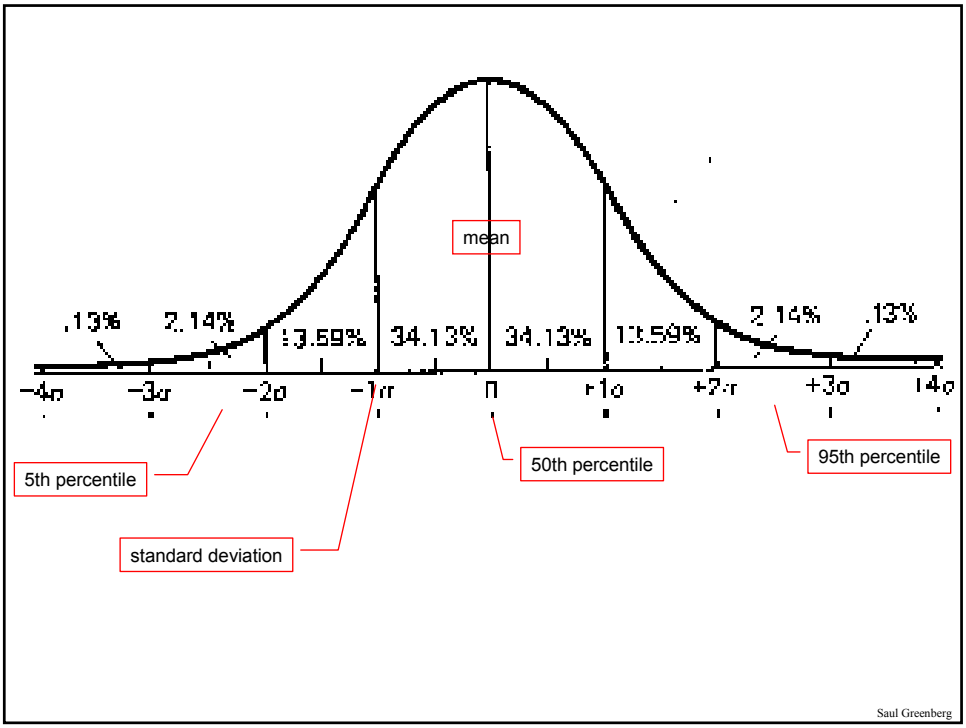
It is rarely possible to accommodate all people perfectly

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 a mistake
  - may exclude half the audience

Examples:

- cars and height: headroom, seat size
- computers and visibility:
  - font size, line thickness, color for color blind people?



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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?

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 use*
  interface affords full task customization

most kiosk + internet systems

most shrink-wrapped systems

custom software

Why Design Is Hard: Changes Over The Last Century

The number of things to control has increased dramatically

1950's – 1970's

1990's – 2000's

Why Design Is Hard (Continued)

- display is often increasingly artificial
  - red lights in car indicate problems vs. flames for fire
- feedback can be more complex, subtle, and less natural
  - is your digital watch alarm on and set correctly?
- errors increasing 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"

Why Design Is Hard (Continued)

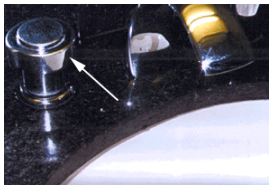
Marketplace pressures

- adding functionality (complexity) now easy and cheap
  - computers
- adding controls/feedback expensive
  - physical buttons on calculator, microwave oven
  - widgets consume screen real estate
- design usually requires several iterations before success
  - product pulled if not immediately successful

Why Design Is Hard (Continued)

People often consider cost and appearance over human factors design

- bad design not always visible

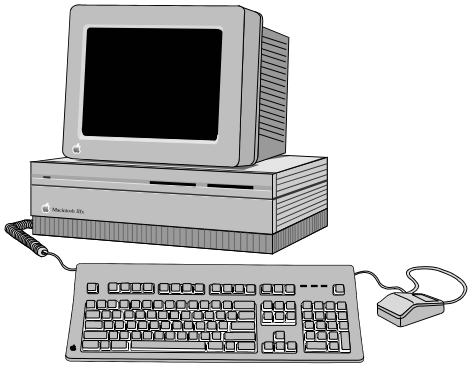


- people tend to blame themselves when errors occur
  - "I was never very good with machines"
  - "I knew I should have read the manual!"
  - "Look at what I did! Do I feel stupid!"

- e.g., the new 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)

Preview: Human factors In Computers

What does this do?



- computers 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

What You Now Know

Human factors comes of age in WWII
- human control of complex machinery could not be maintained even after high degree of training

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

Designers help things work by providing a good conceptual model
- affordances
- causality
- constraints
- mapping
- positive transfer
- population stereotypes

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

Design is difficult for a variety of reasons that go beyond design

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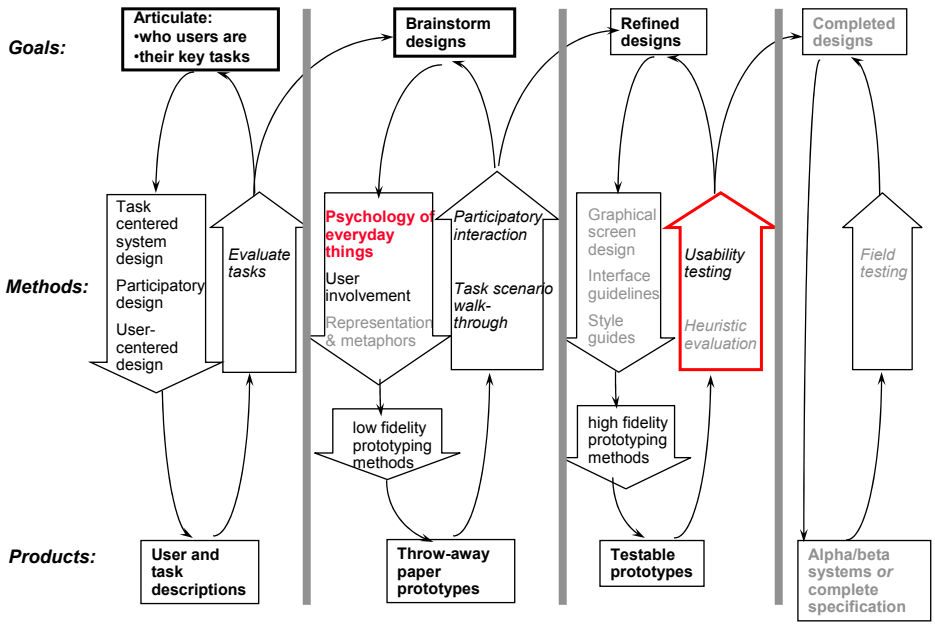
Interface Design and Usability Engineering



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