

Design Concepts

How do interfaces fail?

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

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

Announcements

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

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.

Main lessons from reading:

the psychopathology of everyday things

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.



Early Tractors

frequent CRASHES → used to be called “driver’s error”
but, accidents became infrequent when designs changed to
gravity & wider wheel bases

typical terrain:

un-surfaced, rough, hilly

original design:

Photo credit: John Schanlaub, 2009

narrow

wheel base

high center

of gravity





Traditional shifter vs. monostable shifter



Patient Record System

<https://medium.com/garyyauchan/flatiron-health-emr-produ>

The screenshot displays the Flatiron Health EMR interface. At the top, a navigation bar includes links for Home, Schedules, Lab Requests, Chat, Encounters, Task Manager, Orders Only, Staff Management, Secure, and Logout. A yellow arrow points to the 'Logout' button.

The main window shows a patient record for "Ztest, Ad". The patient's information includes: ID: 00171011, DOB: 07/05/50, Age: 60 yrs M, No Known Allergies, KOP: POP, RD: [None], FSC: [None], and DR: Basic. The 'Advanced Objective/Code Status' section shows "AD ZTEST" and "60 year old male".

On the left, a sidebar lists various medical sections: Chart Review, Demographics, Results Review, Graphs, Growth Chart, History, Problem List, Health Maintenance, Lab, Allergies, Medications, and Select DR Results. Below this is a "Holds/Lab" section.

The central area contains several panels:

- Problem List:** Shows a single entry: "ESOPHAGOGAL REFLUX DISEASE".
- Health Maintenance:** Lists immunizations: CREATINE, INFLUENZA VACCINE (04/15/1955), LIPO SCREENING (04/15/1955), PNEUMOCOCCAL VACCINE (04/15/1955), POLIO VACCINE (04/15/1955), TOBACCO VACCINE (04/15/1955), UNIVERSAL HPV SCREENING (04/15/1953), and VARICELLA-ZOSTER VACCINE (04/15/2010). It also lists colorectal cancer screening (04/02/2011).
- Allergies:** Lists "No Known Allergies".
- Medications:** Lists medications: PREVACIP Pack (Inhaler IPATOL, 250ML 15mg Tab), Rulacicone (FLONASE 50mg Nasal Susp), PREVACIP (PREVACIP) Pack (Inhaler DENTAC 300mg Tab).
- Immunizations/Injections:** Lists immunizations: INFLUENZA VACCINE, TOBACCO VACCINE, and PNEUMOCOCCAL VACCINE.
- Specific Comments:** Notes "No comments regarding your specialty".
- Family Comments:** Notes "None".

At the bottom, a footer bar includes links for CCR Charts, CCR Results, Result Notes, Results Addendum, Charts CCR To Me, Expiring Ord, Open Charts, and Microsoft Internet Explorer.

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

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?

Interfaces can fail because of...

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

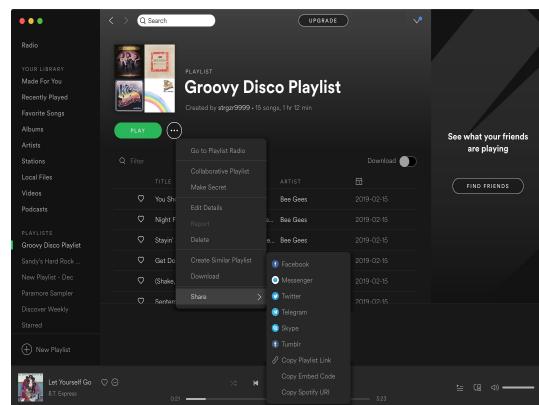
designers don't always start with basic usability needs:

- might try to make it exciting or beautiful first.

The blame game...

where exactly do designers go wrong?

Photo credit: Constantin lordache, 2014. Tuttebel, 2013. M



What
makes interface
design hard?

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.

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

what makes interface design hard?

market place pressures:

users themselves don't always make good purchase choices

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

the basics:

(elements of these in many of
the others)

- Visibility
- Feedback
- Affordance

psychology of everyday things

Don Norman, 2013

Design Concepts

other concepts:

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

psychology of everyday things

Don Norman, 2013

+conceptual (and mental) models
(more on this in the coming weeks)

the basics:

(elements of these in many of
the others)

- Visibility
- Feedback
- Affordance

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)"

YouTube Search

Up next

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

This Barn Owl chick has never heard thunder before. As you can see it is half-moon old, the young will only just be coming about the world when it's striking the moment it passes overhead. This owl took its first flight one week before this moment and is still using the nest for

Robert E Fuller 6,251,748 views · Sep 02, 2019

312K 1.8M SHARE 5.6K SALES

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Barn Owl Live Cam | See 2 Barn Owls Nesting in North Yorkshire...

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"

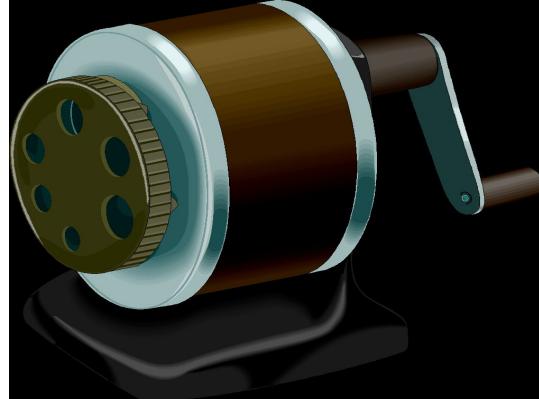
Affordance

Examples:

small, cylindrical, light \Leftrightarrow I can grab this.

flat, sturdy, not too high \Leftrightarrow 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

→ a limit on what we can do with a system.

Plug shapes, Directions, ...

Constraint

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



Signi
er

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.

Signifier

Mapping

Mapping

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

Things I can Perceive

Actions/states

buttons

functions

knob twist

(up/down)

volume

(up/down)

turn wheel

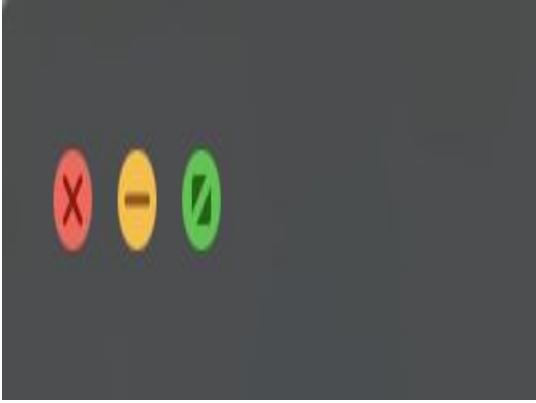
(left/right)

Steer

(left/right)

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.
- Cultural Associations



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

→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!

Individual differences

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 :

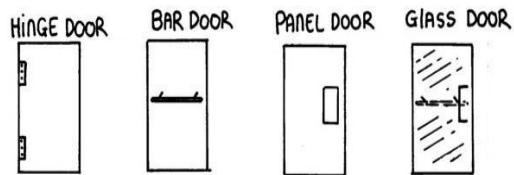
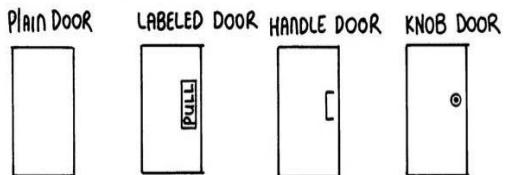
- think about how you'd interact with it
 - circle: side (left/right) and direction (towards/away) that it opens
- if there's more than one possibility record what you would try first.
- also in DOET – but think about it some more

For each, discuss the most relevant design concept(s)
which door do you think has the most usable design? Why?

- Constraints
 - Feedback
 - Transfer effects
 - Individual differences
- (2) [2 min] for each door
- Affordance
 - Signifier
 - Mapping
 - Visibility

how do you interact with each door?

- a.
- b.
- c.
- d.
- e.
- f.
- g.
- h.



Your worksheet
affordance?
signifier?
constraint?
transfer effect?
visibility?
feedback?
what else?

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?

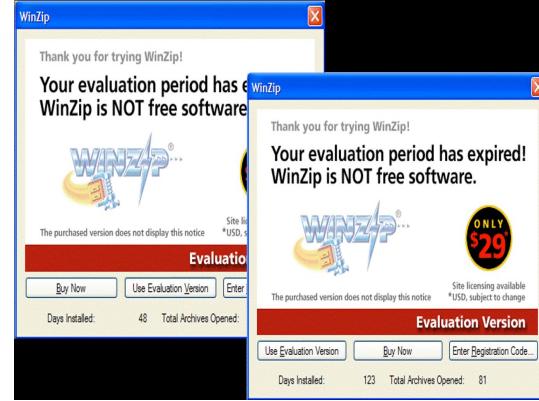
- why?

What does this have to do with design?

**Self-testing
Exercise**

Which design
concept do each
slide describe?

intentional inconsistency/negative transfer

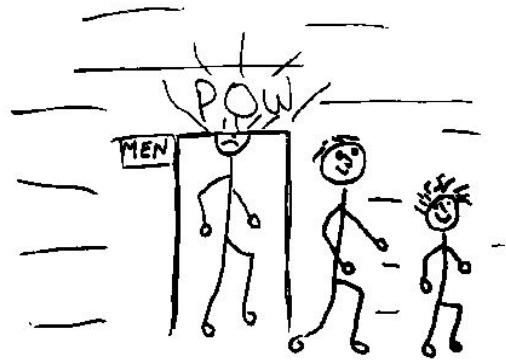


physical
affordance

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



individual differences

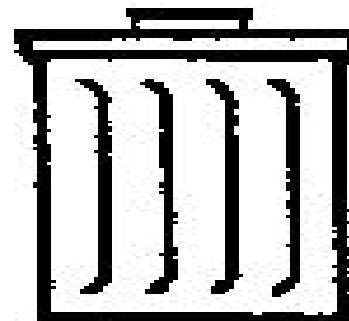


mapping pic



cultural
idioms

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.

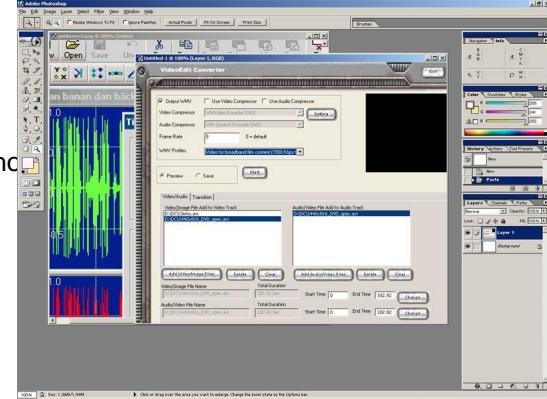


If you've never actually used a tape recorder
...does this user interface represent music? (iOS 6)



Visibility:
photoshop

Note: two editing windows overlapping, both contain UI showing
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

Only active

pallette items

visible

Depressed button

indicates current

mapped item

Cursor re-enforces

selection of current item

