M. Weintraub, F. Tip

USER EXPERIENCE (UX) / USER INTERFACE (UI)

Thanks go to Joel Angiolillo, Demetrios Karis, and Bob Virzi for their insights and help developing this section.

Thanks go to to Rahul Premraj and Andreas Zeller for allowing incorporation of their materials.

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OBJECTIVE

- Understand what user experience (UX) means and how it matters
- Understand how to approach UX and usability
- Understand how to approach UI design

WE ALL EXPERIENCE USER INTERFACES

USER INTERFACES OF A DIFFERENT SORT

WHAT IS GOOD DESIGN?

Did you ever see the time actually set on one of these?

SOME ARE CONFUSING

REALLY CONFUSING

SOME THINGS ARE WELL DESIGNED

WHAT IS USER EXPERIENCE? (UX)

Puts the end user at the center of the universe and defines the system from that perspective

Usability is finding the best match between a user's needs and a product's use

While this is a specialty by itself, a computer scientist/developer can grow an appreciation for UX, which affects

1. Functionality
2. System Organization and Structure
3. Interactions and Look and Feel
4. Access

WHAT IS USER INTERFACE? (UI)

Human-Computer Interaction (HCI) research is focused on the interfaces between people (users) and computers.

The point of interaction or communication between a computer and another entity, such as a printer or human operator. Information flows in one direction or two.

The layout of an application's graphic, spoken, touch, or textual controls in conjunction with the way the application responds to user activity.

UI fulfills two key UX needs:

3. Interactions and Look and Feel
4. Access

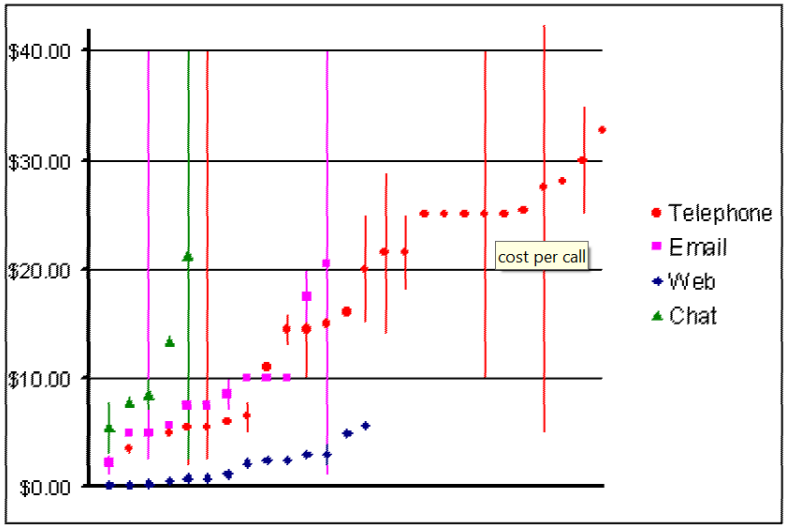
WHY DO WE CARE ABOUT UX/UI?

Because it matters

POOR UX MEANS PEOPLE WON'T USE YOUR PRODUCT

People will call tech support

Dated Study Of What A Call To Tech Support Costs



from "Benchmarking in Call Centers," Diagnostic Strategies, (very dated data)

http://easyerlang.com/pdfs/Call-Center-Benchmarking.pdf.

People won't use it even when it works and will return it

E.g. an ISP had 30% of routers returned as non-working *but they tested fine*

People won't buy your product and worse, will tell their friends not to use it

Measured by negative impact on Net Promoter Score (NPS)

- *Gauges the loyalty of a firm's customer relationships.*
- *Is thought to be correlated with revenue growth.*

https://en.wikipedia.org/wiki/Net_Promoter

UX MATTERS – A TALE OF TWO MP3 PLAYERS

Diamond Rio (1998)

Apple (2001)

Roxio emphasized an experience similar to the then familiar, *Sony Walkman,* and emphasized a digital experience like listening to cassettes

- The user experience was around “pushing play”
- The design emphasized the Walkman design

Diamond bought by S3 Graphics for $100M+ in Late 90’s.

S3 Graphics reformed as SONICBlue, went chapter 11 in 2003.

APPL traded at ~$1.37/share on 10/23/2001 (ipod launch). Since, it has grown by 10,714.51% (as of 2/9/2017)

Apple created an experience around creating and playing “mixes” – what went on the tapes

- the user activities emphasized making playlists, acquiring tunes, and playing music
- The design emphasized one thumb simple

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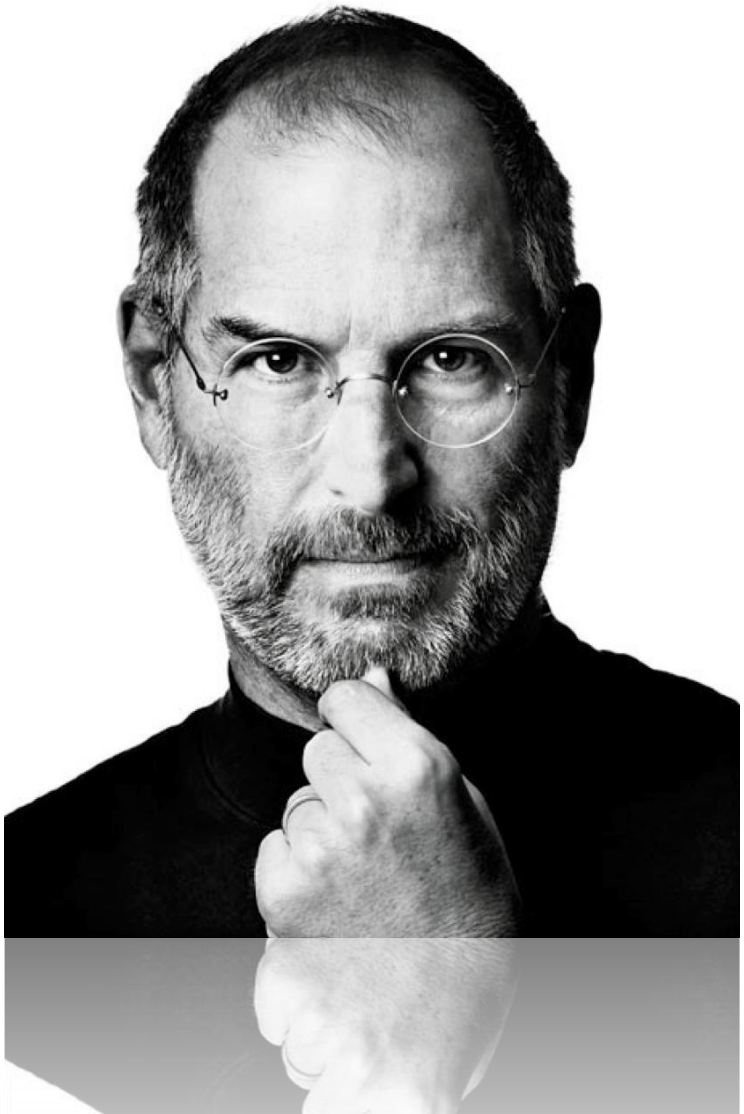
WHAT IS DESIGN?

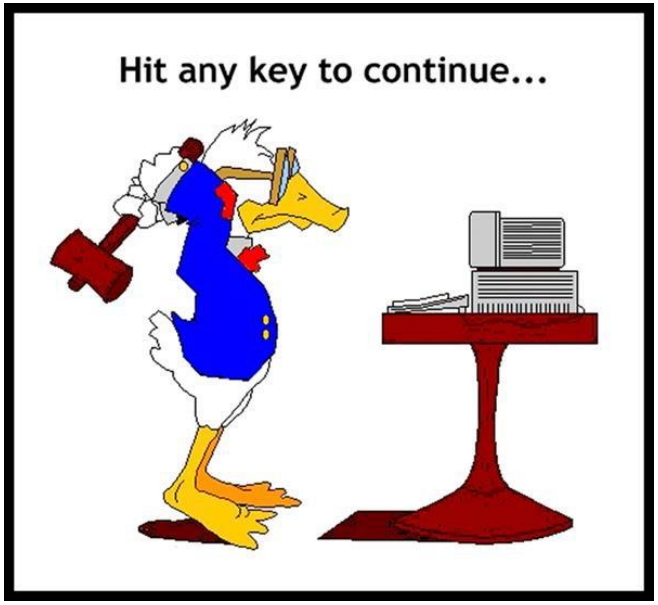


"Most people make the mistake of thinking design is what it looks like. People think it's this veneer – that the designers are handed this box and told, 'Make it look good!' That's not what we think design is. It's not just what it looks like and feels like. **Design is how it works**."

Steve Jobs

R. Walker, The Guts of a New Machine, New York Times Magazine, Nov. 30, 2003

DESIGN IS HARD



DESIGN IS EASY TO OVERDO

WHAT IS A GOOD DESIGN?

A solution that serves the users
and satisfies the client

1. Does what the users need and want
2. Natural to use
3. Helps them avoid trouble

Easy to say, very hard to do well

USER CENTERED DESIGN

Puts the end user at the center of the universe and defines the system from that perspective

So, who or what is a user?

HUMAN CAPABILITIES

1. Memory
2. Attention
3. Visual and Audio Perception
4. Learning
5. Language + Communication
6. Touch
7. Ergonomics (sense of fit)

VALUES & SENSIBILITIES

1. Level of experience
2. Physical or mental capabilities and limitations
3. Cultural expectations
4. Language differences
5. Senses of style
6. Have different needs or values

- *E.g., I want fast acceleration, but you want good fuel economy*

HUMAN CAPABILITIES

1. Memory
2. Attention
3. Vi
   Pe
4. Le
5. La
   Co
6. To
7. Ergonomics (sense of fit)

VALUES/SENSIBILITIES

1. Level of experience
2. Physical or mental
   capabilities and

s
s
or

Challenge: there is *no one User*.

If there was, we would all be driving the same car, wearing the same shoes, and using the same computer.

- *E.g., I want fast acceleration, but you want good fuel economy*

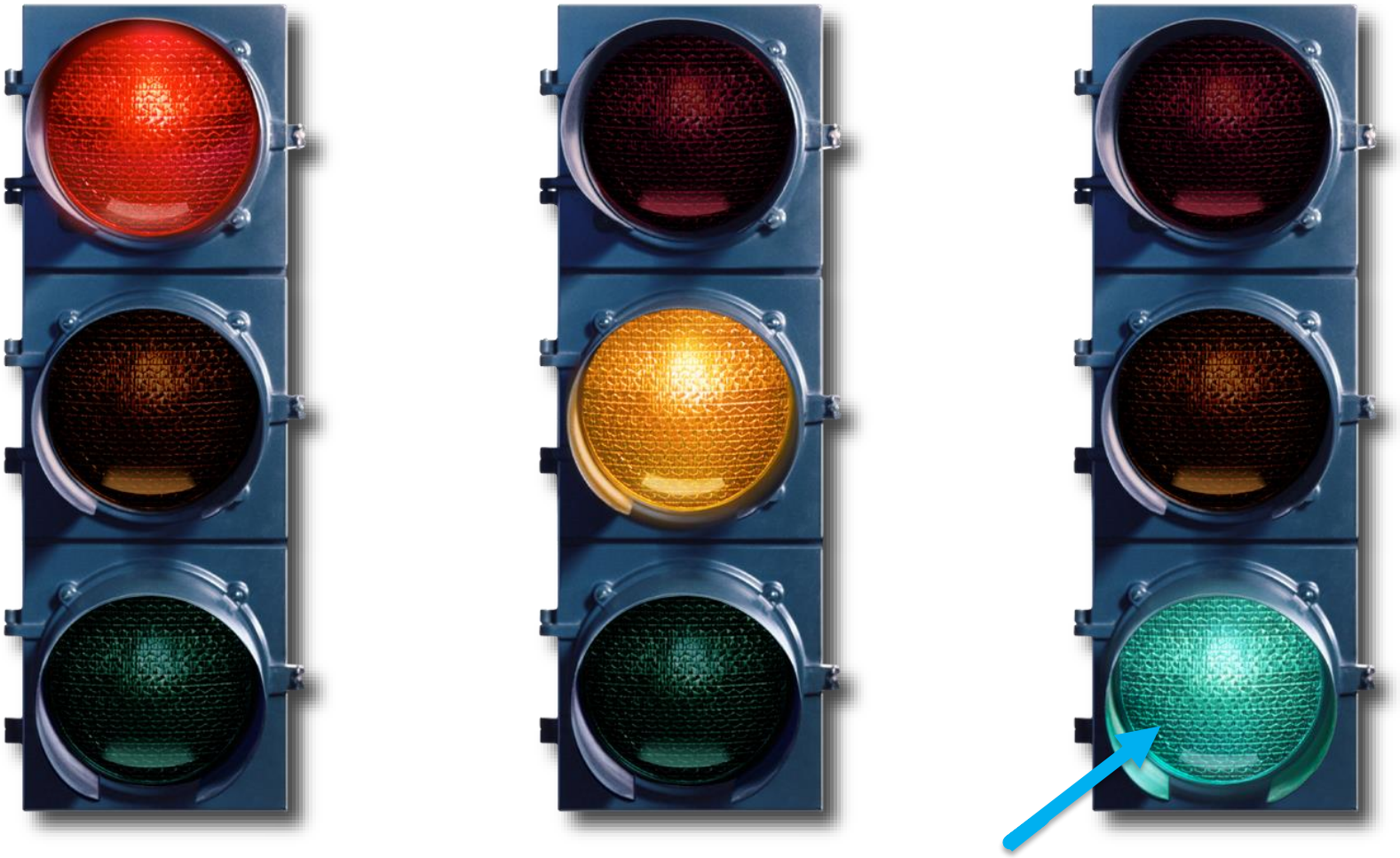
YOU MUST UNDERSTAND HUMAN CAPABILITIES AND PREFERENCES TO DESIGN GREAT SYSTEMS

YOU MUST UNDERSTAND HUMAN CAPABILITIES AND PREFERENCES TO DESIGN GREAT SYSTEMS

Is it a good design if ~10% of users can't really use it easily?

Red-green color blindness (protanopia & deuteranopia) occurs in 8% of males and 0.4% of females

COLOR-BLIND PEOPLE USE OTHER CUES TO READ TRAFFIC LIGHTS

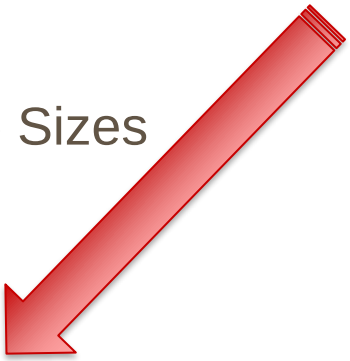


And notice, it's not truly green

CAN YOU PLEASE EVERYONE?

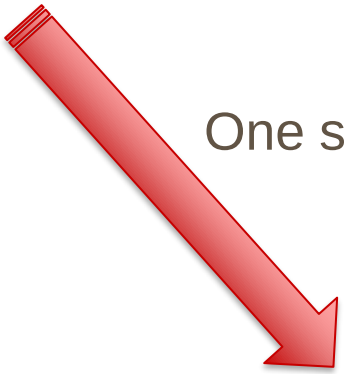
No

Multiple Sizes



You can have different products for different types of users.

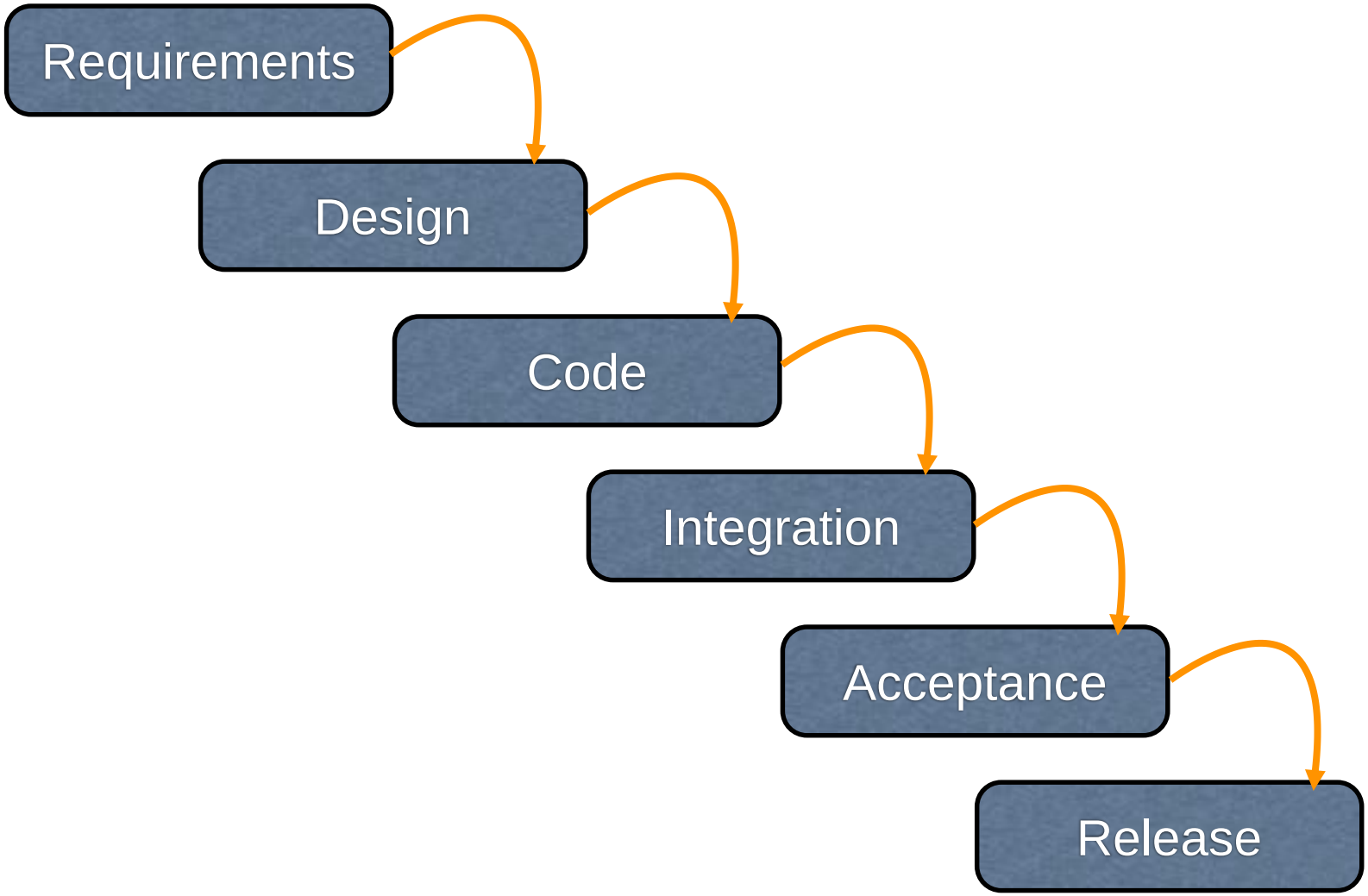
One size fits most/enough



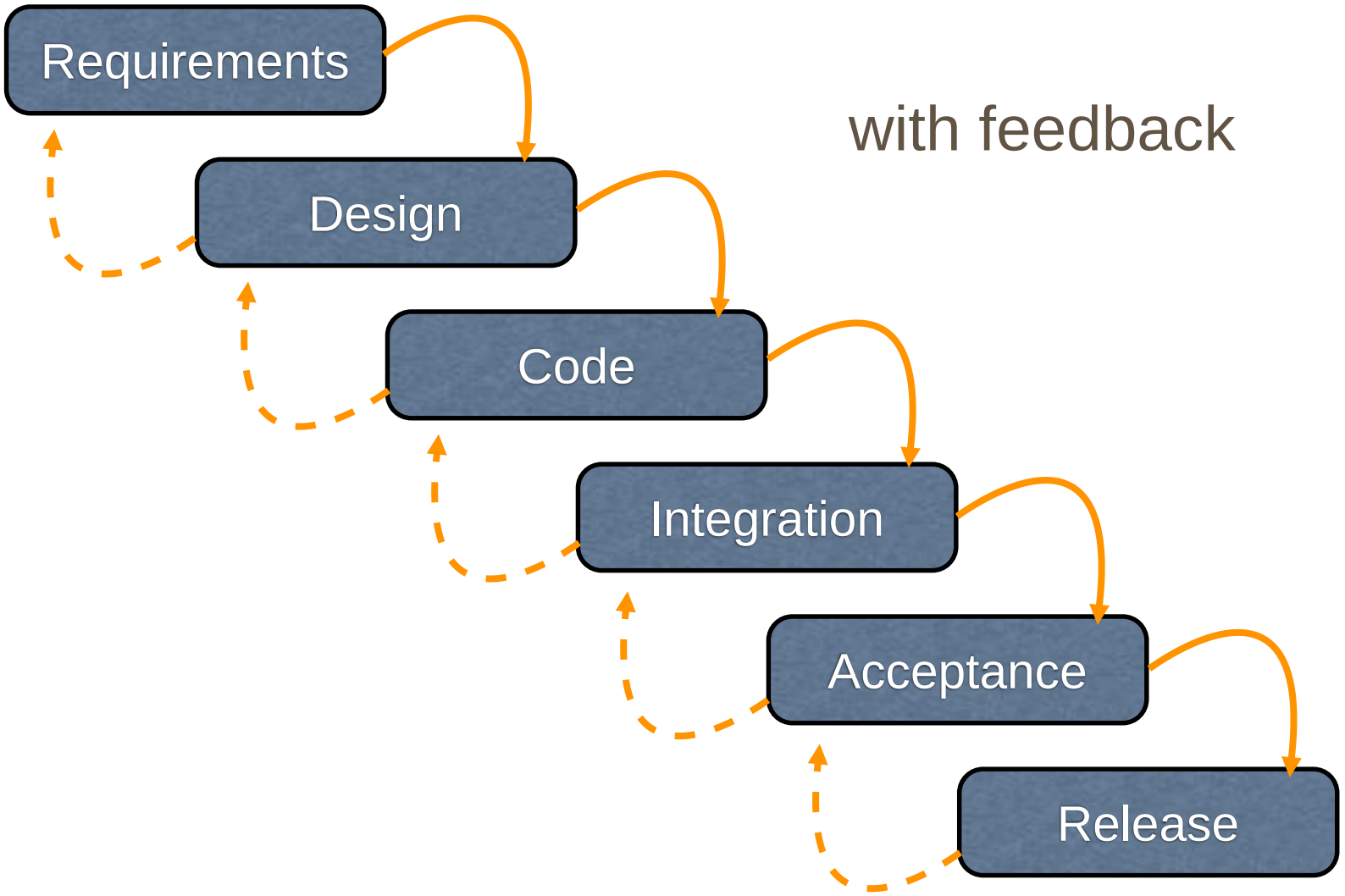
You can have a product for an average user and aim for average within a subset of the market

Either way, you can not optimize the experience for EVERY SINGLE user. You can't succeed.

TRADITIONAL WATERFALL MODEL



TRADITIONAL WATERFALL MODEL



TRADITIONAL WATERFALL MODEL

UI design itself is risky.

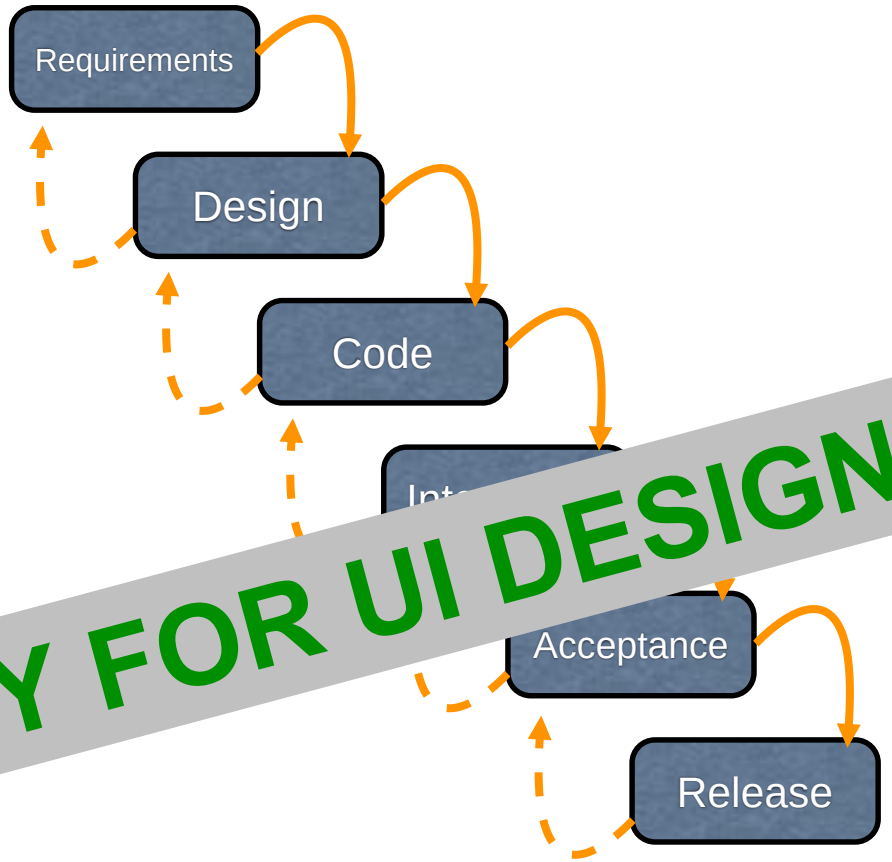
So we are likely to get it wrong. Waterfall makes it hard to recover.

Users are not involved in validation until acceptance testing.

So we won't find out until the end.

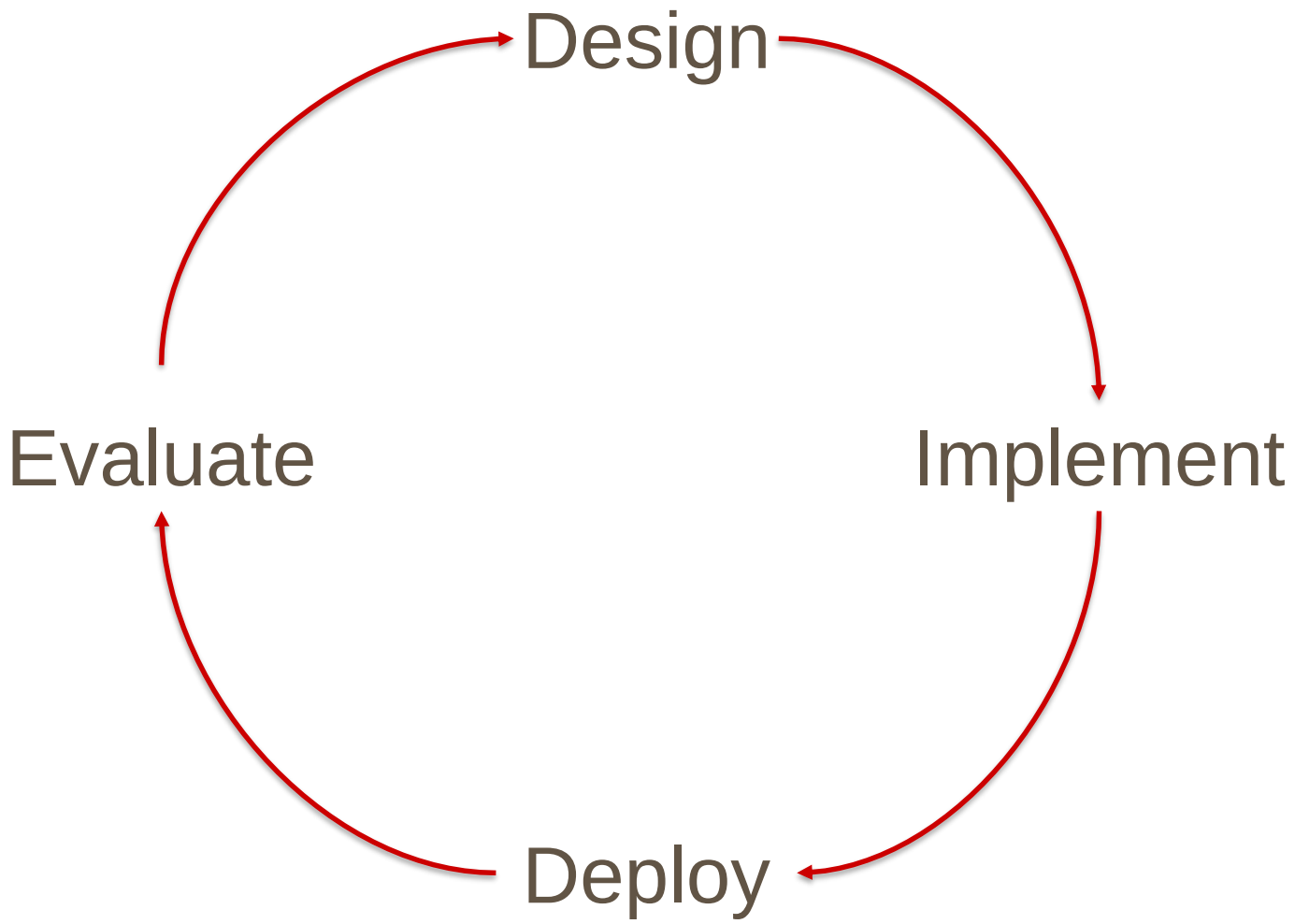
UI flaws often cause changes in requirements and design.

So we have to throw away carefully written and tested code.



WORKS POORLY FOR UI DESIGN

OPTION 2: ITERATIVE DESIGN

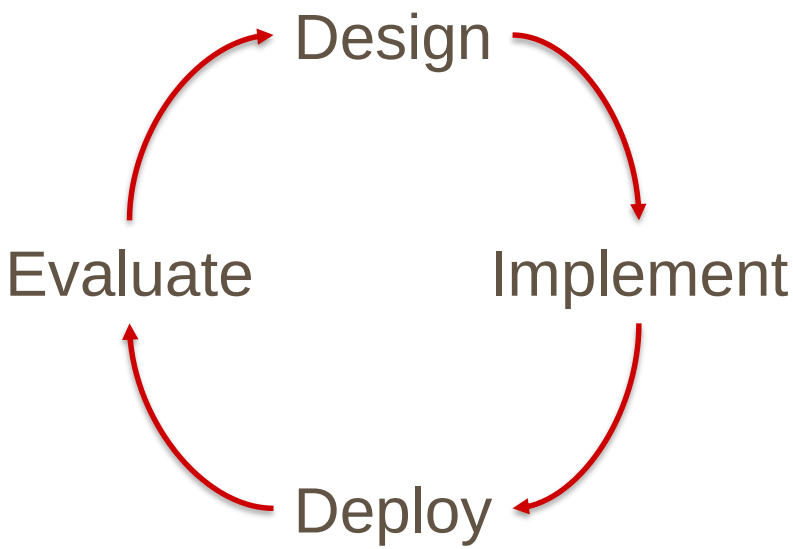


WHY NOT ITERATIVE DESIGN?

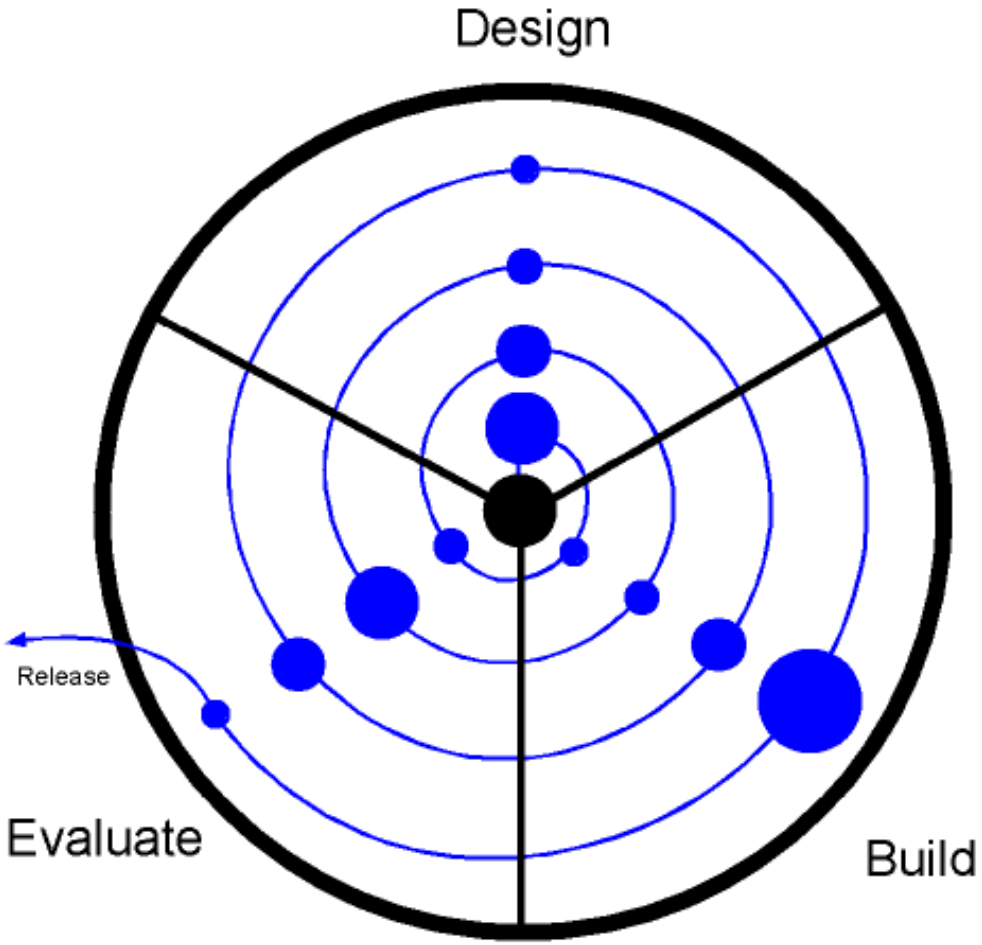
Every iteration corresponds to a release, so *evaluation (complaints/issues) feeds back into next version's design*, which is too late

Using your paying customers to evaluate your usability is a big risk

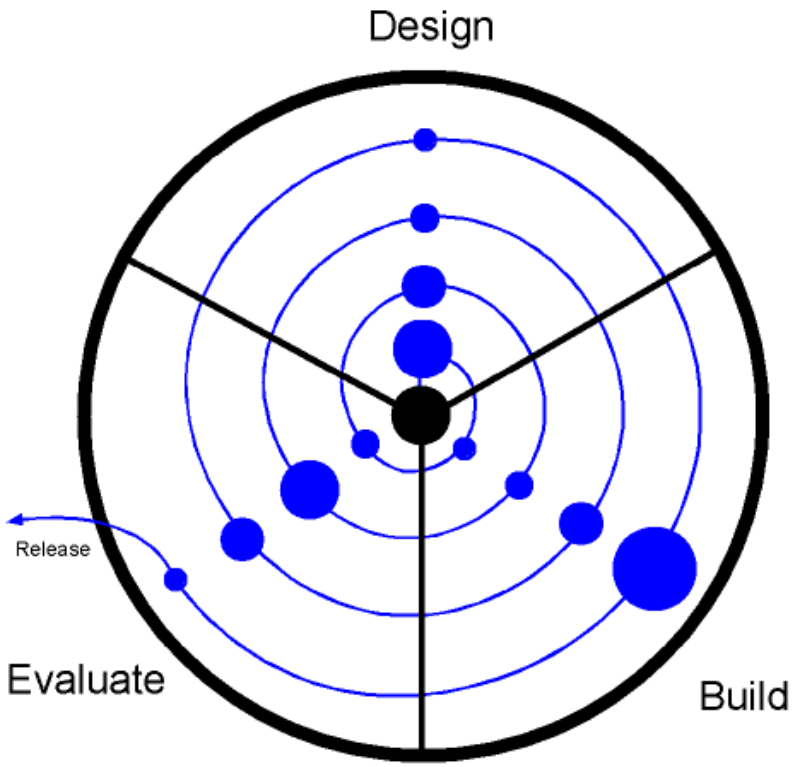
(they won't like it and won't buy the next version)



OPTION 3: SPIRAL MODEL



SPIRAL MODEL ITERATIONS



- Early iterations use cheap, quick to create, and easy to pitch prototypes (paper prototyping)
- Later iterations have richer implementations
- More iterations generally means better UI
- Only mature iterations get released

USER CENTERED DESIGN

Three Steps

1. Identify who the users are

2. Identify what they want to accomplish

3. Constantly assess (1) and (2)

KNOW YOUR USER
ROLES, RESPONSIBILITIES, CAPABILITIES

1. Ethnographics
   - ✦ Age, gender, ethnicity
2. Skill level
   - ✦ Novice
   - ✦ Knowledgeable, intermittent user
   - ✦ Knowledgeable, frequent user
3. Mental or Physical abilities
4. Knowledge
   - ✦ Domain experience
   - ✦ Application experience
5. Environment
   - ✦ Noisy, quiet
   - ✦ Inside, outside…
6. Communication patterns

1. Who are the users: novices or experts?
2. What are users trying to accomplish?
3. How often will the user be using the system?

   Should the design emphasize ease of use and learning or efficiency?
4. What information do they need to accomplish their task?
5. How easily can they identify the information they need and the steps needed to accomplish their tasks?
6. Is the information and task structures (aka the system) accessible to everyone?

THE BEST TECHNIQUE: INTERVIEWING & OBSERVING PEOPLE

- Talking to users and potential users
  - Semi-structured interviews
    https://en.wikipedia.org/wiki/Semi-structured_interview
    lots of tips for creating an interview guide and how to conduct the interview.
  - Structured interviews
- It may be hard to recruit subjects and some users are expensive to talk to.

http://www.usability.gov/how-to-and-tools/methods/individual-interviews.html

HOW TO CONDUCT A STUDY?

1. Plan topics in advance

   Best practice: create an interview guide, an informal grouping of topics and questions that the interviewer can ask in different ways for different participants.

2. Identify the target user base in advance
3. Give users a task to do against your interface and observe their behavior
   a) Have them think aloud about what they seeing, what they are trying to do, and actions they are taking.
   b) Take copious notes/record the session
   c) Do not lead the user. Let them run the task until they are successful or give up.

      Struggles are important indicators that information is not organized well or that something is missing.

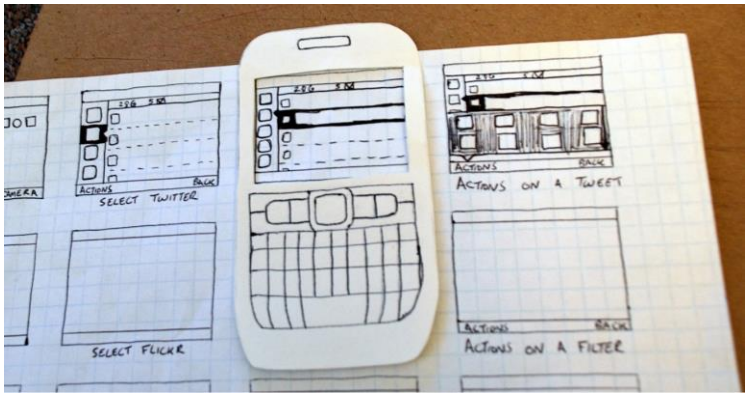
4. Reflect on observations and write up a report with findings

Source: http://www.userlytics.com/blog/unmoderated-vs-moderated-usability-user-experience-testing

HOW DO WE EXPRESS DESIGNS?

START WITH PAPER PROTOTYPES

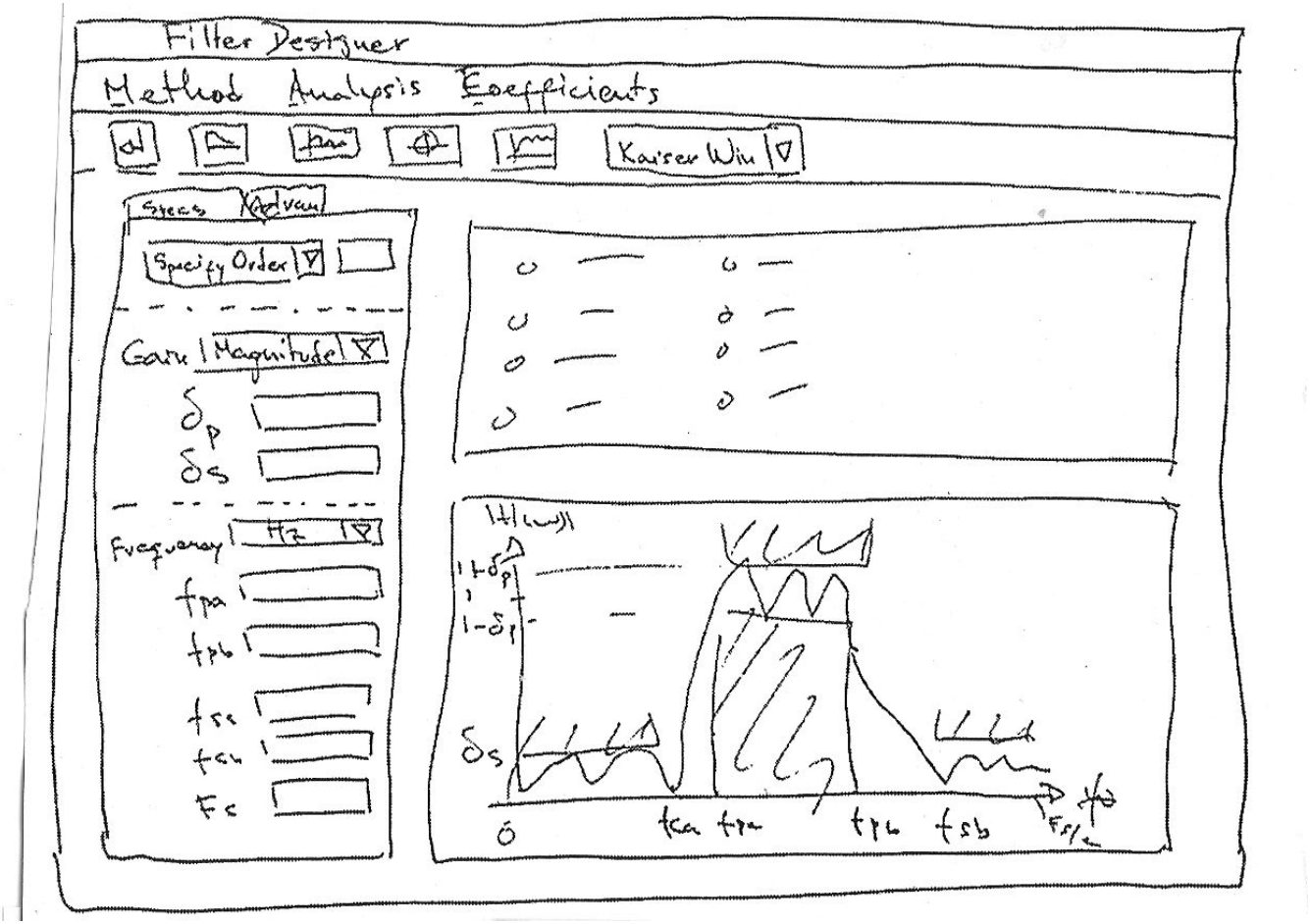
Karis and Virzi have shown you can often get the same design information from easier and cheaper to make low fidelity prototypes as from higher fidelity prototypes.



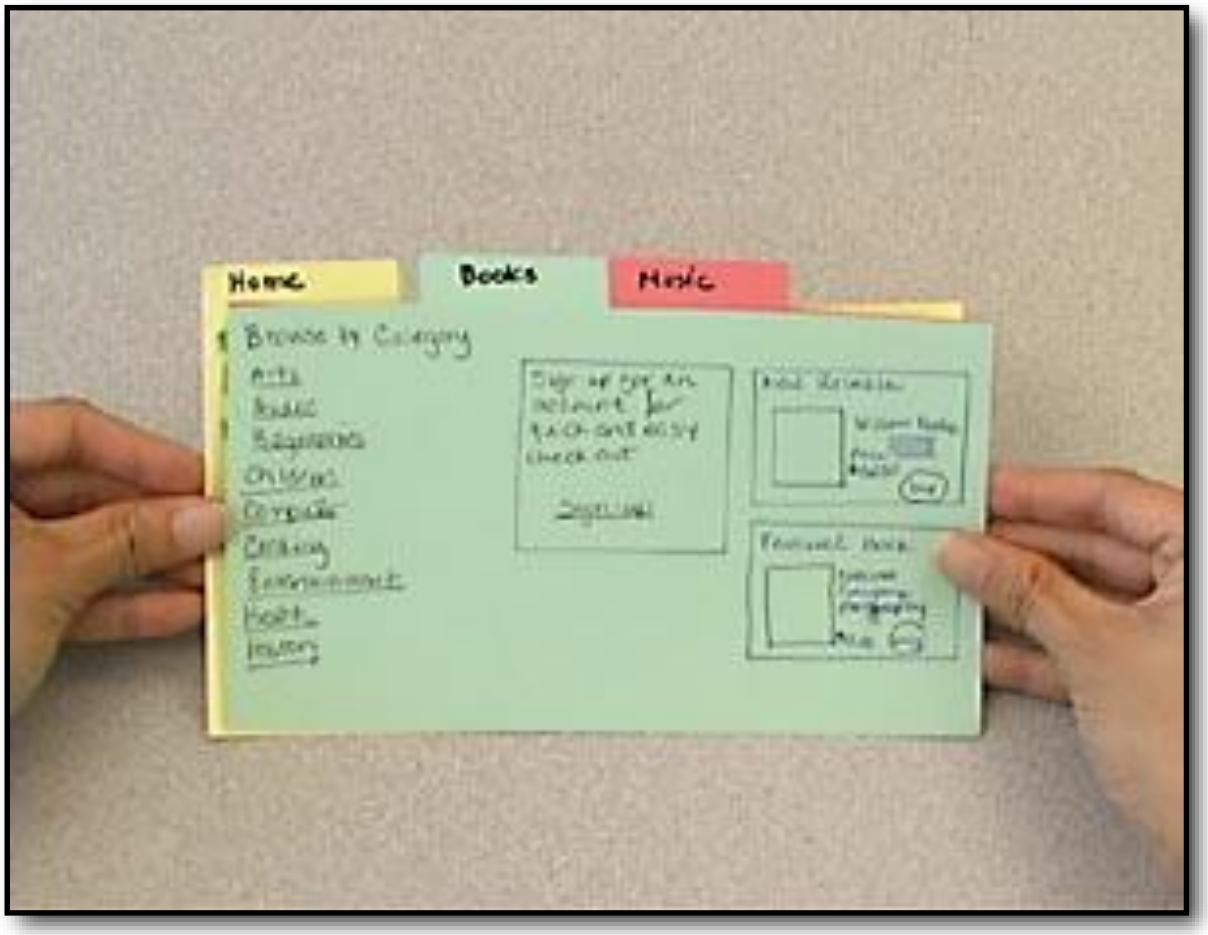
Credit to: Ariel Waldman, on Interaction Design/ Rachel Ilan

F. Cifaldi, Gamsutra, *Sometimes, paper is your best prototyping tool - even if you're Nintendo*, 2012 On the development of the Wii U tablet

SIMPLE PAPER PROTOTYPES ARE EASY TO CREATE AND CHANGE



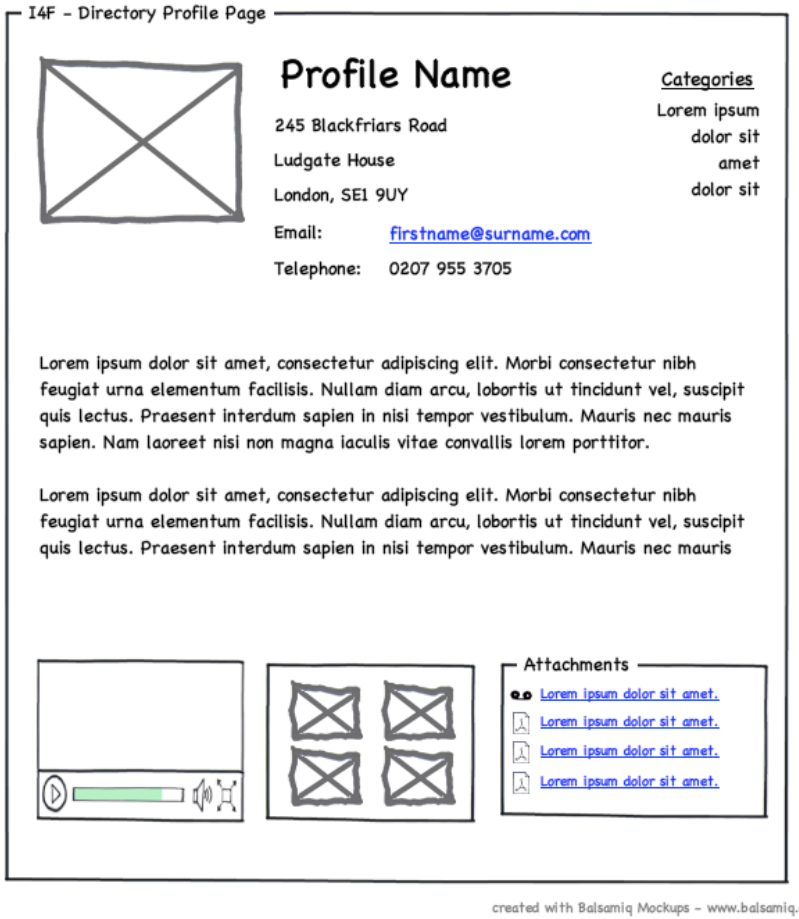
FANCIER EXAMPLE



YOU ARE NOT LIMITED TO 8.5”X11”

AFTER PAPER, WIREFRAMES

You can also compose parts of these on a computer, of course (at various levels of detail, up to a full-fledged mockup).



PUTS AND TAKES ON WIREFRAMING

Advantages

1. Fast way to mock up an interface - no coding required.
2. Finds a variety of problems with the interface.
3. Allows an interface to be refined based on user feedback before implementation begins.
4. A multidisciplinary team can participate.

Disadvantages

1. Doesn’t produce any code.
2. Does not find all classes of problems with an interface.
3. Can affect the way users interact with the interface.
4. Has stronger benefits in some situations than in others.

Credits: Paper Prototyping

PRINCIPLES FOR DESIGNING UI'S

Jacob Nielsen's

10 Principles Of

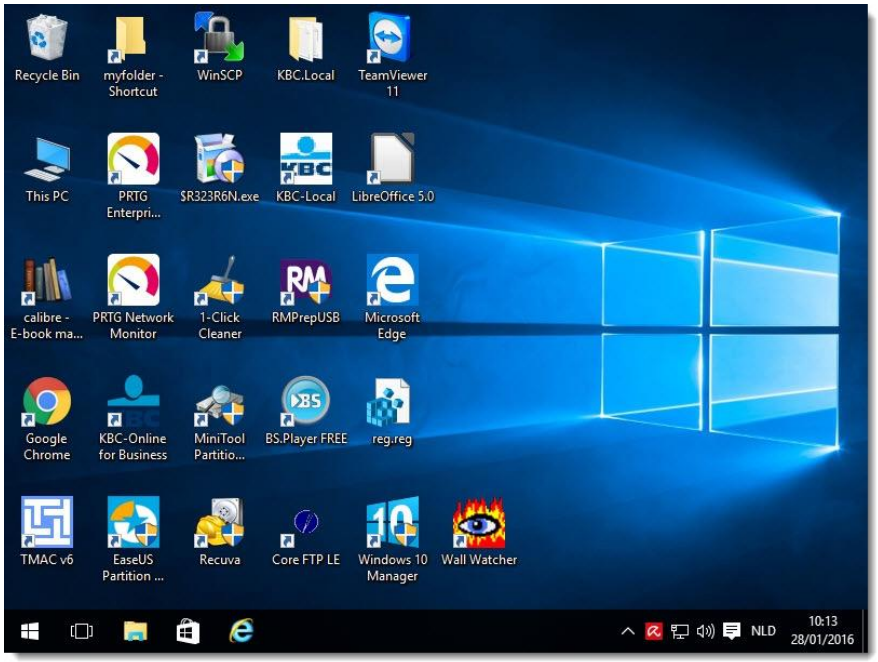
UI Design

https://www.nngroup.com/articles/ten-usability-heuristics/

#1: MATCH THE REAL WORLD

Examples

- ✦ Desktop
- ✦ Trashcan



Dangers of metaphors

1. Often hard for designers to find
2. Deceptive
3. Constraining
4. Breaking the metaphor

✦ Using a metaphor doesn't excuse other bad design decisions

DIRECTLY MANIPULATE OBJECTS

- User interacts with visual representation of data objects
  - *Continuous visual representation*
  - *Physical actions or labeled button presses*
  - *Rapid, incremental, reversible, immediately visible effects*
- Examples
  - *Files and folders on a desktop*
  - *Scrollbar*
  - *Dragging to resize a rectangle*
  - *Selecting text*
- Visual representation and physical interaction are important

OBJECTS SUGGEST SPECIFIC ACTIONS (MANIPULATIONS) FOR USE

Perceived and actual properties of a thing that determine how the thing could be used

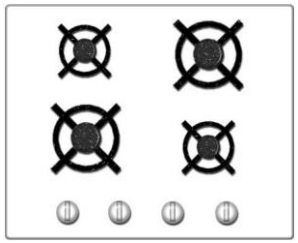
1. Chair is for sitting
2. Knob is for turning
3. Button is for pushing
4. Listbox is for selection
5. Scrollbar is for continuous scrolling or panning

NATURAL MAPPING

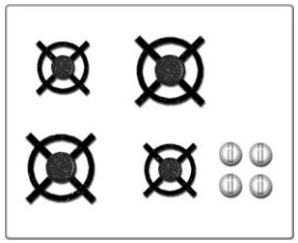
Physical arrangement of controls should match arrangement of function

Best mapping is direct, but natural mappings don't have to be direct

- ✦ Light switches
- ✦ Stove burners
- ✦ Turn signals
- ✦ Audio mixer



Poor mapping: arbitrary arrangement of stove controls



Good mapping: full natural mapping of controls and burners

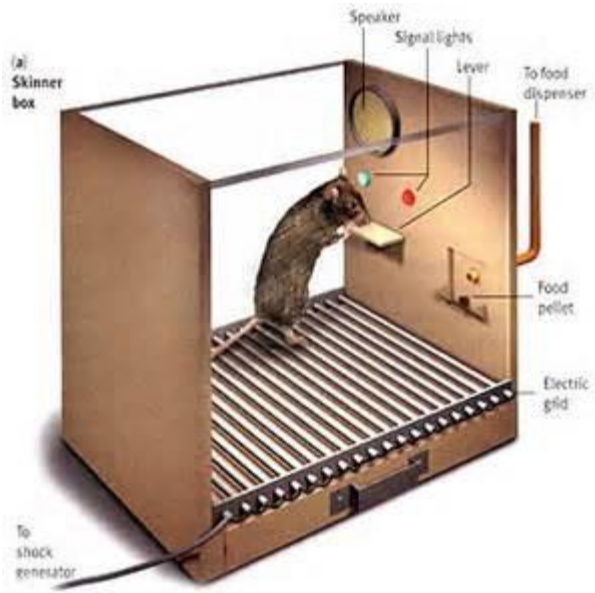
Norman, Donald A., "Knowledge in the Head and in the World". The Design of Everyday Things. New York: Basic Book, 1988. 77

ACTIONS SHOULD HAVE IMMEDIATE, VISIBLE EFFECTS

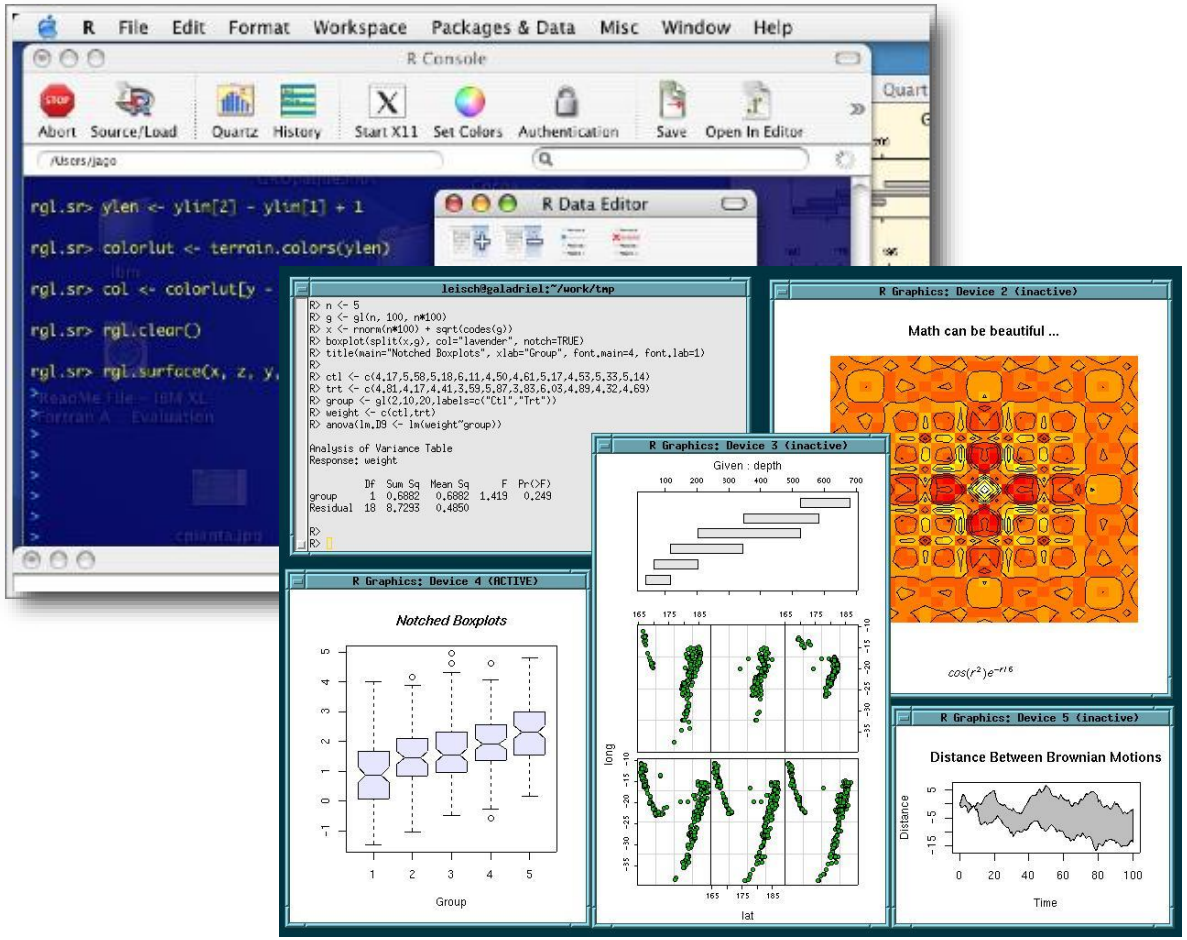
Examples

- Push buttons
- Scrollbars
- Drag & drop

- Kinds of feedback
  - Visual
  - Audio
  - Haptic (conveyed by sense of touch)



#2: CONSISTENCY AND STANDARDS



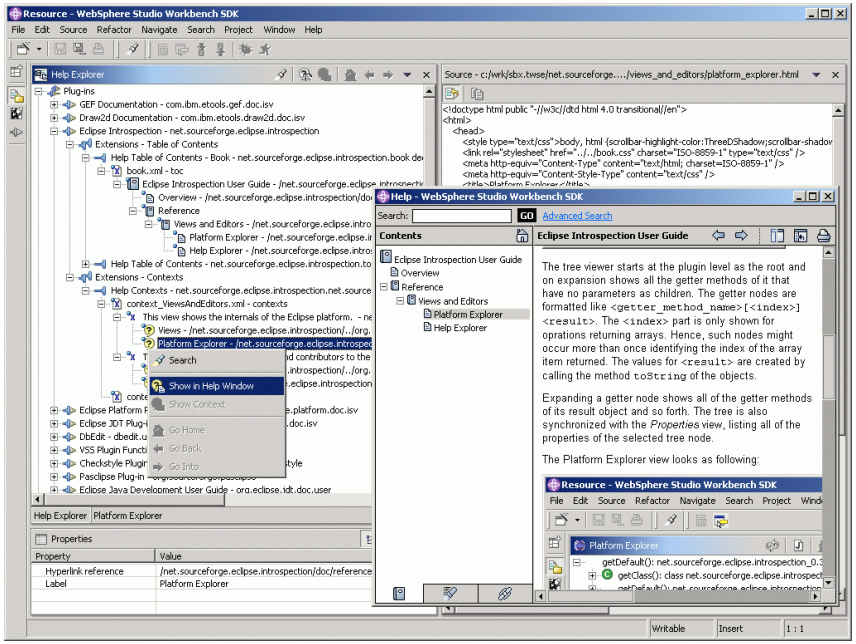
Users should not have to wonder whether different words, situations, or actions mean the same thing.

Follow platform conventions….

#3: HELP AND DOCUMENTATION

Help should be

1. Searchable
2. Context-sensitive
3. Task sensitive
4. Concrete
5. Short
6. NOT NEEDED

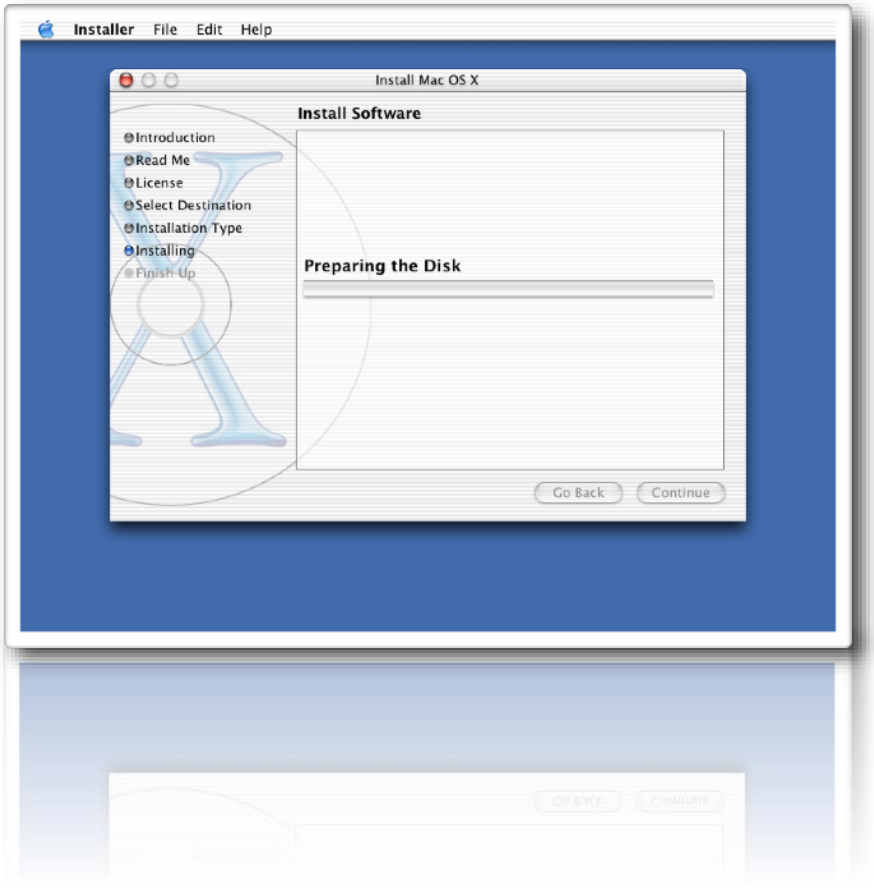


#4: USER CONTROL AND FREEDOM

Users may run in trouble by using a system function by mistake and need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue

1. Provide Undo
2. Long operations should be allowed to be paused/suspended
3. All dialogs should have a cancel button

#5: VISIBILITY OF SYSTEM STATUS

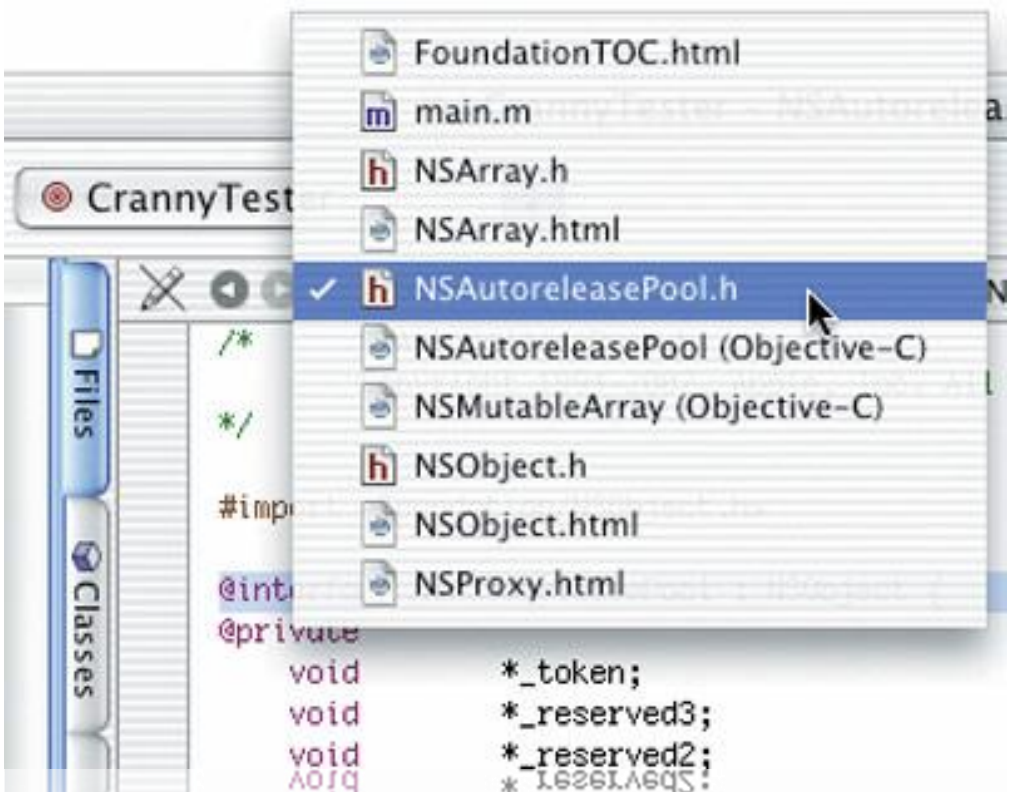


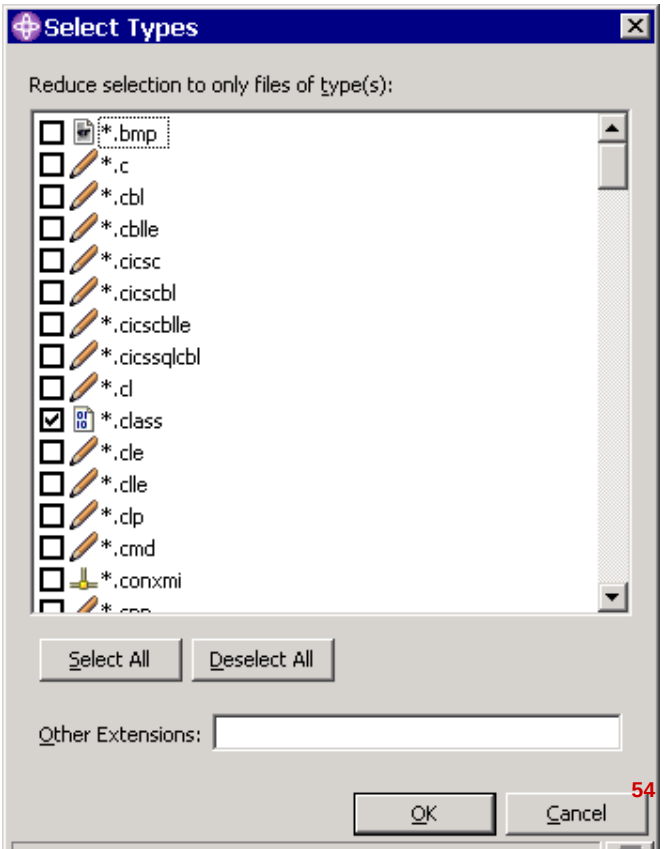
The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

1. change cursor to indicate action
2. use highlights to show selected objects
3. use status bar to show progress

#6: FLEXIBILITY AND EFFICIENCY

Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions. [follows from the power law of practice]





#7: RECOGNITION, NOT RECALL

Minimize the user's memory load by making objects, actions, and options visible.

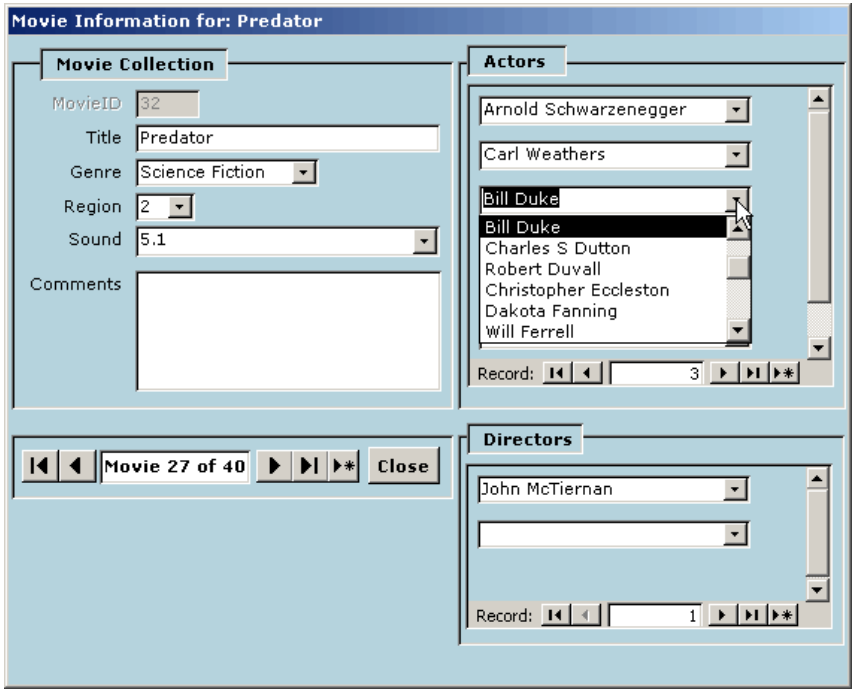
The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

1. Use menus, not command languages
2. Use combo boxes, not textboxes
3. Use generic commands
4. All needed information must be visible

#8: ERROR PREVENTION

Even better than good error messages is a careful design which prevents a problem from occurring in the first place.

Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.

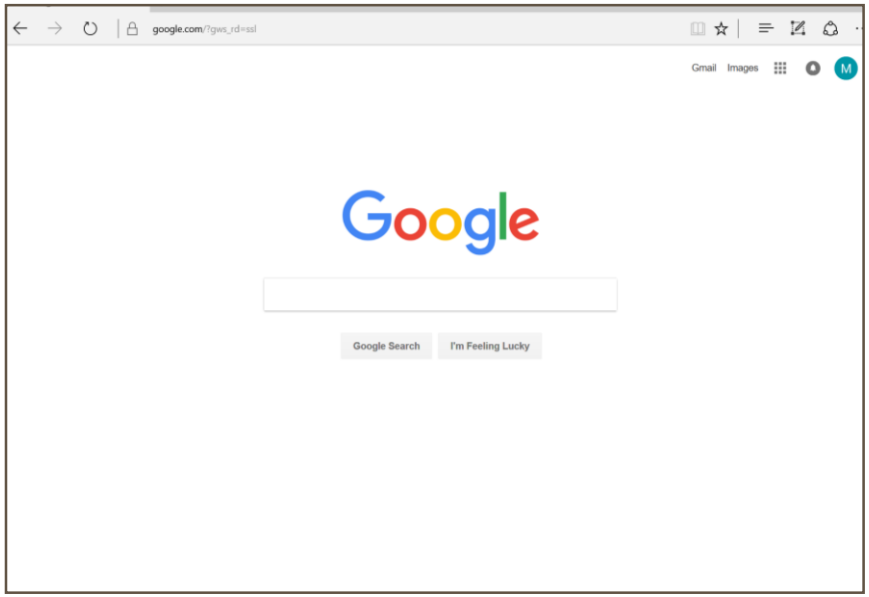


#9: HELP USERS RECOGNIZE, DIAGNOSE, AND RECOVER FROM ERRORS

Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

And they should be polite…

#10: AESTHETIC AND MINIMALIST DESIGN



Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

TESTING THE UI

Testing the UI is like testing done early on, except now you use the actual system.

1. Give the users a task and watch them work.
2. Take copious notes
3. Do not steer the user

Frustrations and failures are part of the game

HAVE REAL USERS TEST IT!

TYPICAL AND UNFORTUNATE REACTIONS

Typically, when project managers observe their design undergoing a usability test, their initial reaction is:

Where did you find such stupid users?

Or the typical engineer's response:

It's designed right.
You are too dumb to use it correctly.

TYPICAL AND UNFORTUNATE REACTIONS

Typically, when project managers observe their design undergoing a usability test, their initial reaction is:

Where did you find such stupid users?

Or the typical engineer's response:

It's designed right.
You are too dumb to use it correctly.

The users are telling you something. Listen to them!

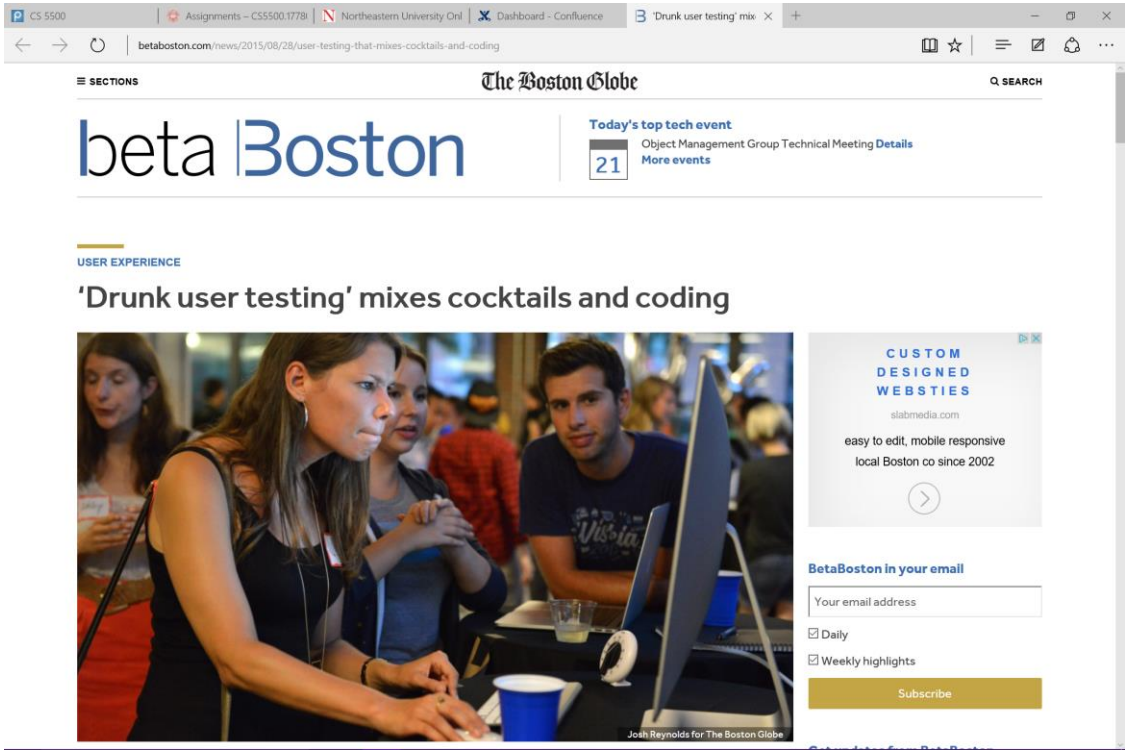
EXTRA

OUR AIM IS CREATE A SYSTEM THAT *DELIGHTS THE USERS*

We want to create a great user experience across the entire lifecycle of system use

1. Acquiring
2. Installing
3. Using
4. Maintaining
5. Ending

YOUR INTERFACE SHOULD BE SO SIMPLE A DRUNK PERSON COULD USE IT



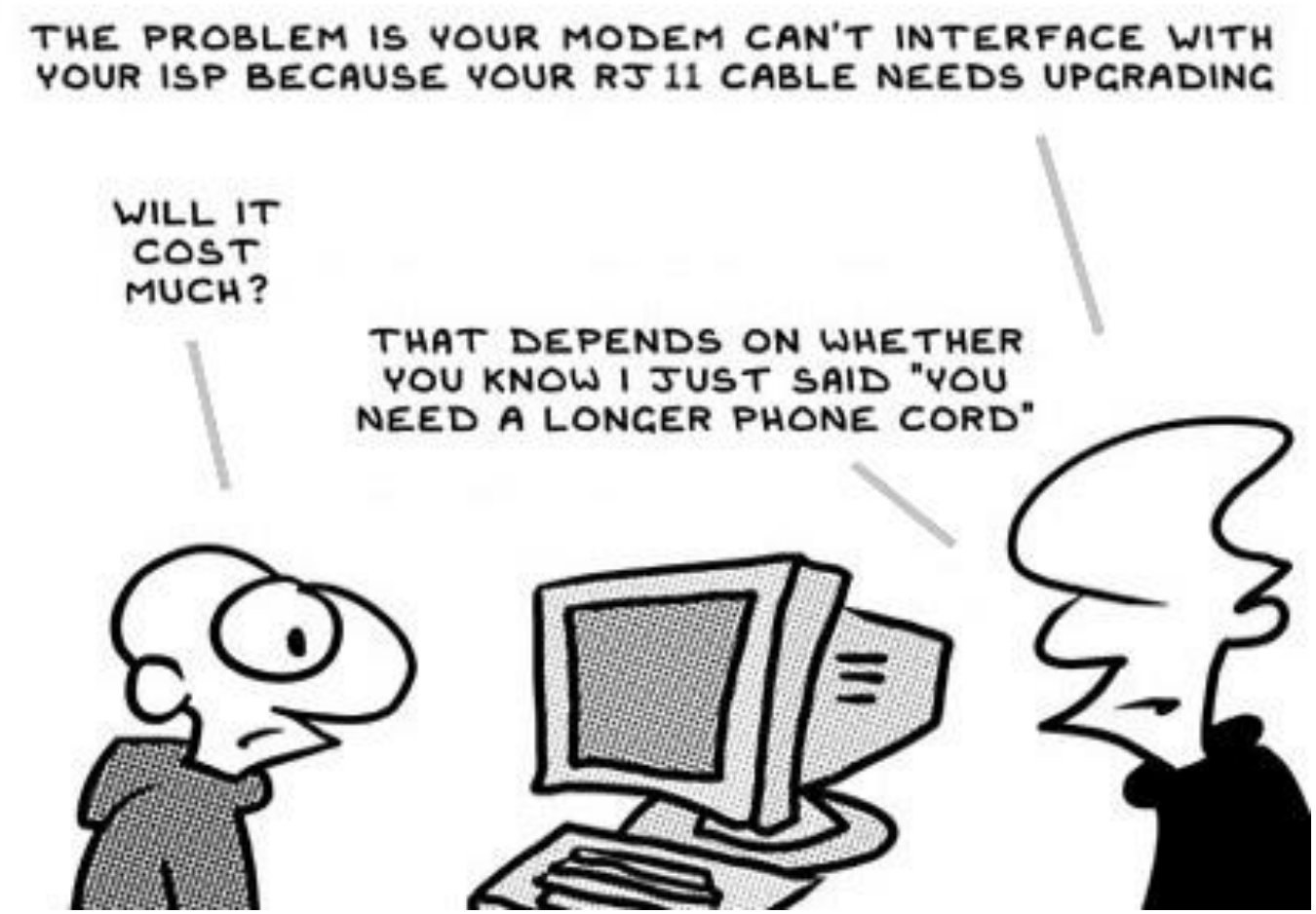
Someone took this seriously

http://www.betaboston.com/news/2015/08/28/user-testing-that-mixes-cocktails-and-coding/

SOME, MAYBE NOT SO MUCH

credit: http://judestewart.com/writing/Umbrellas.html

#1: MATCH THE REAL WORLD



CAUTIONS

Usability And Interviewing Are Robust

Even if you make a lot of mistakes in the process you'll still learn a lot

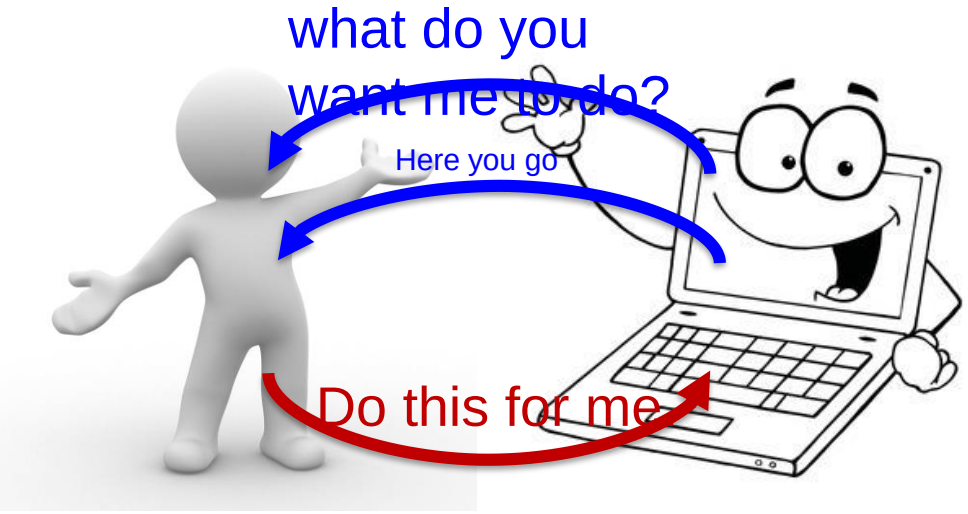
Online Surveys Are NOT Robust

- ! There are many, many ways to make mistakes, that will often destroy the validity of the results
- ! While it's trivial to write and distribute an online survey, but if you don't know what you're doing, there's a significant probability that you'll end up with garbage

USER INTERFACE IS ABOUT A DIALOGUE

The challenge is putting the dialogue in the right terms and in the right order.

- ✦ How to organize all the things a user could want to do
- ! Users may not be good at forming their questions, expressing the needs.



To construct a good dialogue, one has to spend a lot of time watching a lot of different people "talking" with it

Everything in the product design contributes to this dialog - from the button labels/placements to noises to screen prompts

ORGANIZING THE DIALOGUE: TASK ANALYSIS

1. Identify the individual tasks to be solved.
2. Each task is a goal.
3. Start with the big goal and then, decompose hierarchically.

1. What must be done?

   Goal
2. What must be done before to make it possible?

   Preconditions

   Tasks on which this task depends

   Information that must be known to the user
3. What steps are involved in doing the task?

   Subtasks

   (may be decomposed recursively)

PARTICIPATORY DESIGN

Involve all the stakeholders in the design process

Both for learning
about needs and tasks
and
sharing designs

Source: http://www.webdesignfanatic.com/participatory-design-valuable-designers/