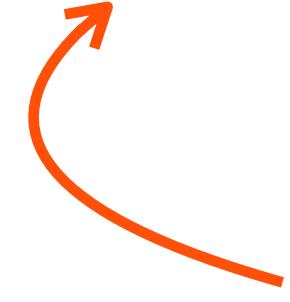


# UI DESIGN



*Crash Course!*

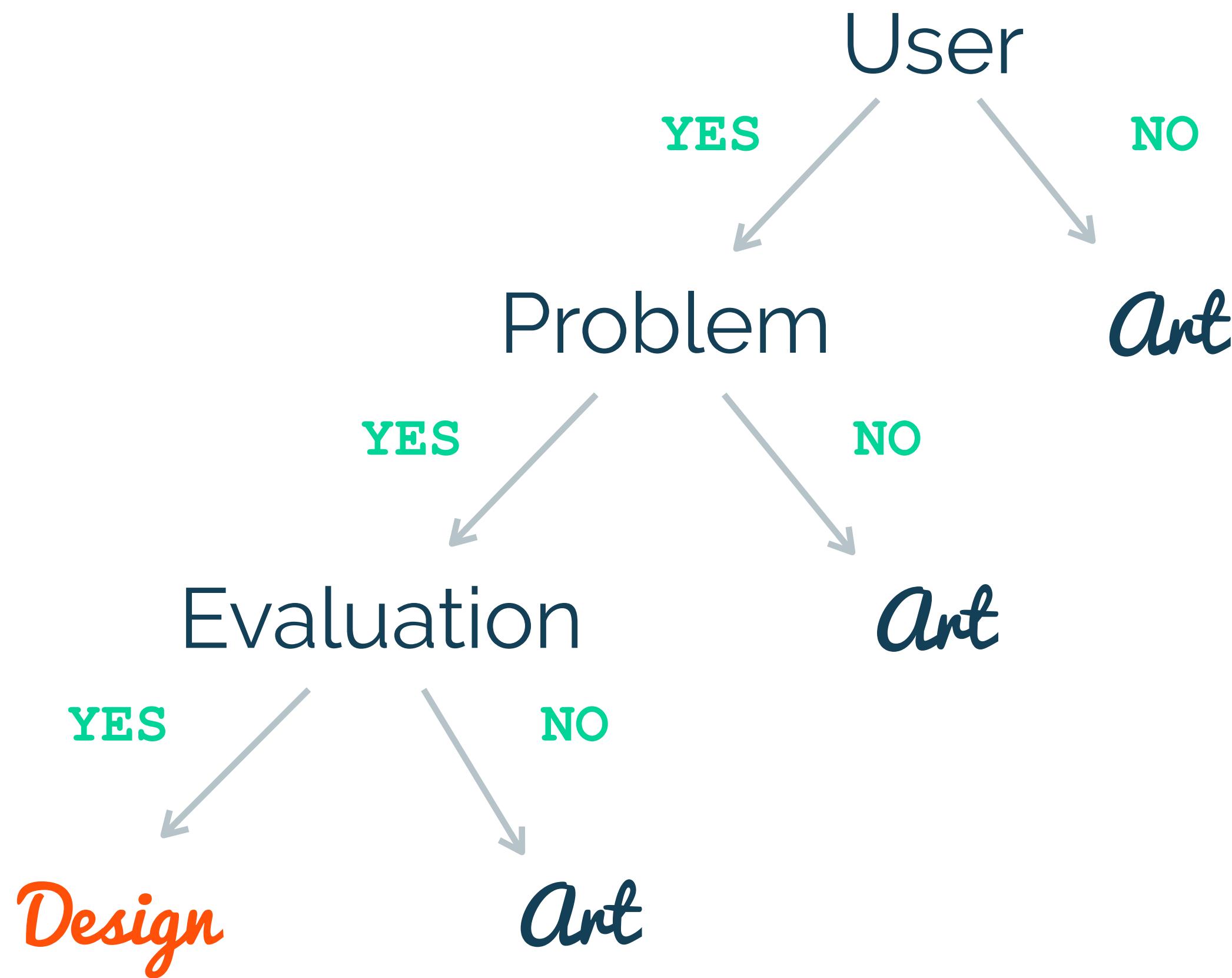
*What is Design?*

# “DESIGN IS DOING THINGS WITH INTENTION,

*trying to decide what's important to somebody, building a bunch of prototypes and showing them around, developing a point of view and getting it out so that it has impact in the world. So design is really a process of making impact on the world by doing this kind of creation of something new to the world and then getting it out there.”*

David Kelley

<http://boingboing.net/2012/09/22/design-thinking-for-social-goo.html>

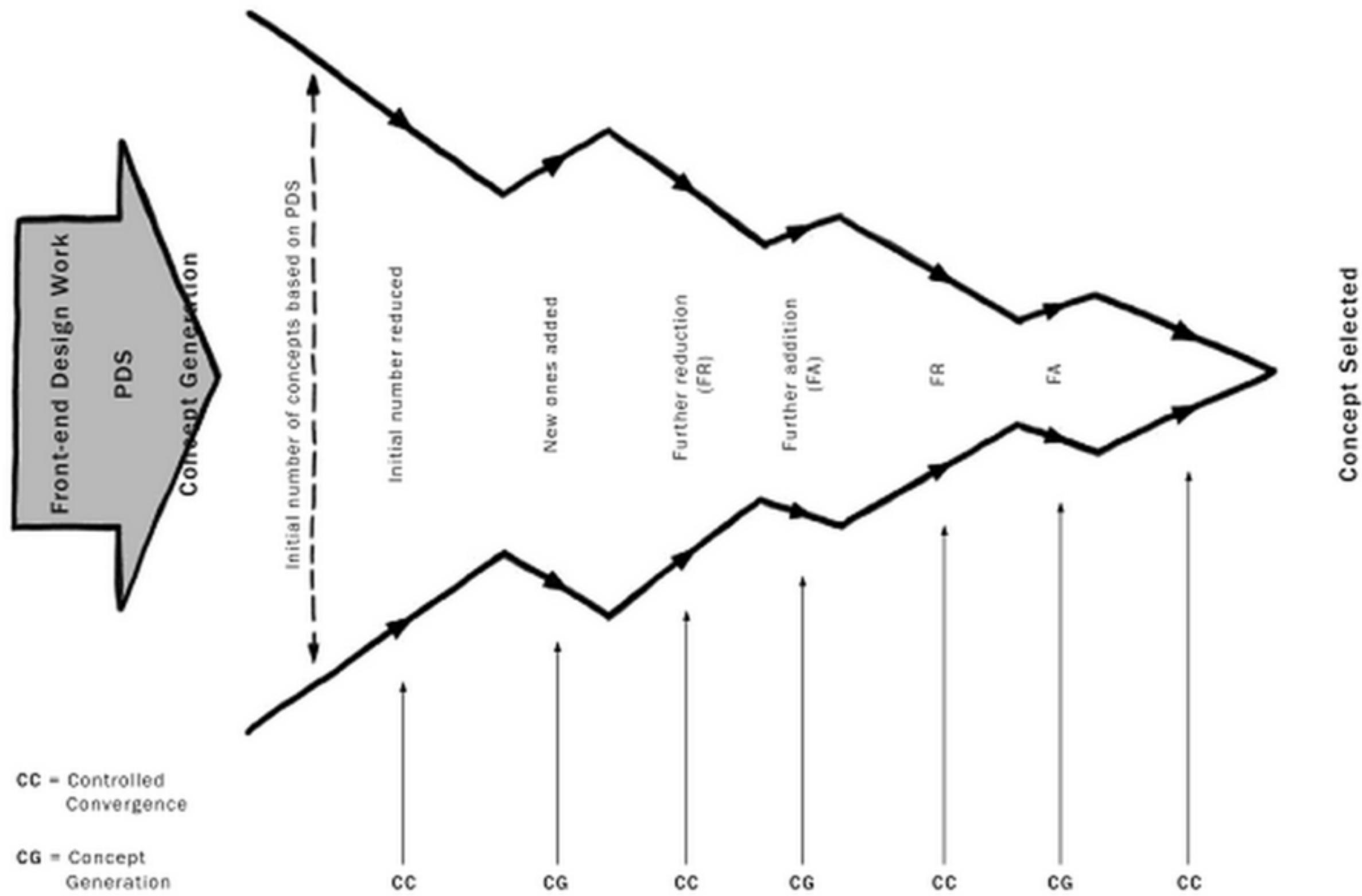


# “DESIGN IS CHOICE,

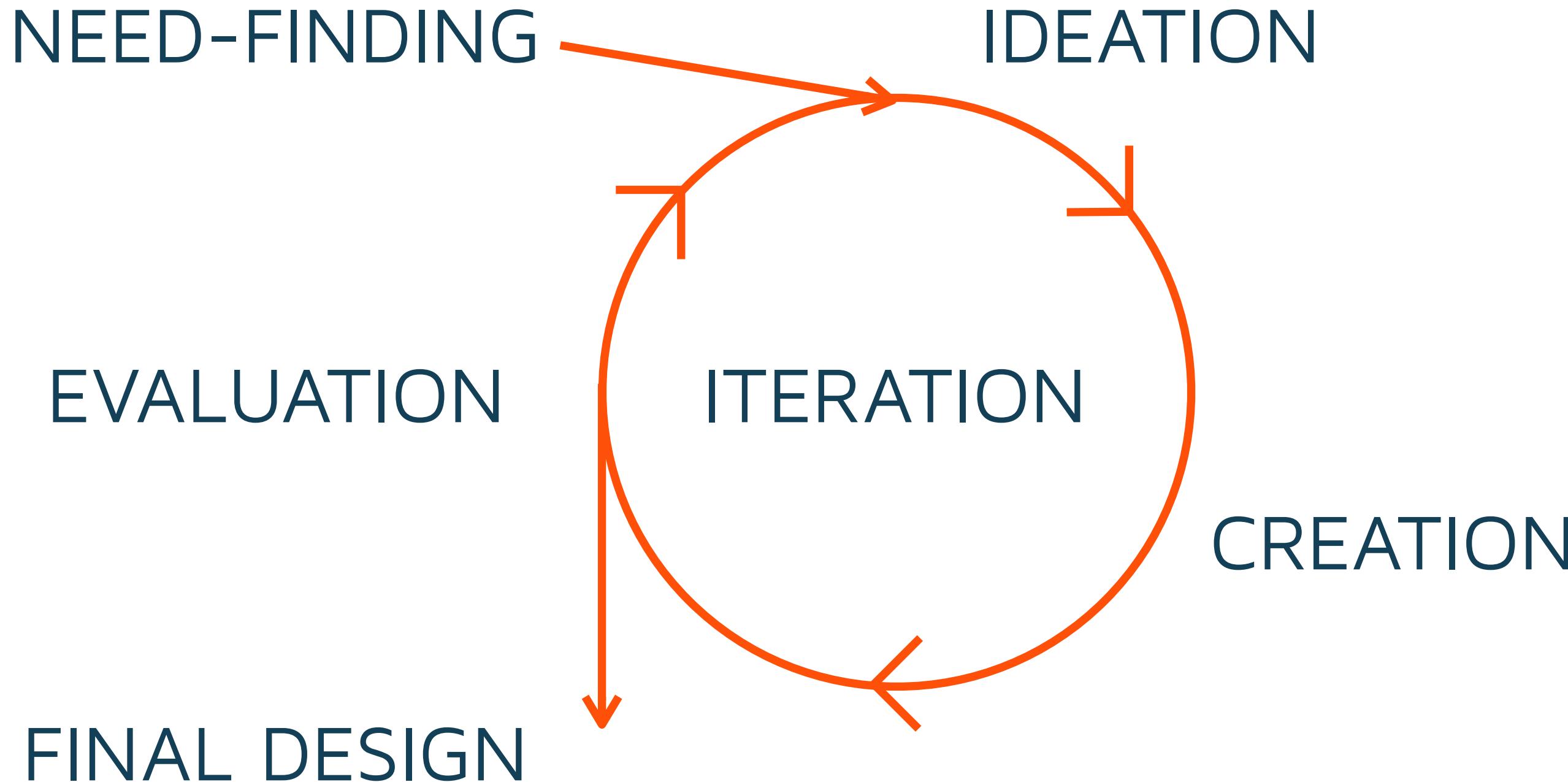
*and there are two places where there is room for creativity:*

- 1. the creativity that you bring to enumerating meaningfully distinct options from which you choose*
- 2. the creativity that you bring to defining the criteria, or heuristics, according to which you make your choices.”*

Bill Buxton  
*Sketching User Experiences*



# THE DESIGN PROCESS



# DESIGN IS *Wicked* HARD

indeterminate, incomplete, contradictory, and  
changing requirements

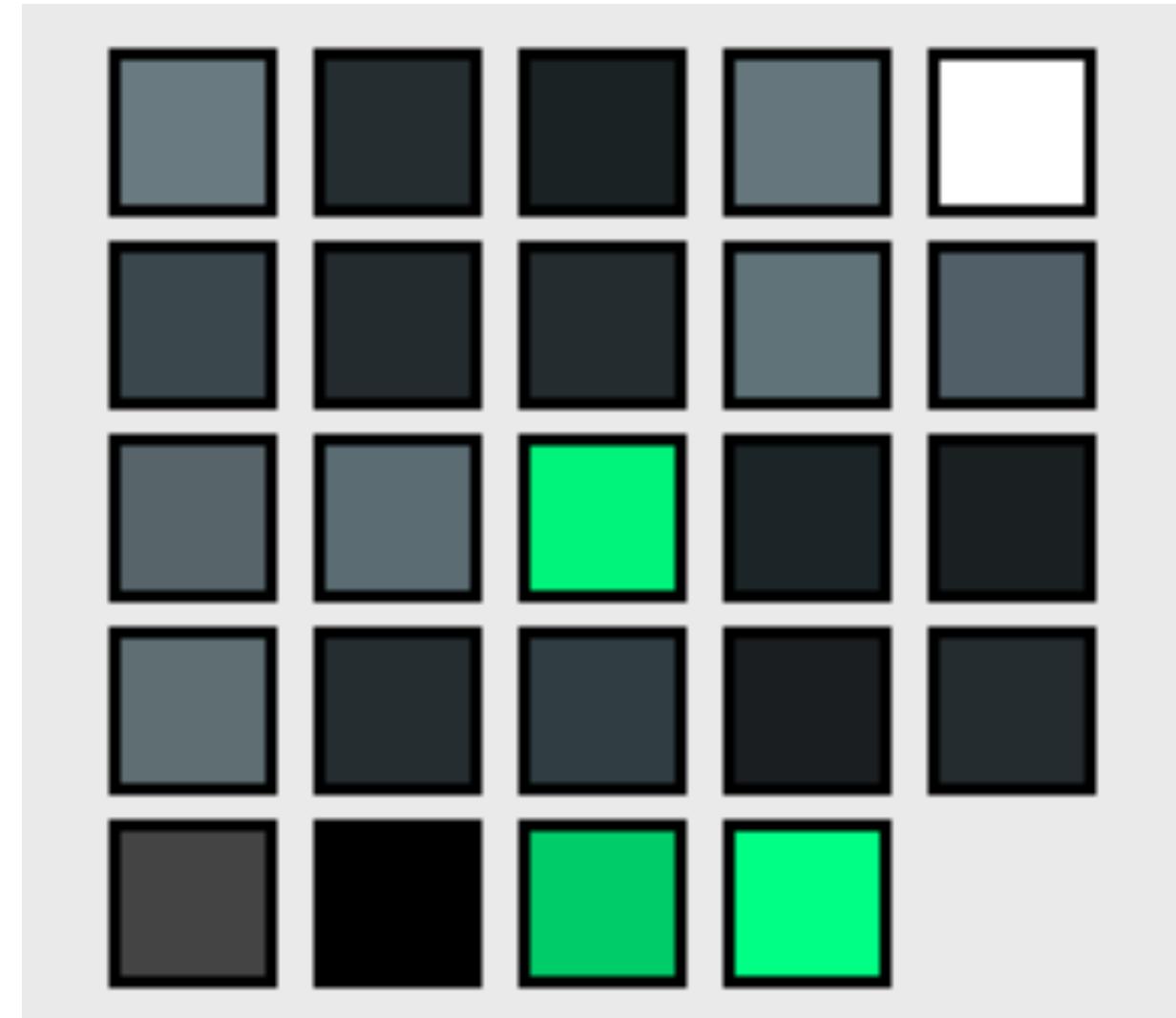
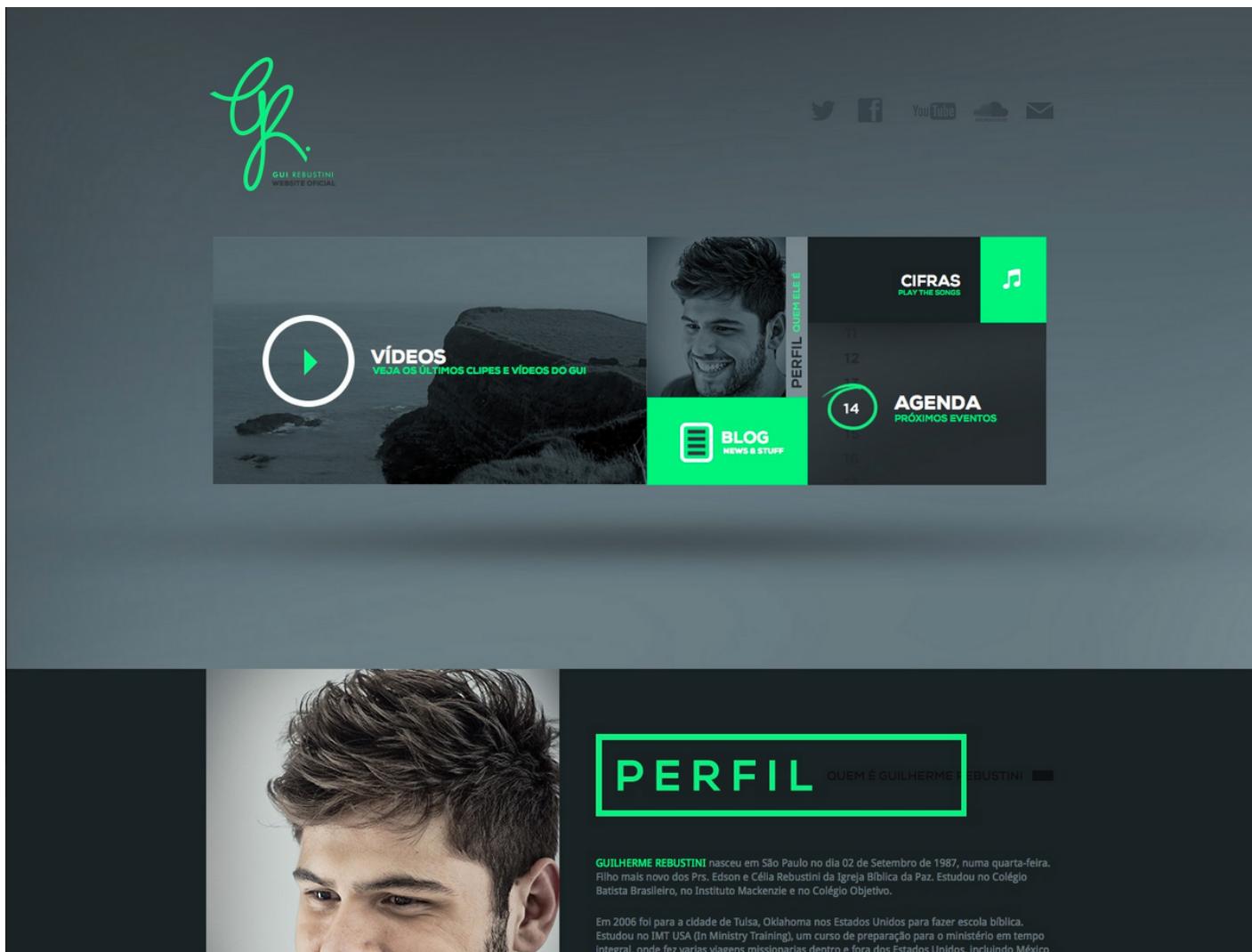
*Wicked Problem*

Exploring enough of the solution space

Evaluating amongst alternatives

Knowing when you're done

# NUMBER OF DESIGN DECISIONS



*Fifty Shades of Grey*

*What is Good Design?*

# MENTAL MODELS

User's understanding of how  
something works

Inferred from the interacting with  
the design

# MENTAL MODEL

Good design communicates the right mental model

Bad design: designer's model differs from user's model

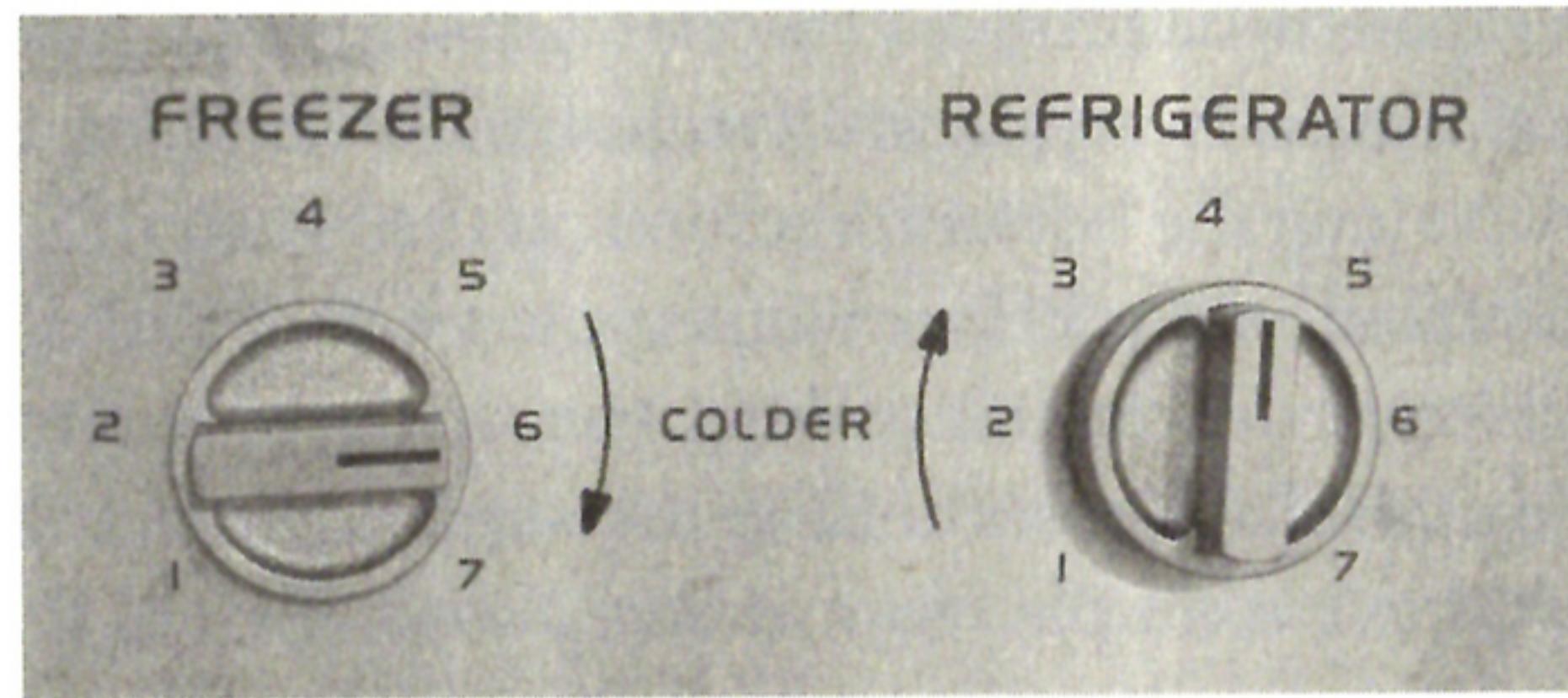
*Intention vs Perception*



clear mapping between  
controls and functionality

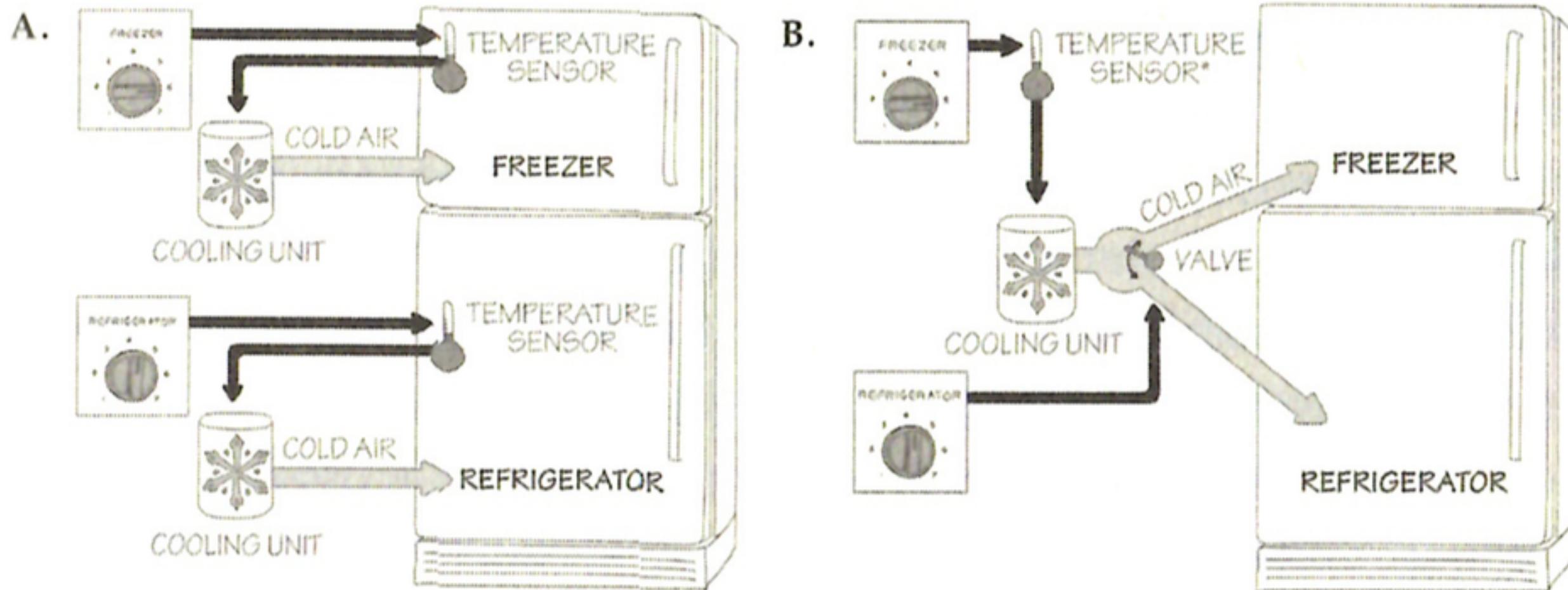
*not a natural mapping!*

# NORMAN'S REFRIGERATOR



The Design of Everyday Things, Don Norman

# NORMAN'S REFRIGERATOR



The Design of Everyday Things, Don Norman

# THERMOSTATS

What's the fastest way to bring a room  
up to the desired temperature?



# THERMOSTATS



on-off switch

furnace runs full blast until the  
room is at set temperature

*No fast way!*

# NEST

*Rotation: cycle  
through options*



*Push: make selection*

*Prototyping*

# PROTOTYPES

Cheap and fast

Spectrum of fidelity

Multi-resolution design

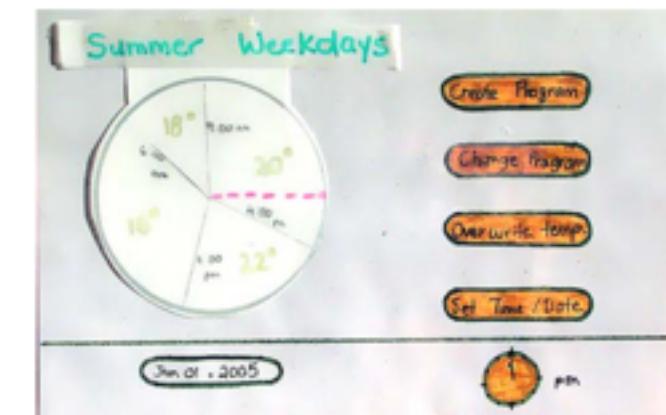
Tools: paper & pen, powerpoint,  
photoshop, balsamiq

# TYPES OF PROTOTYPES

Storyboarding



Paper prototypes



Video prototypes

Functional prototypes

*higher fidelity*

# WIZARD-OF-OZ PROTOTYPING

Functional prototype minus the functionality

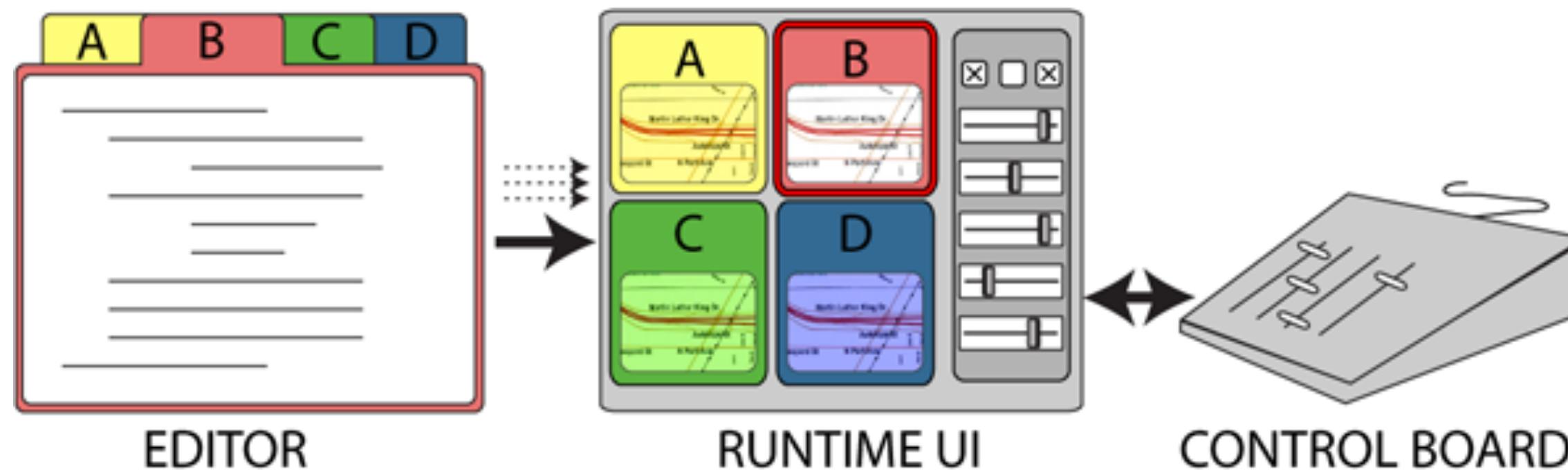
Test interaction before solving the hard problem

*So it's a tototype!*



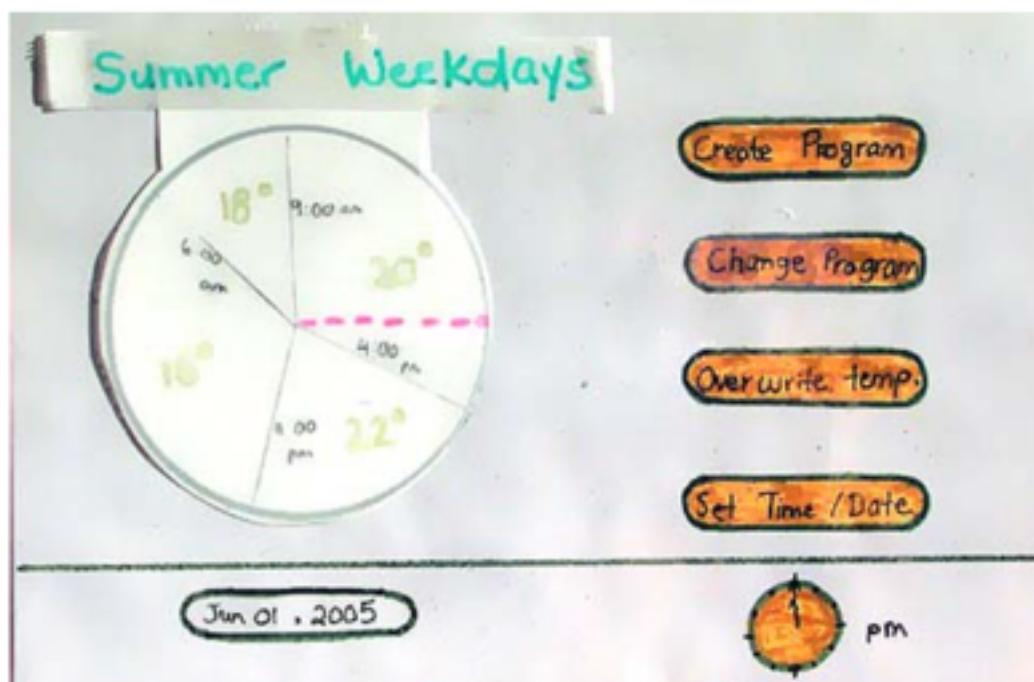
# PARALLEL PROTOTYPES

## Design space exploration



# PARALLEL PROTOTYPES

## Better feedback



A hand-drawn prototype for a 'Summer on Vacation' program editor. It includes a dropdown menu 'Program' set to 'Summer on Vacation'. Below it are four sections: 'Morning', 'Day', 'Evening', and 'Night', each with three input fields for 'From', 'to', and 'temperature'. At the bottom are three buttons: 'Date' (with dropdowns for month, day, year), 'Time' (with dropdowns for hour, minute, AM/PM), and 'Temperature' (with a dropdown menu set to 23°).

A hand-drawn prototype for a 'Summer Weekend' interface. It features a 'Today:' section with a date field 'Jun 01'. A red horizontal bar at the top represents time from 6:00 to 21:00. Below it is a red horizontal bar representing temperature, with a red slider set to 15°. At the bottom are three yellow buttons labeled 'Program', 'Time / Date', and 'Change Temp.'

Getting the Right Design and the Design Right: Testing Many Is Better Than One  
Tohidi et al., CHI 2006

# PARALLEL PROTOTYPES

Better design and more divergence



Parallel Prototyping Leads to Better Design Results, More Divergence, and Increased Self-Efficacy  
Dow et al., TOCHI 2010

# *Heuristic Evaluation*

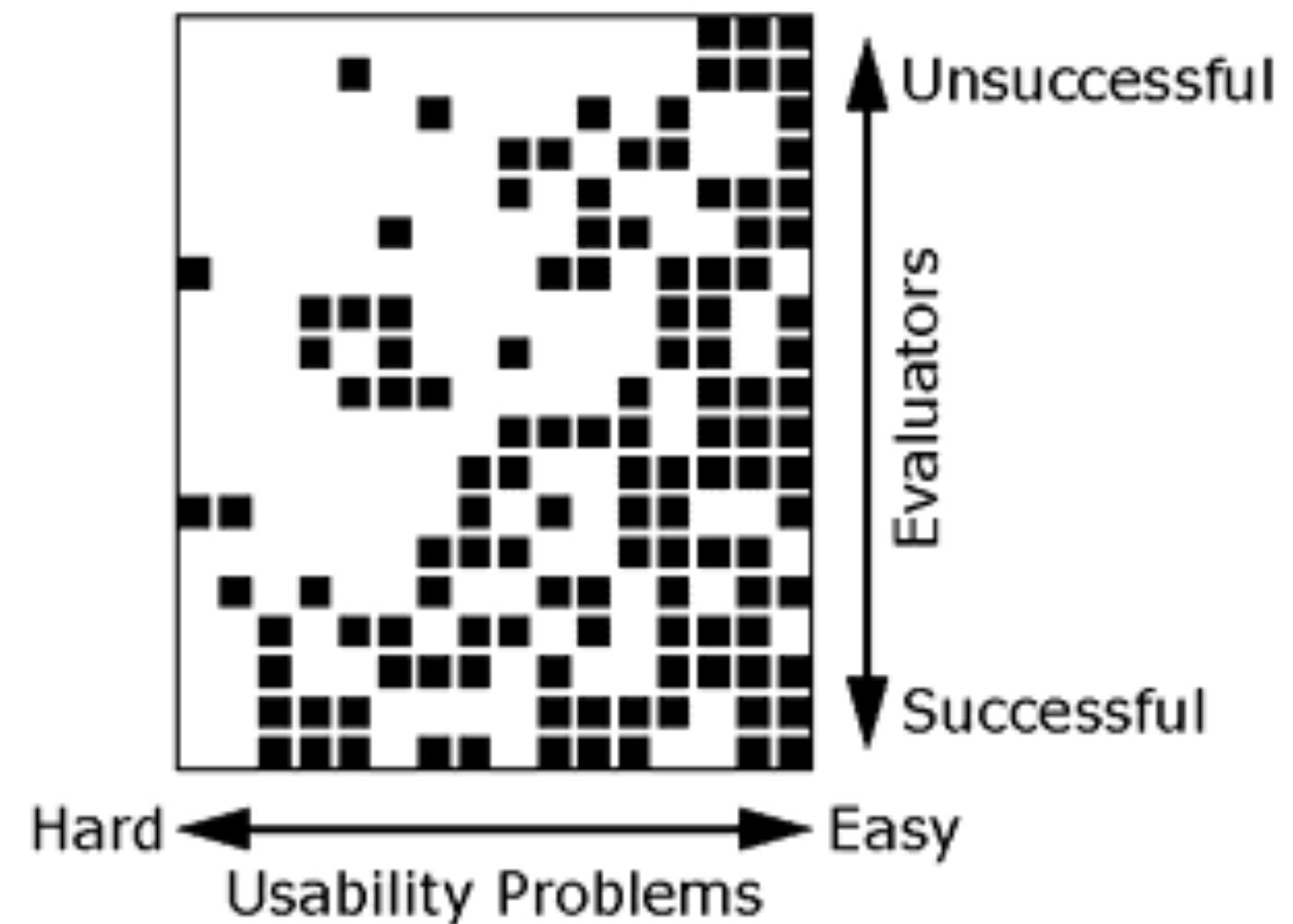
# HEURISTIC EVALUATION (HE)

small set of evaluators identify  
interface problems based on a set  
of usability principles (“heuristics”)

works on functional UI and sketches

# HE EVALUATORS

>1 evaluator; 3-5 recommended  
different evaluators  
find different problems



# THE PROCESS

Evaluators independently step through interface several times (at least x2)

Produces a list of usability problems, each explained in the context of a specific heuristic

Aggregate and rank lists; redesign and fix problems

# HE VS USER TESTING

HE is usually faster

HE results are interpreted

User testing is more accurate (real tasks and users)

*covered in a  
few weeks*

# NIELSEN'S USABILITY HEURISTICS

Show system status

Recognition over recall

Familiar metaphors and language

Flexibility and efficiency

Control and freedom

Aesthetic and minimalist design

Consistency

Recognize, diagnose, and recover from errors

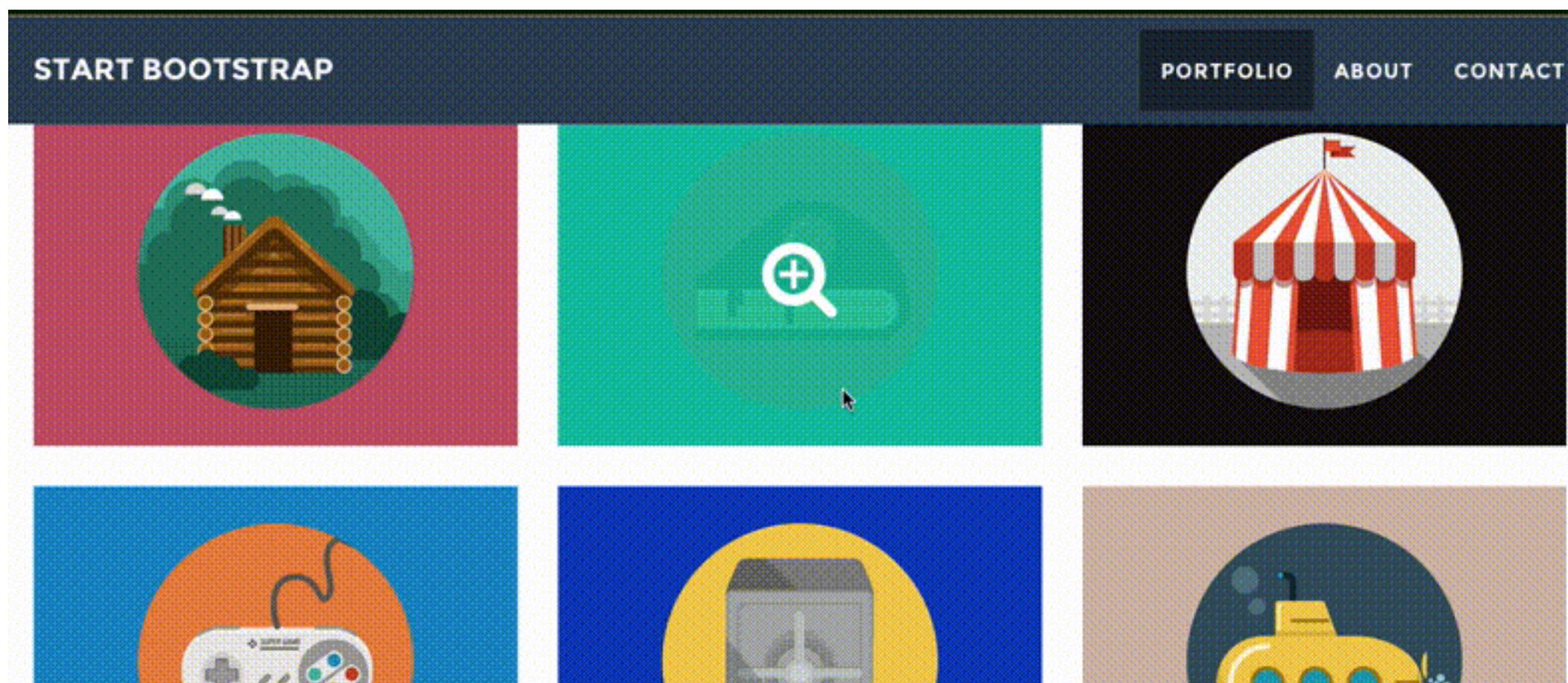
Error prevention

Help

Jacob Nielsen, [www.nngroup.com/articles/ten-usability-heuristics/](http://www.nngroup.com/articles/ten-usability-heuristics/)  
naming conventions from Scott Klemmer and Michael Bernstein

# SHOW SYSTEM STATUS

keep users informed through appropriate feedback within reasonable time



START BOOTSTRAP

PORTFOLIO ABOUT CONTACT

*navbar*

*highlighting*

# CONTROL AND FREEDOM

quickly explore and  
correct state

support undo and redo

Virgin America

February 2015

11 \$ 497	12 \$ 501	13 \$ 501	14 \$ 443
15 \$ 443	16 \$ 447	17 \$ 447	18 \$ 184
19 \$ 328	20 \$ 443	21 \$ 451	
22 \$ 485	23 \$ 184	24 \$ 184	25 \$ 135
26 \$ 184	27 \$ 184	28 \$ 135	

March 2015

# FAMILIAR METAPHORS AND LANGUAGE

skeuomorphism

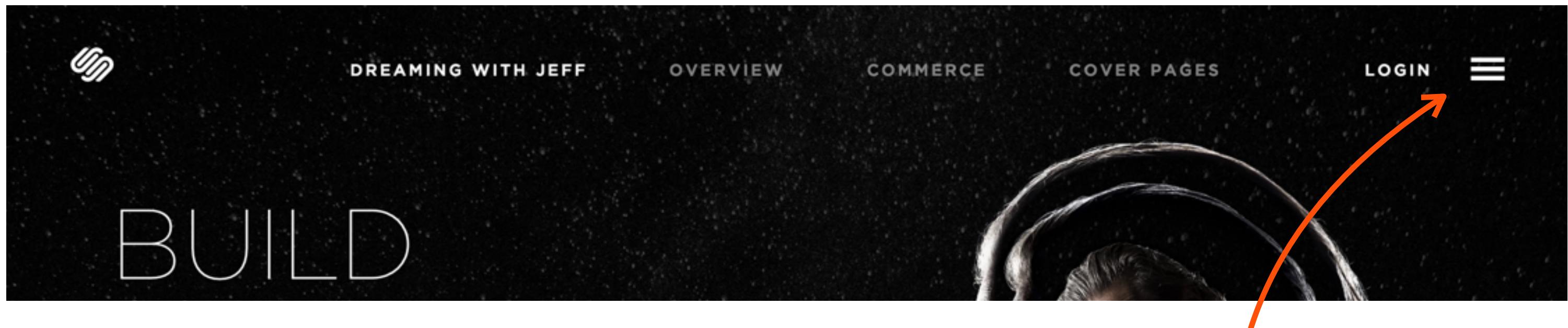
design cues are taken  
from the physical world



# CONSISTENCY

principle of “least surprise”

similar things should look and act similarly



Squarespace

*desktop hamburger menu*

# ERROR PREVENTION

prevent a problem from occurring in the first place

ZIP Code

Enter a ZIP for your City and State

ZIP Code

City, State

J.Crew Checkout

# RECOGNITION OVER RECALL

make objects, actions, and options visible

graphical previews of files

recently viewed items

# FLEXIBILITY AND EFFICIENCY

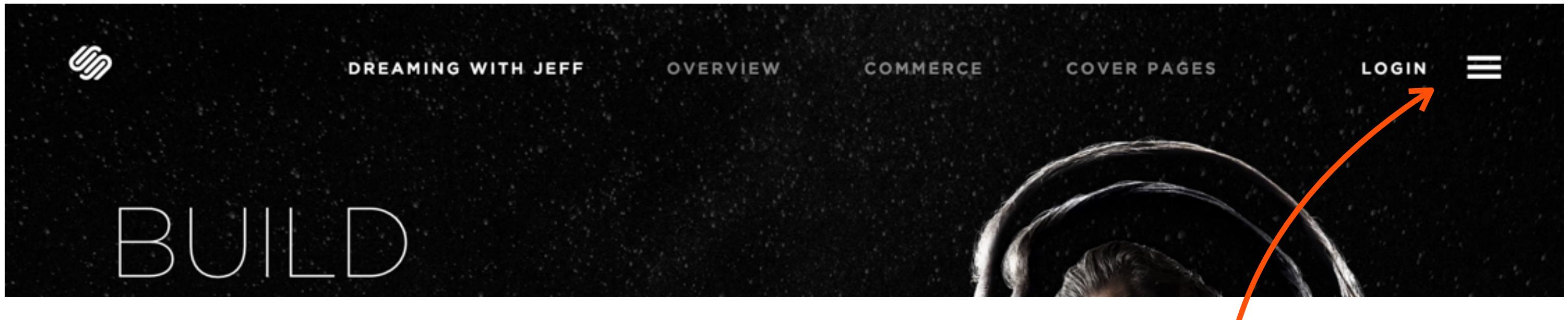
allow users to tailor frequent actions

accelerators for expert users

keyboard shortcuts

# AESTHETIC AND MINIMALIST DESIGN

everything on a screen is competing for attention  
remove information that is irrelevant/rarely used



Squarespace

*hide secondary nav*

# RECOGNIZE, DIAGNOSE, AND RECOVER FROM ERRORS

Express error messages in plain language

*not codes!*

precisely indicate the problem

constructively suggest a solution

# HELP

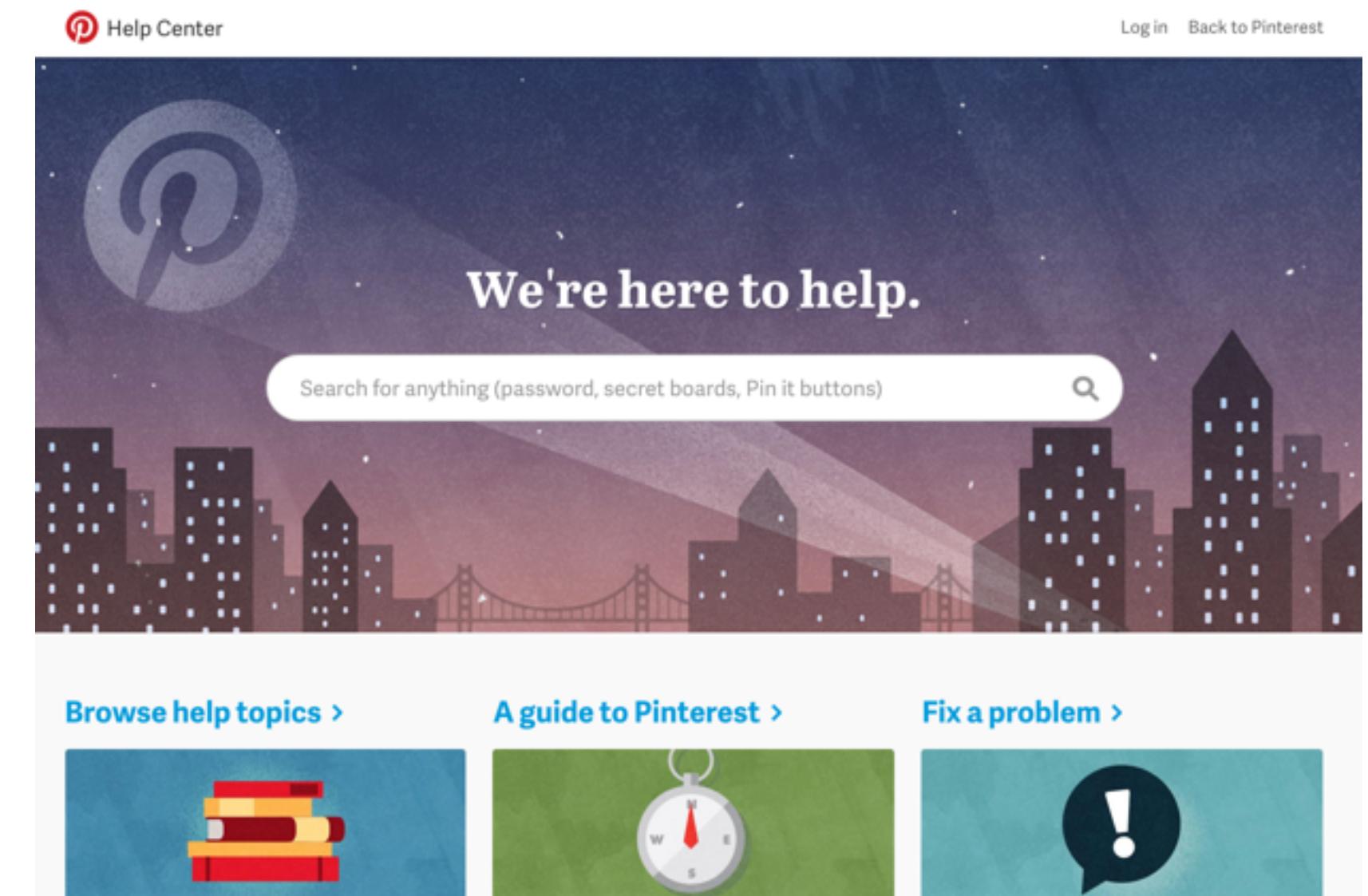
documentation should be...

easy to search

focused on specific tasks

operational (list of steps)

not too large



*Examples can help!*

“GOOD ARTIST BORROW,  
GREAT ARTISTS STEAL.”

Pablo Picasso



# Bonnie E. John

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E mail: [bej@cs.cmu.edu](mailto:bej@cs.cmu.edu)

**Home**

**Research**

**Teaching**

**Positions**

**Service**

**Personal**

## RESEARCH

I am interested in techniques to improve the design of computer systems with respect to their usefulness and usability. To that end, I have investigated the effectiveness and usability of several HCI techniques (e.g., think-aloud usability studies, Cognitive Walkthrough, GOMS) and produced new techniques for bringing usability concerns to the design process (e.g., CPM-GOMS and software architecture evaluation for usability). Much of my work focuses on cognitive modeling, where I work within a unified theory of cognition to develop models of human performance that produce quantitative predictions of performance with less effort than prototyping and user testing. I also work on bridging the gap between HCI and software engineering, specifically including usability concerns in software architecture design.

Two active research projects have their own websites.

[Usability and Software Architecture \(U&SA\)](#)

[The CogTool Project: a Tool for Cognitive Modeling](#)

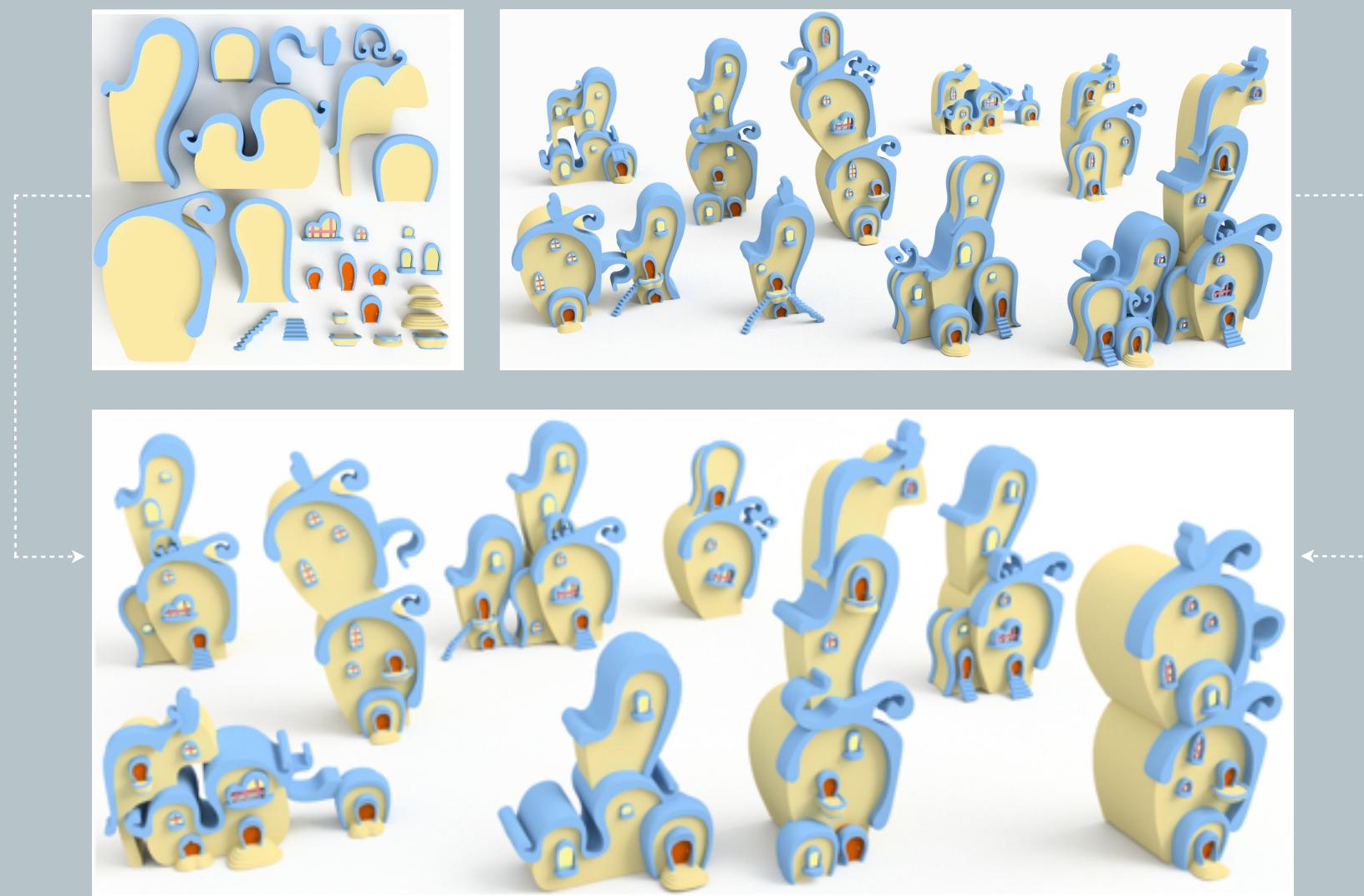
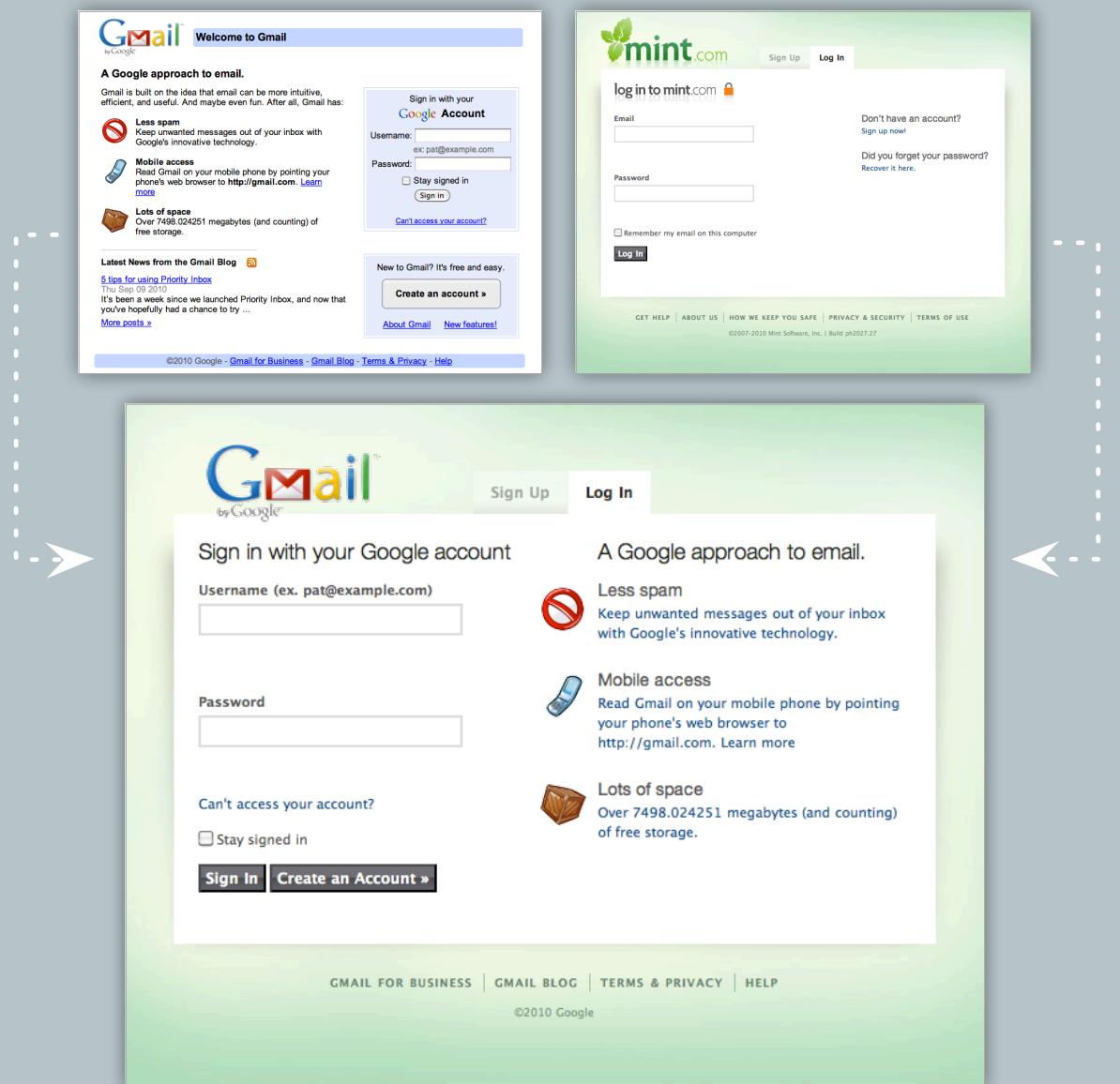
## TEACHING

I teach courses in HCI design and evaluation methods. I was the Director of the [Master of Human-Computer Interaction Program](#) for almost a dozen years, stepping down in January 2009.

[\*\*FULL CURRICULUM VITA \(.pdf\)\*\*](#)

Orig

# DATA-DRIVEN DESIGN



Kumar et al., CHI 2011

Talton et al., UIST 2012

*lather, rinse, repeat*

*"Good writing is bad writing  
that was rewritten"*

Marc Raibert, Founder of Boston Dynamics

*"Candor could not be more crucial to our creative process. Why? Because early on, all of our movies suck. That's a blunt assessment, I know, but I make a point of repeating it often, and I choose that phrasing because saying it in a softer way fails to convey how bad the first versions of our films really are. I'm not trying to be modest or self-effacing by saying this. Pixar films are not good at first, and our job is to make them so---to go, as I say, 'from suck to not-suck.'"*

Ed Catmull  
Creativity, Inc.

# DESIGN FEEDBACK ISN'T PERSONAL

*“People on a design team must be as happy to be wrong as right. If their ideas hold up under strong (but fair) criticism, then great, they can proceed with confidence. If their ideas are rejected with good rationale, then they have learned something. A healthy team is made up of people who have the attitude that is better to learn something new than to be right.”*

Bill Buxton  
Sketching User Experiences

# NEXT CLASS: VISUAL DESIGN

[courses.engr.illinois.edu/cs498rk1/](https://courses.engr.illinois.edu/cs498rk1/)