
# Design Concepts

## How do interfaces fail?

**Instructor: Parsa Rajabi**
**Department of Computer Science**
**University of British Columbia**

# Agenda

- Announcements
- Learning goals
- Readings: main takeaways
- UX + Usability Goals
- Design Concepts
- Activities + Discussion
- Wrap up

# Announcements

- Workshop balancing survey
  - Due tonight!
  - Workshops start **this week**!
- TCPS Ethics ⅓
  - Complete parts 1-3
- Team formation survey
  - To be released Friday, due next week
  - Get to know your (*new*) friends this week!

# Learning Goals

# Learning Goals

After this lecture, you should be able to:

- explain the relationship between the myth of human error and the goals of human-computer interaction
- list concepts / heuristics / principles for good / bad interaction design.
- be able to identify and critique strengths and weaknesses of a given interface in terms of this language.

# Psychopathology of everyday things

# *how interfaces fail: myth of human error*

# Main lessons from reading:
## *the psychopathology of everyday things*

### the myth of human error:

#### Lesson 1

- Failures of human-machine system are due to **poor designs**
  - that don't recognize people's capabilities and fallibilities
- This leads to apparent machine misuse and **"human error"**

#### Lesson 2

- good design accounts for **human limitations**.

# *know thy enemy and its name:*

## Motivate: good design?

- there are some **principles** for good design
- common failures often associated with their absence

## Learn: design principles

- can use principles to **analyze** and **critique** interfaces
- design better interfaces by applying them

## Apply: using the principles

- need to **use them judiciously**
  - Applied blindly, they will get you in trouble
- "Subjective?" A lot of *wrong* answers and only a few right ones.


JOHN DEERE
630
JOHN DEERE

# Early Tractors

## original design:

high center of gravity

narrow wheel base


## typical terrain:

un-surfaced, rough, hilly

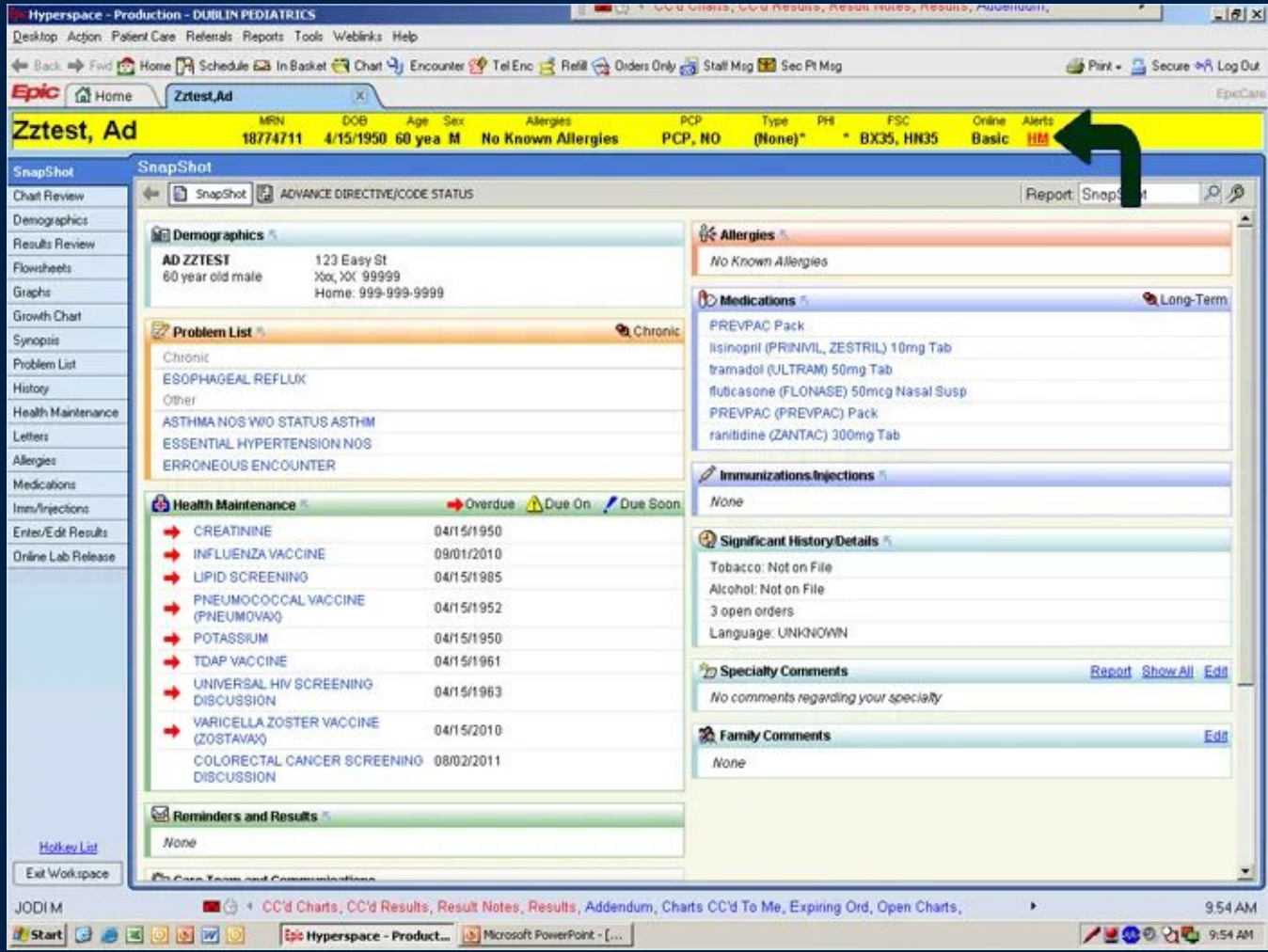
**frequent CRASHES → used to be called "driver's error"**

*but*, accidents became infrequent when designs changed to low center of gravity & wider wheel bases

Photo credit: John Schanlaub, 2009

# Traditional shifter vs. **monostable** shifter


# Patient Record System




https://medium.com/garyyauchan/flatiron-health-emr-product-case-study-edd85049d19

# The myth of human error

humans are **imperfect** and **unpredictable**.

- we have lousy memories
- we don't see what's really there
- we get confused when too much is going on
- we are easily distracted and don't pay attention
- we get tired or bored
- we don't say what we really mean

Need to design for human errors:

- many so-called human errors and "machine misuses" are actually errors in design

# Where do designers go wrong?

# UX + Usability Goals

# Interfaces can fail because of…

## functionality problem

what are the functions this object can perform?
will it do what I want?

## visibility problem

what mode is this object in?
which sequence of controls do I use to get what I want?

## negative transfer

what would happen if I do what I usually do?

# The blame game…
# where exactly do designers go wrong?

designers fail to …

- understand the range of users and their limitations
- understand contexts of use
- communicate *what* it does, *how* it works/worked, etc.

# The blame game…

# where exactly do designers go wrong?

***Goals:*** things that can be ***defined*** in a given context, and then ***evaluated***

designers don't always start with basic usability needs:

– might try to make it exciting or beautiful first.

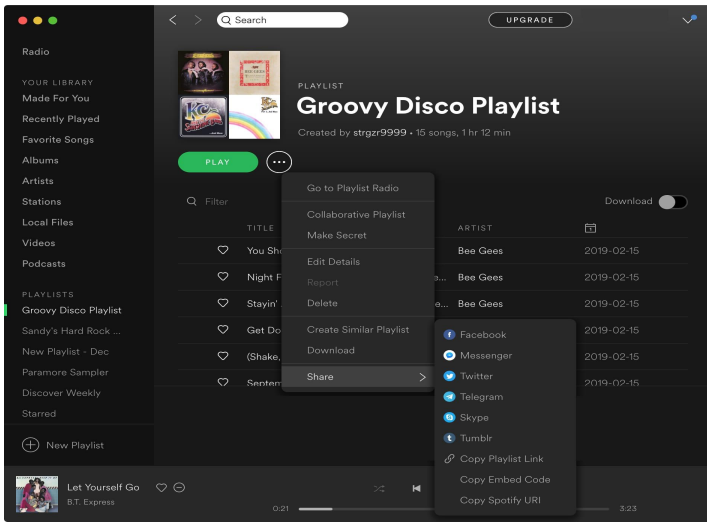




Photo credit: Constantin Iordache, 2014. Tuttebel, 2013. Mr.TinDC, 2011

# What makes interface design hard?

# the task of interacting is complex, often poorly defined

## tasks are implicit (and complex)

- the machine often doesn't "know" the user's goal.
- distribution of tasks between human & machine is a moving target

## interaction is unpredictable (and complex)

- cooperative (coordination is complicated)
- users change their minds & get distracted
- they use in unforeseen ways – then evolve that use.

## what makes interface design hard?

# market place pressures:

## users themselves don't always make good purchase choices

### adding functionality (complexity) is easy & cheap

- a faster clock speed, larger memory

### adding controls/feedback expensive + takes up space

- physical buttons, speakers, vibrators cost money and real estate

## what makes interface design hard?

# market place pressures:

## users themselves don't always make good purchase choices

### designer time is expensive

- design usually requires several iterations before success

### errors increasingly serious and/or costly

- airplane crashes, losing days-worth of work...

### some consumers value cost / looks over usability!

- looks great in store …but doesn't work the way you expected when you get it home

# Design Concepts

# What are the differences...

- ➔ interface VS interaction?
- ➔ usability/UX goal, design principle, and design concept?

# What is a Design Concept?

# what is a “design **concept**”?

design ***concept:***

- high level, abstract, ***descriptive***
- how we talk about “***properties***” of an interface
  - e.g., “signifier”, “visibility”
    (or relationship with a user in case of “affordance”)

# what is a “design **principle**”?

design ***principle / heuristic / guideline:***

- help you implement the concept
- typically ***prescriptive***: “do it this way”
  - can conflict – don’t follow slavishly
  - e.g., “provide a signifier that can clearly communicate proper affordances”

Neither are completely clear cut—can overlap

# Design Concepts

psychology of everyday things
Don Norman, 2013

## the basics:

(elements of these in many of the others)

- Visibility
- Feedback
- Affordance

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psychology of everyday things
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## the basics:

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- Visibility
- Feedback
- Affordance

## other concepts:

- signifiers
- mapping
- constraints (perceptible)
- transfer effects
- cultural associations
- individual differences

+conceptual (and mental) models

*(more on this in the coming weeks)*

# Visibility

# Visibility

➔ How **perceptible** a system status or a function is.

*more than just visual…*

Good to think about in relation to additional concepts:

- **Discoverability**
  Can the user easily perceive (encounter) the actions that they were not aware of?
- **Findability**
  Can the user easily find the actions that they assume is present?
- **Learnability**
  **“**How quick and easy a system is to learn to use (RSP)”


# This Barn Owl Baby Just Heard Thunder for the First Time | Wildlife Moments

6,720,740 views • Sep 30, 2019

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Robert E Fuller
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This barn owl chick has never heard thunder before. At just two and a half months old the young owl is only just learning about the world when a deafening thunderstorm passes overhead. This owl only took its first flight two weeks before this moment and is still using the nest for

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Funniest Animals - Awesome Funny Animals' Life...
Funniest Animals Ever
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# Feedback

# Feedback

➔ a **signal** from the system after an **action** is performed

Can the user correctly interpret the relationship between **their actions** and the **system's actions**?

- e.g. **good** feedback: when I type on my iPhone keyboard, a 'click' sound plays
- e.g. **no** feedback: when press a button, and nothing happens…what's wrong?
- e.g. **bad** feedback: when my computer is frozen, I bang on it, then it magically starts working again…



Door Lock

# Affordance

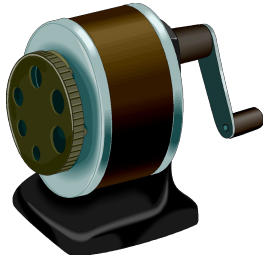
# Affordance

Normanian definition:

> “a ***relationship*** between the properties of an object and the capabilities of the agent that determine how the object could possibly be used”

# Affordance

Examples:



small, cylindrical, light ⇔ I can grab this.

flat, sturdy, not too high ⇔ I can sit on this.

chairs afford sitting… but so do tables, boxes, floor

- Affordance(s) Perceived
- Affordance(s)
- Signifier(s)


Photo credit: Ade Oshineye, 2012

# Constraint

# Constraint

➔ a **limit** on what we can do with a system.

*Plug shapes, Directions, …*

Photo credit: Jamie McCall, 2008

# Transfer Effect

# Transfer Effect

➔ when **knowledge** acquired earlier affects one's ability to learn/perform in another context.

*Can be positive or negative.*

# Transfer Effect

# Signifier

# Signifier

Normanian definition of ‘proper signifier’:

> “a perceivable indicator that communicates appropriate behavior to a person (DOET, Norman, 2013)”

*Definition from Semiotics: the material form of a sign.*

# Signifier

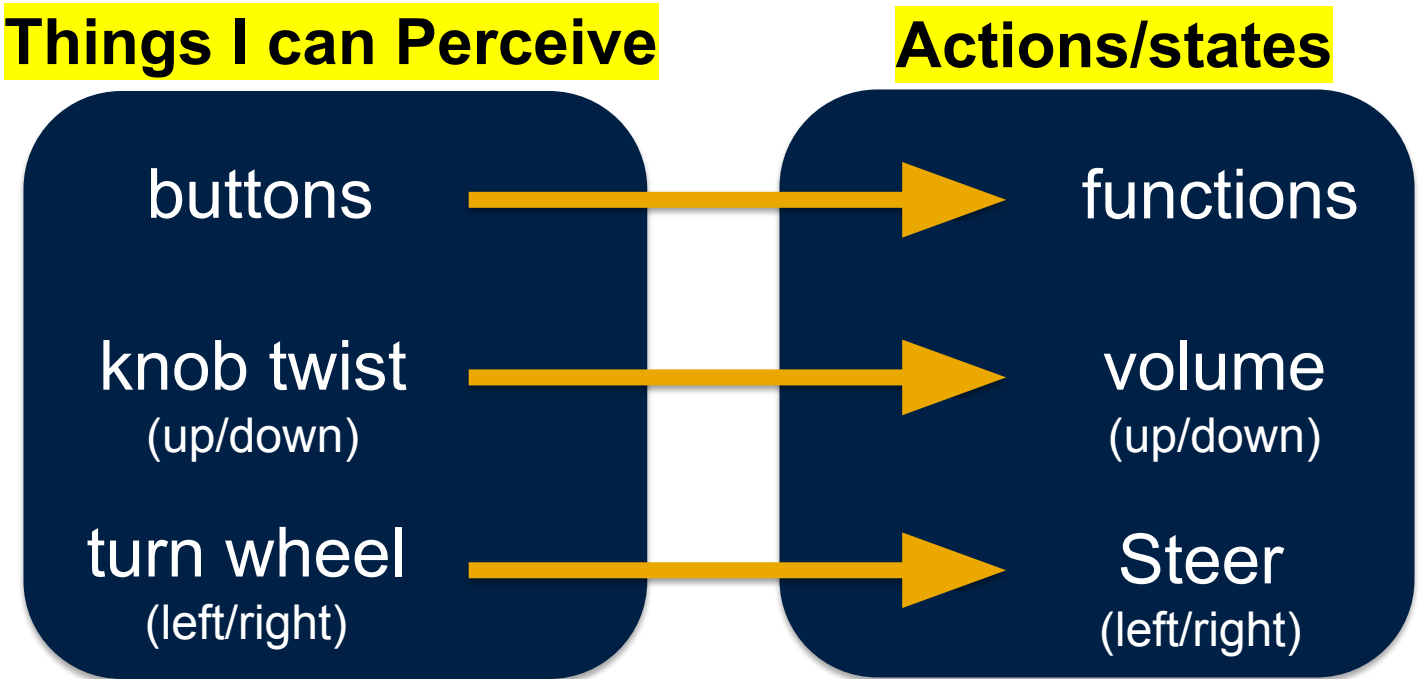
You manipulate signifiers to ***communicate*** an affordance.

- i.e. you change the ***properties*** of an object to tell people what they can do with it.

# Mapping

# Mapping

➔ A relationship between signifiers and functions/states of an interface. Can be natural or arbitrary



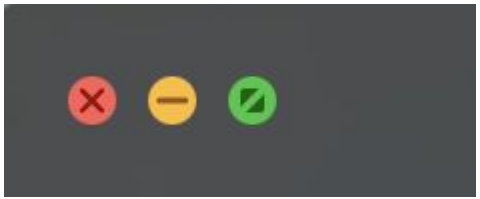
# Cultural Associations

# Cultural Associations

➔ Different cultures associate different meanings with different signifiers.

*Think about it*

- how do you know that red means stop?
- yellow means slow down?
- green means go?



➔ Culture, in this case, doesn't especially mean nationality.

# What cultural associations *do you* have that your parents *do not*?

# Individual Differences

# Individual differences

➔ Different people have different abilities, experiences, and values.

- Everyone's ***bodies*** are shaped **differently**.
- Everyone's ***histories*** are **varied**.
- Everyone's ***minds*** are (wildly) **different**.
- Everyone's ***goals*** are been **different.**
- Everyone's ***thoughts*** are **different.**
- Everyone's ***interpretation*** are **different.**

# Individual differences

➔ As a designer, you can try to:

a) design for the average
- *does this exist?*
- *Why is this **problematic**?*

b) design for specific groups
- *how do you **choose** which groups?*

c) design for **personalization**
- *not easy!*

# They are complicated!

As designers, you are defining systems, and implement structures that create *culture*.

It's YOUR responsibility to think about the world as a complicated, ethically fraught place.

# Always ask...

1) Who are my **users**?
2) What are their **needs**?

# Class Activity

# Activity I: [**10 mins**]
# Good and bad interfaces around you

## how to talk like a UX/UI designer…

Tips:

1. Work on a ***design*** problem. If your problem is purely technical, like “my home WiFi signal being too weak and video streaming is delayed,” applying design concepts can be challenging.

2. When selecting an example, it's important to consider whether the explanation ***requires*** the use of design concepts covered in the pre-readings. In other words, you can think backward and choose an example that calls for the use of those concepts.

# Activity II **[25 mins]**
# Applying design concepts to doors

Analyze a simple object that should be straightforward to use: **a door**.

(1) ***[1 min]*** for each door :

- think about how you'd interact with it
- circle: side (left/right) and direction (towards/away) that it opens

if there's more than one possibility record what you would try first.

*also in DOET – but think about it some more*

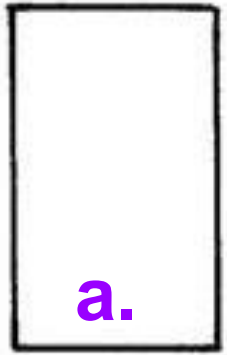
# (2) ***[2 min]*** for each door

For each, discuss the **most relevant design concept(s)**

- Affordance
- Signifier
- Mapping
- Visibility
- Constraints
- Feedback
- Transfer effects
- Individual differences

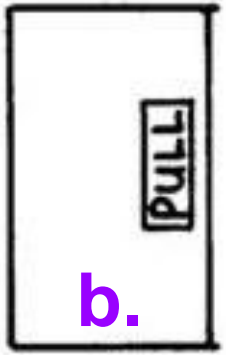
which door do you think has the most **usable** design? **Why**?

PLAIN DOOR



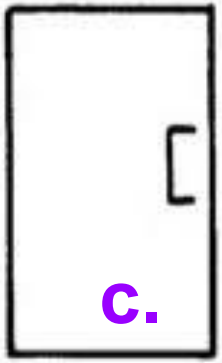
a.

LABELED DOOR



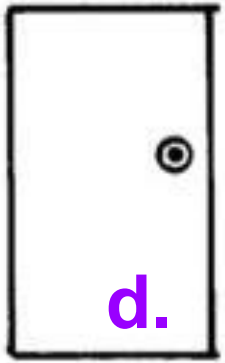

b.

HANDLE DOOR



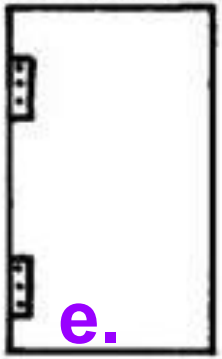
c.

KNOB DOOR



d.

HINGE DOOR

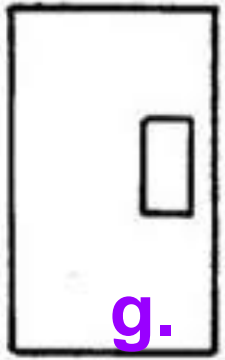


e.

BAR DOOR

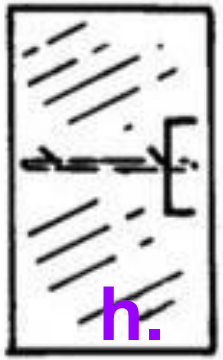
f.

PANEL DOOR



g.

GLASS DOOR



h.

# Your worksheet

affordance?

signifier?

constraint?

transfer effect?

visibility?

feedback?

what else?

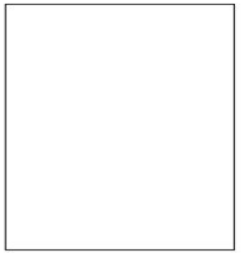
Full Name: _____

Student ID: _____

**Worksheet: Good and Bad Interfaces Around You**

**Activity I**

1. Think of: a [technological] interaction from last week that irritated you
2. Draw it, any way you like:



3. Write / diagram exactly HOW it failed for you.
4. Now, dig deeper: write / diagram WHY it failed as best you can.
5. Set down your pencil/pen.

# Look at your worksheet, Activity I

Who drew in the box, instead of outside of it?

- why?

What does this have to do with **design**?

# Self-testing Exercise

# Which design concept do each slide describe?

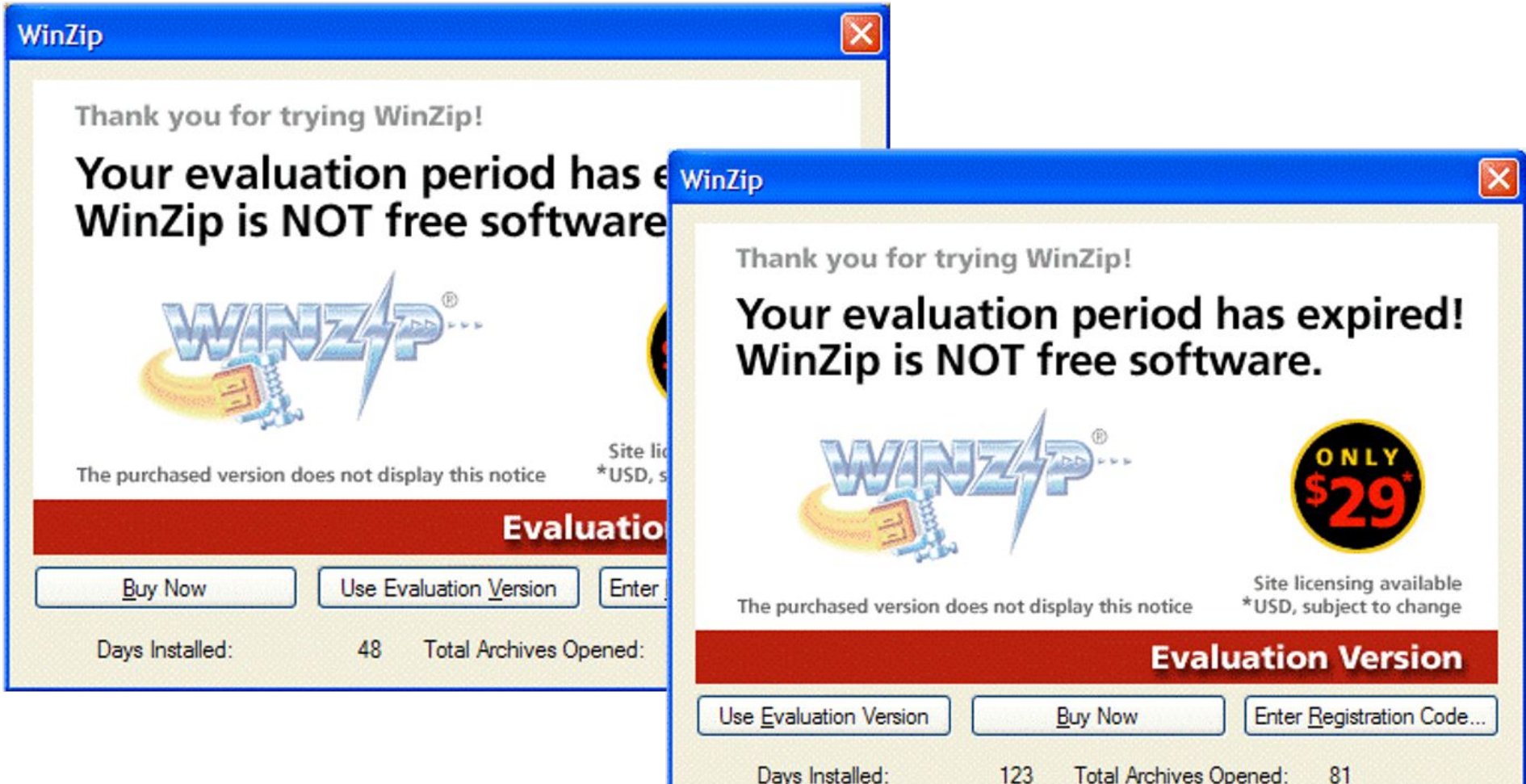
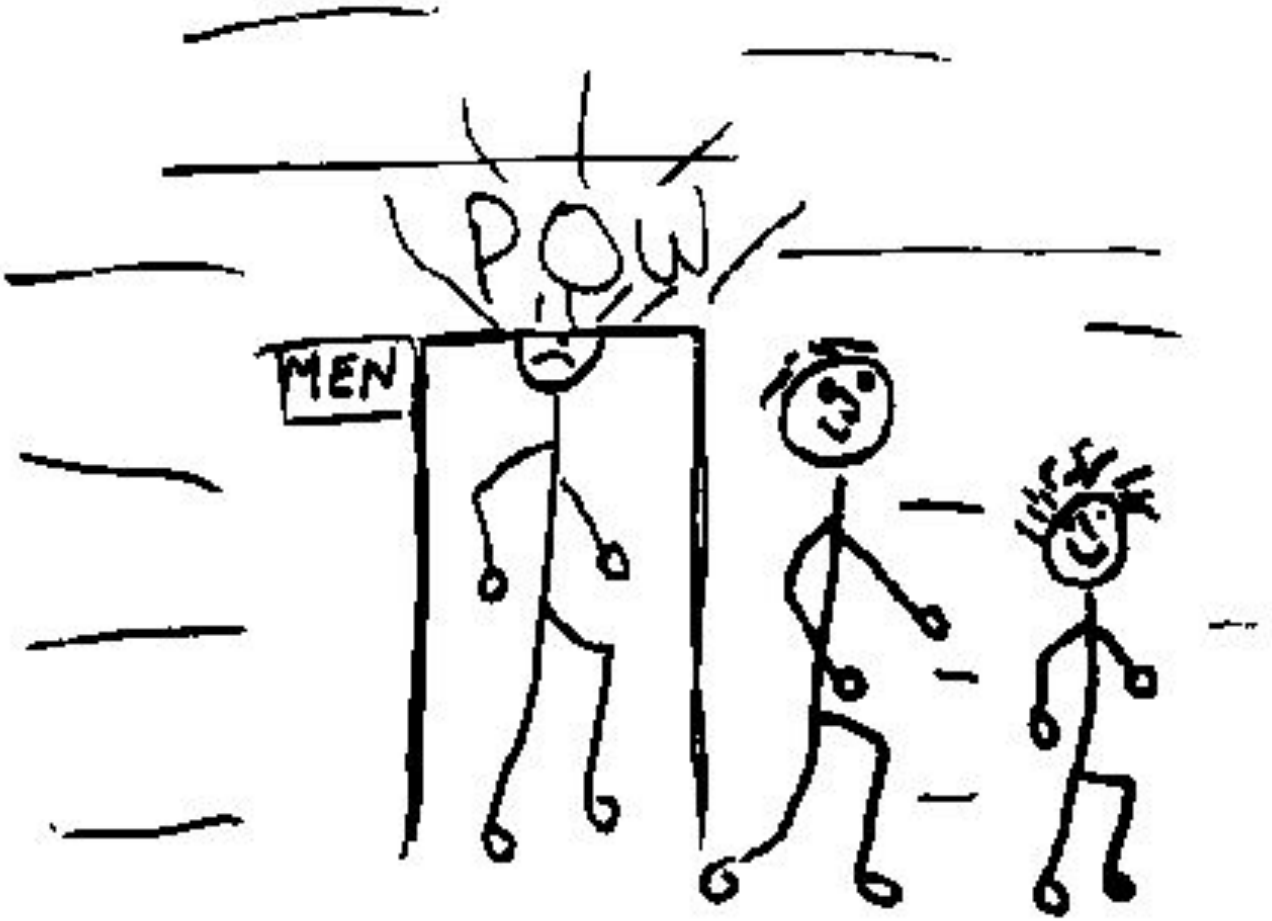

WinZip
Thank you for trying WinZip!
Your evaluation period has e
WinZip is NOT free software
The purchased version does not display this notice
Evaluatio
Buy Now
Use Evaluation Version
Days Installed: 48
Total Archives Opened:
WinZip
Thank you for trying WinZip!
Your evaluation period has expired!
WinZip is NOT free software.
ONLY $29*
The purchased version does not display this notice
Site licensing available
*USD, subject to change
Evaluation Version
Use Evaluation Version
Buy Now
Enter Registration Code...
Days Installed: 123
Total Archives Opened: 81


Photo from Don Norman's "good design" gallery:
http://www.jnd.org/GoodDesign.html


POW
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OFF
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200
150
ON
200 230 260
400 450 500
OVEN
HOTPLATES
GRILL
Centenary

Because a trashcan in some places may look like this:

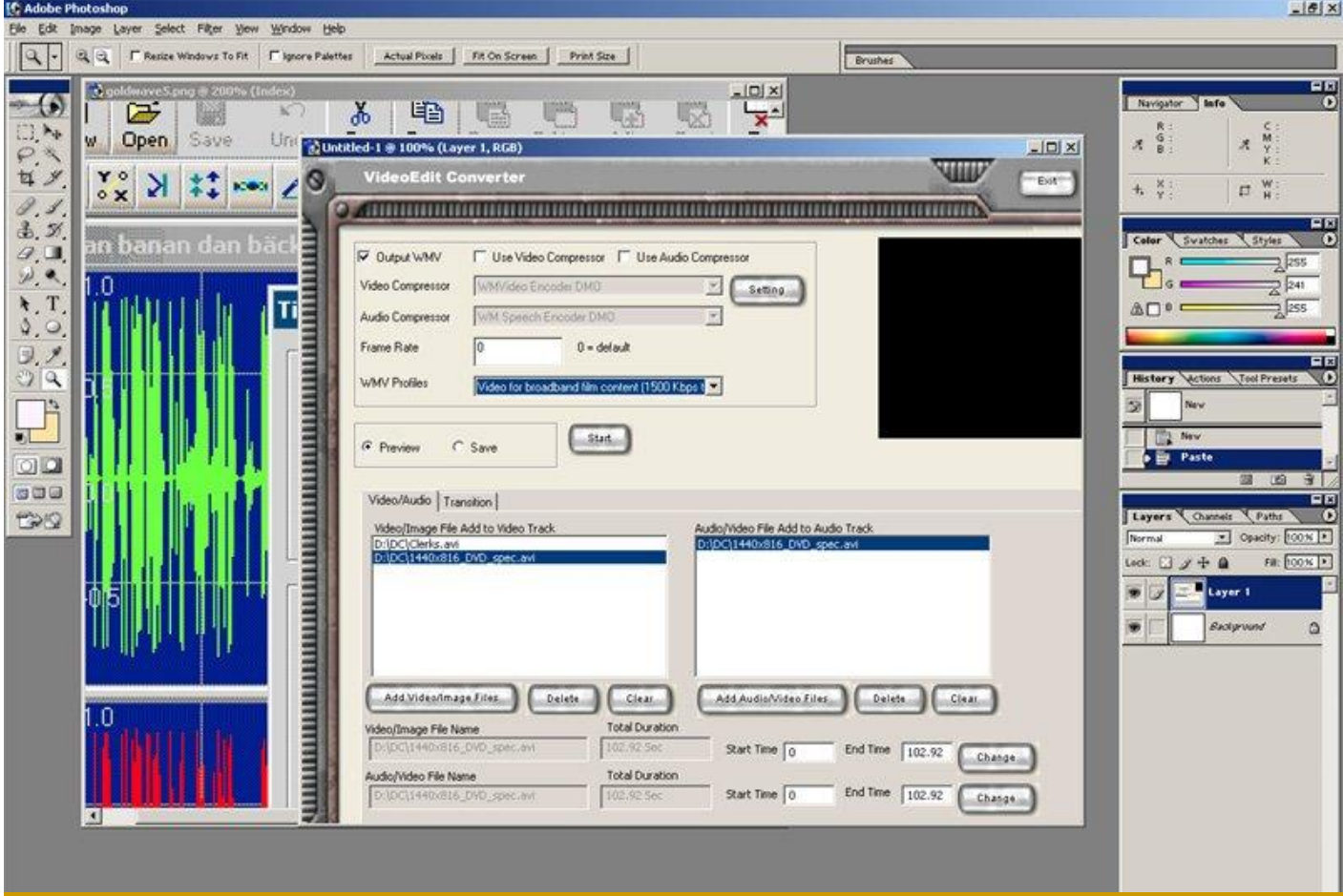
International users might be confused by this image in Apple interfaces:

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


If you've never actually **used** a tape recorder

…does this user interface represent music? (iOS 6)

# Visibility: photoshop

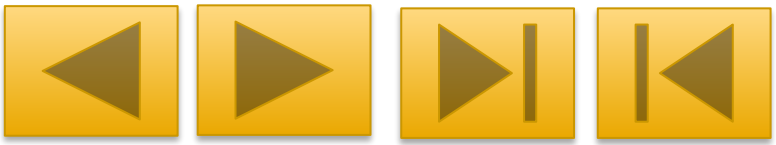



Note: two editing windows overlapping, both contain UI shots
Good UI? Visible? Maybe for some but not others.

# What is mapping?

- The set of possible / natural relations between objects

  e.g. control-display compatibility:
  - visible mapping and mimic diagrams: rewind, fast rewind, play, fast forward
  - cause and effect: steering wheel-turn right, car turns right



arbitrary; placement of button doesn't help

placement of buttons mimics sequence of actions

# Example of mappings

Cursor re-enforces selection of current item

Only active pallette items visible

Depressed button indicates current mapped item