Physical UI (PhUI!)

March 21, 2021

ILAN'S BANANA DEMO

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Argon
FORTY

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RASPBERRY PI ⌄   RPI CASES ⌄   STARTER KITS   ACCESSORIES

HOME > ARGON ONE PI 3 RASPBERRY PI CASE

Argon ONE Pi 3 Raspberry Pi Case

★★★★★ | Be the first to review this product

- **SLEEK ALUMINUM ENCLOSURE** | Made with aluminum alloy and polished with a modern S

- **PASSIVE AND ACTIVE COOLING** | The whole case top acts as a passive cooling for the Ra temperature management.

- **EASY ASSEMBLY & NEAT CABLE MANAGEMENT** | Assembling the case with the Raspbe the Argon ONE in one line.   All of the ports are accessed at the back, making the mini-compu

- **PROPER SYSTEM SHUTDOWN** | A proper power button is installed on the case to prevent f built in features.

- **MAGNETIC REMOVABLE TOP & ACCESS TO GPIO** | The PCB Board built into the case provides separate power sources to the fan and power switch, as well as extending the GPIO pins to use the case in multiple projects.

image from https://www.argon40.com/
argon-one-raspberry-pi-3-case.html

Lab Review

Grading Rubric
Grader comments
Grading distribution

Innovating from scratch vs. Shanzhai innovation

Photo from the Atlantic, by Anna Greenspan

When so much of developing interactive devices is "just" the rearrangement and repurposing of basic modular units, the design— placement, packaging, presentation, application, target user, use case —is what makes the product.

The physical form matters

PHOTO: JOHN R. COUGHLIN

THE PHYSICAL FORM MATTERS

image from https://www.wired.com/2010/01/apple-tablet-1983/

The physical form matters
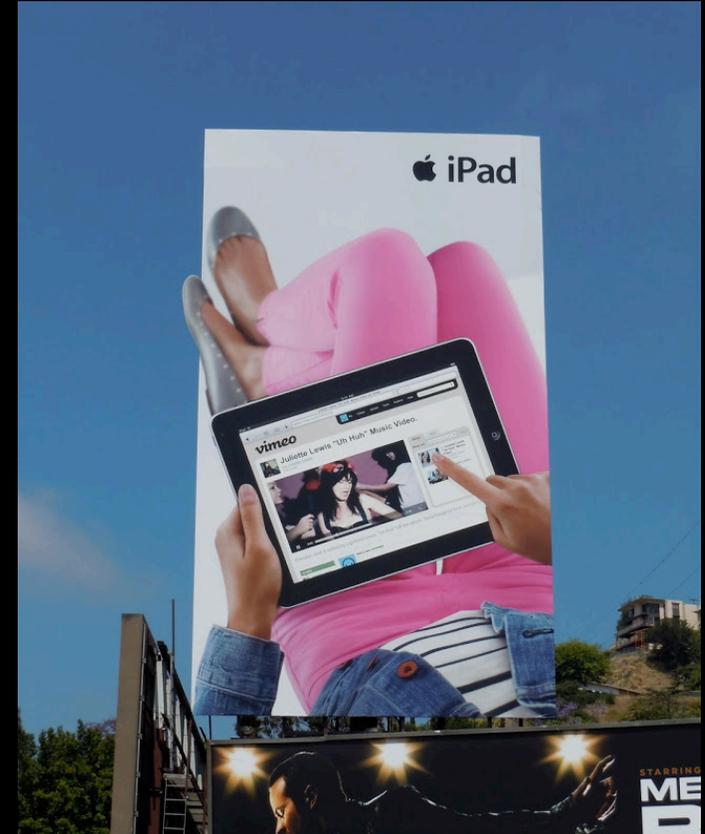
The physical form matters

The physical form matters

Prototyping

Getting the Design Right vs. Getting the Right Design

image from NYT, http://www.nytimes.com/2007/06/03/nyregion/
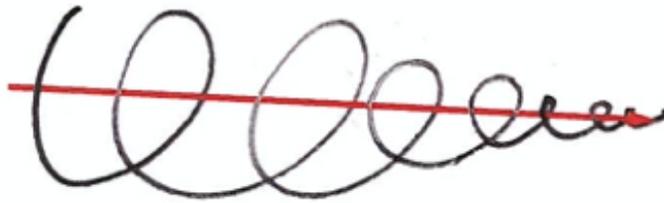nyregionspecial2/03artswe.html

Figure 149: Prototyping as Iterative Incremental Refinement

In engineering, prototyping is like a spiral closing in along a single trajectory. Each prototype is a refinement of the previous one, and takes you one step closer to the final product. Iterative prototyping is a form of incremental refinement and validation, rather than a technique of exploration.
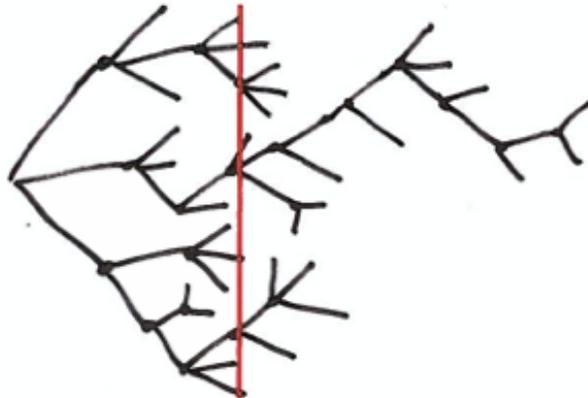

Figure 150: Design as Branching Exploration and Comparison

Design is about exploring and comparing the relative merits of alternatives. There is not just one path, and at any given time and for any given question, there may be numerous different alternatives being considered, only one of which will eventually find itself in the product.

images from Buxton, Sketching User Experiences
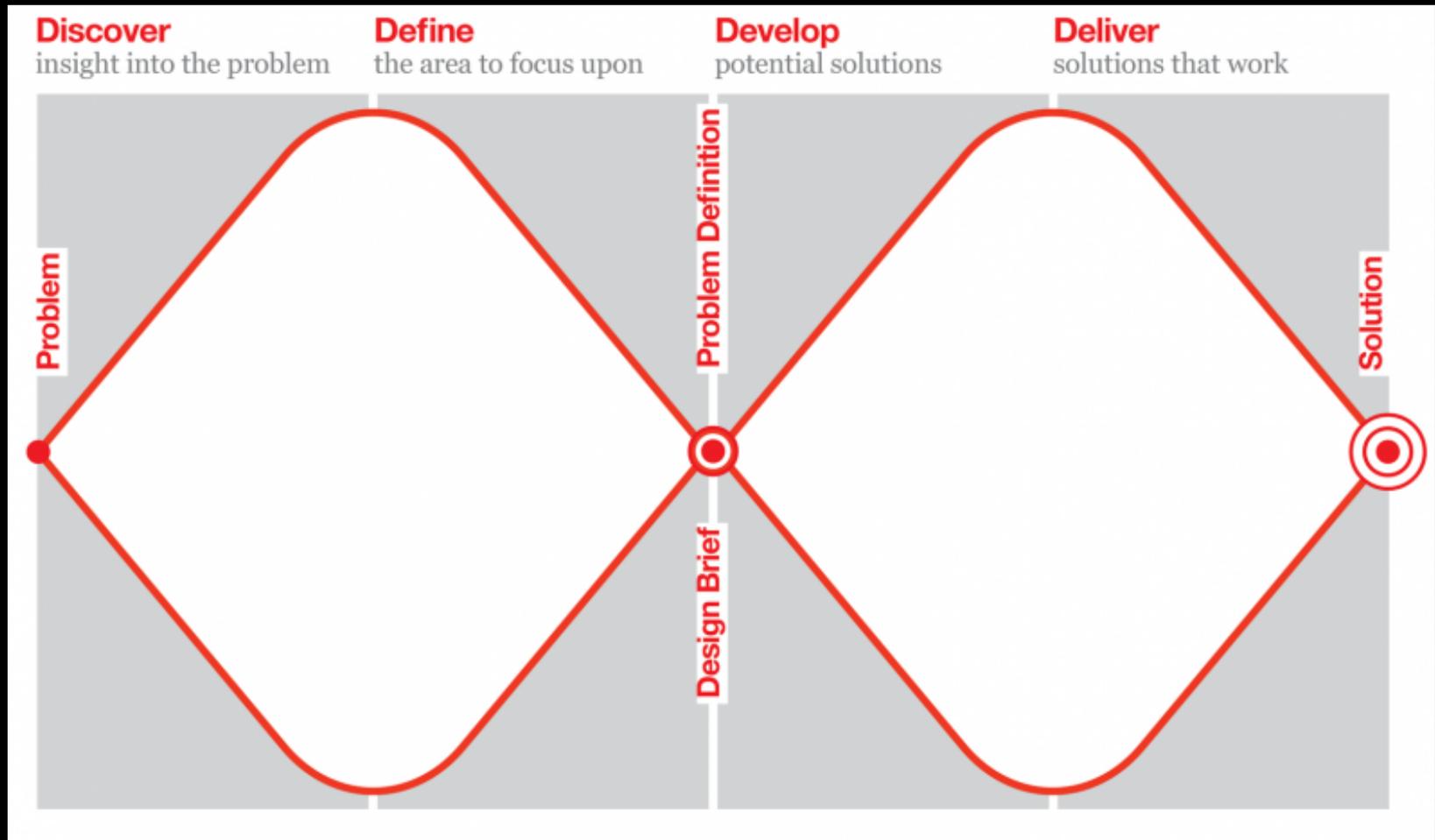
Double Diamond Design Process, British Design Council
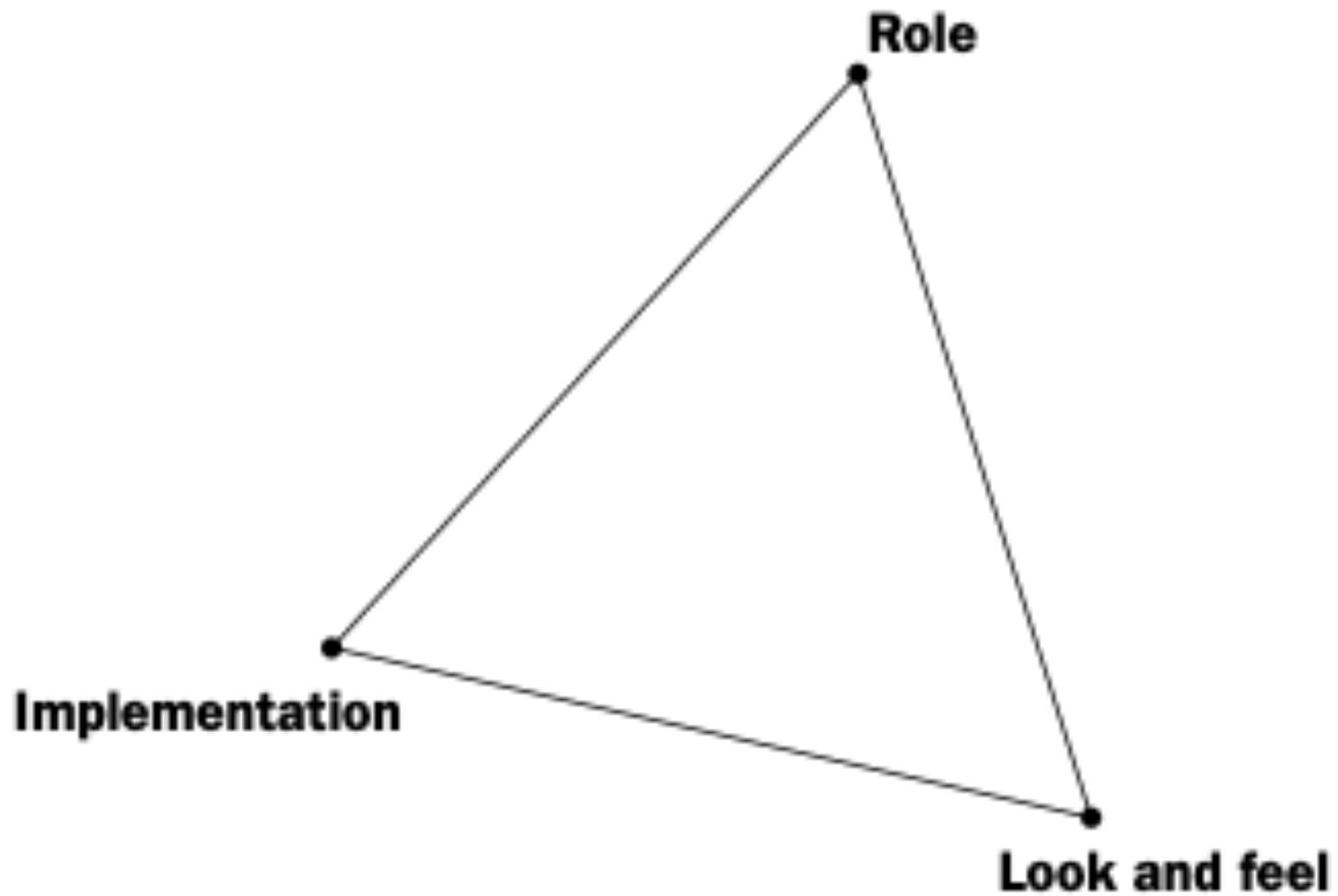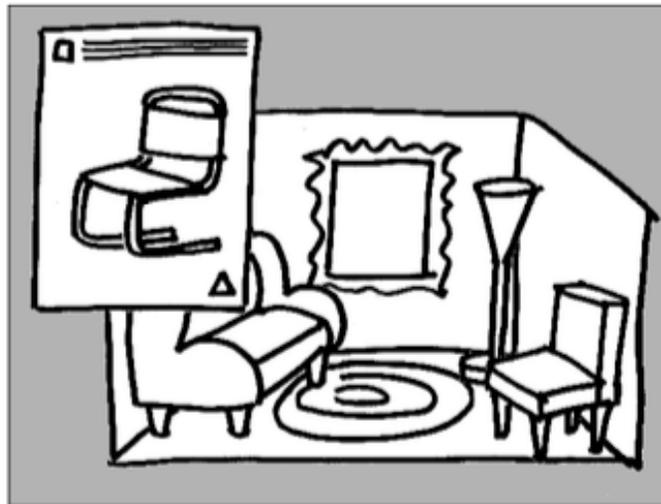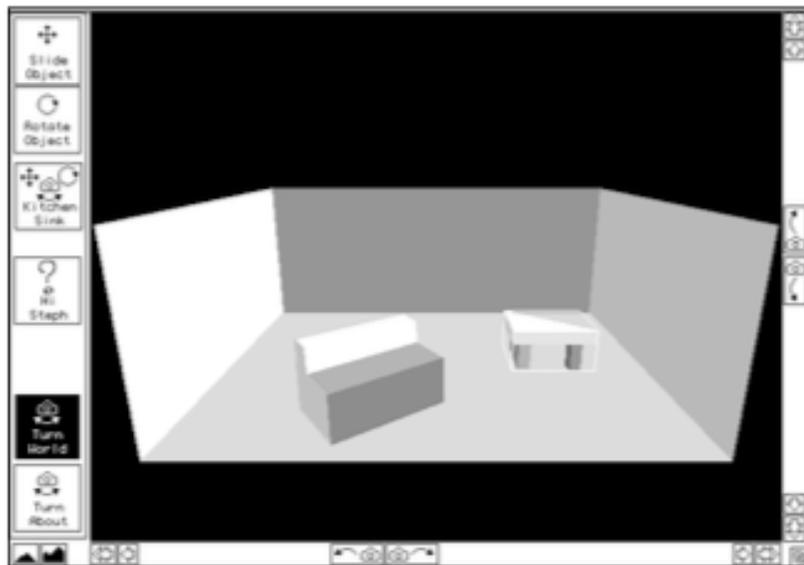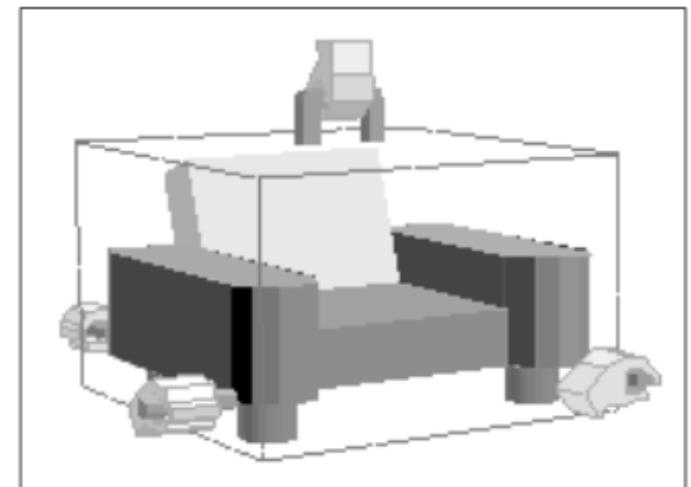
Figure 1. A model of what prototypes prototype.

Houde & Hill '97 What do Prototypes Prototype?

Example 1. Role prototype for 3D space-planning application [E1 Houde 1990].

Example 3. Implementation prototype for 3D space-planning application [E3 Chen 1990].

Example 2. Look-and-feel prototype for 3D space-planning application [E2 Houde 1990].

Houde & Hill '97 What do Prototypes Prototype?

Prototypes

- [ ] Describe
- [ ] Refine
- [ ] Answer
- [ ] Test
- [ ] Resolve
- [ ] Specify
- [ ] Depict
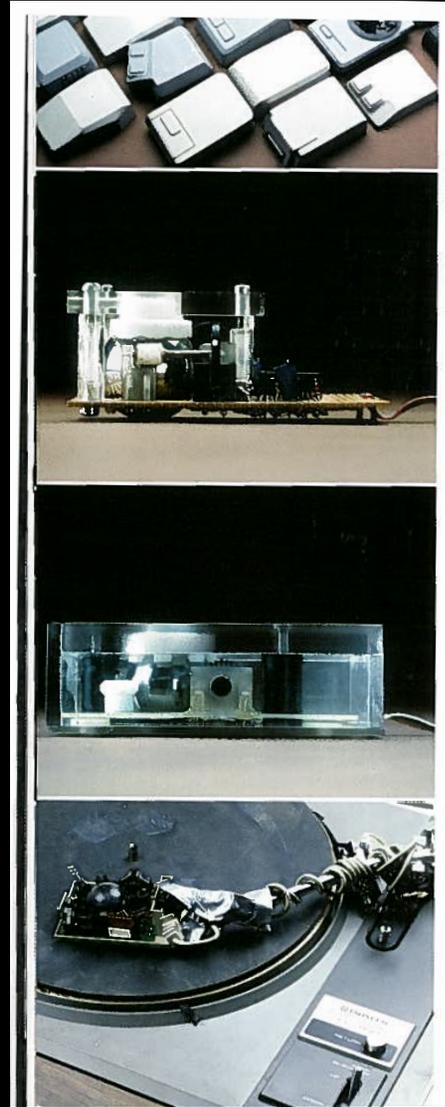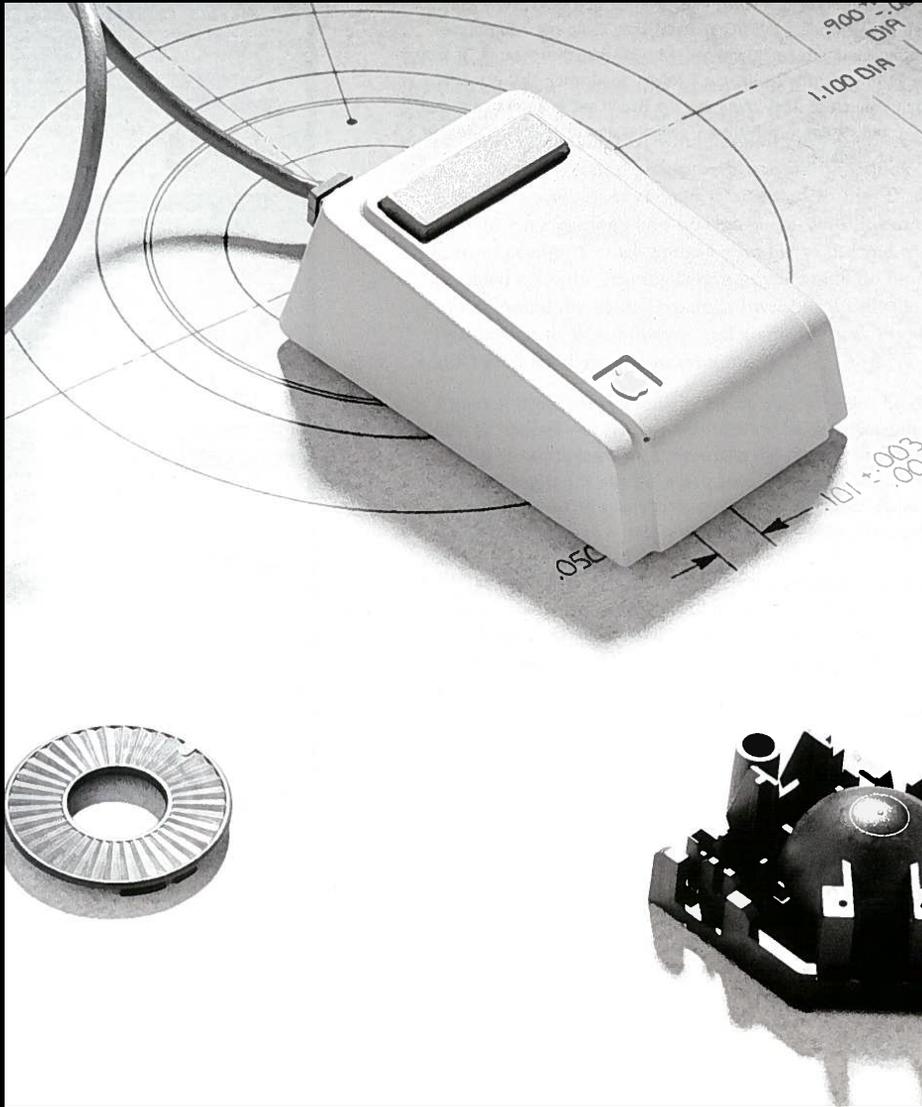
Examples of Physical Prototypes

Sketches, Prototypes, & How they are used
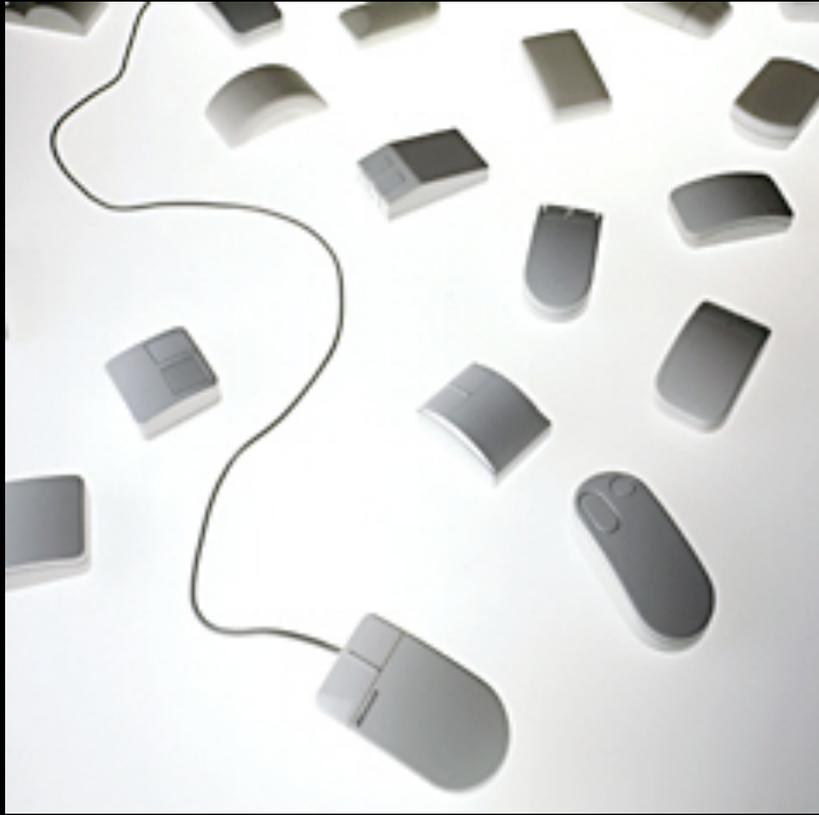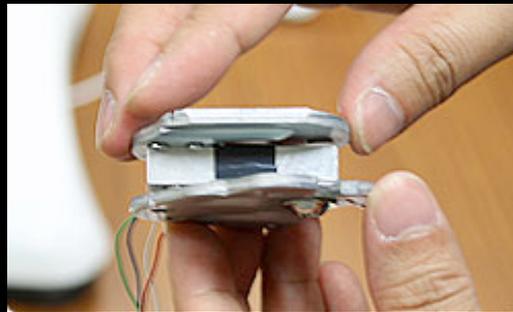
image from Bill Moggridge, Designing Interactions (2006)

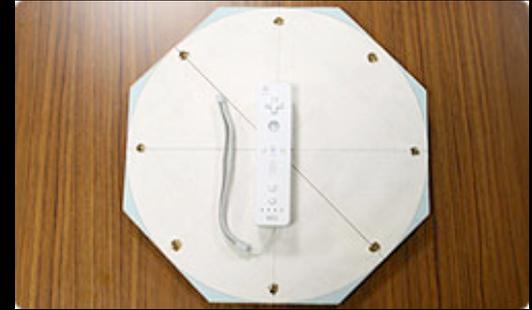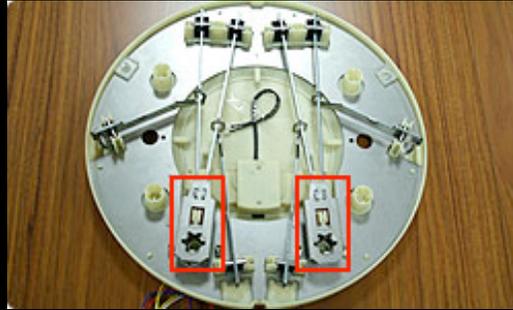image from Bill Moggridge, Designing Interactions (2006)

Wii Fit

1 **Moby** – cordless dynamic speaker system.
2 **Hand-Powered Toys** – interactive storyteller and a projector using hand-generated energy.
3 **Game Board** – combining the traditional qualities of a game board with the dynamism of video games.
4 **Creativity Mat** – electronic paper to write and draw on with a network link to friends.
5 **Mumbo** – sound manipulator and music mixer.
6 **Mimic World** – intuitive physical participation in a virtual experience.
7 **Biko Games** – detachable toys for communication, navigation or tracking.

8 **Kid Watch** – allows parents to monitor their children's safety wherever they are.
9 **Multimedia Tools** – a camera, a touch-screen display, a microphone, a pager and a loudspeaker.
10 **Ludic Robots** – unpredictable and friendly 'electronic pets'.
11 **Interactive Globe** – combines the attractive qualities of a traditional globe with an interactive multimedia display.
12 **Emotional Communicators** – paging devices for sending and receiving emotional messages.
13 **Storyteller** – by stringing different elements together, children can compose and listen to their own stories.
14 **Hansel & Gretel** – a homing device.
15 **Recharge Mats** – surfaces conducting power and signals to operate electronic toys.
16 **Kid's Projector** – LCD projector providing a flexible way of viewing films, animations and children's multimedia presentations.
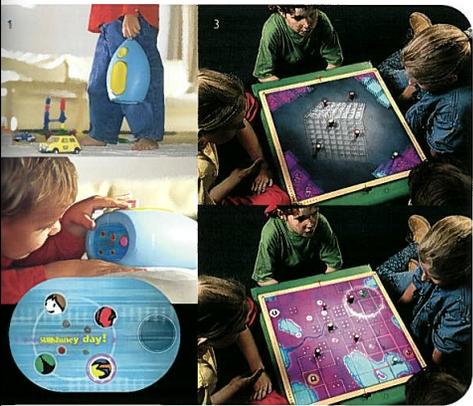
the electronic playground
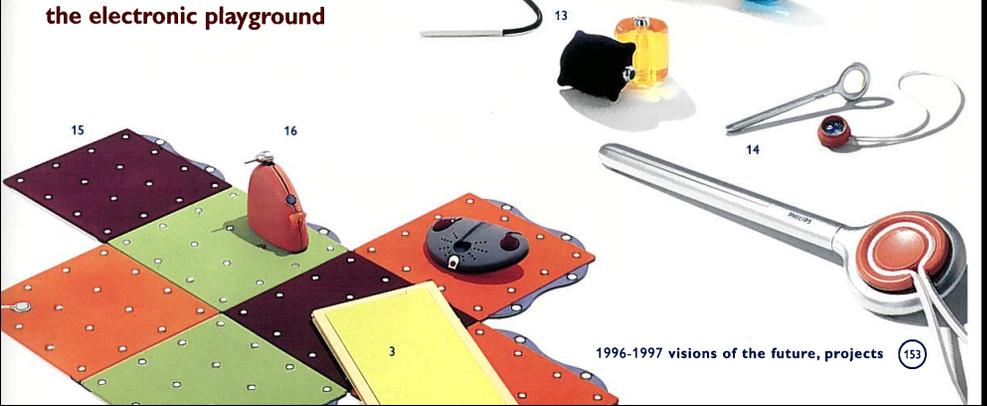
1996-1997 **visions of the future, projects** (153)

image from Philips Design, Creating Value by Design

image from Philips Design, Creating Value by Design

image from Buxton, Sketching User Experience

Process for Physical Device UI

Paper Prototype
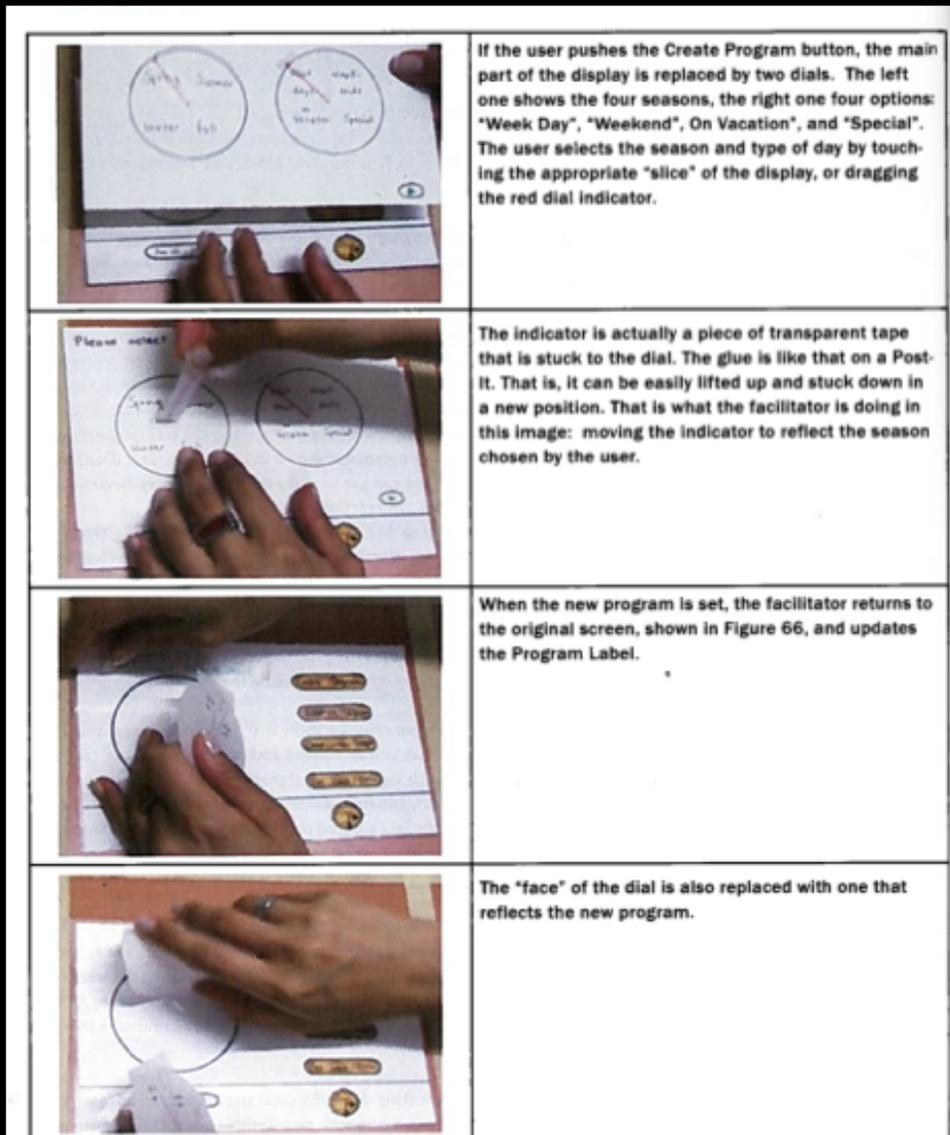

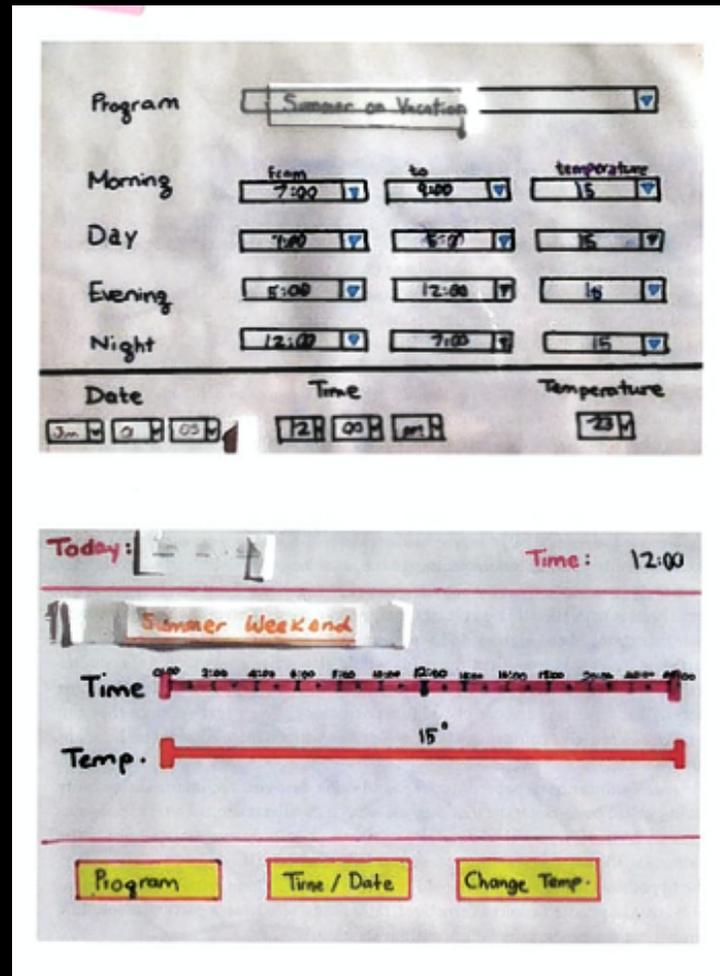Figure 146: Creating a New Program

PAPER PROTOTYPE

image from Buxton, Sketching User Experience

Breadboarding

image from Tom Igoe, http://www.tigoe.net/pcomp/code/understanding-electricity/breadboards
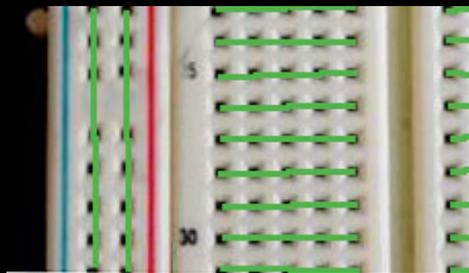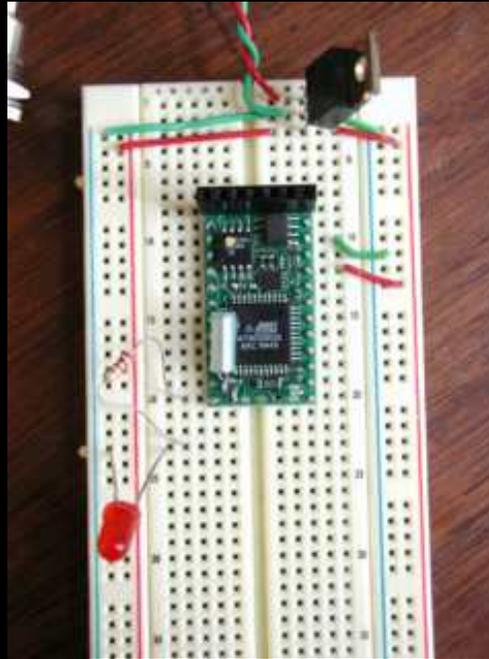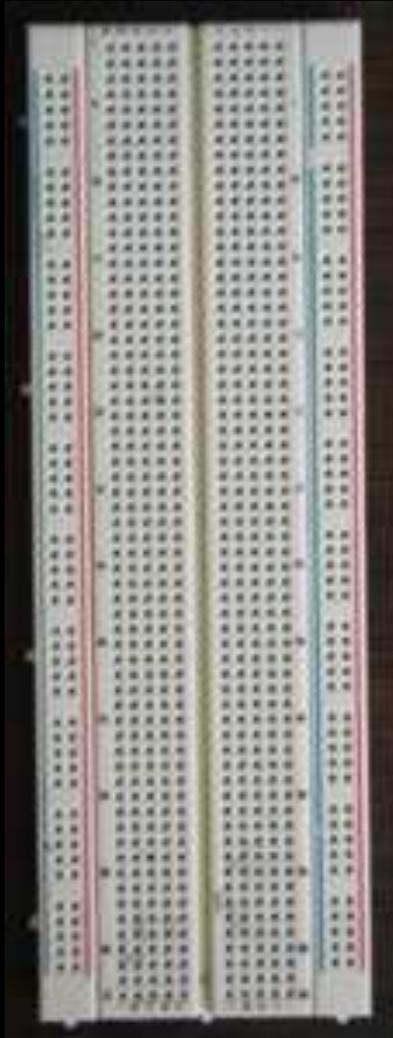
CARDBOARD FACEPLATE

Protoboarding:
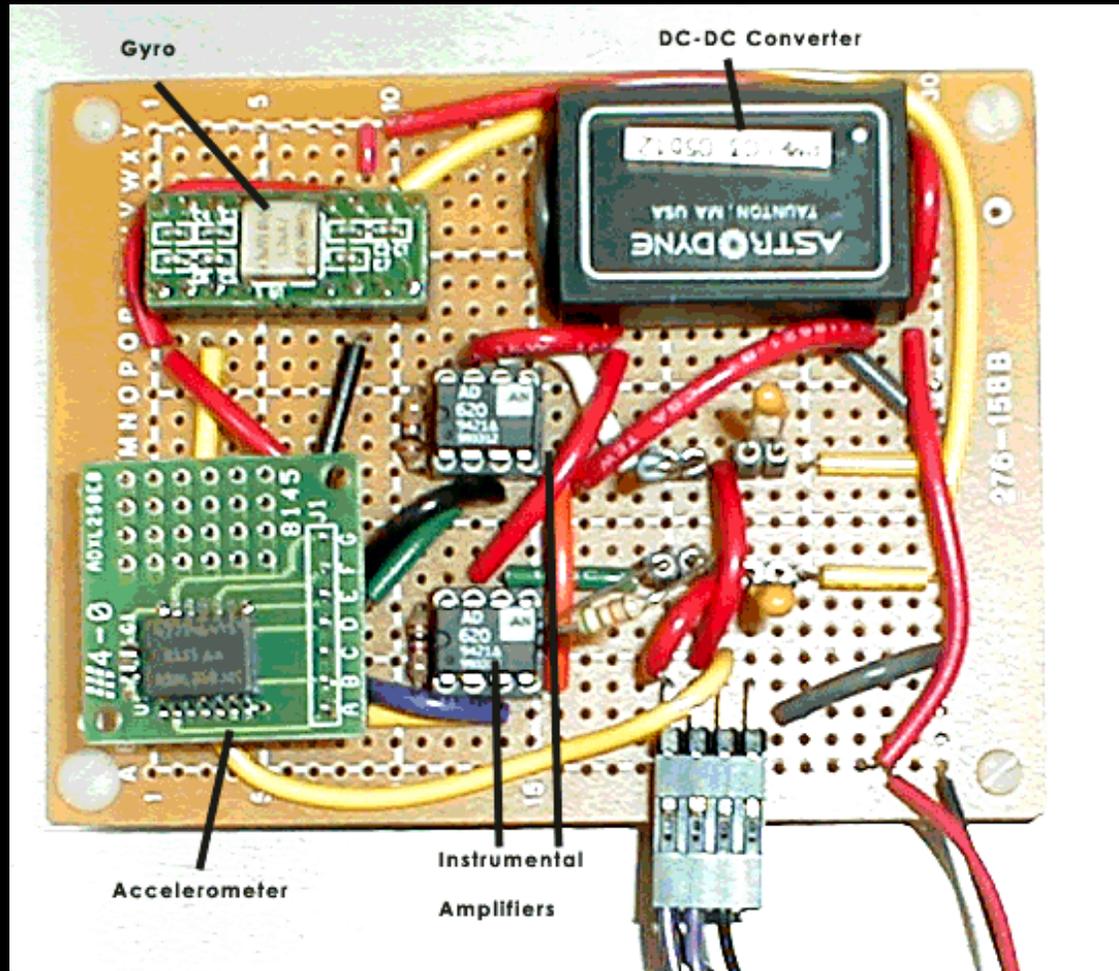
Cardboard for cheap, fast and recyclable Embodiment

Standing Faceplate

Serviceable Box

3D SLICING

Images from https://www.epiloglaser.com/resources/sample-club/trex-head-3d-model.htm https://www.instructables.com/How-to-Slice-Up-a-T-Rex-in-123D-Make/
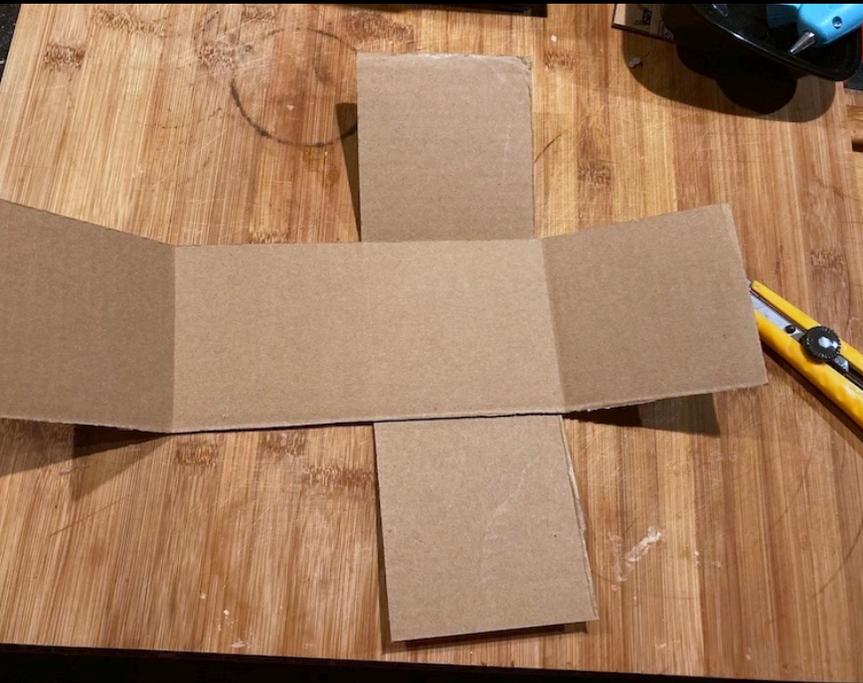
Complex forms

Images from https://makezine.com/2016/04/21/working-with-cardboard-tips-cut-fold-mold-papier-mache/

WHAT COLOR SHOULD THE LEDS ON THIS INTERFACE BE?

CARDBOARD CUTTING DEMO

Materiality

What should it be made of?

How should it feel?

How should it behave?

Examples from HRI workshop

Image from http://guyhoffman.com/blossom-handcrafted-soft-social-robot/

Usability

Useful concepts, principles and methods

The human mind is exquisitely tailored to make sense of the world. Give it the slightest clue and off it goes, providing explanation, rationalization, understanding.

Poorly designed objects can be difficult and frustrating to use. They provide no clues—or sometimes false clues. They trap the user and thwart the normal process of interpretation and understanding.

Alas, poor design dominates.

Donald Norman, Design of Everyday Things

Useful concepts in usability
Affordances

Image from http://jareddonovan.com/blog/?cat=10

The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill.
J.J. Gibson

USEFUL CONCEPTS IN USABILITY
Affordances

hide prey

hide, climb

throw

use as tool

hurt toe

Image from http://www.macs-eu.org/images/affordance-animals.jpg
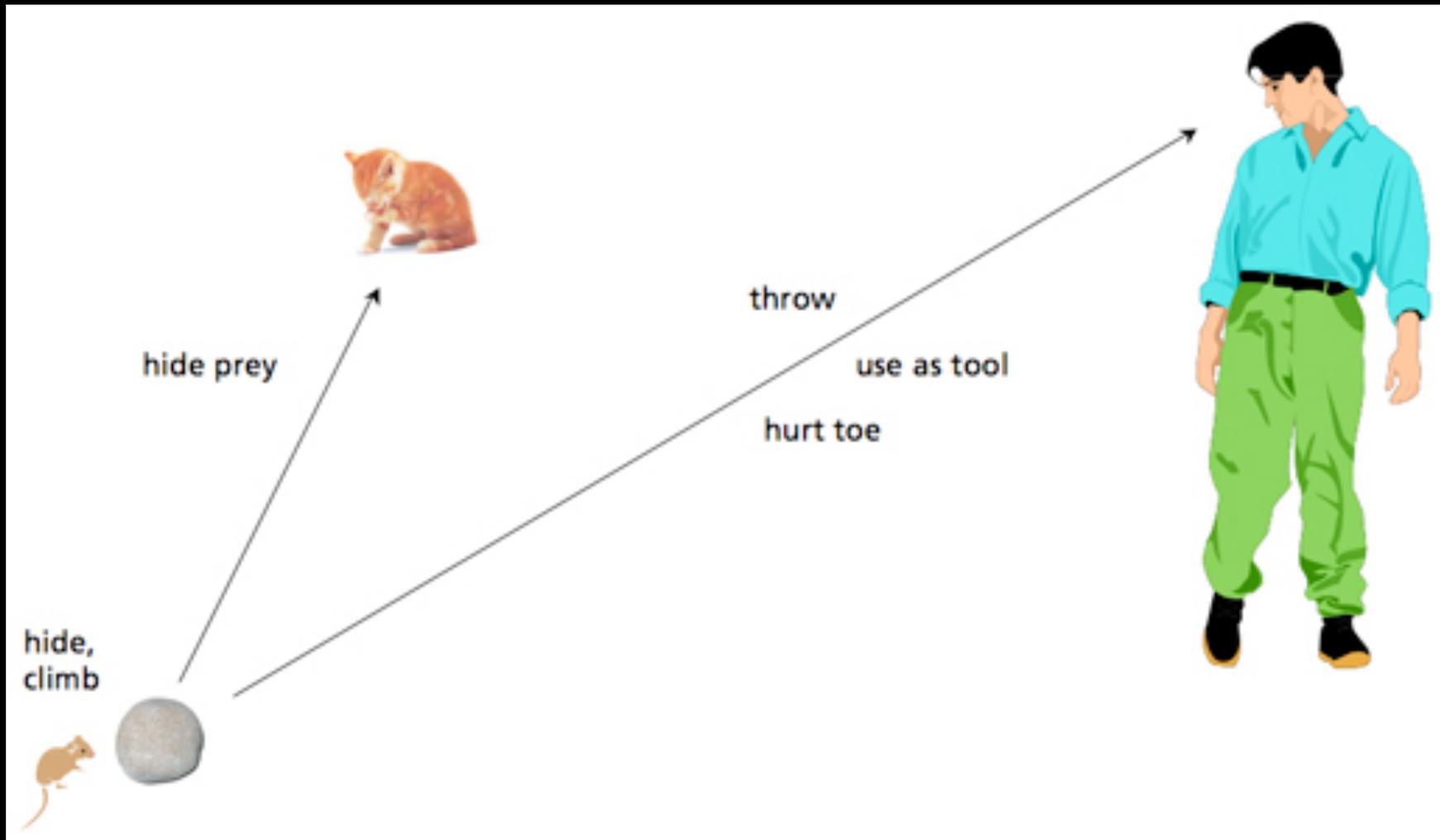
USEFUL CONCEPTS IN USABILITY
Perceived affordances

Affordances provide strong clues to the operation of things. Plates are for pushing. Knobs are for turning. Slots are for inserting things into.
Don Norman

Conceptual model

- A good conceptual model allows us to predict the effect of our actions.
- Conceptual models need not be very complex. However, when the model presented is inadequate or wrong, we can have difficulties.

Useful concepts in usability
Visibility

	Knowledge in world	Knowledge in head
Retrievability	Whenever visible or audible	Not easily retrievable
Learning	Learning not required	Requires learning
Efficiency of Use	Slower, due to need to find and interpret info	Can be very efficient
Ease of first use	High	Low
Aesthetics	Can be cluttered	Can be more elegant

## Mapping
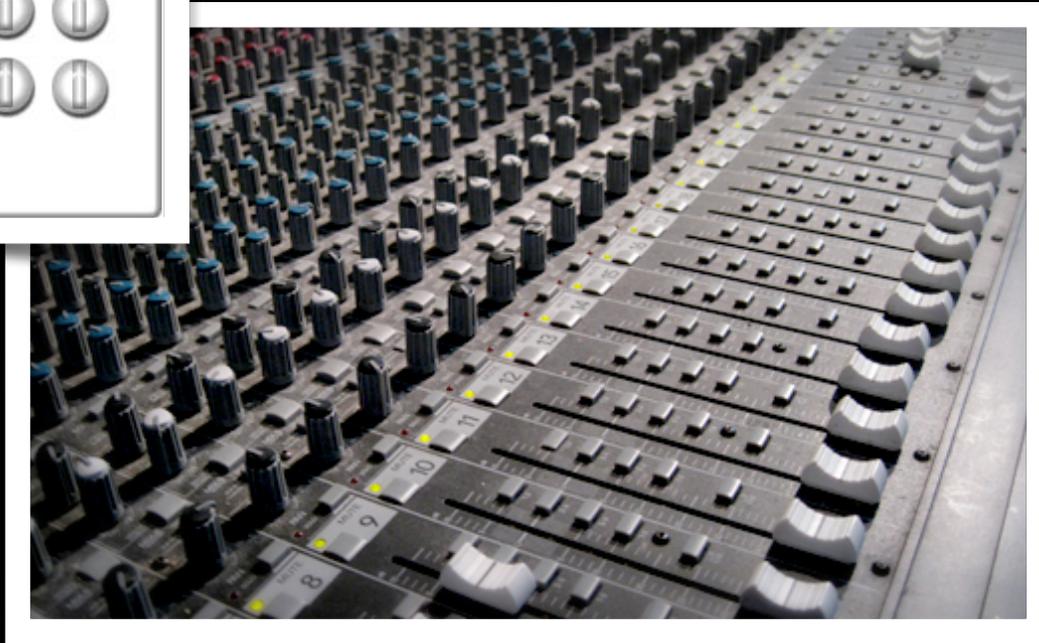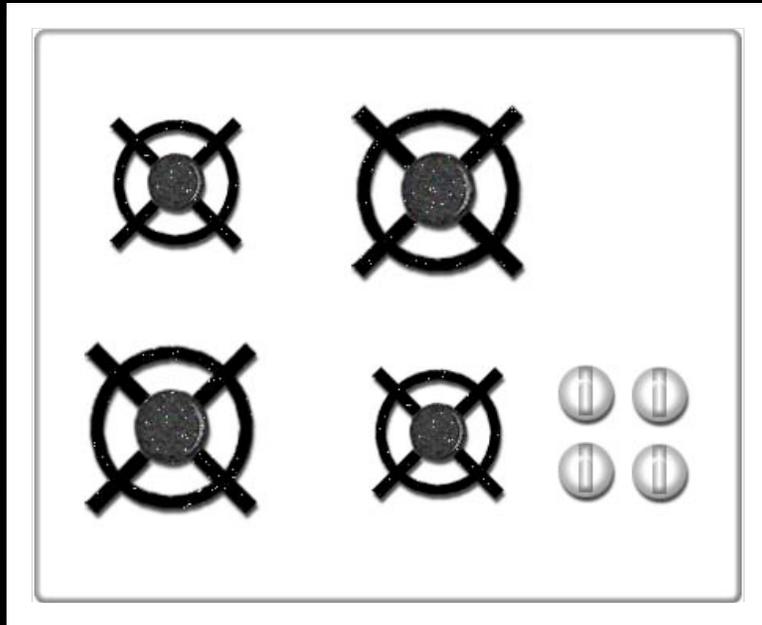
Useful concepts in usability
Slips vs. mistakes

☐ **Slips** result from automatic behavior, when subconscious actions that are intended to satisfy our goals get waylaid en route.

☐ **Mistakes** result from conscious deliberations, incorrectly derived conclusions of how things relate.

Task structure

HOT TURKEY SOUFFLE

3 cups cubed turkey
1 small onion
1 1/2 cup diced celery
4 eggs
1 can mushroom soup
1/2 cup mayonaisse
1 green pepper diced
8-12 slices bread cubed
3 cups milk
1/4 cup grated cheddar cheese
Combine turkey, mayo, onion, green pepper, and celery.
Alternate this mixture with bread cubesin large casserole

(OVER)

- Breadth in task structure increases complexity.
- Shallow task structures (like choosing from many ice cream flavors) or Narrow task structures (like performing a recipe) are easier.
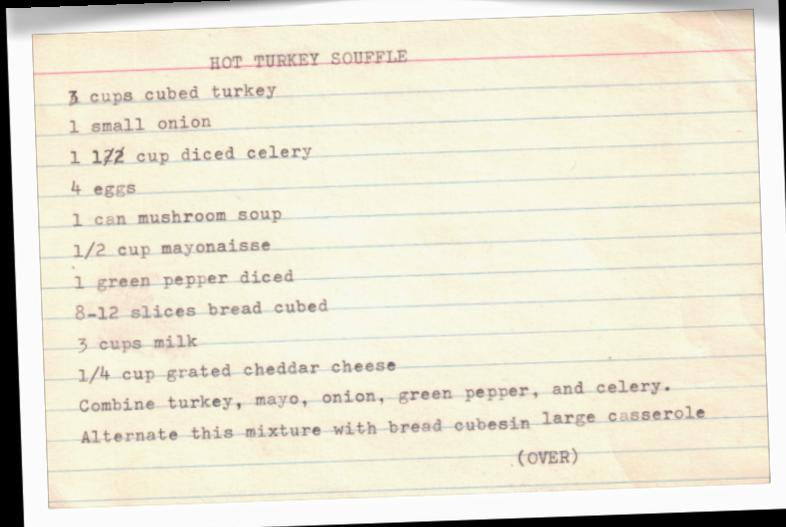
Feedback

- ☐ Feedback gives people information about what they did, and what result follows.
- ☐ A lot of feedback use to come for "free" but now we have to design it in!

PRINCIPLES OF DESIGN
For usability

1. Make things visible (even to novices).
2. Start with a strong conceptual model.
3. Use good (that is, intuitive) mappings.
4. Provide the user with lots of feedback.

LAB 4: PhUI

Physical prototyping!

Figure out how to contain ~~your excitement~~ the Pi.

Think about how big or small it is.

Think about where you want to mount the screen, the sensors, the buttons.

How does the user use it? On a table? On a wall? In their hands?