IN4MATX 148: Ubiquitous Computing Prototyping and Projects

How to develop and communicate innovative Ubicomp designs

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Your Host

Stephen Voida

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Worked with Beth Mynatt at Georgia Tech, who led Mark Weiser's former ubicomp group at PARC

Study interface design and ubicomp technologies for information workers (e-mail, multitasking, collaboration)

How to Find Me

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(Monday mornings)

Often can be found around the 5th floor of Bren Hall

Course Goals

1. You will learn about the research challenges and opportunities posed by the vision of Ubiquitous Computing

2. You will learn—and practice—a variety of high- and low-fidelity prototyping techniques for ubicomp systems/environments:
   - sketching
   - physical prototyping
   - interactive prototyping
   - narrative storyboarding
   - interactive storyboarding
   - role-playing
   - video prototyping

3. You will learn to present your design ideas and elicit feedback from peers

4. You will gain experience working with a research group/mentor in Informatics

Course Goals (The Short Version)

- Think like a designer
- Communicate your ideas to others
- Imagine where computing might take us

Part I: Course Logistics

https://students.ics.uci.edu/~svoida/Teaching/INF148/
(also linked through EEE)

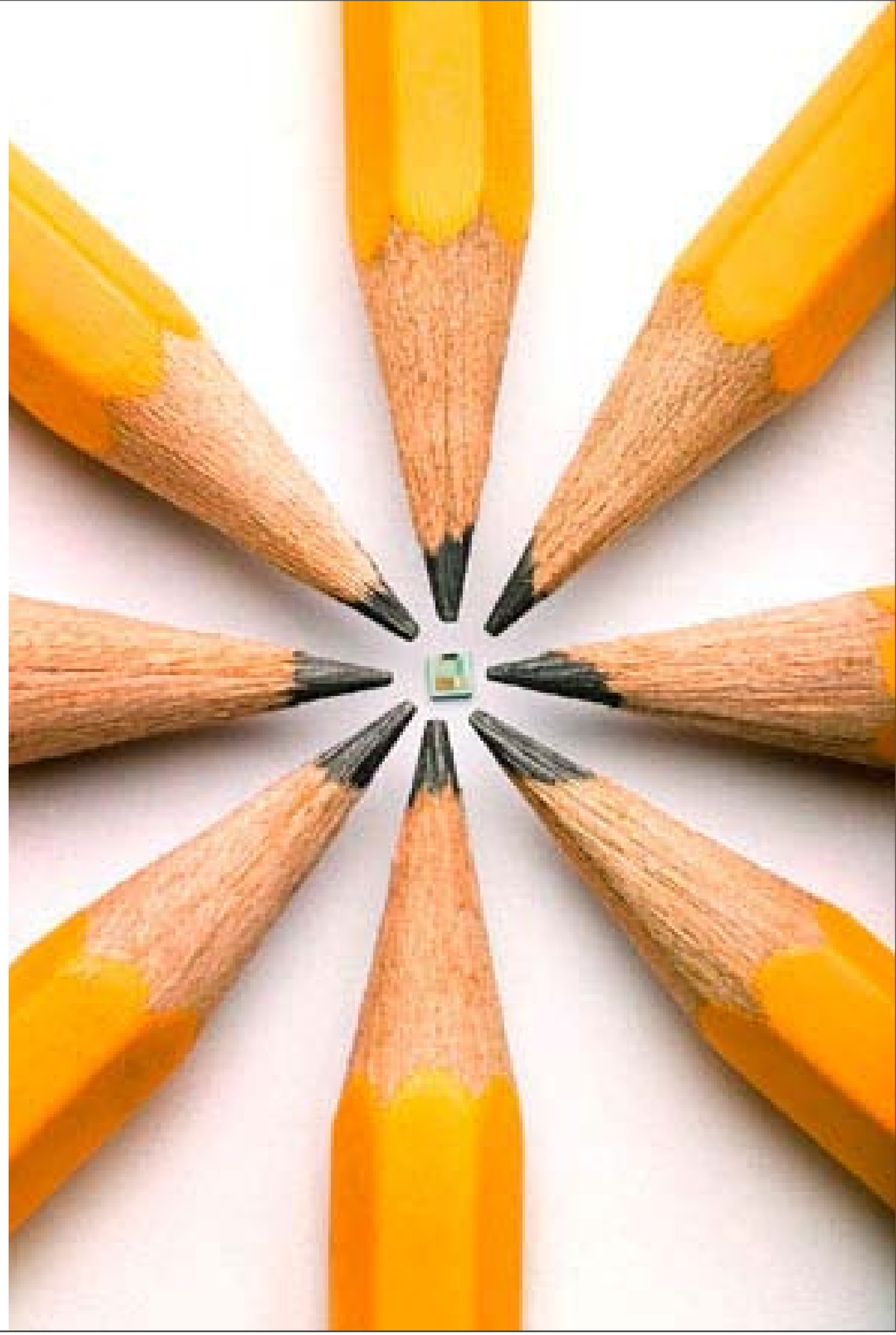
Part II: Interaction in Ubiquitous Computing

based in part on Tom Rodden's 2007 lecture and
Gillian Hayes' previous course materials

Prediction: Computers will be small, powerful, cheap, and embedded in everyday objects

Pencil tips surround a tiny wireless data chip, developed by HP, that could further bridge the physical and digital worlds.

Henry Taub (VP of research at HP) notes this chip is half the size of a grain of rice, could cost less than a $1 and can currently hold up to 4MB of data



Phones

In **1995**, in a survey of telecommunications by The Economist magazine, the phrase "**half the world's population has never made a phone call**" first appeared (attributed to Richard Klugman or Paine Webber)

> A **2003** survey from the Henley Management Centre and Teleconomy found that 46% of 25-34 year-olds **could not live** without their phones

> 800 million cars, 850 million personal computers, 1.3 billion fixed landline phones, 1.4 billion credit cards, 1.5 billion TV sets. **How many mobile phones in use today? In use today, yes, 2.7 billion….** Three times as many mobile phones as automobiles or personal computers. About twice as many mobile phone owners as those of fixed landline phones or credit cards. And almost twice as many mobile phones in use as TV sets.
>
> —Toni Ahonen's "Putting 2.7 billion in context: Mobile phone users" (2007)

The Vision of Everyday Smart Spaces

- More and more computers built into more and more objects
- The world populated by billions of digitally interactive objects
- A universal infrastructure to link all of these “smart” objects together

The Computing Timeline

Mainframe

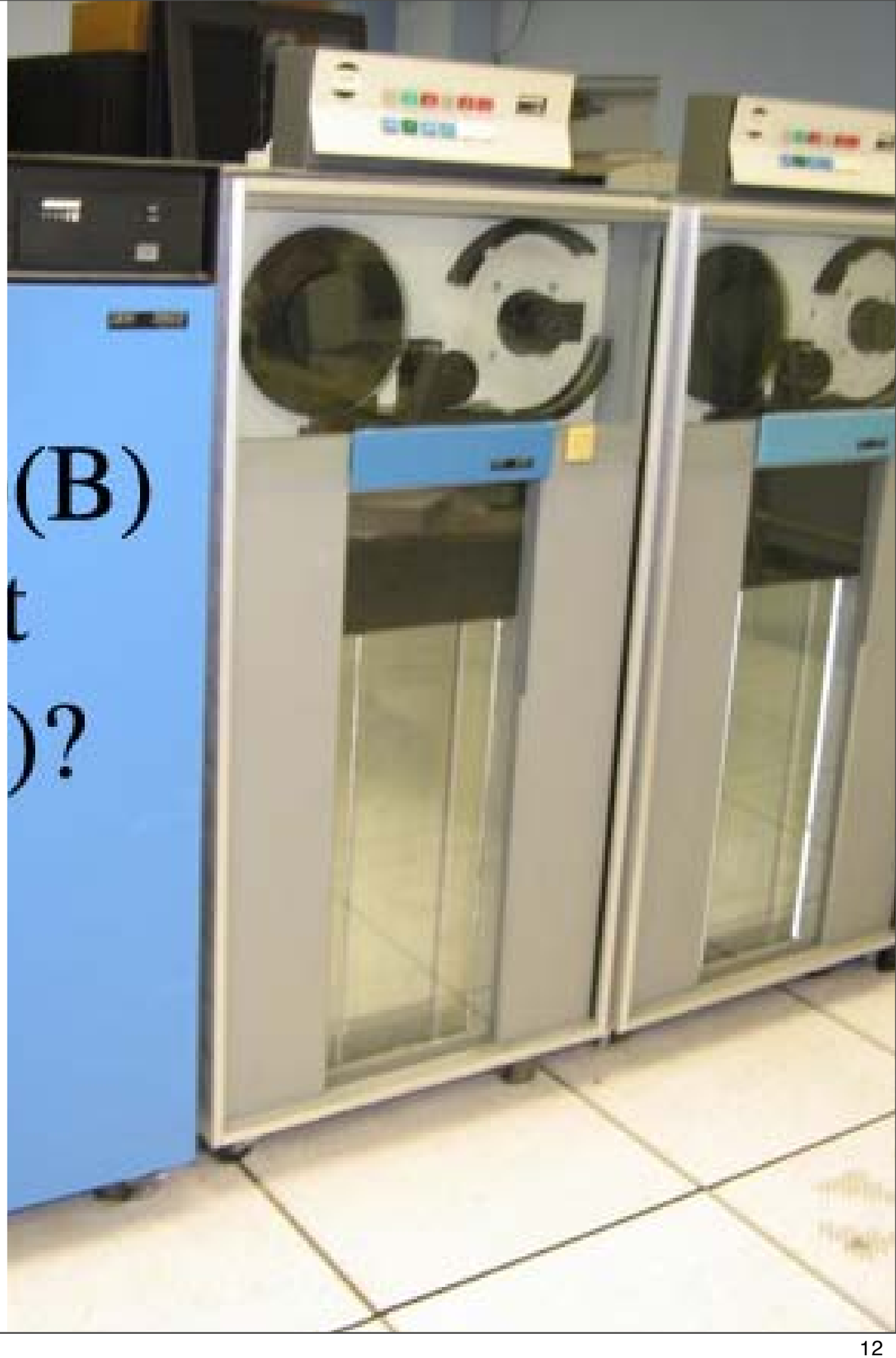
Personal Computers

The Internet

Ubicomp

The Mainframe View

- Single computation device
- Many users
- Users see computers as scarce resources
- Computer as “big brain mainframe”



The Personal Computing View

- One Computer
- One User
- The interface focuses on the computer screen, single users
- Computing can be intimate and immersive

Photo: Rama (Wikimedia/CeCILL)

The Internet View

- Computers are connected to the world

- Interaction focuses on finding and using information

- Interaction is a means of cooperation, coordination, and

Image: The Tango! project

The Vision of Ubicomp

- Many computers
- Many users
- Technology embedded in the world

> The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it.
>
> –Mark Weiser, 1991

The Ubicomp Environment

- Interconnected computing devices
  - Very cheap
  - Can talk to each other
  - Information provided to use everywhere
  - There is nowhere without these systems

Different Scales of Interaction

- Tabs
- Pads
- Boards

Images: PARC, HTC, Apple, SMART Technologies

“Natural” interfaces

- Shift away from desktop interactions
  - Speech
  - Gestures
  - Pens
  - Tangible interfaces
  - Computational perception

Stanford *iRoom*

smartskin
Jun Rekimoto, Sony CSL

Making Computers Disappear?

- Technology disappears when it becomes unremarkable
- Computers disappear into everyday things
- People make computers disappear through their everyday actions....
  but they will reappear in new ways (different shapes, sizes, uses)

Calm computing?

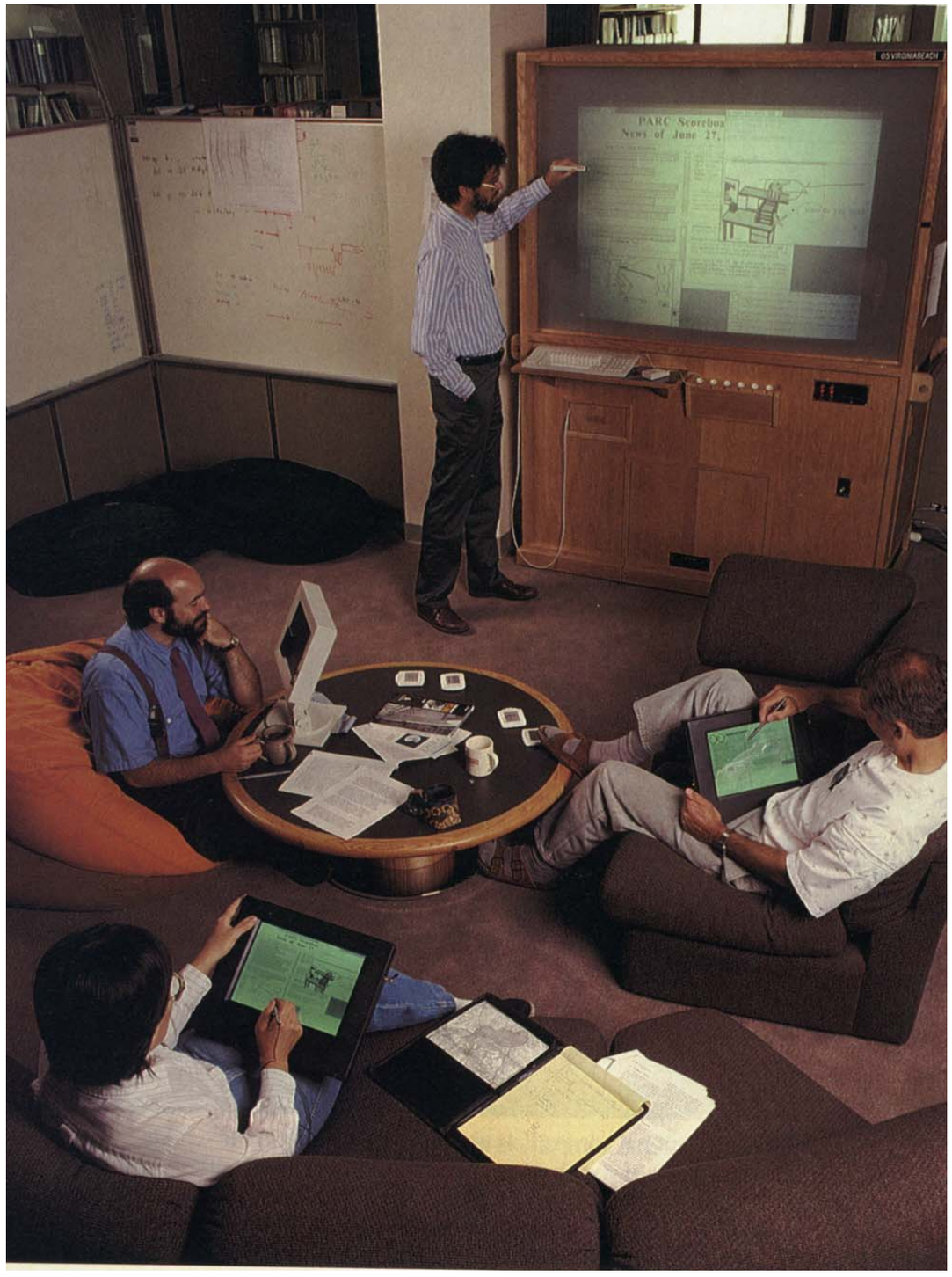


Image: Eboy

Living with Ubicomp

- Visions are dominated by the technology
- Also must consider how this technology will weave into our everyday lives
- Requires new ways to think about the relationship between technology and life

Image: PressureFunk.com

Designing Interaction for Ubicomp

- What is a computer?
- Where will we use it?
- Who will be around?
- What information will I have access to (that I didn't before)?
- What else will I be doing at the time?

Part III: Sketching the User Experience

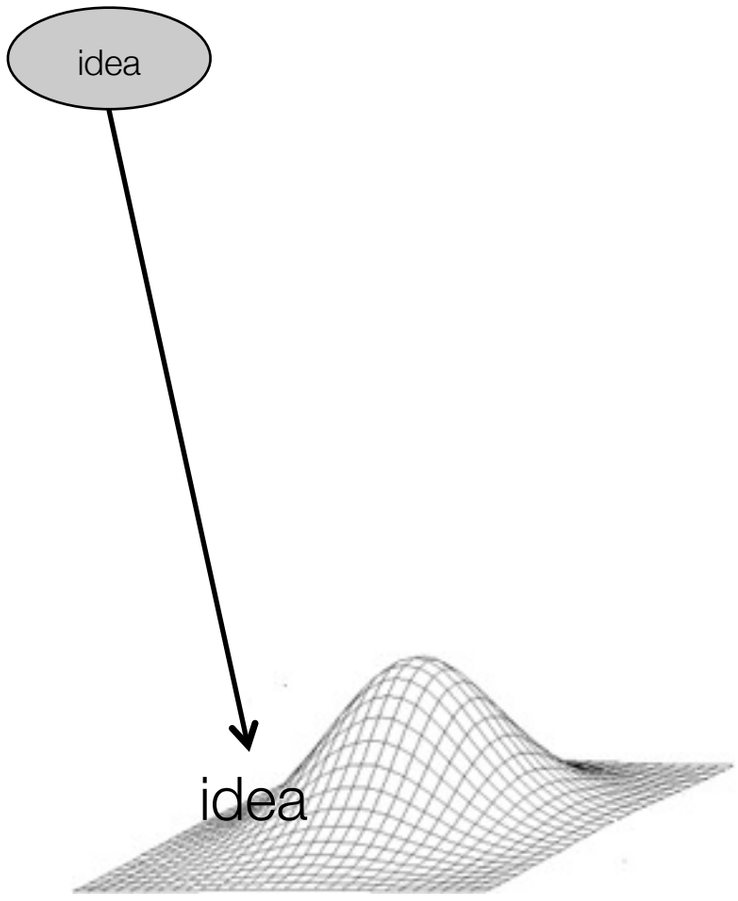
based on Saul Greenberg's CPSC581 lecture materials

Sketching is about Design

From Bill Buxton slide deck. Need to attribute the photograph.

Why Sketch?

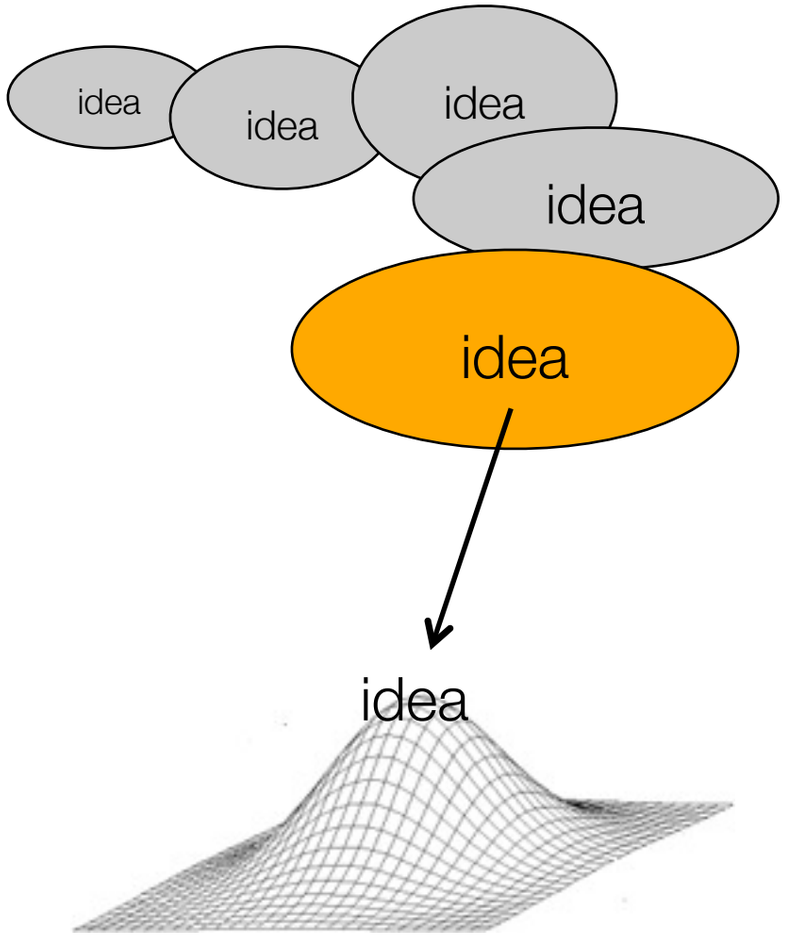
- Getting the Design Right
  - generate an idea



Graphs on the next few slides were modified from images found in the Sept. 2009 Wikipedia entry: *hill climbing*

Why Sketch?

- Getting the Design Right
  - generate an idea
  - iterate and develop it



But is it the best idea?

Why Sketch?

- Getting the Design Right
  - generate an idea
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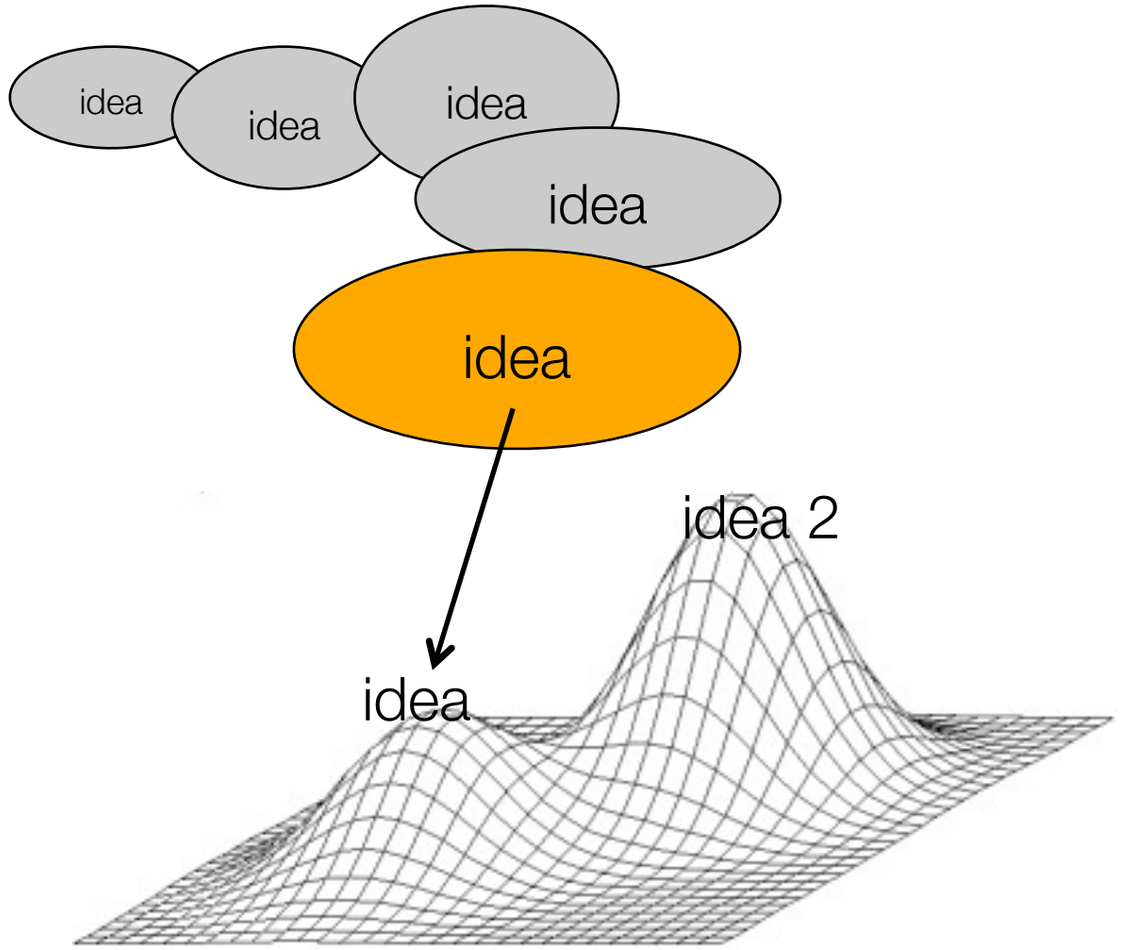
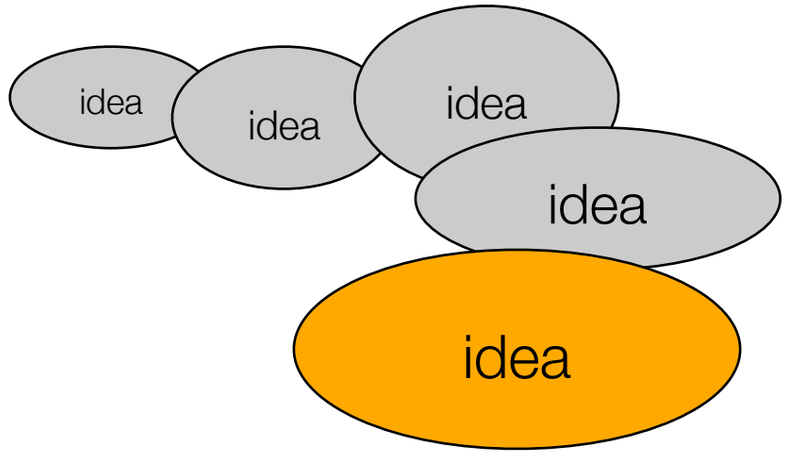


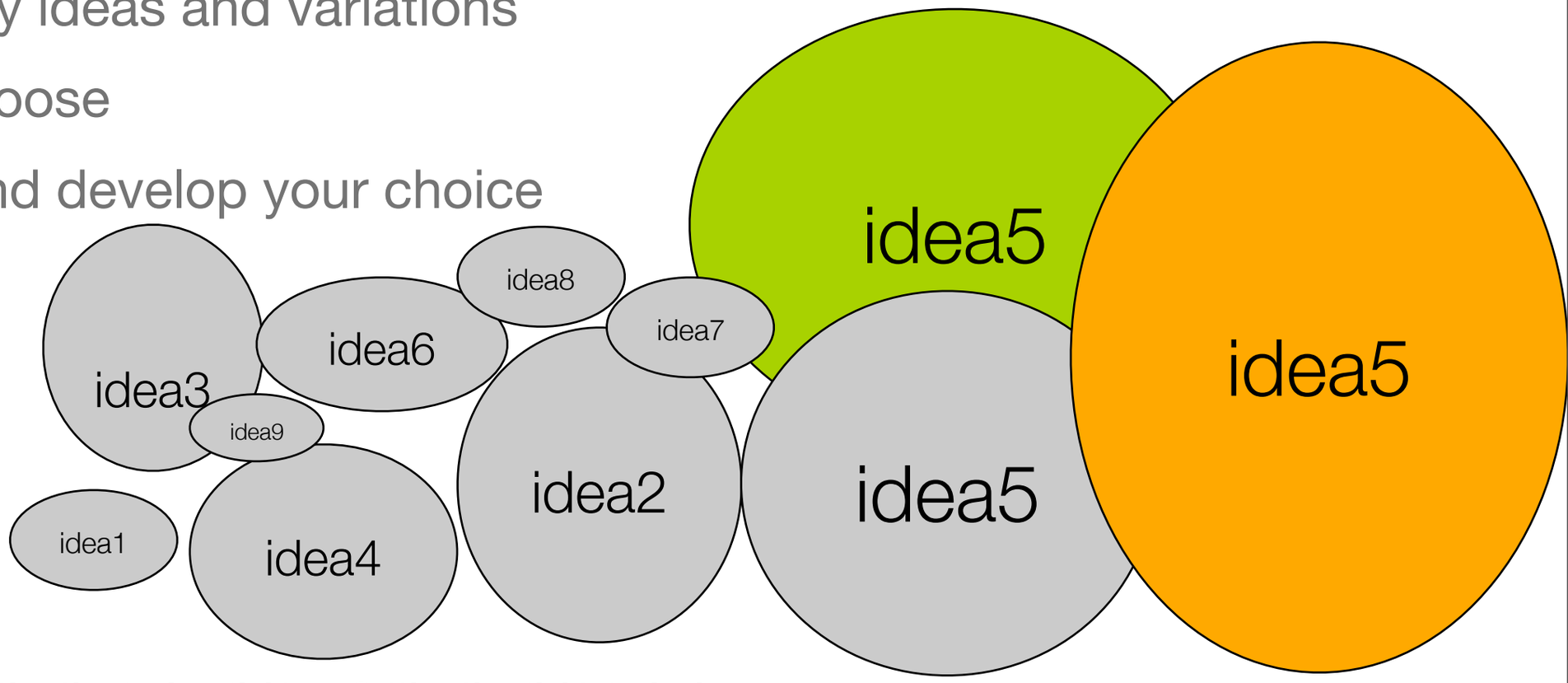
- The problem
  - other better solutions may be available in different ideas
  - local vs. global maxima (local hill climbing)
  - often results from fixating on a single idea

Why Sketches

- Getting the Design Right
  - generate an idea
  - iterate and develop it

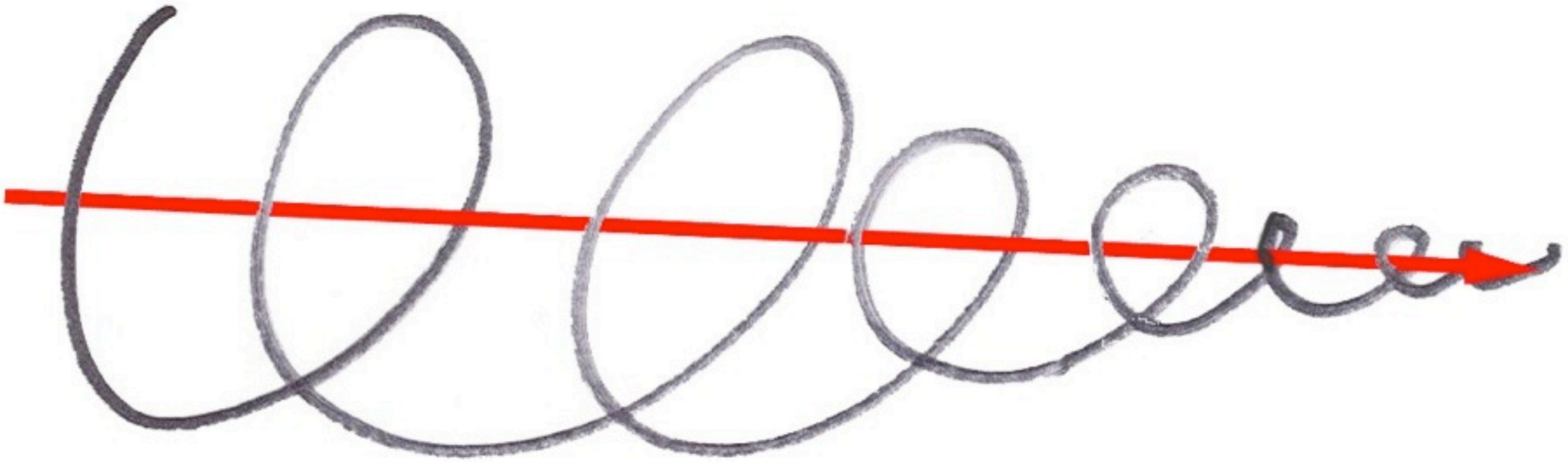


- Getting the Right Design
  - generate many ideas and variations
  - reflect and choose
  - then iterate and develop your choice



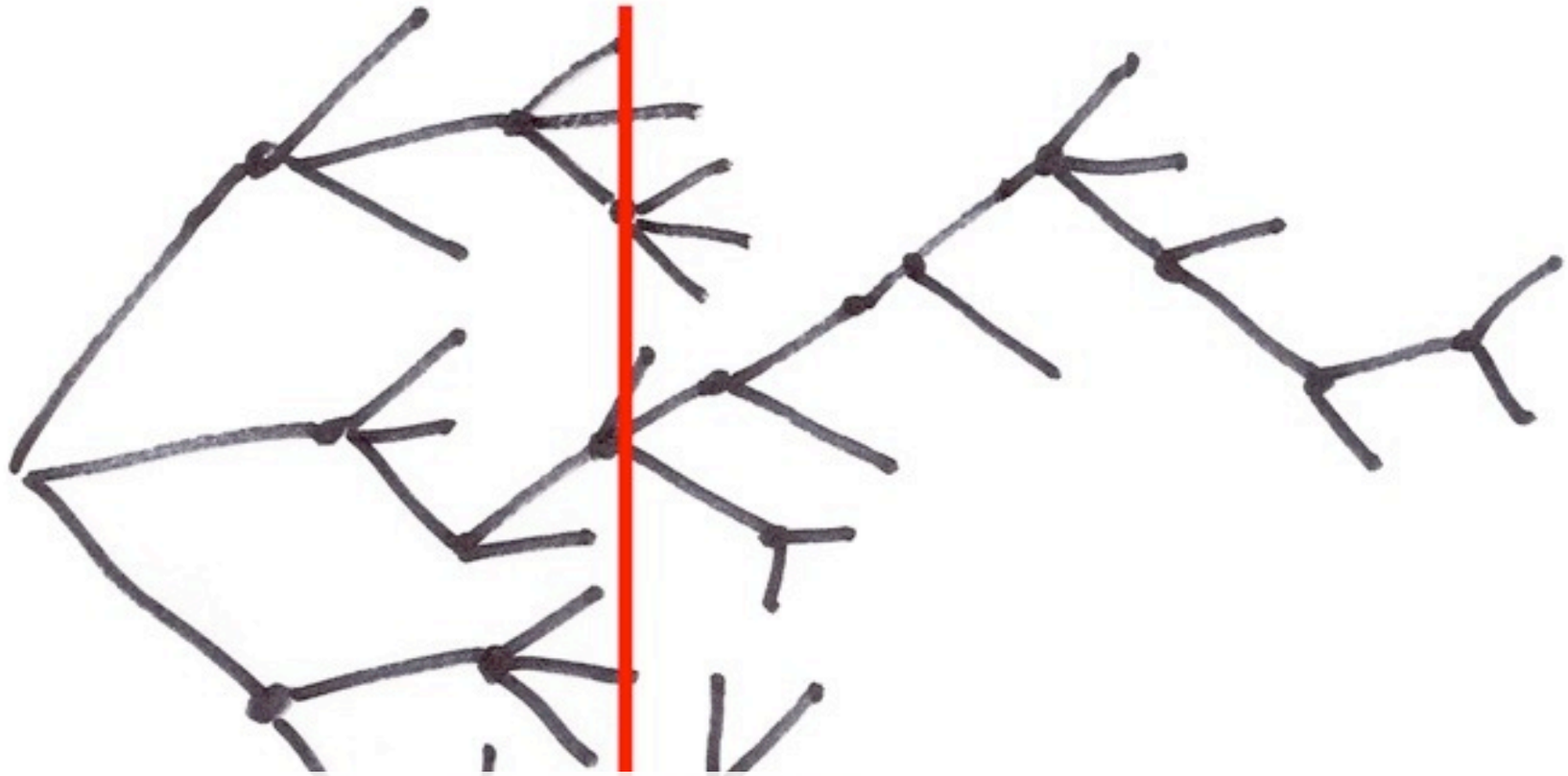
Bill Buxton coined the expression 'Getting the Design Right *vs.* Getting the Right Design'

Exploration of a single idea



Slide contributed by Bill Buxton

Exploration of Alternatives



… a designer that pitched three ideas would probably be fired. I'd say 5 is an entry point for an early formal review (distilled from 100's) … if you are pushing one you will be found out, and also fired … it is about open mindedness, humility, discovery, and learning. If you aren't authentically dedicated to that approach you are just doing it wrong!

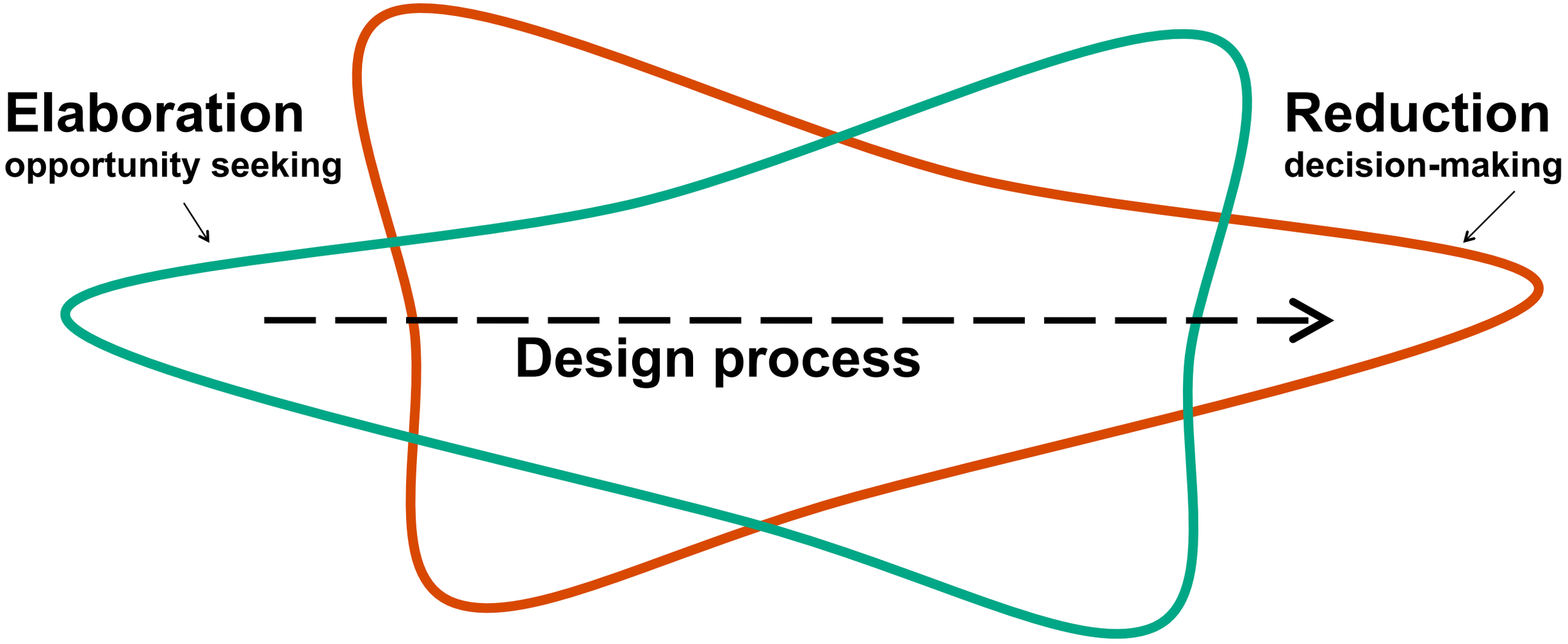
Alistair Hamilton
VP Design
Symbol Technologies

Slide contributed by Bill Buxton

keypads

touch

two different design ideas for cell phones



Slide idea by Bill Buxton. Source: Laseau,P. (1980) Graphic Thinking for Architects & Designers. John Wiley and Sons

Design is choice. There are two places where there is room for creativity:

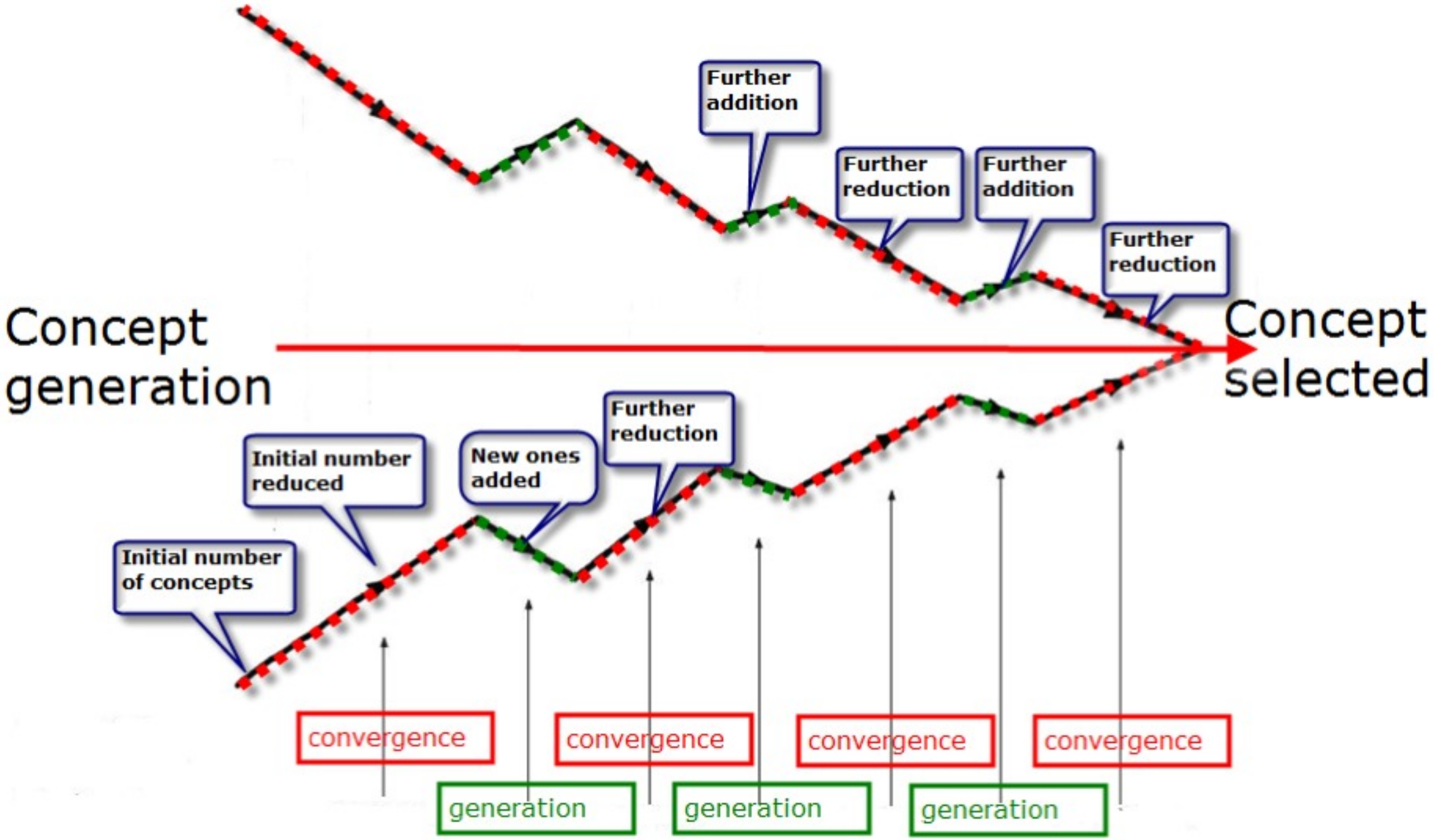
1. The creativity that you bring to enumerating meaningfully distinct options from which to choose

2. The creativity that you bring to defining the criteria, or heuristics, according to which you make your choices.

– Bill Buxton

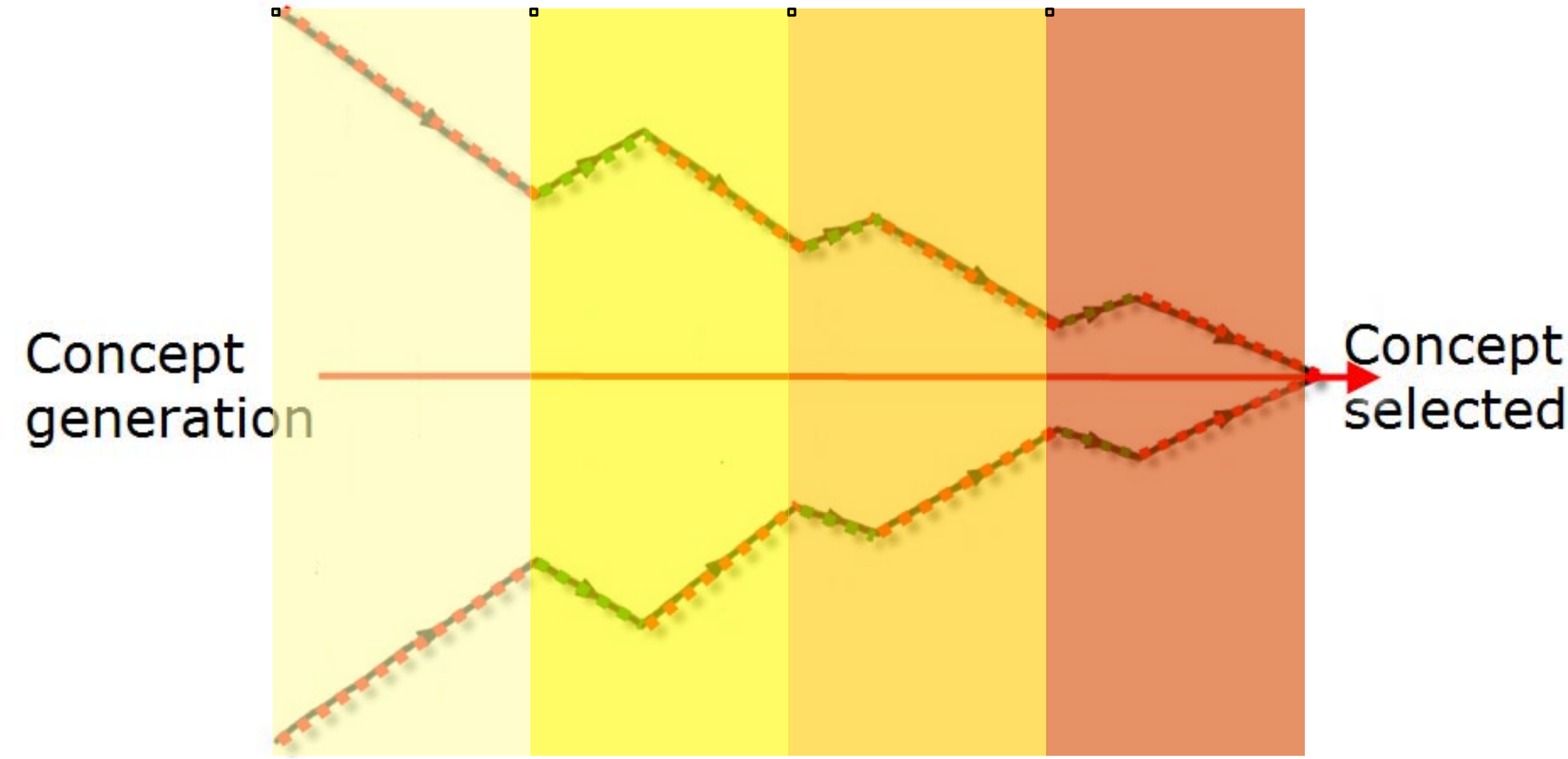
Source: Buxton book, p. 145

Another Design Funnel



From Buxton. Modified from Pugh, S. (1990) Total design: Integrated methods for successful products engineering. Addison-Wesley. P. 75

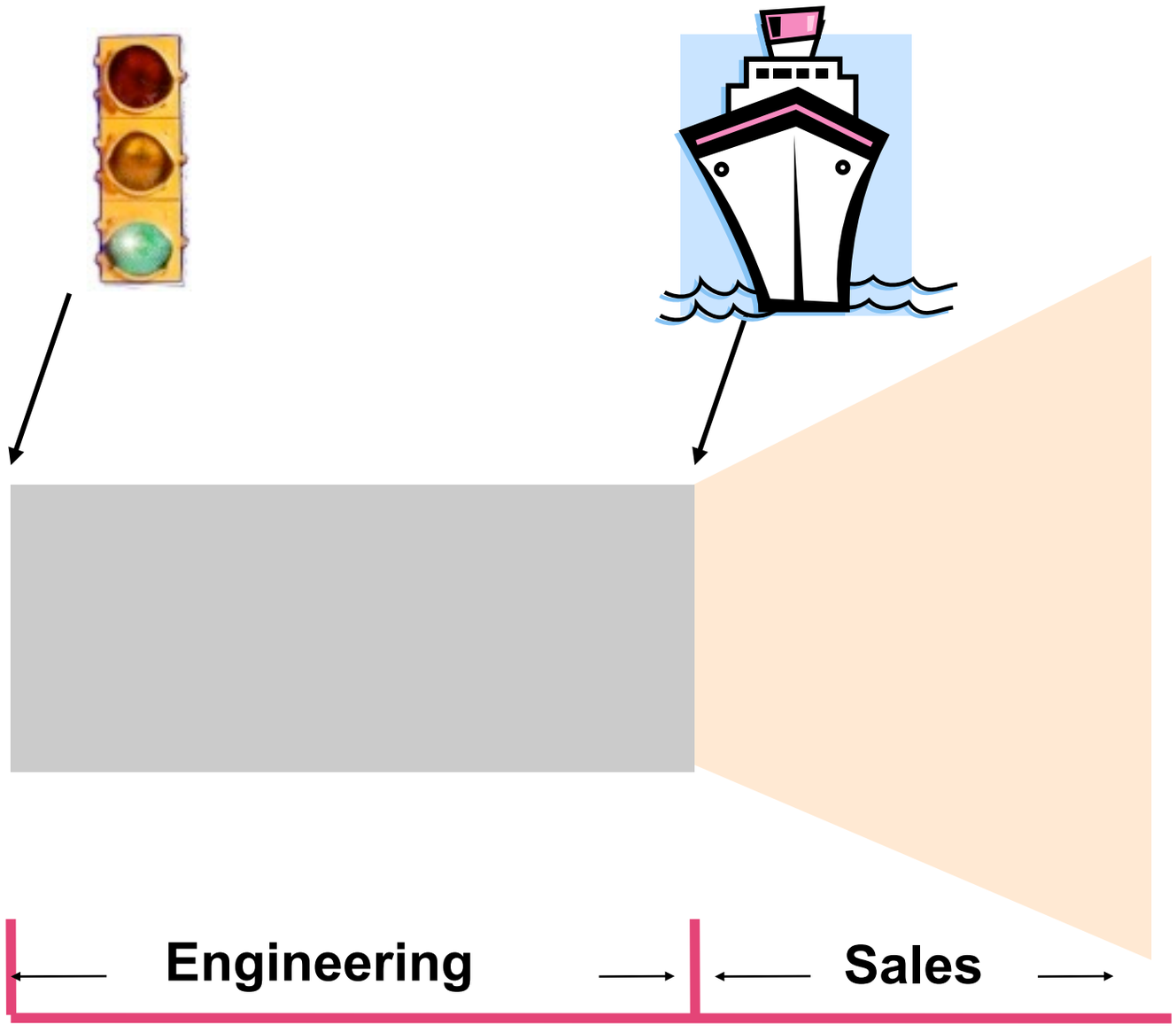
Another Design Funnel



Iterative:	**General** overall concepts	**Iteration 1** exploratory	**Iteration 2** clarification	**Iteration 3** resolution
Granularity:	**General** overall concepts	**Course** big gestures	**Medium** intermediate development	**Fine** detailed refinement

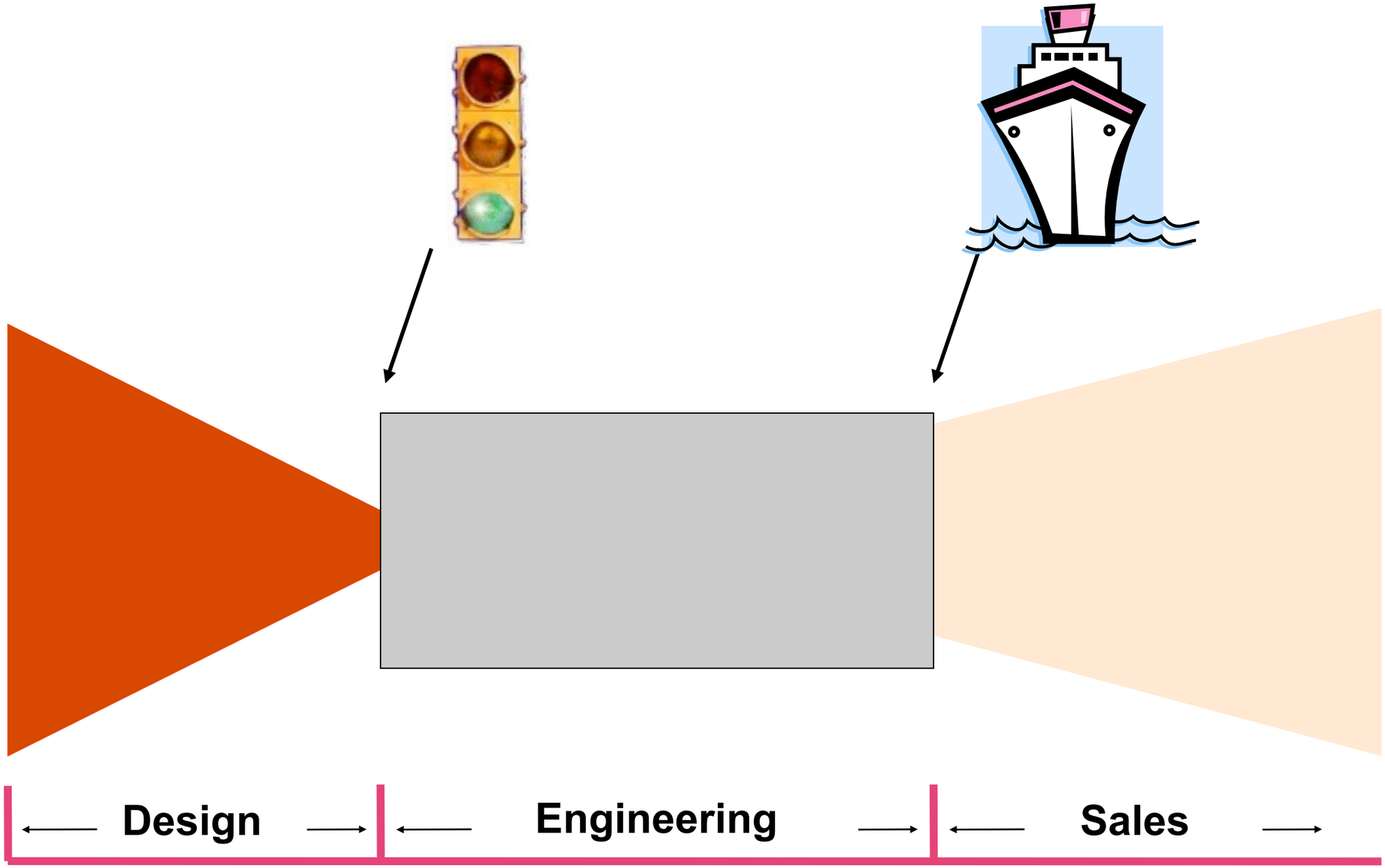
From Buxton. Modified from Pugh, S. (1990) Total design: Integrated methods for successful products engineering. Addison-Wesley. P. 75

Product View: The Status Quo



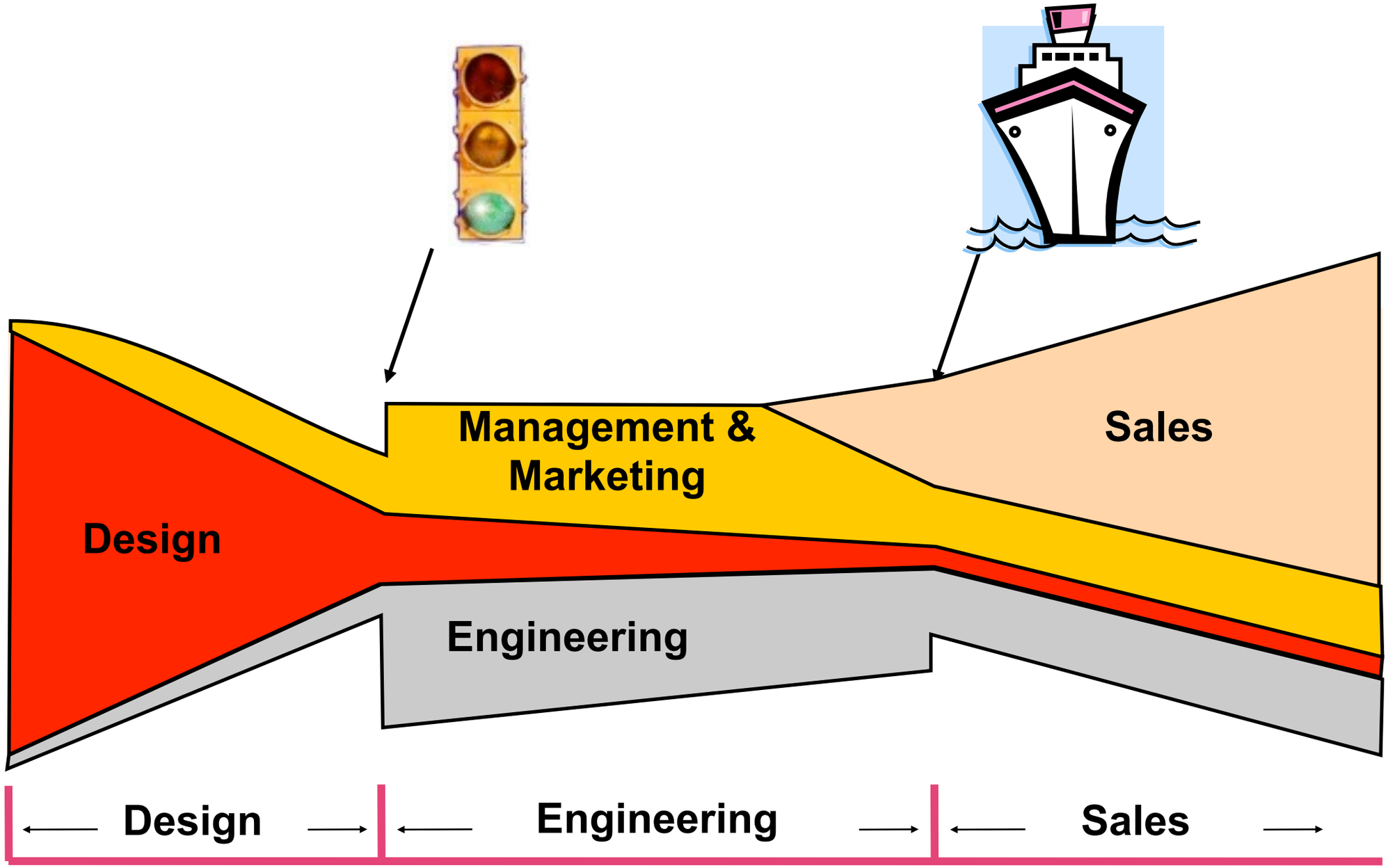
Modified from Buxton, p.72

Product View: Integrating Design



Modified from Buxton, p.74

Product View: No Silos



Modified from Buxton, p.76

You Now Know

- Sketching is about design

- The design process is about getting the right design, and then getting the design right

- The design funnel is about iteratively generating and elaborating designs choosing and reducing between designs

- Design in product development is about using the design funnel to develop ideas for green/red light appraisal

Your Role

- Think About Where Computation is Headed

- Sketch Your Ideas
  - Carry a sketchbook constantly
  - Collect / generate / develop a multitude of ideas
  - Your media choice affects what you create

- Communicate Your Ideas
  - Present often, present often, present often
  - Aesthetics matter (being a ‘dweeb’ is no excuse)

- Critique and Receive Criticism
  - Challenge all designs you see
  - Be open to new ways of seeing problems/opportunities

Next Week

- Design Crit 101
- Intro to Sketching
- Intro to Wearable Computing
- Bring: sketchbook, drawing materials
- Due this week:
  - Introduce yourself on the class wiki
  - READ!