KAIST Fall 2018

CS408E/F: Computer Science Project

User-Centered Design Process

2018.08.27

Juho Kim

CS408

Project-oriented course in which students design, develop, test, validate, and present a software system in a team.

"What goal to keep in mind as we design our 408 system?"

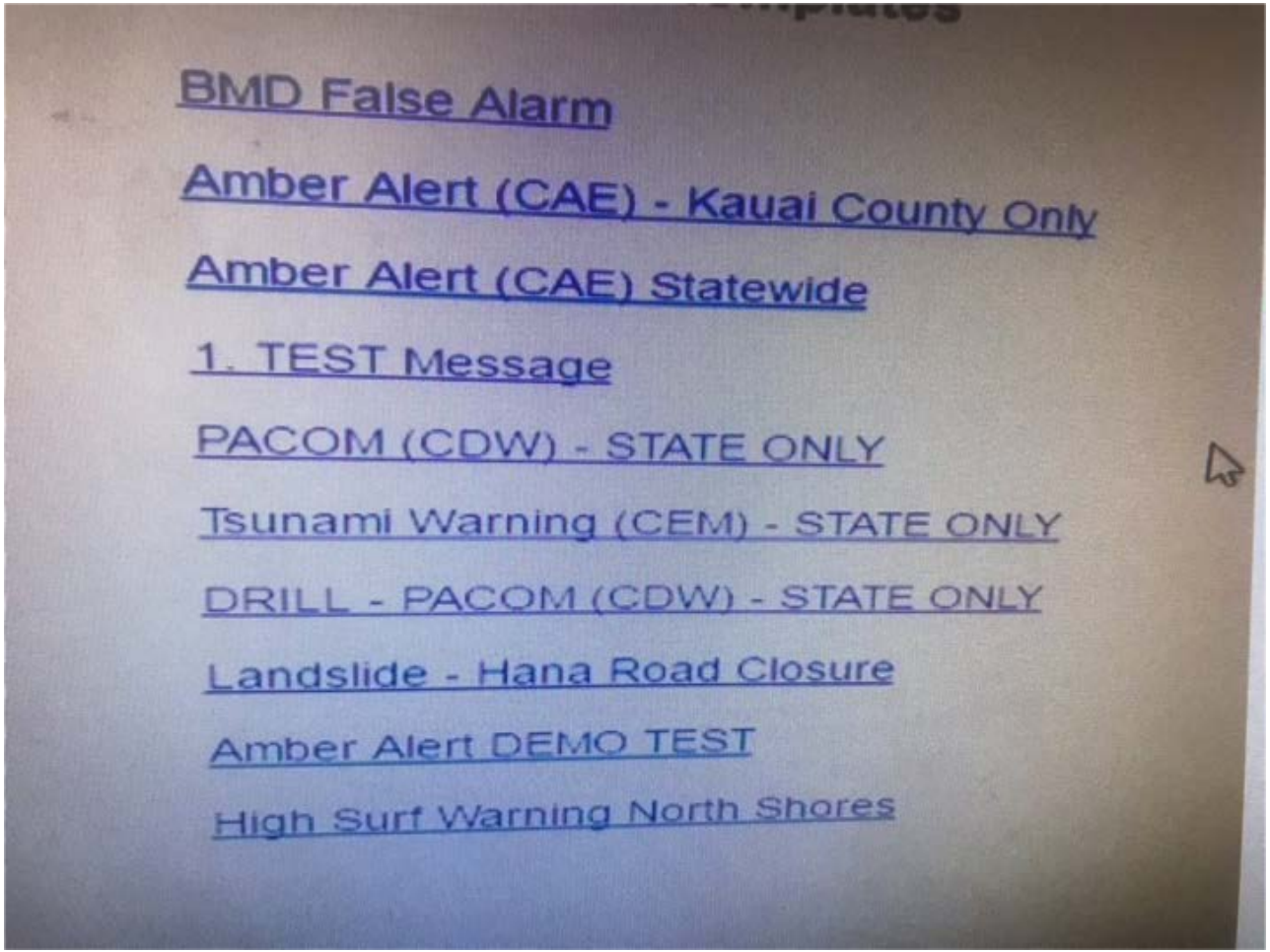
Usability

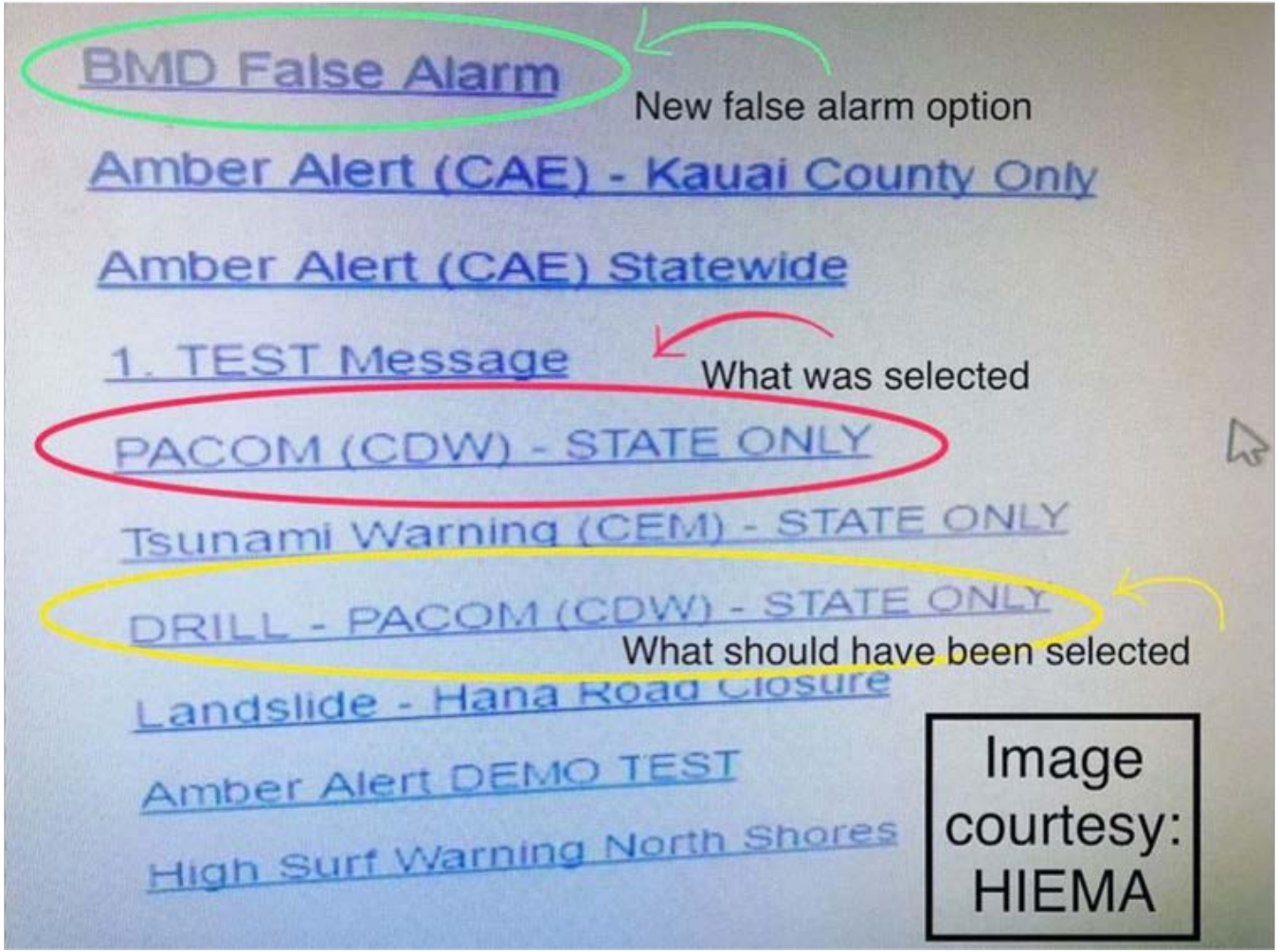
"What process should my team follow while working on a 408 project?"

User-centered design
as a guiding principle

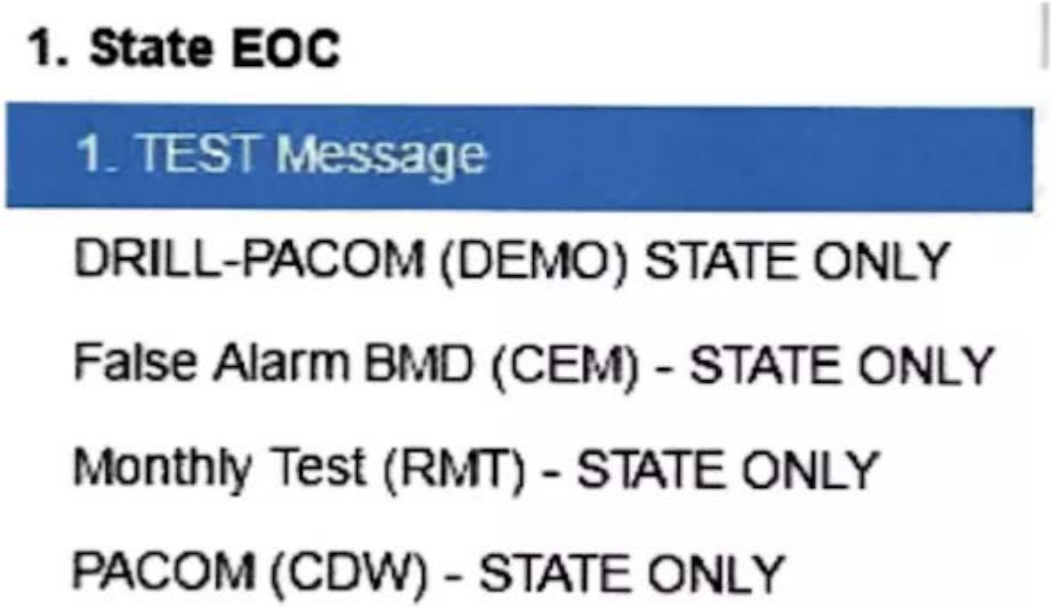
Twitter @wpugh/via Reuters

Anthony Quintano/Civil Beat/AP, @MorganMyrmo on Twitter


BMD False Alarm
Amber Alert (CAE) - Kauai County Only
Amber Alert (CAE) Statewide
1. TEST Message
PACOM (CDW) - STATE ONLY
Tsunami Warning (CEM) - STATE ONLY
DRILL - PACOM (CDW) - STATE ONLY
Landslide - Hana Road Closure
Amber Alert DEMO TEST
High Surf Warning North Shores



Hawaii Emergency Management Agency via Hawaii News Now



Richard Rapoza / Via Hawaii Emergency Management Agency

“Stupid users keep making mistakes when using this simple feature.”

“I built this really cool thing. How come nobody uses it?”

Human Error?
No, it's BAD DESIGN.

You're not the user.

- System needs to communicate with users.
  - Users are NOT LIKE YOU.

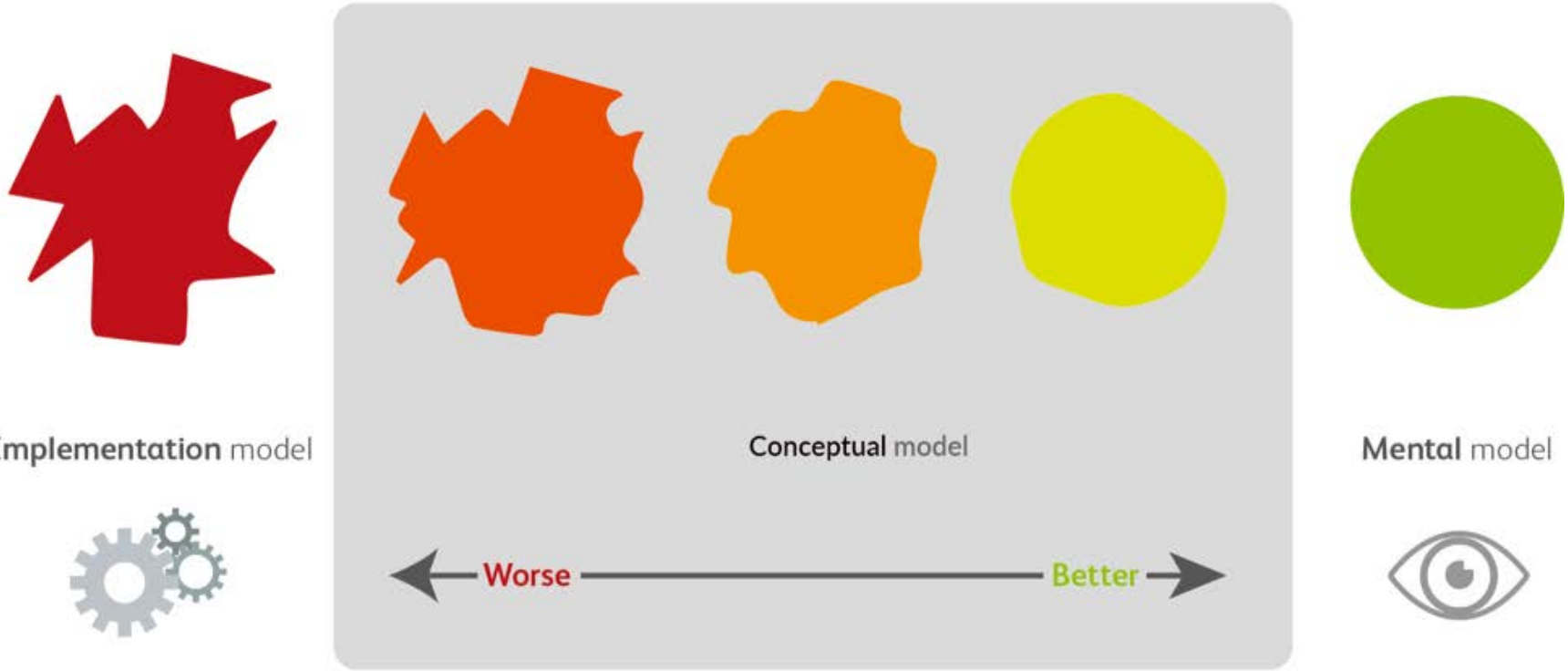
- The user is ALWAYS RIGHT.
  - Usability problems are the designer's fault.

Computer system

Interaction interface

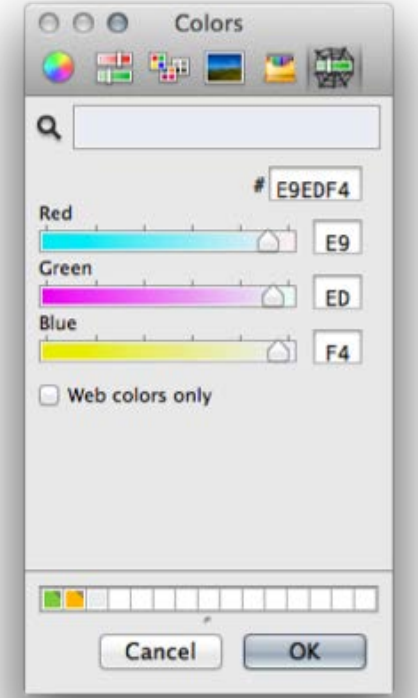
Human user

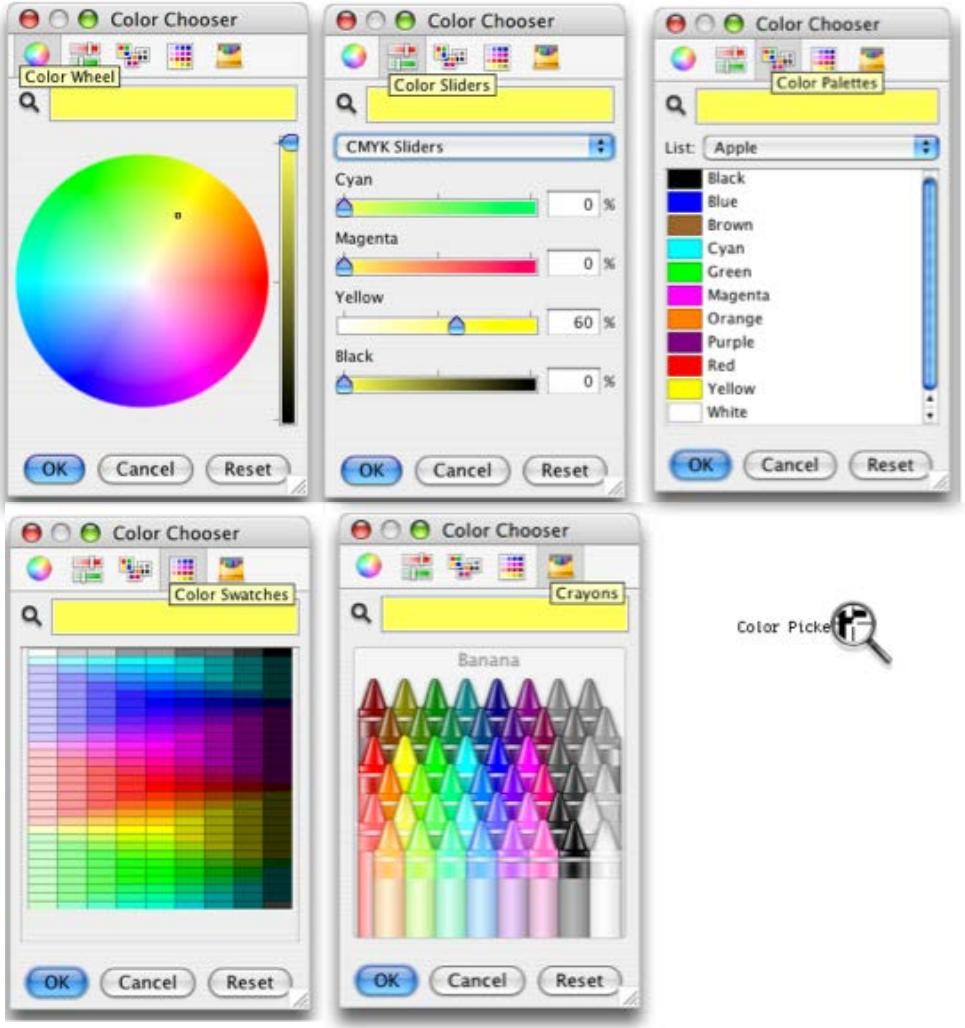
User experience **models**



Technology-centric

User-centric





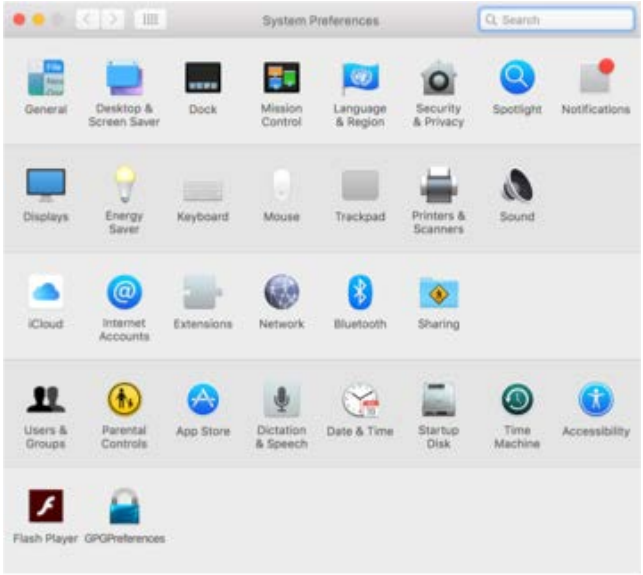
Example from https://medium.com/@vinoth3.141/mental-model-ux-64e7a9d2a03f

Usability

how well users can
use the system’s functionality

Dimensions of Usability

- **Learnability**: is it easy to learn?
- **Efficiency**: once learned, is it fast to use?
- **Safety**: are errors few and recoverable?

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$ open 10-prototyping/inclass/slides.pptx

juhokim at Juhos-MacBook in /Applications/mamp/htdocs/6.831/2015/classes on master [?]
$ workon
data
recipe

juhokim at Juhos-MacBook in /Applications/mamp/htdocs/6.831/2015/classes on master [?]
$ workon recipe
(recipe)
juhokim at Juhos-MacBook in /Applications/mamp/htdocs/6.831/2015/classes on master [?]
$
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Learnability

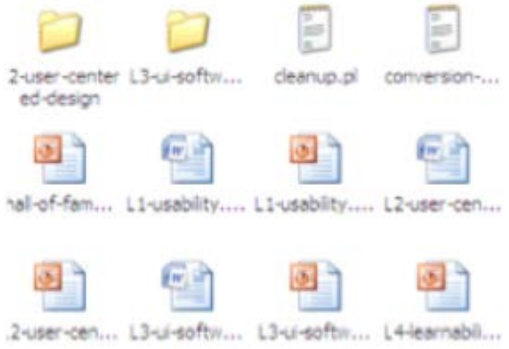

Single Stream
RECYCLING
FOOD SCRAPS/
COMPOSTABLES
TRASH
Single Stream
RECYCLING
FOOD SCRAPS/
COMPOSTABLES
TRASH


Interdepartmental Mail
& U.S. Stamped Mail
Domestic Mail
To Be Processed
International Mail
To Be Processed

Photo by Hyunjong Lee

Better Learnability?

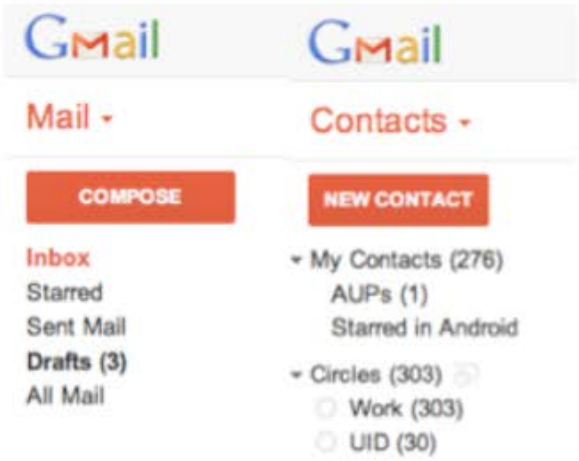
Metaphor



Desktop metaphor

Trashcan metaphor

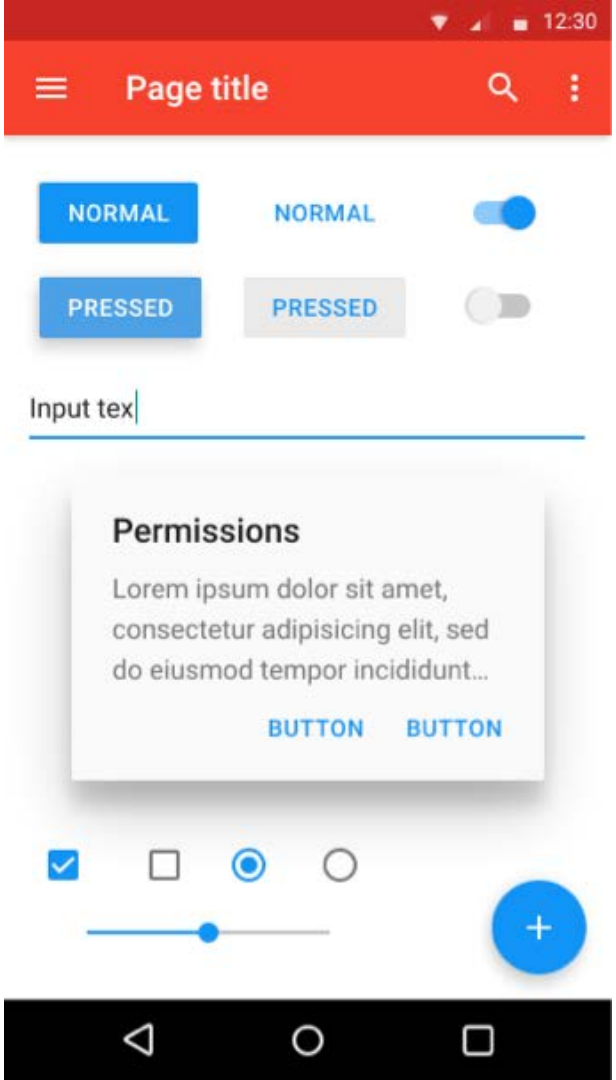
Consistency



Internal:
with itself

External:
with other UIs or the real world

Metaphorical:
with the chosen interface metaphor



External Consistency: Design Guidelines

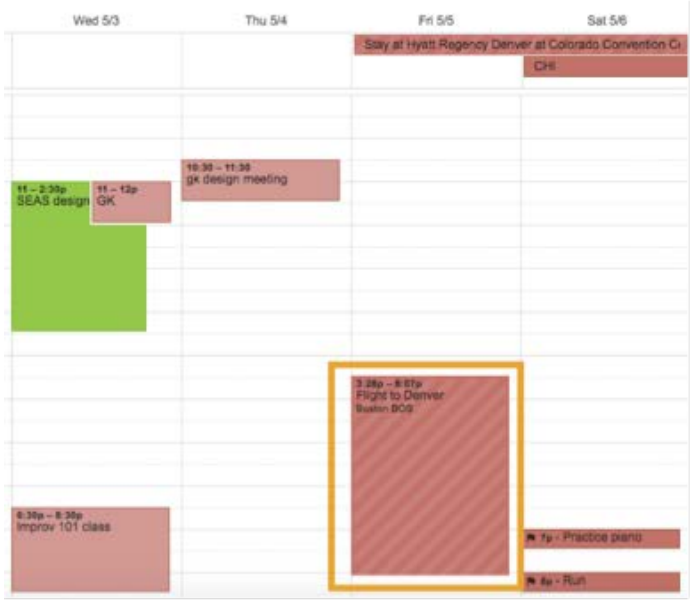
material.io/guidelines

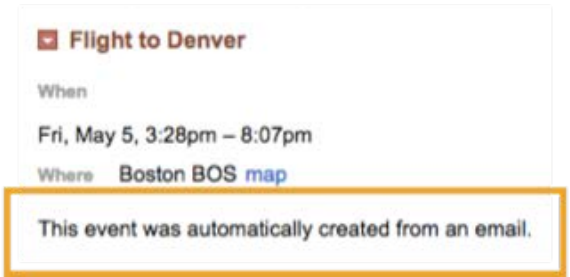
"Develop a single underlying system that allows for a unified experience across platforms and device sizes."

Affordances

Affordances

Feedback Matters



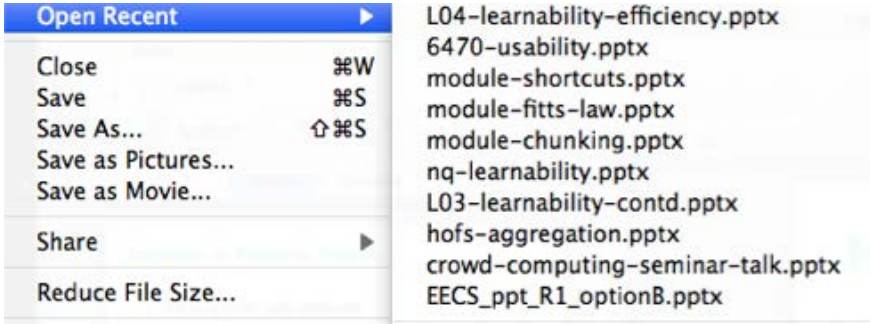


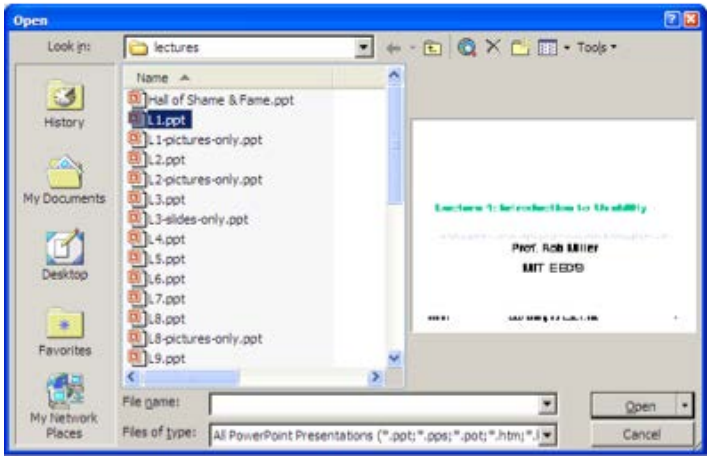
Explanation of the system's model

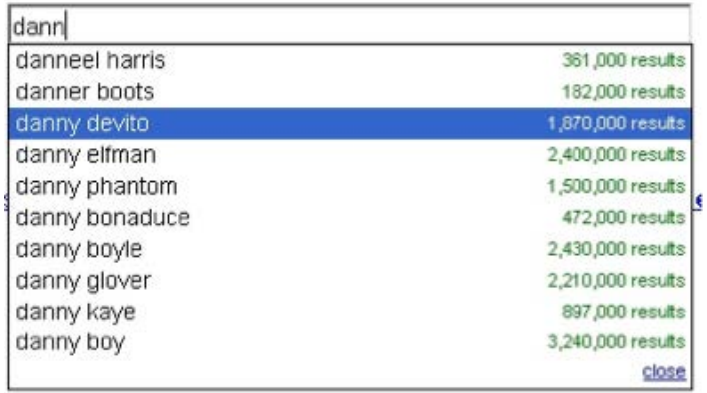
Customers Who Shopped for *Concept Board Game* Also Shopped For

Efficiency

UI Techniques for Improving Efficiency

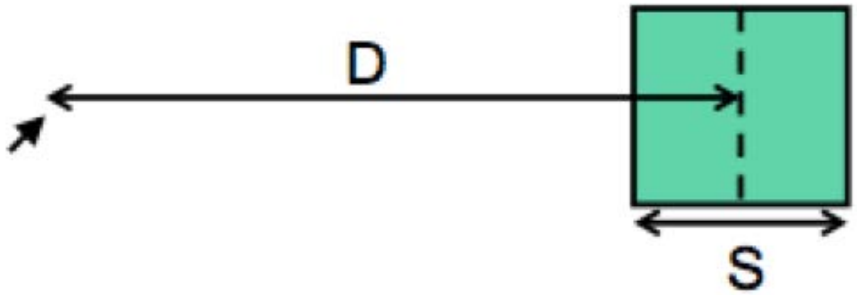




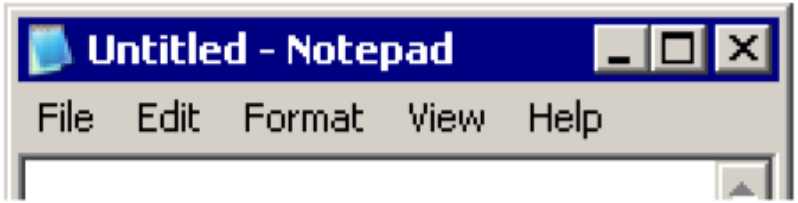


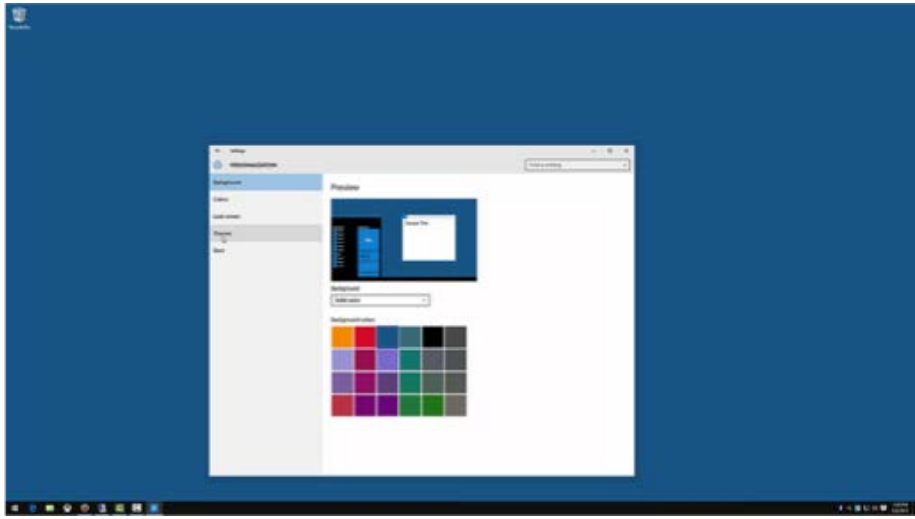
Fitts's Law

- The time required to rapidly move to a target area is a function of the ratio between the **distance** to the target and the **width** of the target.

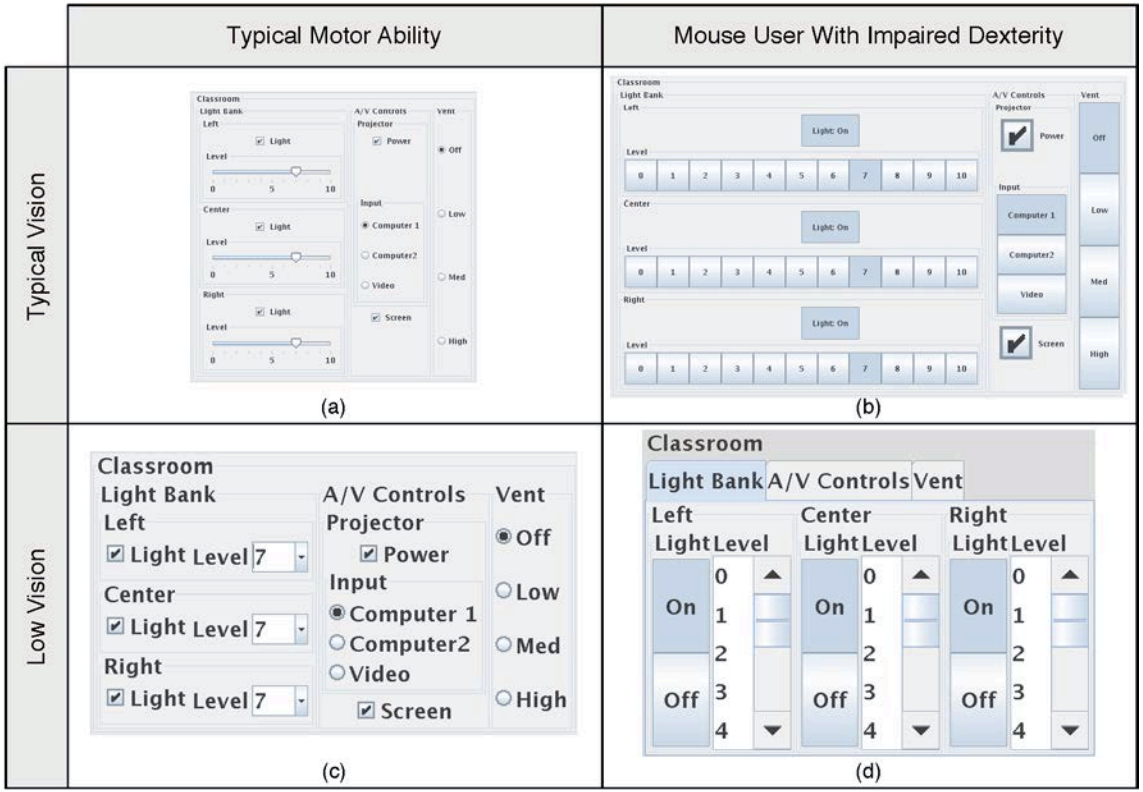


Mac vs Windows





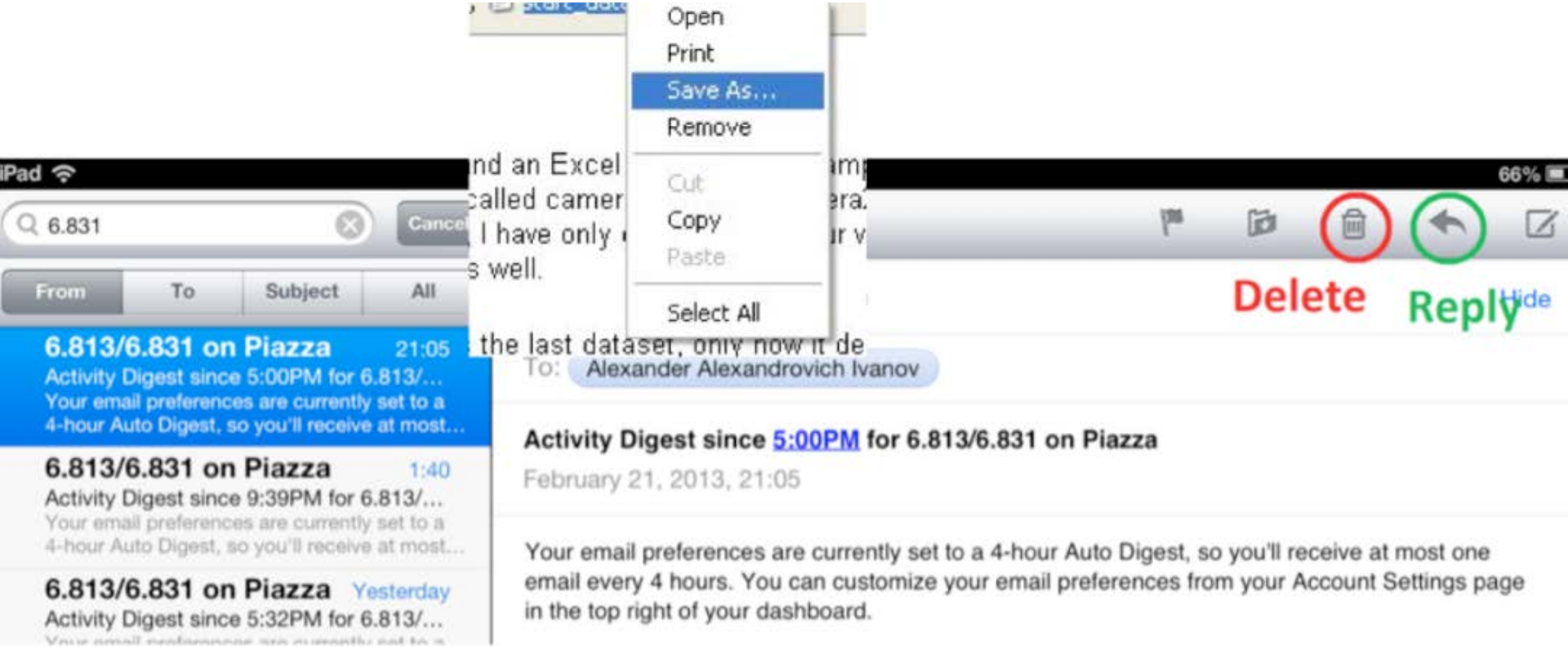
Personalized Interfaces



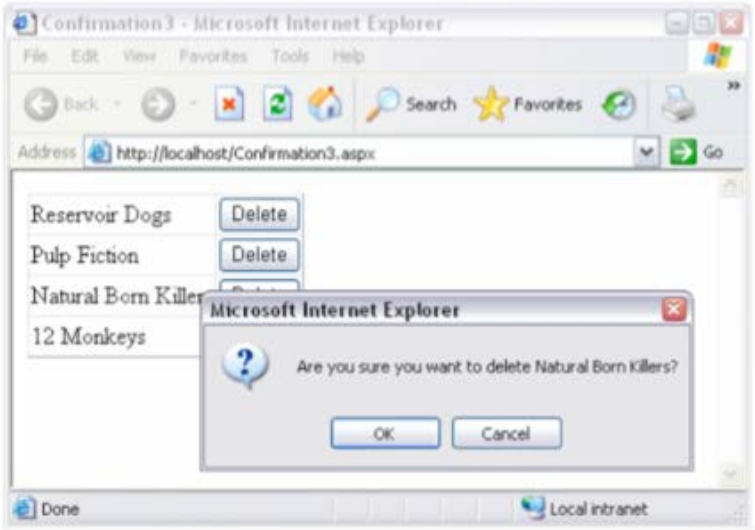
http://www.eecs.harvard.edu/~kgajos/research/supple/

Safety

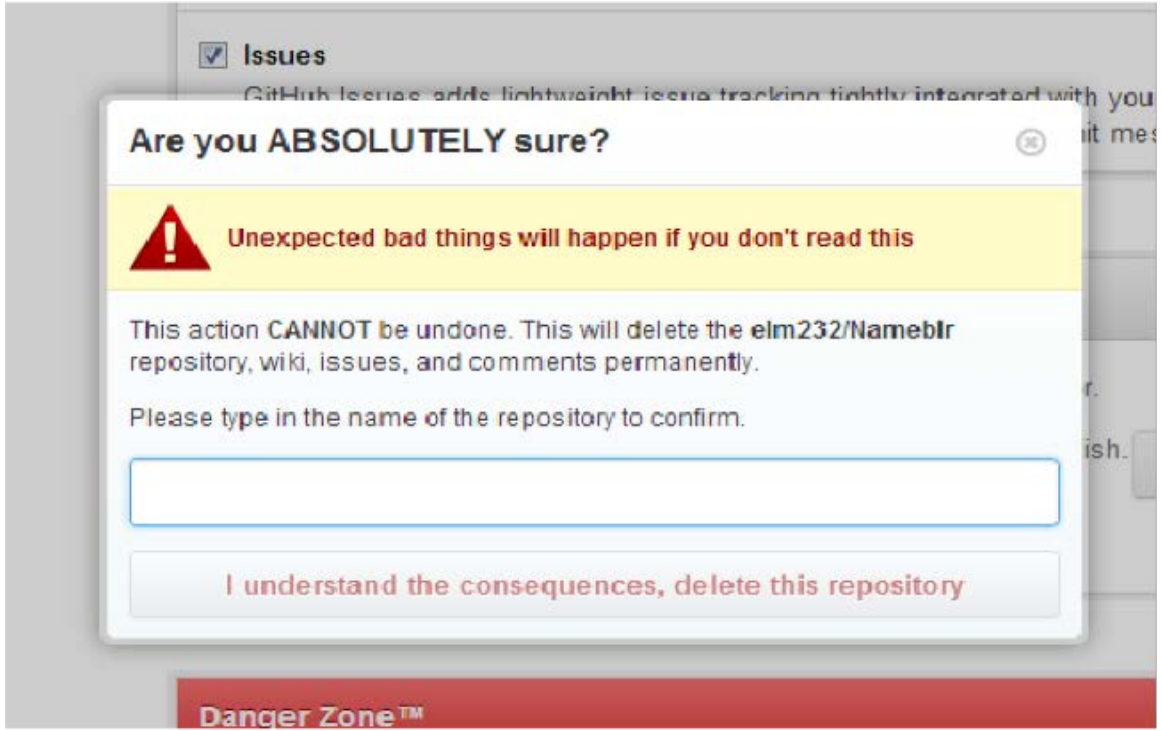
Dangerous Actions Should be Far Apart



Confirmation Dialogs: Good or Bad?



Confirmation Dialogs: Use for Rare, Crucial Actions

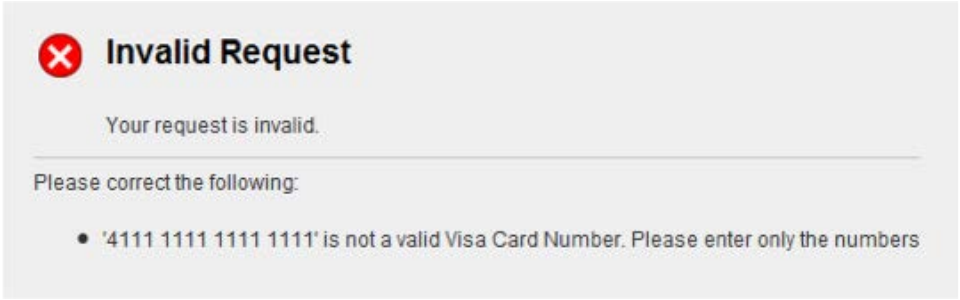


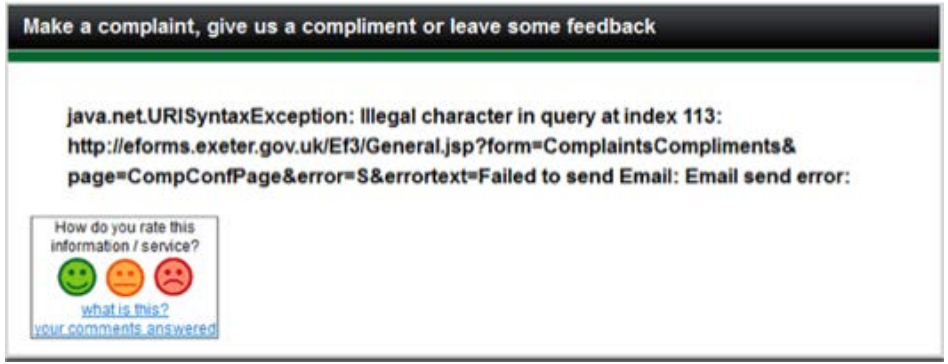
from github

Gmail Keyboard Shortcuts

Action	Shortcut
Move focus to toolbar	,
Select conversation	x
Toggle star/rotate among superstars	s
Archive	e
Mute conversation	m
Report as spam	!
Delete	#
Reply	r
Reply in a new window	Shift + r
Reply all	a
Reply all in a new window	Shift + a
Forward	f
Forward in a new window	Shift + f

Error Messages

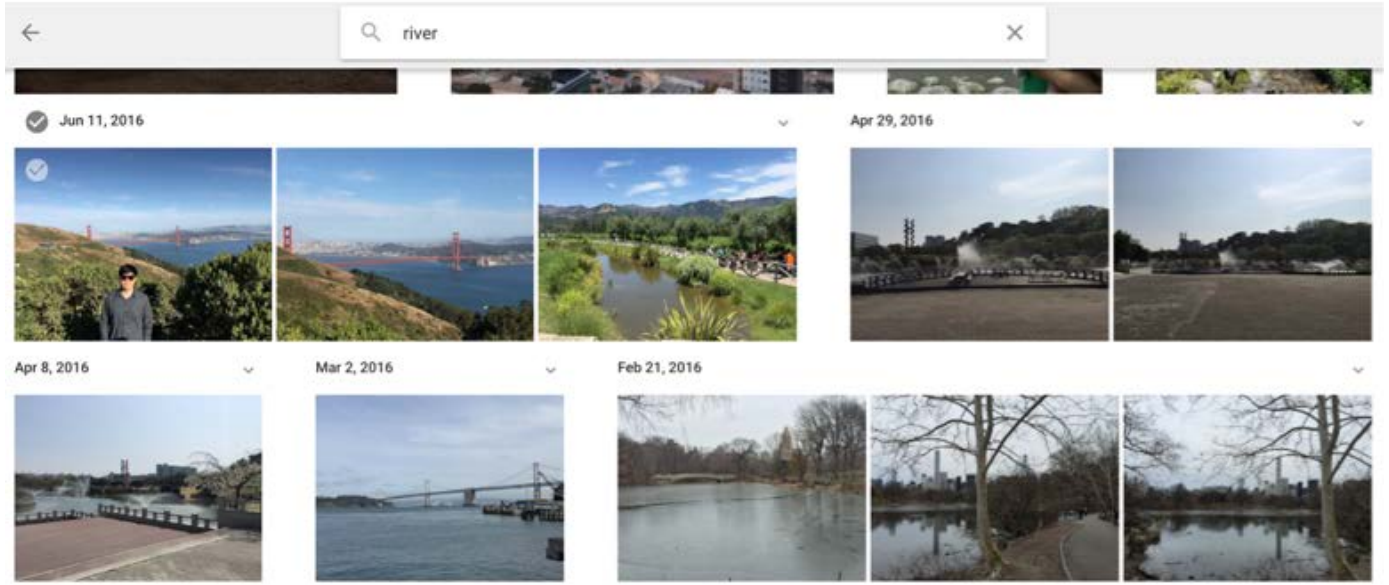




- be polite, non-blaming
- be precise
- speak user's language
- restate the input
- suggest how to fix

Intelligent Search

- Google Photos uses automated object recognition and tagging in their search interface.



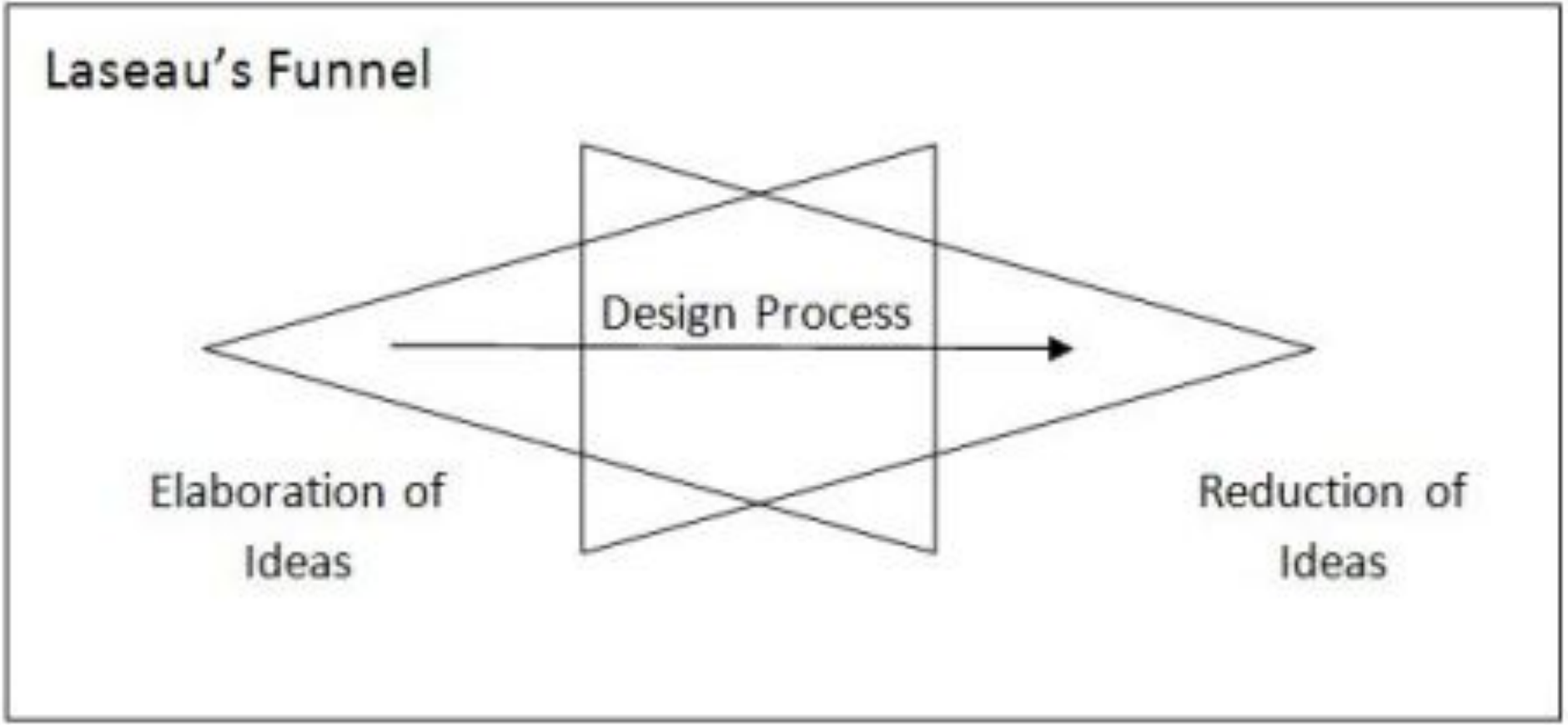
Intelligent Search: cost of failure

http://mashable.com/2015/07/01/google-photos-black-people-gorillas/#v3QwN6bx1uqX

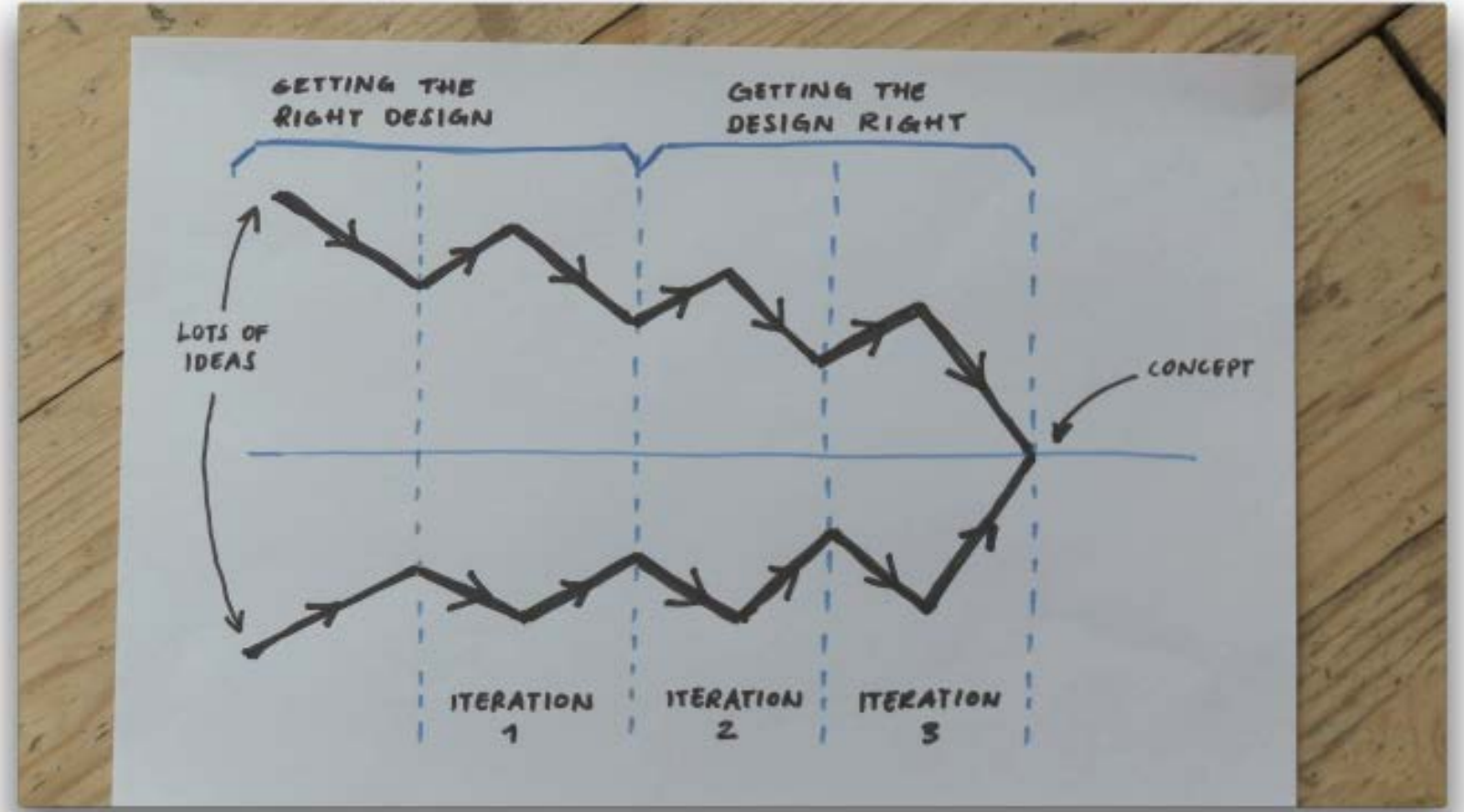
What Properties Does Good Software Have?

- Performance
- Cost
- Security
- Maintainability
- Size
- Reliability
- Standards
- Marketability
- Modularity
- Intelligence
- **Usability**

Designing Usable Software: User-Centered Approach

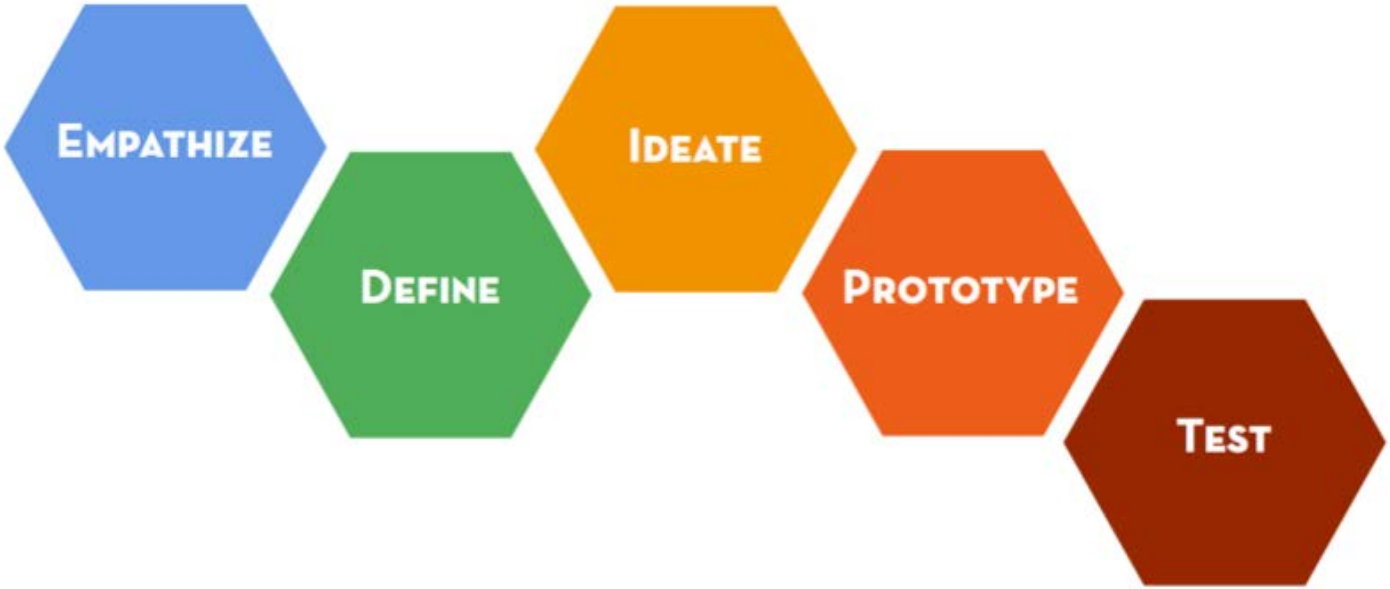


https://divergentmba.wordpress.com/2011/03/14/sketching-user-experiences-by-bill-buxton/

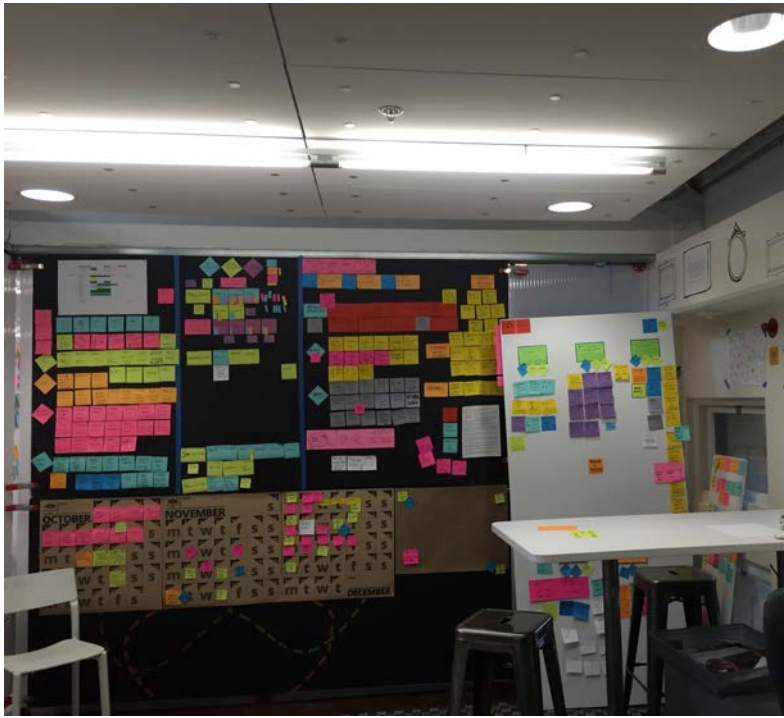


https://www.linkedin.com/pulse/bill-buxtons-design-funnel-frank-kloos

User-Centered Design Process



Needfinding



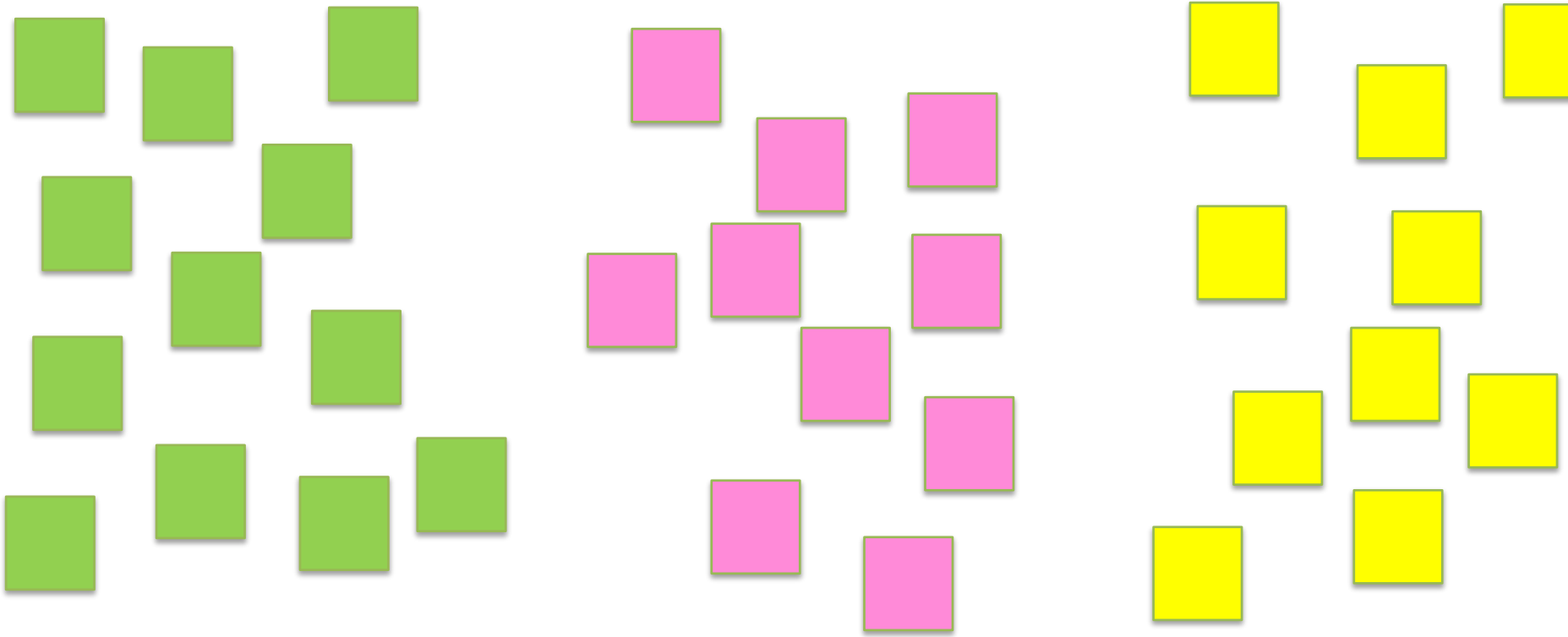
Popular Methods for Needfinding

- Interview & Observation
- Contextual Inquiry
  - In the user's actual work environment, discussing actual work products
  - Establish a master-apprentice relationship
- Participatory Design
  - Include a user directly on the design team
  - When domain expertise matters

Users

Needs

Insights




USERS
NEEDS
INSIGHTS
DORM HOUSE-PARENT
OPEN DOOR
IDENTIFY STUDENTS
REVIEW ENROLLMENT HISTORY
REST
PATROL
TURN LIGHT ON
Useless First-aid KIT
INTACT FIRE ALARM


POV.
• We met...
• We were amazed to realize...
• It'd be game-changing to...
POV2
POV3
alarm -t

Point of View

- Focus on ONE meaningful challenge.
- “a unique, concise reframing of the problem that is grounded in user needs and insights.”

Ideas from Stanford CS147, James Landay

POV Example

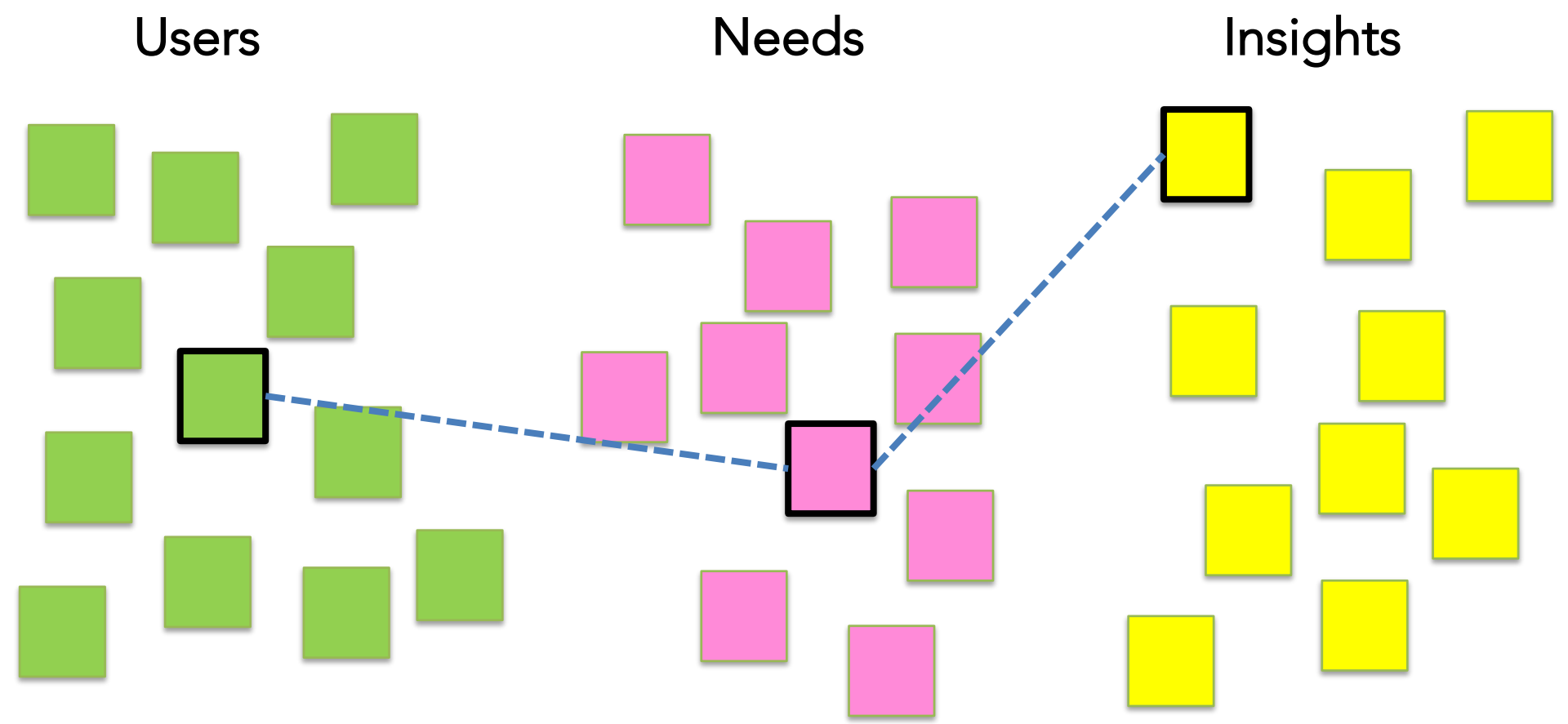
- We met
  - a young millennial living in Daejeon.
- We were amazed to realize
  - he protects & preserves clothing by not washing them often.
- It'd be game-changing to
  - help him care for his clothes while keeping them clean.

Example from Stanford CS147, James Landay

- Tide Total Care keeps your colors like new.

- Protects Colors -- Conditions wash water to help prevent damage from chlorine and mineral deposits

- Maintains Finish -- Helps maintain the smoothness and overall texture of your clothes by reducing the friction between fibers that occurs during washing and daily wear.


Users
Needs
Insights
"We met…"
"We were amazed to realize…"
"It'd be game-changing to…"

For each POV, come up with HMW questions

- How Might We…?
- “Might” helps you defer judgment.
- Go for quantity.
- Encourage wild, open ideas.

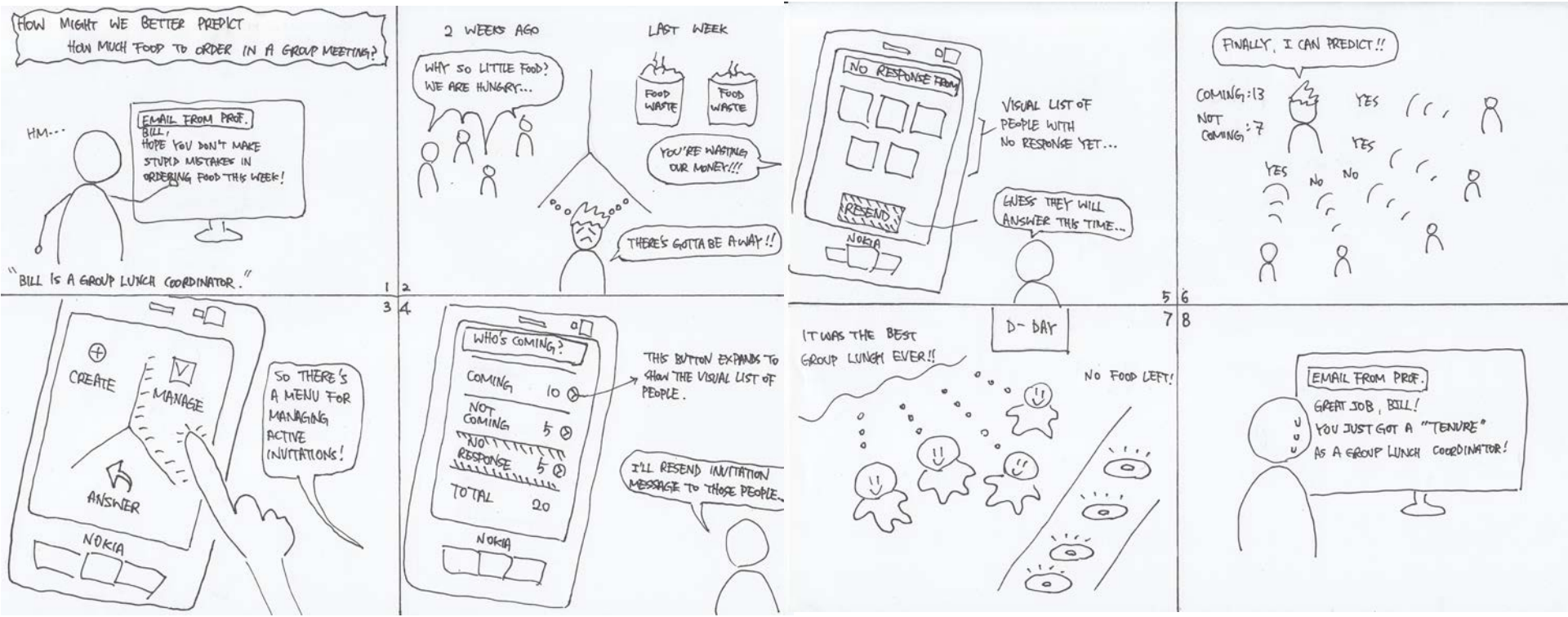
- **Too narrow**: “HMW create a cone to eat ice cream without dripping?”
- **Too broad**: “HMW redesign dessert?”
- **Proper**: “HMW redesign ice cream to be more portable?”

For each HMW, come up with solution ideas

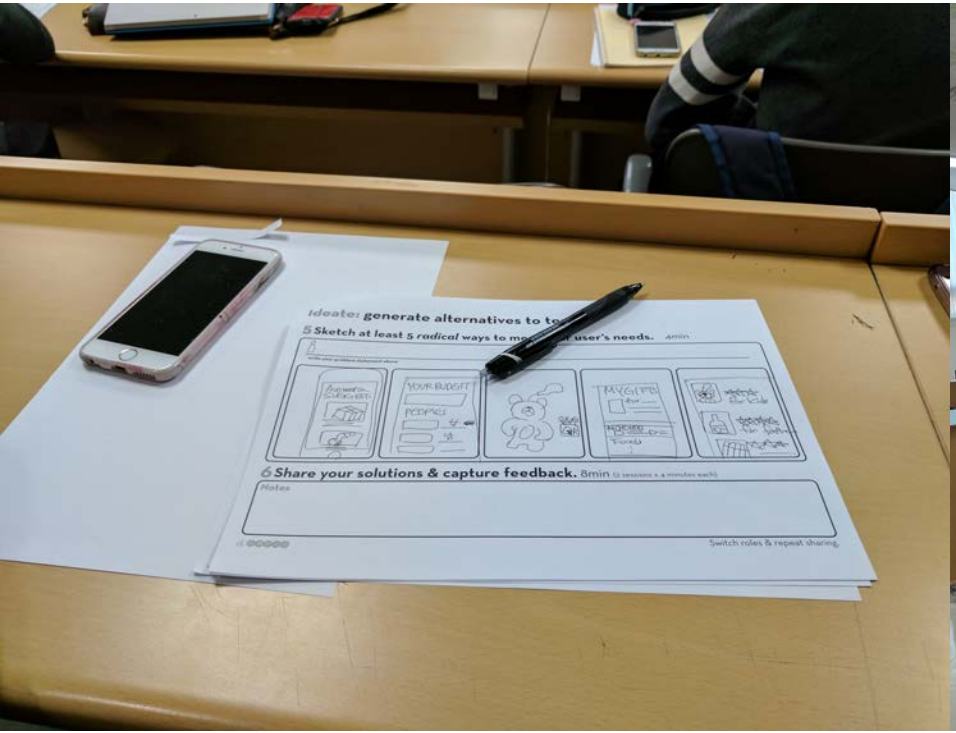
Extreme in some way

- ultra-learnable
- ultra-efficient
- ultra-safe (preventing all errors)
- for illiterate users
- for blind users
- for children
- for the elderly
- for use while driving
- for other extreme users, context, situations

Storyboarding



Team FoodEx, Stanford CS147, Fall 2008


Ideate: generate alternatives to
5 Sketch at least 5 radical ways to
user's needs. 4min
YOUR BUDGET
POEMES
MY GIFTS
Food
6 Share your solutions & capture feedback. 8min
Notes
Switch roles & repeat sharing

Prototype

"A representation of a design, made before the final solution exists."

Moggridge, Designing Interactions

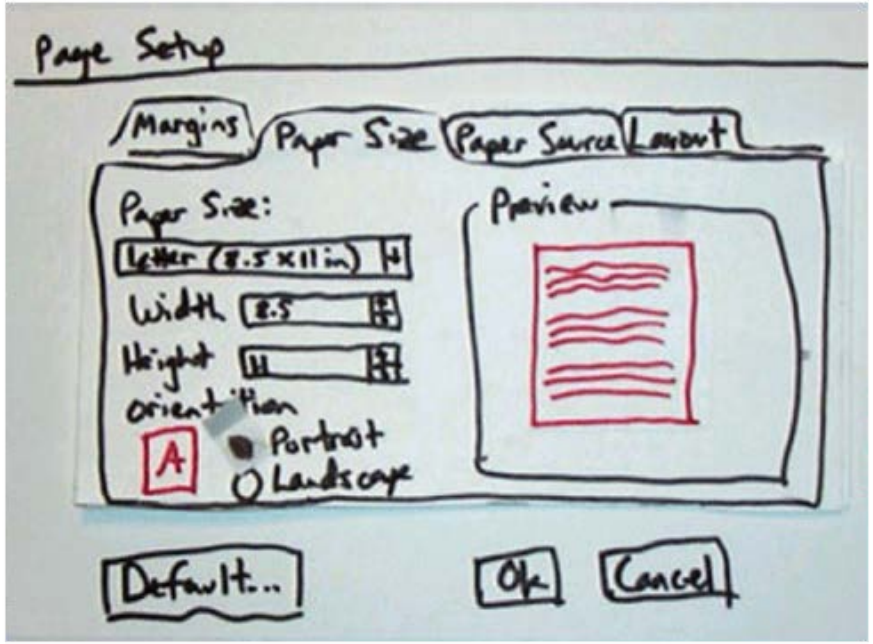
Prototyping a Computer Mouse

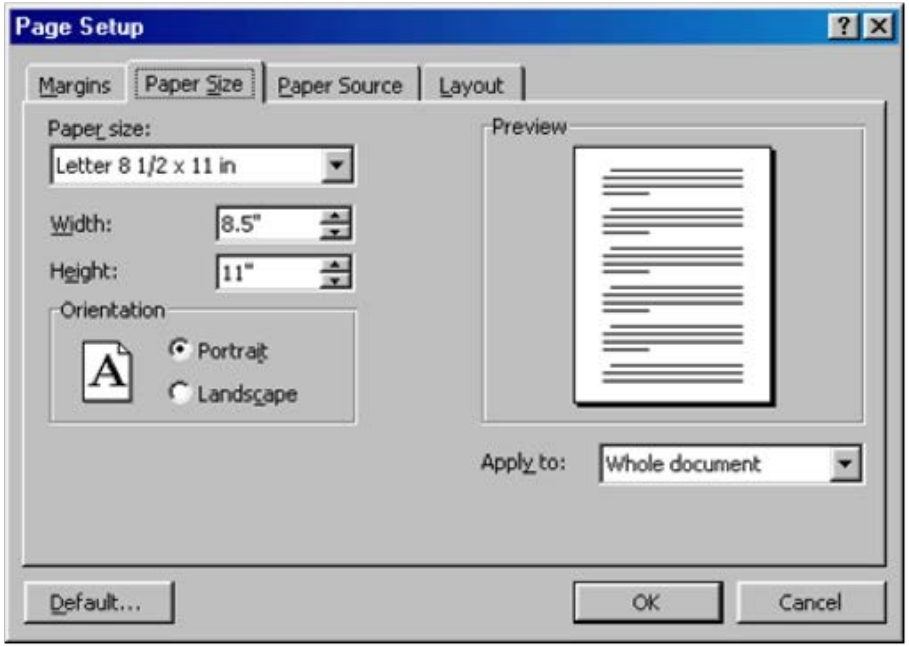
https://www.youtube.com/watch?v=0LQr1FIold0

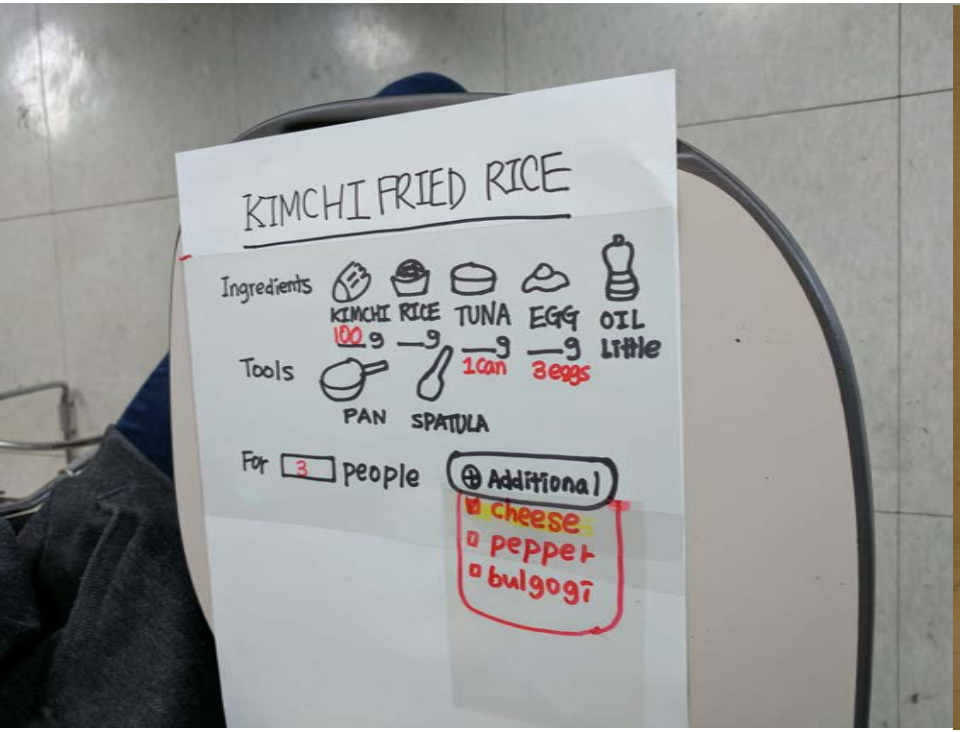
- “Even best designers are wrong the first time.”
- “Multiple prototypes matter so that you can compare and test your assumptions & hypotheses.”
- “Offends engineers.”

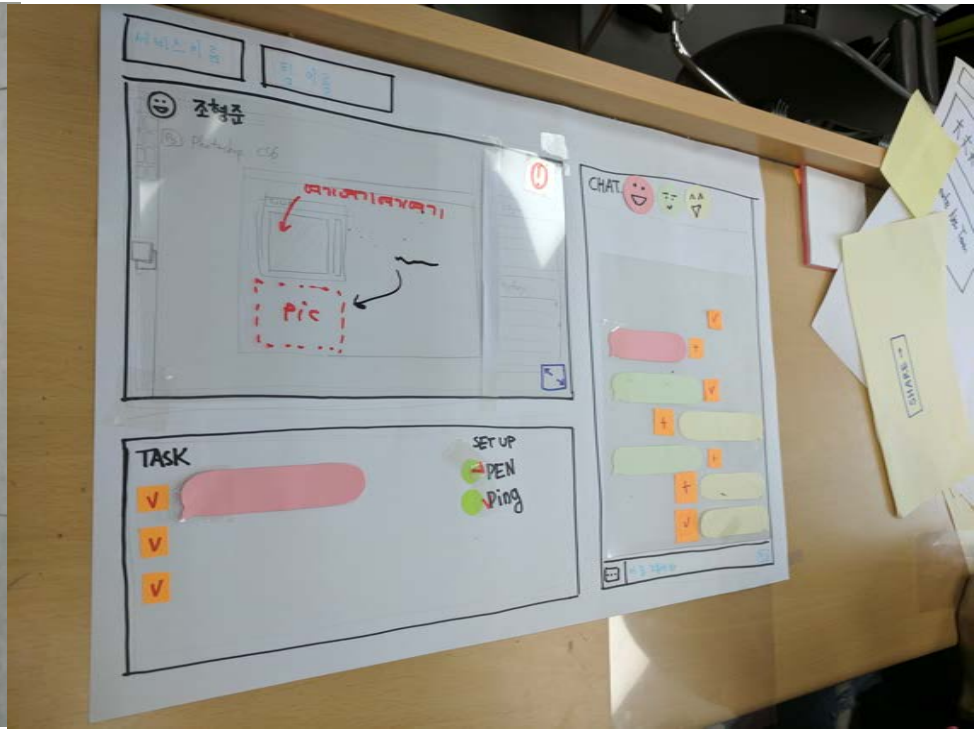
https://www.youtube.com/watch?v=0LQr1FIold0

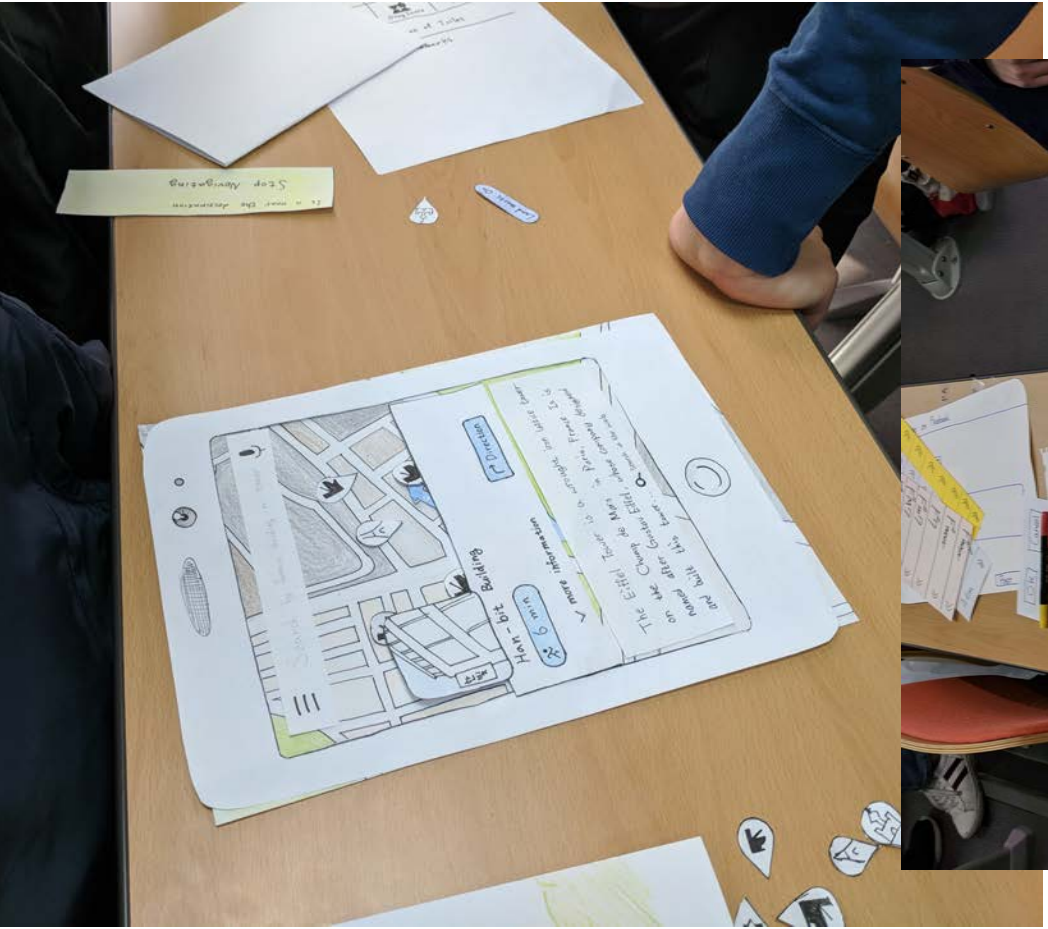
Paper Prototyping






KIMCHI FRIED RICE
Ingredients
KIMCHI RICE TUNA EGG OIL
100g —g —g —g little
Tools
1can 3eggs
PAN SPATULA
For 3 people
⊕ Additional
cheese
pepper
bulgogi


조형준
Pic
CHAT.
TASK
SET UP
PEN
Ping


Chordplay
Seul-gi
Share
Export
Chord Library
C
C#(Db)
D
D#(Eb)
E
F
F#(Gb)
G
G#
Dm7
Dbm7
Gm6
F#m7
Bm7
Em7
A7

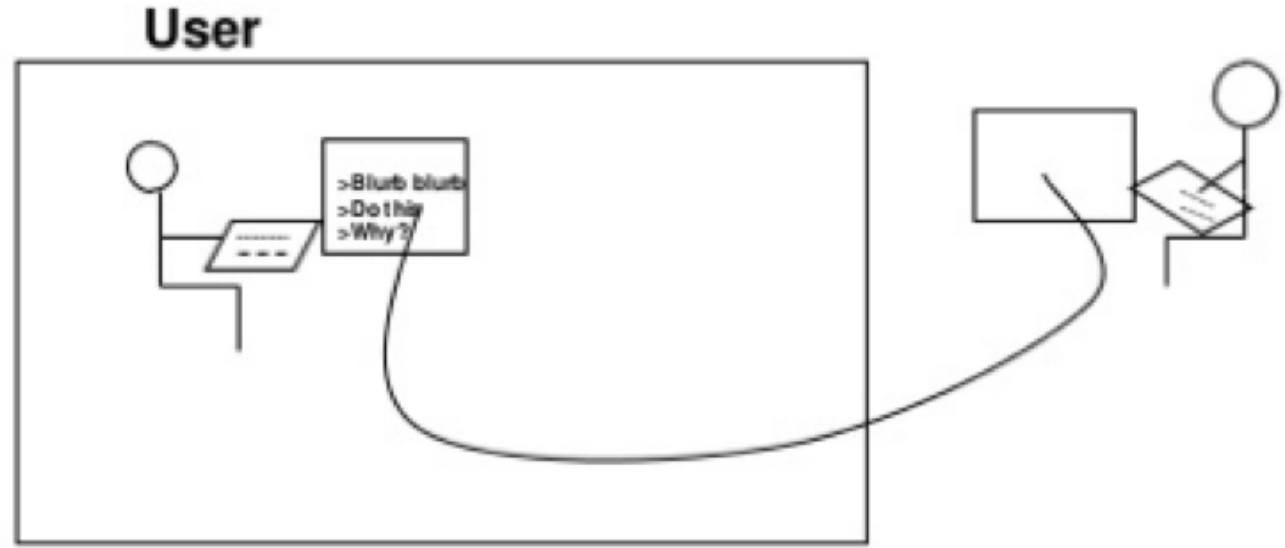
Hanmail Paper Prototype

- What are some of the useful techniques?

Why Paper Prototyping?

- Fast to build
- Easy to change
  - Even *during* a user test
  - No code investment
- Focuses attention on big picture
  - Designer doesn't waste time on details
  - Customer makes more creative suggestions, not nitpicking
- Nonprogrammers can help
  - Only kindergarten skills are required

Wizard of Oz Prototyping



http://www.slideshare.net/emanabedalwahhab/prototyping-34600987

Kramer's Moviefone

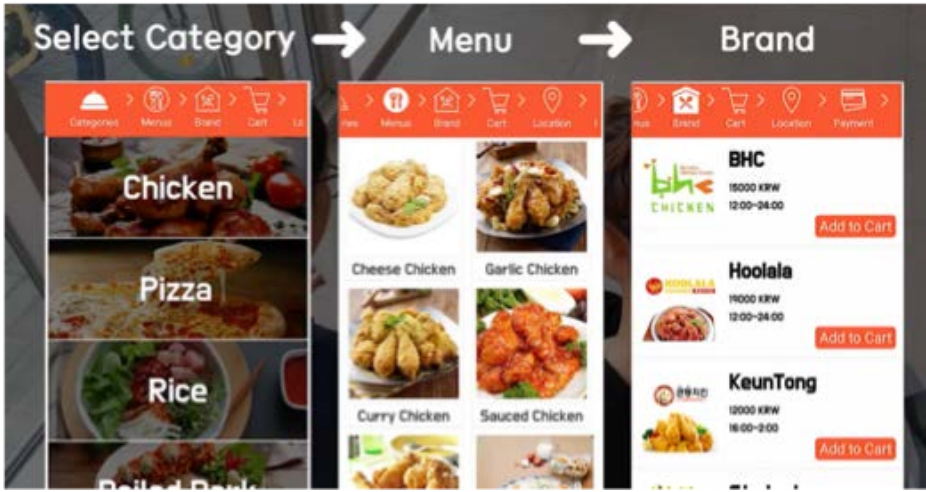
Wizard of Oz Prototyping

- Simulate machine behavior with human operators
- Make an interactive prototype without (much) code

- Rapidly test the prototype with people
  - Higher fidelity than paper
  - Lower cost than actual implementation

- Simulations might misrepresent, wizard training & fatigue

Video Prototyping



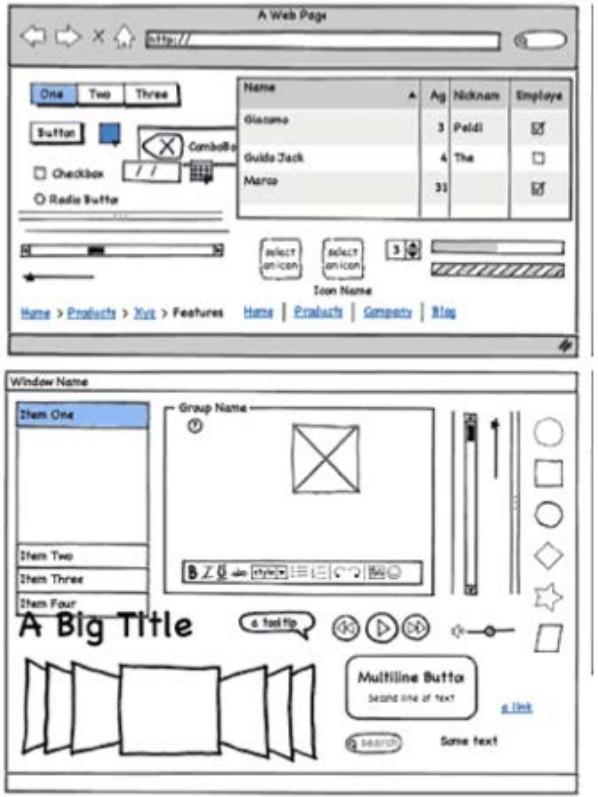
https://www.youtube.com/watch?v=tLBOZJ1M2J4

Video Prototyping

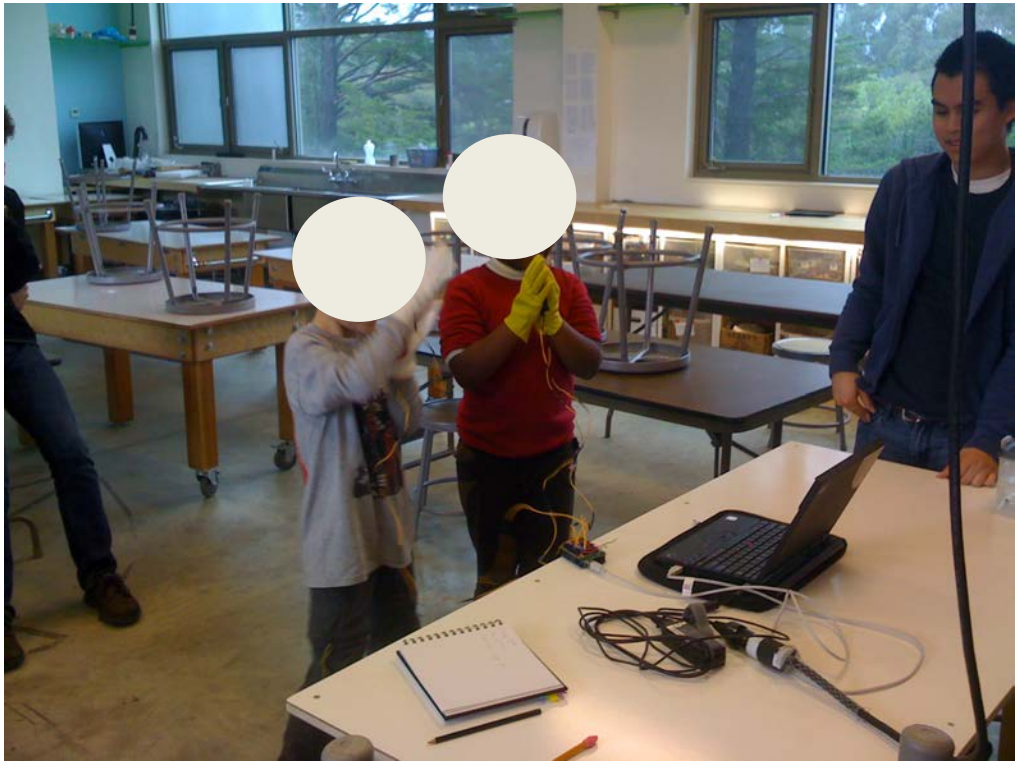
- Capture rich & real context, illustrate context of use
- Great communication tool, portable
- Connects UI and task
- Full usage scenario needs to be thought out
- Good storyboards & paper prototypes can yield quick videos
- Not interactive
- Can be caught up in detail

Prototype Tools

- Photoshop, Powerpoint
- Balsamiq Mockup, Marvel, InVision, proto.io, …



User Testing



Team CCR, Stanford CS247 Winter 2009

Types of User Testing

- **Formative evaluation**
  - Find problems during iterations
  - Often in lab, with chosen tasks
  - Qualitative observations (usability problems)
- **Field study**
  - Find problems in context
  - In real context, on real tasks
  - Mostly qualitative observations
- **Controlled experiment**
  - Tests a hypothesis (e.g., interface X is faster than interface Y)
  - Often in lab, with chosen tasks
  - Mostly quantitative observations (time, error rate, satisfaction)

Presentation & Communication


Tasks
1. Browse through contents, within and between categories
2. View and like Jjals created by other Ducks
3. Create and share Jjals with other Ducks
13 >> User Interface
VIP


NEEDS
POV
HMW
User Needs & Problems
From DP1,
- Interviewee C
- Early 30s married man
- Living in the United States of America.
- He cooks breakfast every day together with his wife.
- He wants to cook together with his wife efficiently.
Presentation Order
Creativity & Challenge
KAIST

CS374 Design Process Example

- [DP0] Week 03: Team Formation
- [DP1] Week 04: Needfinding
- [DP2] Week 06: Storyboards
- [DP3] Week 07: Paper Prototyping
- [DP4] Week 09: Lo-fi Prototyping
- [DP5] Week 11: Mid-fi Prototyping
- [DP6] Week 13: Hi-fi Prototyping
- [DP7] Week 14: User Testing
- [DP8] Week 16: Iteration & Wrap-up

Takeaway Messages

- It's not human error. It's bad design.
- Usability: learnable, efficient, & safe (≠ good-looking)
- User-centered design process
  - Empathize ➔ Define ➔ Ideate ➔ **Prototype** ➔ Test
- Use different prototyping methods for your needs.
- Talk to users well before you have a final solution.
- Iterate. Multiple times.