Overview

11.2 Prototyping

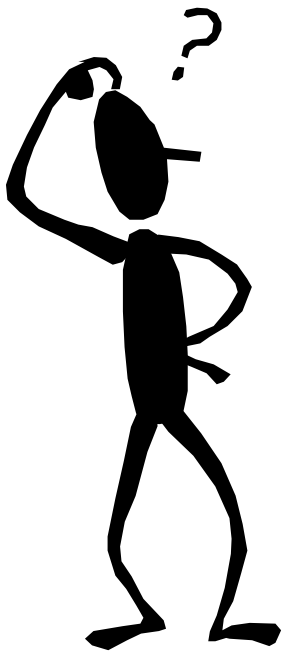
11.3 Conceptual design

11.4 Concrete design

11.5 Using scenarios

11.6 Generating prototypes

11.7 Construction



11.2 Prototyping

- What is a prototype?
- Why prototype?
- Limitation of prototype?
- Different kinds of prototyping
  - Low fidelity (Lofi)
  - High fidelity
- Compromises in prototyping
  - Vertical
  - Horizontal
- Final product needs to be engineered

What is a prototype?

In other design fields a prototype is a small-scale model:

- a miniature car
- a miniature building or town
- the examples here come from a 3D printer

(a)

Figure 11.1 (a) Color output from a 3D printer: all the gears and rods in this model were 'printed' in one pass from bottom to top, and when one gear is turned, the others turn too.

Source: (a) The Computer Language Company, Inc., courtesy of Alan Freedman

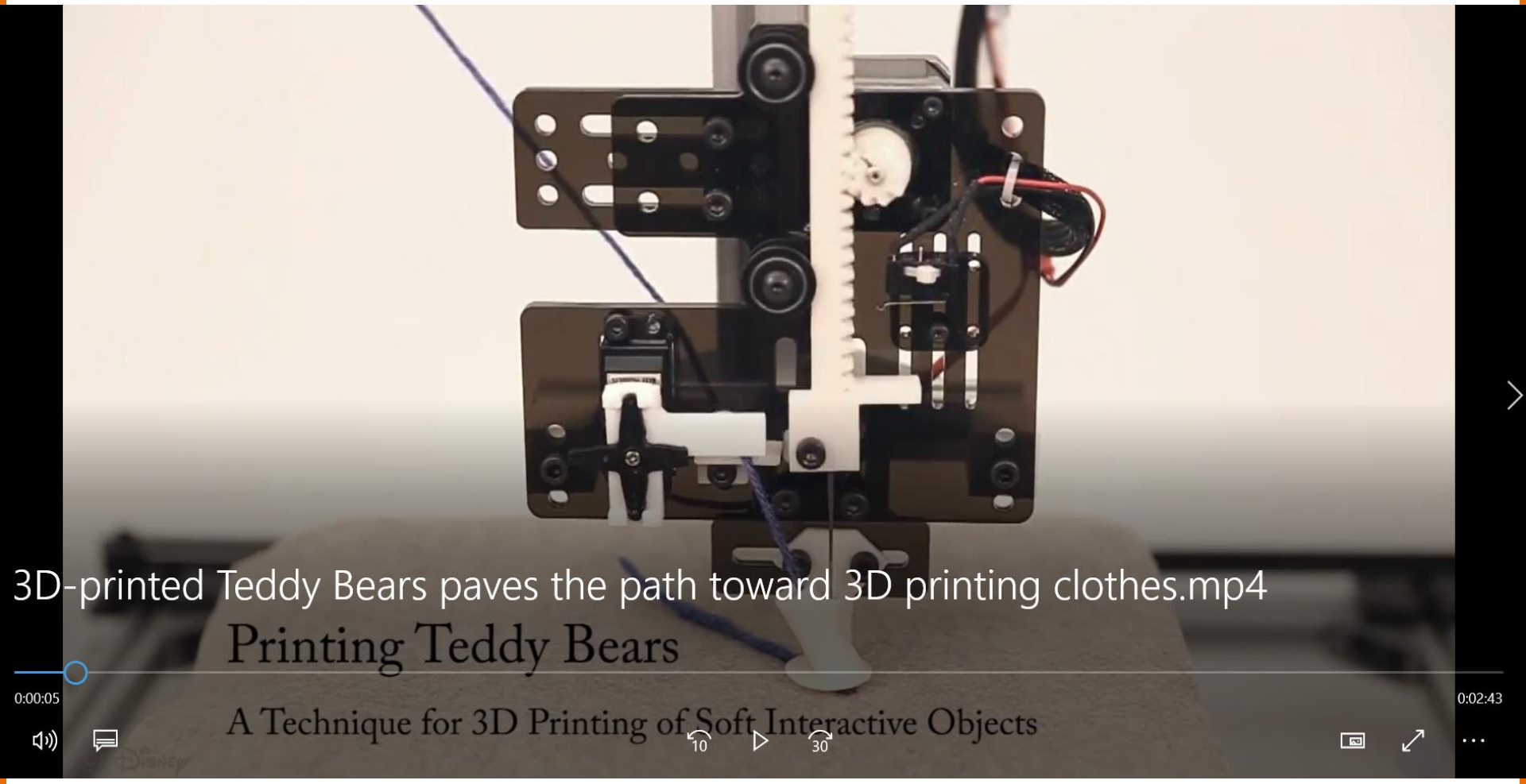
The use of 3D printing in James Bond's new Skyfall film

https://www.telegraph.co.uk/technology/news/9712435/The-names-Printing-3D-Printing..html

(c)

(c) A teddy bear ‘printed’ from a wireframe design http://www.disneyresearch.com/project/printed-teddy-bears/

3D-printed Teddy Bears paves the path toward 3D printing clothes



https://www.youtube.com/watch?v=XPhh4PBKbUQ

What is a prototype?

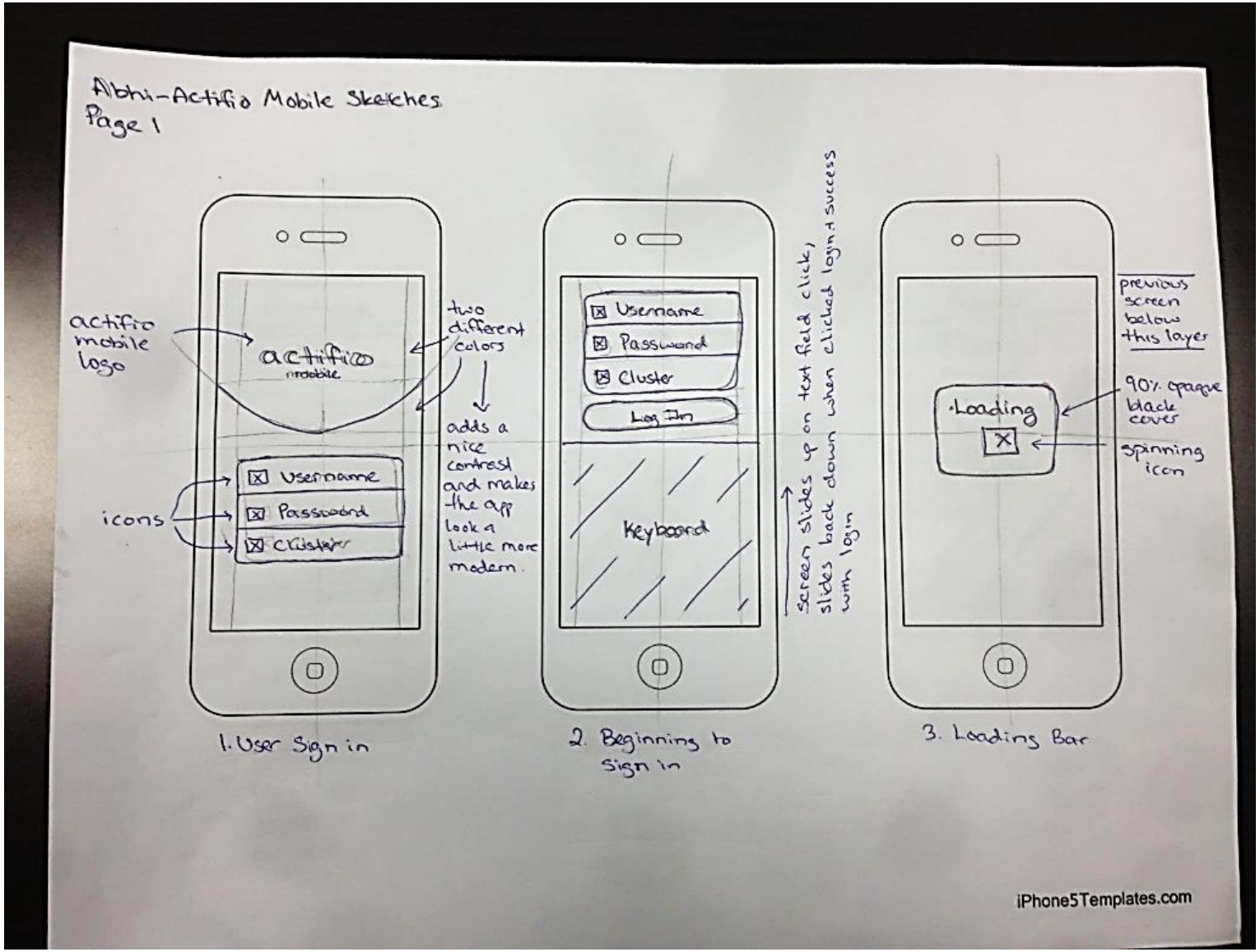
In interaction design it can be (among other things):

- a series of screen sketches
- a storyboard, i.e. a cartoon-like series of scenes
- a Power-point slide show
- a video simulating the use of a system
- a lump of wood (e.g. PalmPilot)
- a cardboard mock-up
- a piece of software with limited functionality written in the target language or in another language

PA: personal assistant

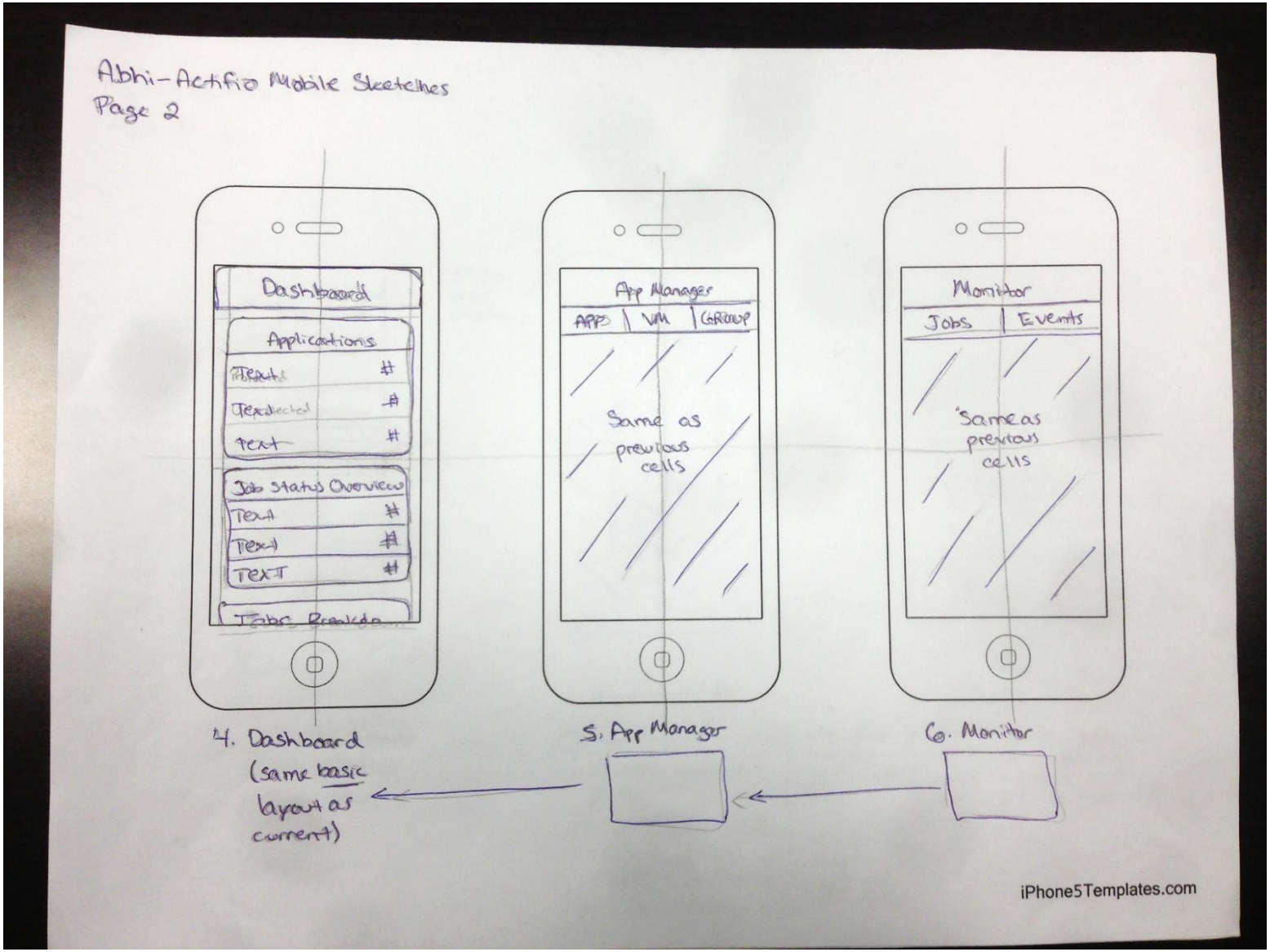
PalmPilot

a series of screen sketches



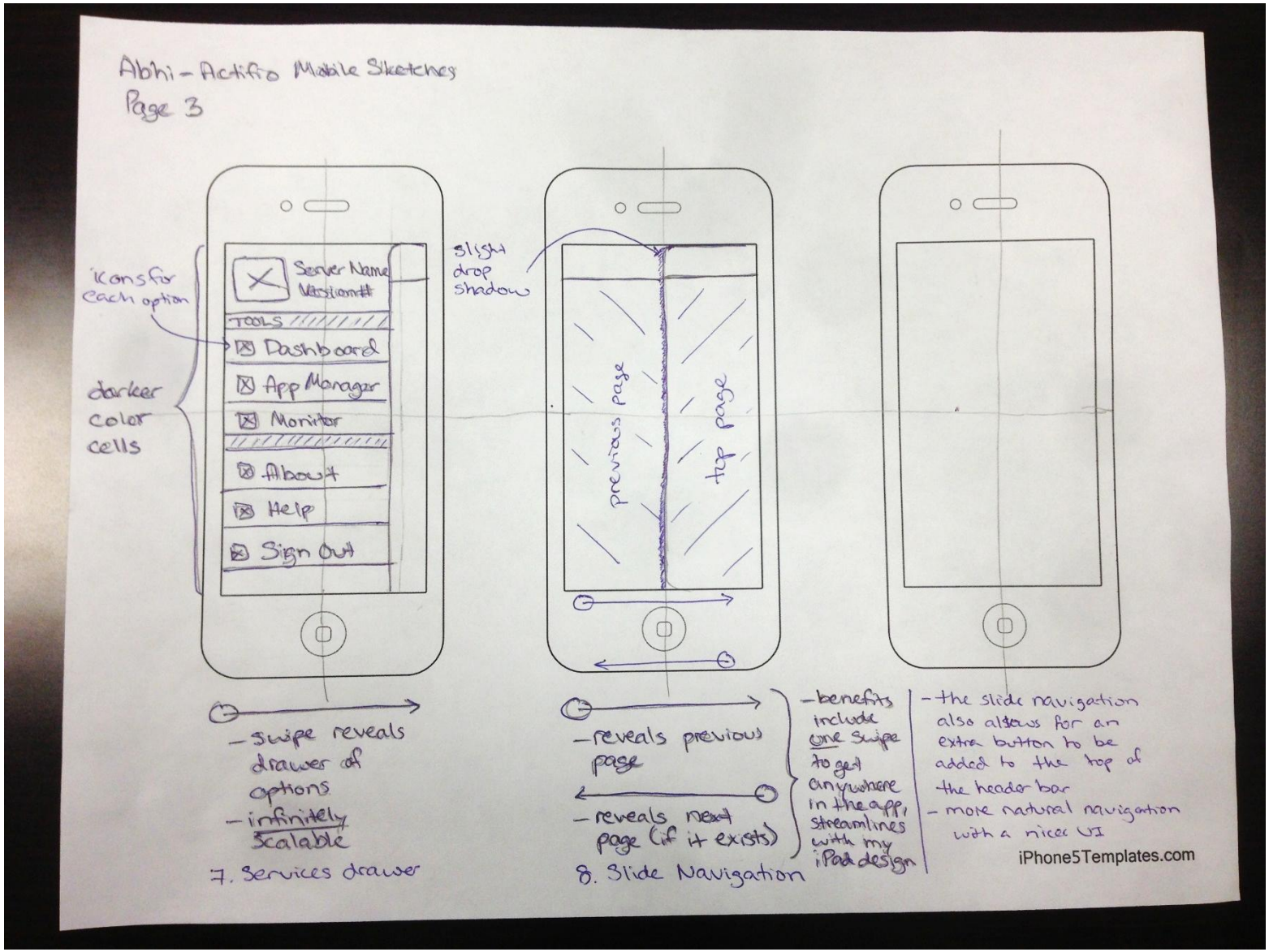
THE LOGIN SCREEN AND LOGIN PROCESS

a series of screen sketches



THE DASHBOARD, APPS MANAGER, AND MONITOR BASIC LAYOUTS.

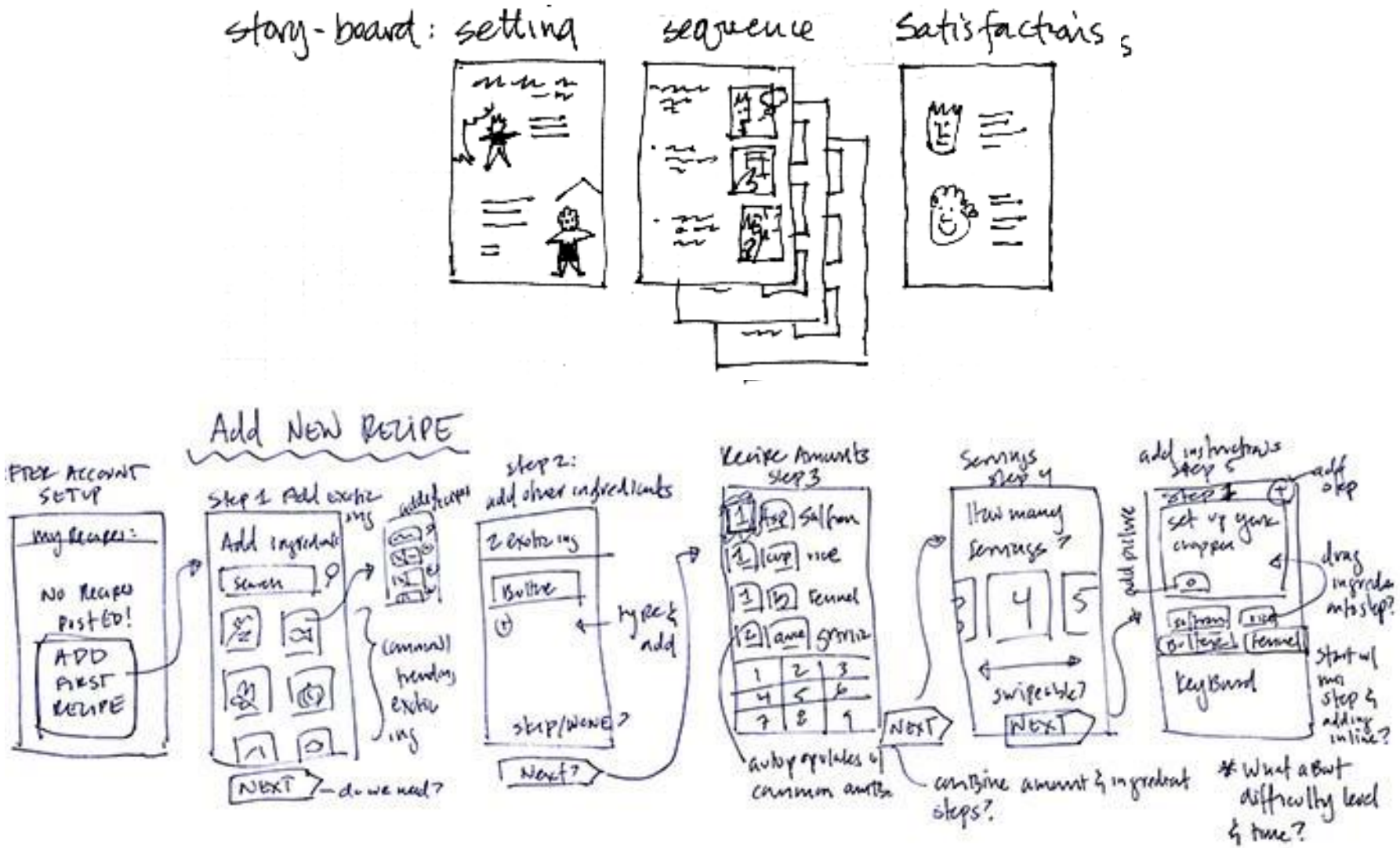
a series of screen sketches



THE SLIDING NAVIGATION CONCEPT.

Sketching to problem solve

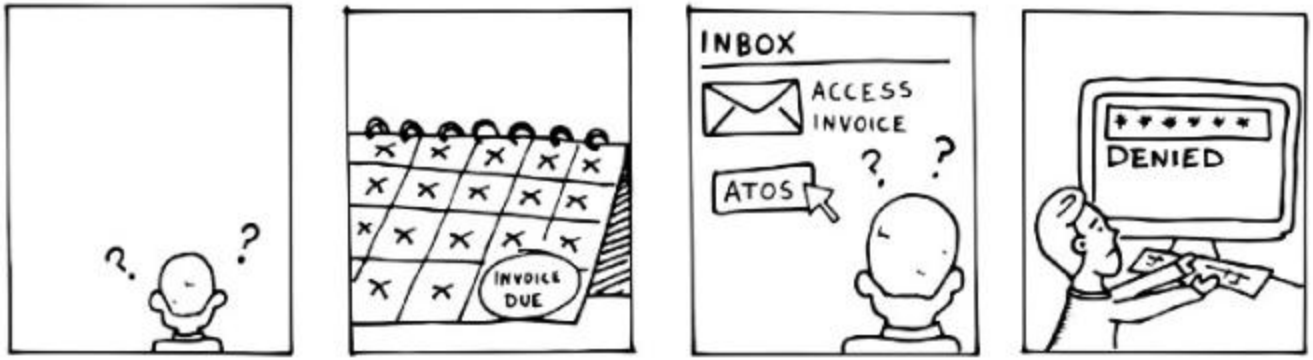
a storyboard

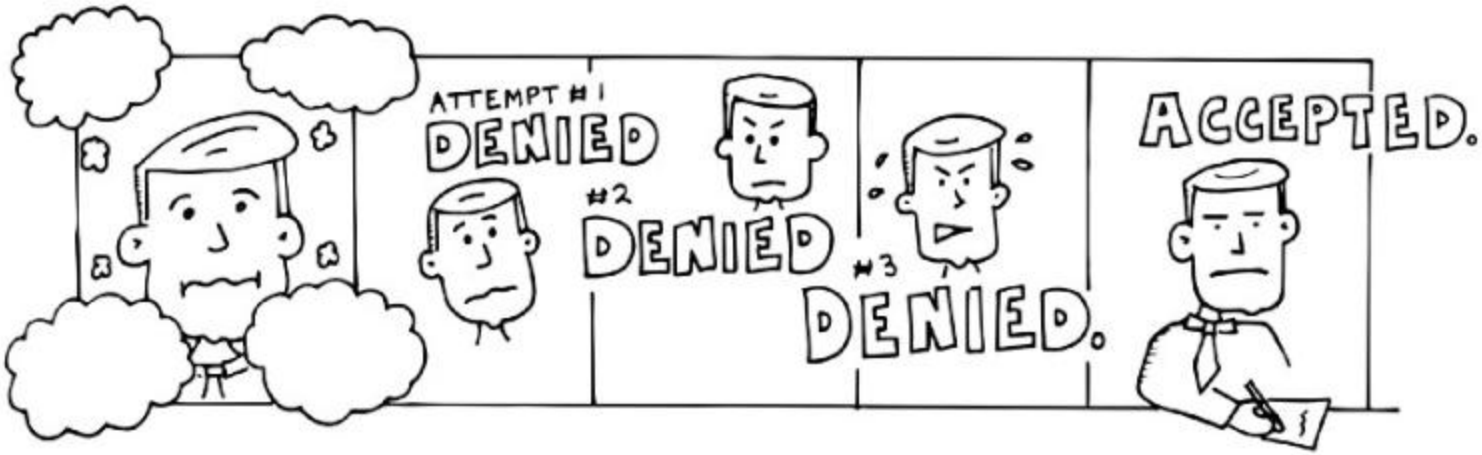


https://hci.stanford.edu/courses/cs147/2007/assignments/4_storyboard.html

https://alistapart.com/article/ooux-a-foundation-for-interaction-design

a storyboard





https://uxdesign.cc/pens-process-product-sketching-for-ux-1b4992c47565

screen sketches, paper and cardboard mockups, wireframes, and many post-its.

SITU Smart Food Nutrition Scale

SITU weighs your food in calories and nutrients in addition to grams and ounces.

********** (PLEASE NOTE: This campaign is finished and no longer monitored by the creators). ********

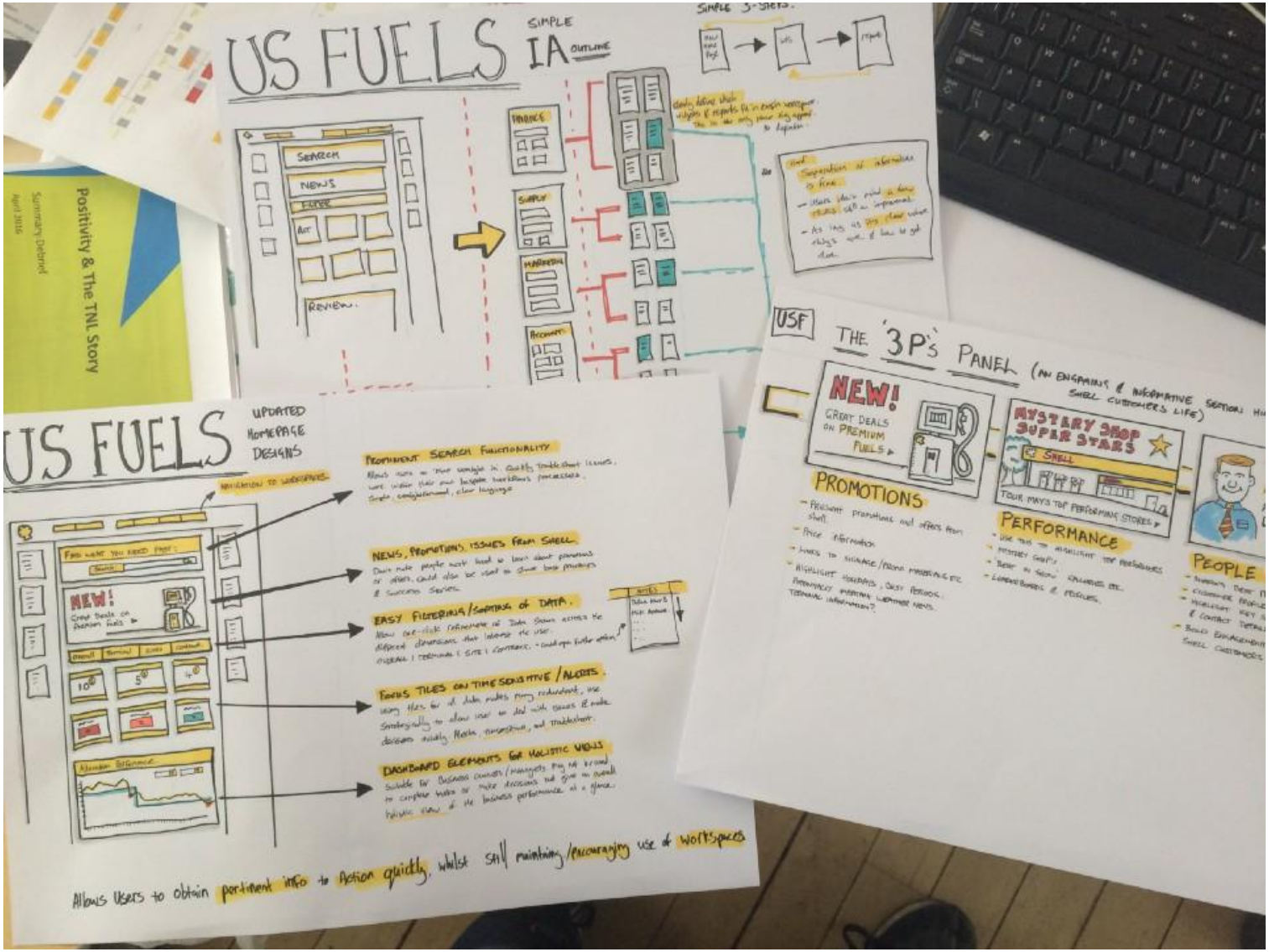
Created by

Michael Grothaus Limited (deleted)

621 backers pledged £39,757 to help bring this project to life.

https://www.kickstarter.com/projects/situ/situ-smart-food-nutrition-scale

Prototyping screens and information architecture



https://uxdesign.cc/pens-process-product-sketching-for-ux-1b4992c47565

Why prototype?

- **Stakeholders** can see, hold, interact with a prototype more easily than a document or a drawing
- Team members can **communicate effectively**
- You (designer) can **test out ideas for yourself**
- It encourages reflection: very important **aspect of design**
- Prototypes answer questions, and support designers in **choosing between alternatives**

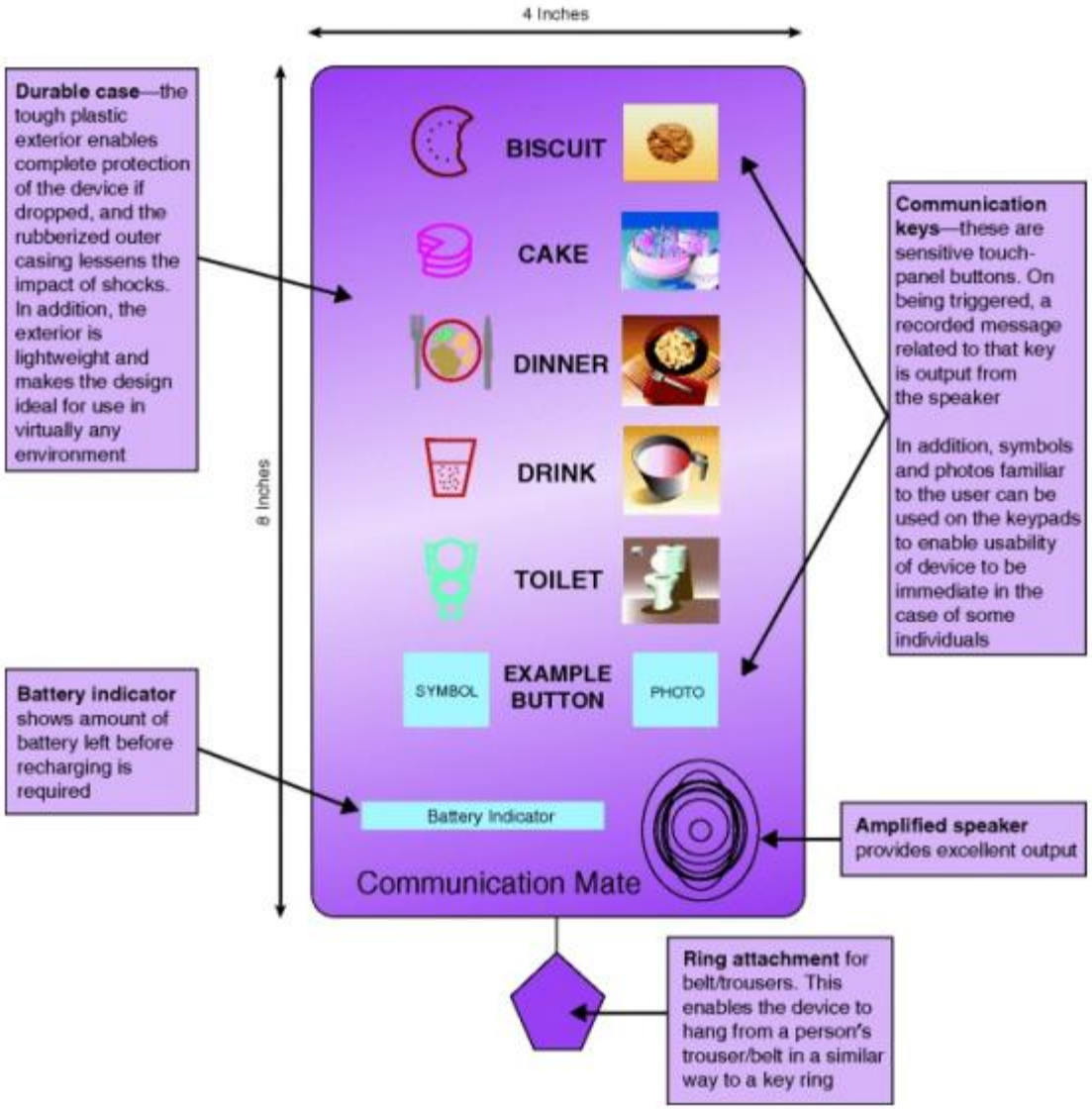


Figure 11.2 A paper-based prototype of a handheld device to support an autistic child

Source: Reprinted by permission of Sigil Khwaja.

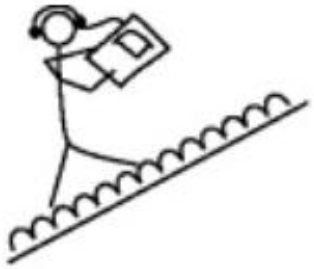
Low-fidelity Prototyping

- Uses a medium which is unlike the final medium, e.g. paper, cardboard
- Is quick, cheap and easily changed → useful
- Importance in early stages of development
- Examples:
  - sketches of screens, task sequences, etc
  - 'post-it' notes
  - storyboards
  - 'Wizard-of-Oz'
  - Lump of wood and PalmPilot

Storyboarding

- Often used with scenarios, bringing more detail, and a chance for users to role play
- It is a series of sketches showing how a user might progress through a task using the device
- Used early in design

Example of storyboards



Christina walks up hill; the product gives her information about the site

Christina adjusts the preferences to find information about the pottery trade in Ancient Greece

Christina scrambles to the highest point

Christina stores information about the pottery trader's way of life in Ancient Greece

Christina takes a photograph of the location of the pottery market

Sketching

- Sketching is important to low-fidelity prototyping
- Don’t be inhibited about drawing ability. Practice simple symbols

Some simple sketches

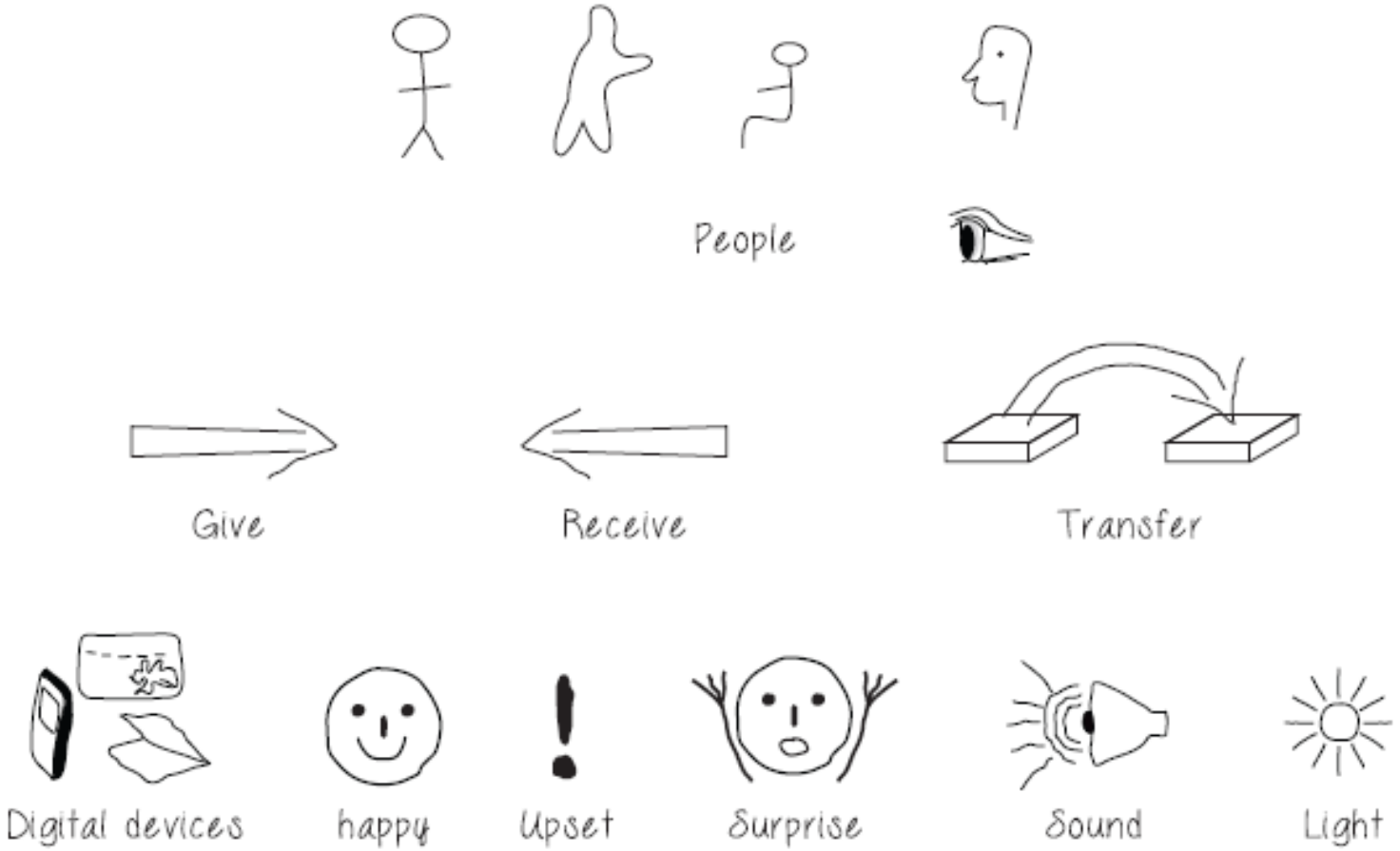
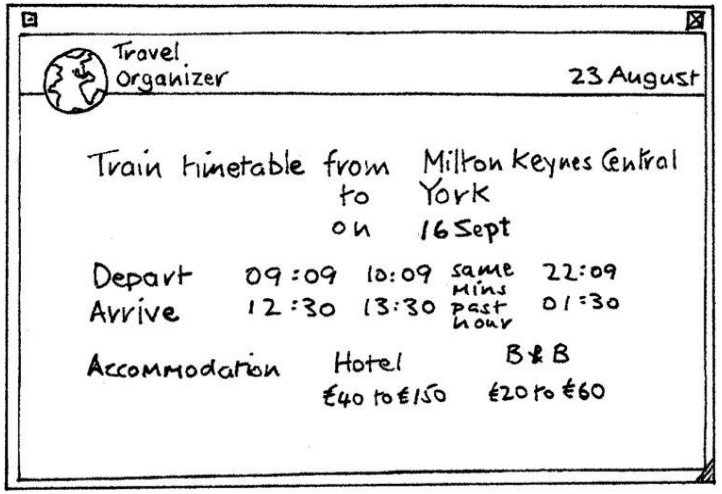


Figure 11.4 Some simple sketches for low-fidelity prototyping

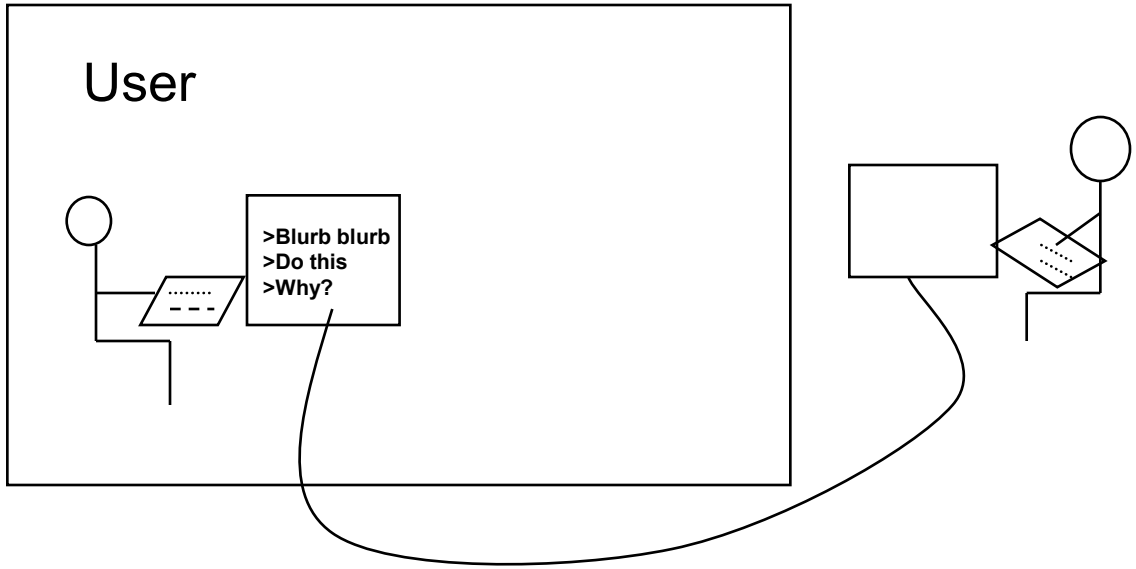
Index cards (Card-based prototypes)



- Index cards (3 X 5 inches)
- Each card represents one screen or part of screen
- Often used in website development

‘Wizard-of-Oz’ prototyping

- The user thinks they are interacting with a computer, but a developer is responding to output rather than the system.
- Usually done early in design to understand users’ expectations
- What is ‘wrong’ with this approach?



Activity 11.1

Hãy tạo một storyboard để mô tả việc nạp nhiên liệu xăng vào xe hơi

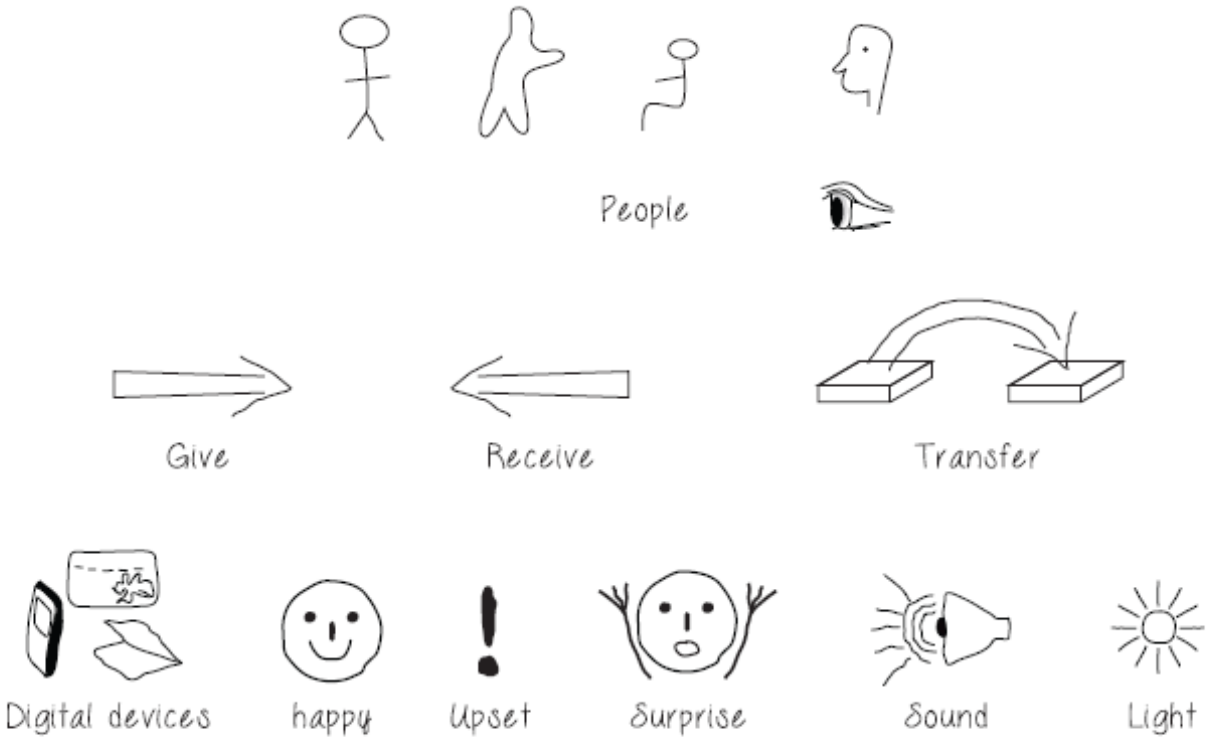


Figure 11.4 Some simple sketches for low-fidelity prototyping

Activity 11.1

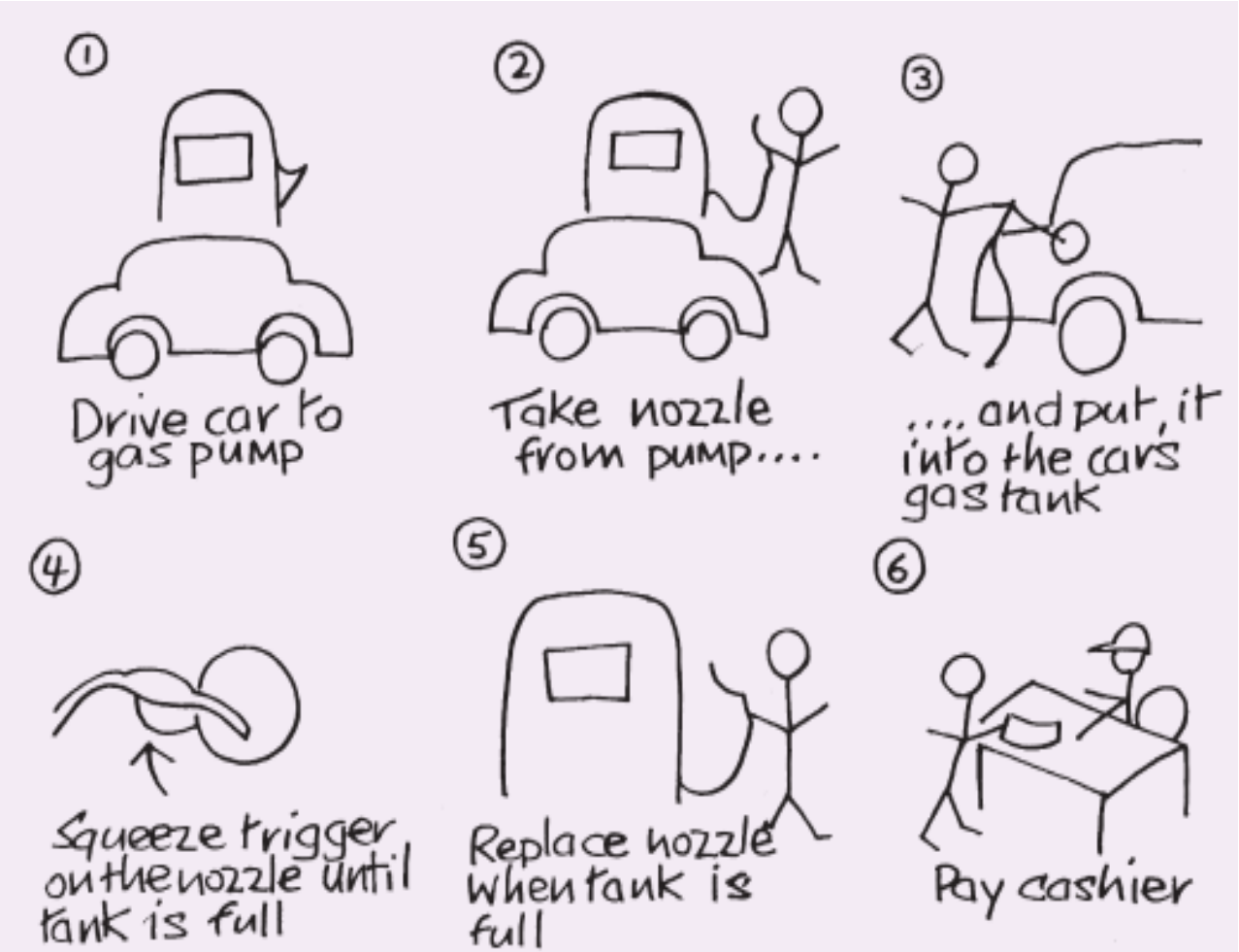
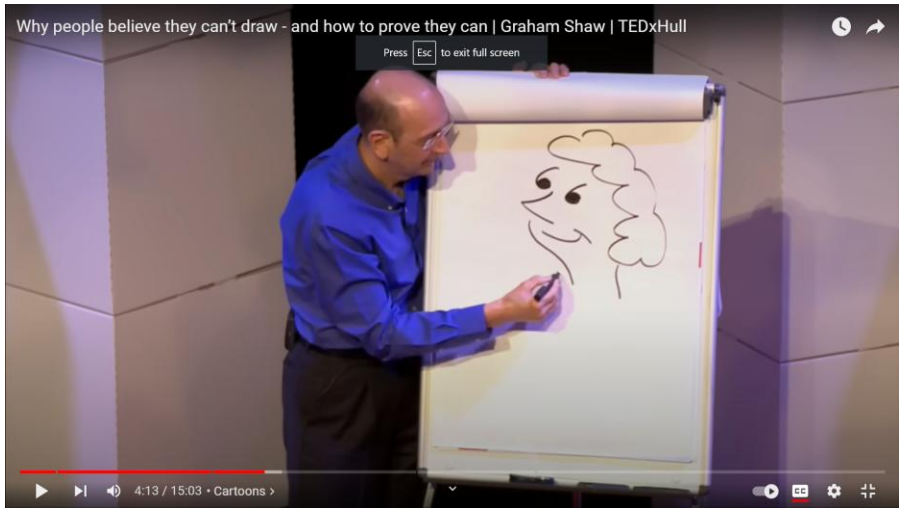
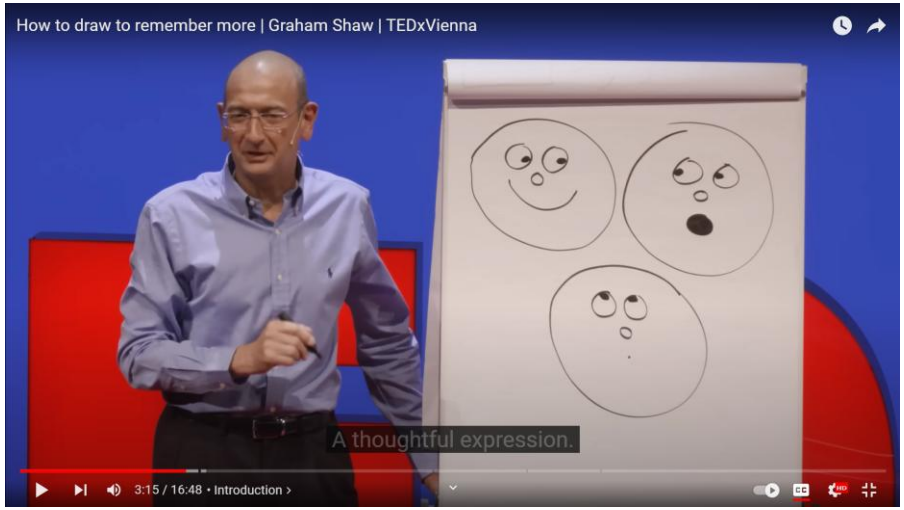


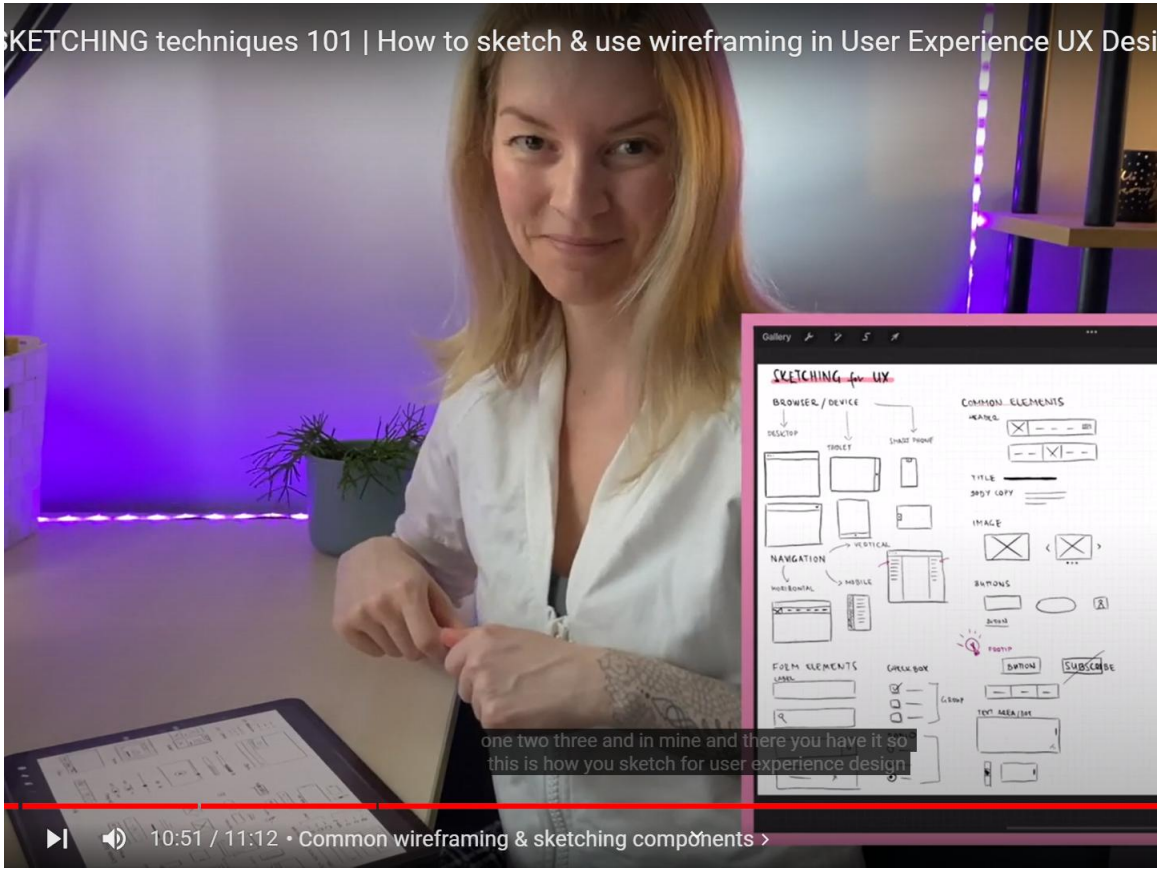
Figure 11.5 A storyboard depicting how to fill a car with gas

How to sketch

- https://www.youtube.com/watch?v=7TXEZ4tP06c
- https://www.youtube.com/watch?v=gj3ZnKlHqxI

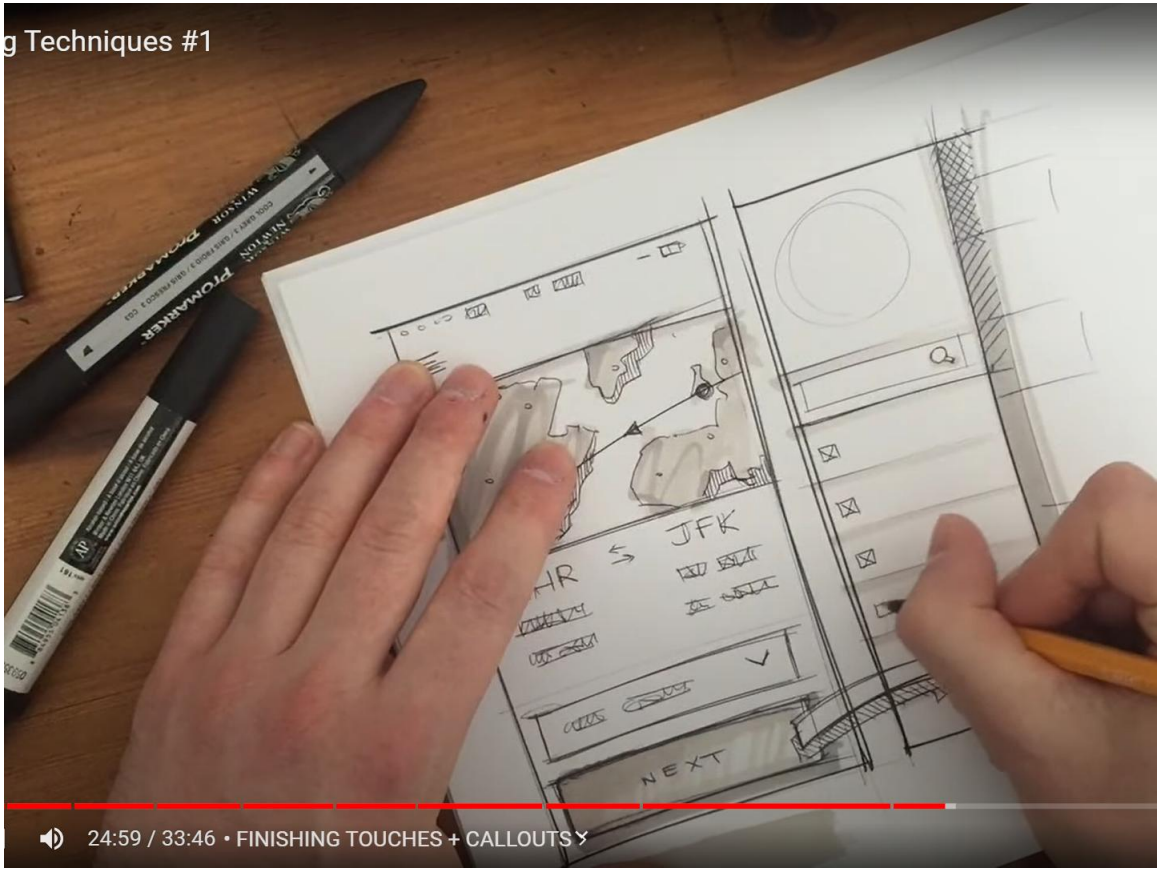






UX sketching techniques

https://www.youtube.com/watch?v=5p1WoXx8w3M



Sketching Techniques for UX Designers

https://www.youtube.com/watch?v=vN2MFF2YZjo&list=PLktTfcgPEMhgNOoT6U8io239Z24FXFJkn

UX Writing Tips for Designers

https://www.youtube.com/watch?v=HAtspnO3X3Q

High-fidelity prototyping

- Uses materials that you would expect to be in the final product
- Prototype looks more like the final system than a **low-fi**delity version
- High-fidelity prototypes can be developed by integrating existing hardware and software components
- Danger that users think they have a complete system…….see compromises

Compromises in prototyping

- All prototypes involve compromises
- For software-based prototyping maybe there is a slow response? sketchy icons? limited functionality?
- Two common types of compromise
  - horizontal: provide a wide range of functions, but with little detail
  - vertical: provide a lot of detail for only a few functions
- Compromises in prototypes mustn't be ignored. Product needs engineering

Box 11.1
Filtering dimensions of prototyping

Filtering dimension	Example variables
Appearance	size; color; shape; margin; form; weight; texture; proportion; hardness; transparency; gradation; haptic; sound
Data	data size; data type (e.g., number; string; media); data use; privacy type; hierarchy; organization
Functionality	system function; users' functionality need
Interactivity	input behavior; output behavior; feedback behavior; information behavior
Spatial structure	arrangement of interface or information elements; relationship among interface or information elements – which can be either two-or three-dimensional, intangible or tangible, or mixed

Box 11.1
Manifestation dimensions of prototyping

Manifestation dimension	Definition	Example variables
Material	Medium (either visible or invisible) used to form a prototype	Physical media, e.g. paper, wood, and plastic; tools for manipulating physical matters, e.g. knife, scissors, pen, and sand-paper; computational prototyping tools, e.g. Macromedia Flash and Visual Basic; physical computing tools, e.g. Phidgets and Basic Stamps; available existing artifacts, e.g. a beeper to simulate a heart attack
Resolution	Level of detail or sophistication of what is manifested (corres-ponding to fidelity)	Accuracy of performance, e.g. feedback time responding to an input by a user (giving user feedback in a paper prototype is slower than in a computer-based one); appearance details; interactivity details; realistic versus faked data
Scope	Range of what is covered to be mani-fested	Level of contextualization, e.g. website color scheme testing with only color scheme charts or color schemes placed in a website layout structure; book search navigation usability testing with only the book search related inter-face or the whole navigation interface

Table 11.2 The definition and variables of each manifestation dimension

Advantages and disadvantages of low- and highfidelity prototypes

Type	Advantages	Disadvantages
Low-fidelity prototype	Lower development cost Evaluates multiple design concepts Useful communication device Addresses screen layout issues Useful for identifying market requirements Proof of concept	Limited error checking Poor detailed specification to code to Facilitator-driven Limited utility after requirements established Limited usefulness for usability tests Navigational and flow limitations
High-fidelity prototype	Complete functionality Fully interactive User-driven Clearly defines navigational scheme Use for exploration and test Look and feel of final product Serves as a living specification Marketing and sales tool	More resource-intensive to develop Time-consuming to create Inefficient for proof-of-concept designs Not effective for requirements gathering

Table 11.3 Advantages and disadvantages of low- and high-fidelity prototypes

Case study
Generate card-based prototype from use case

Figure 11.6 Prototype developed for cell phone user interface

What to prototype?

- Technical issues
- Work flow, task design
- Screen layouts and information display
- Difficult, controversial, critical areas

11.3 Conceptual design

- Transform user requirements/needs into a conceptual model
- A conceptual model is an outline of what people can do with a product and what concepts are needed to understand and interact with it
- Mood board may be used to capture feel
- Consider alternatives: prototyping helps

Mood board

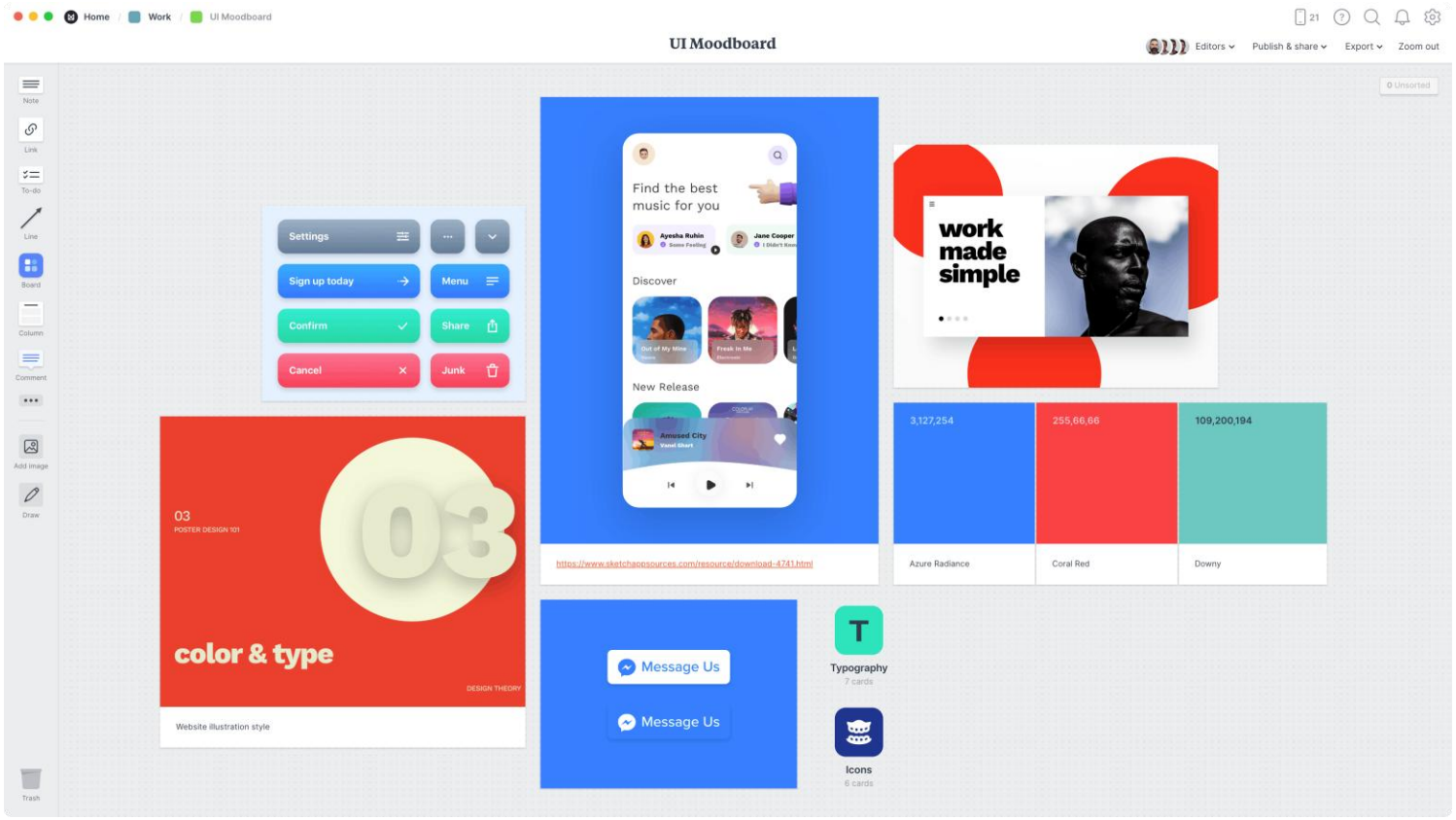
Broad
Black board

Xem thêm: https://youtu.be/1CeSjFJflD4?t=875

Mood board

Figure 11.7 An example mood board

UX Mood board



Source: https://milanote.com/templates/moodboards/UI-moodboard

11.3.1 Developing an Initial Conceptual Model

- Derive from the requirements for the product
- Steep yourself in the data you have gathered about your users and their goals and try to empathize with them.

Really understand the users' experience

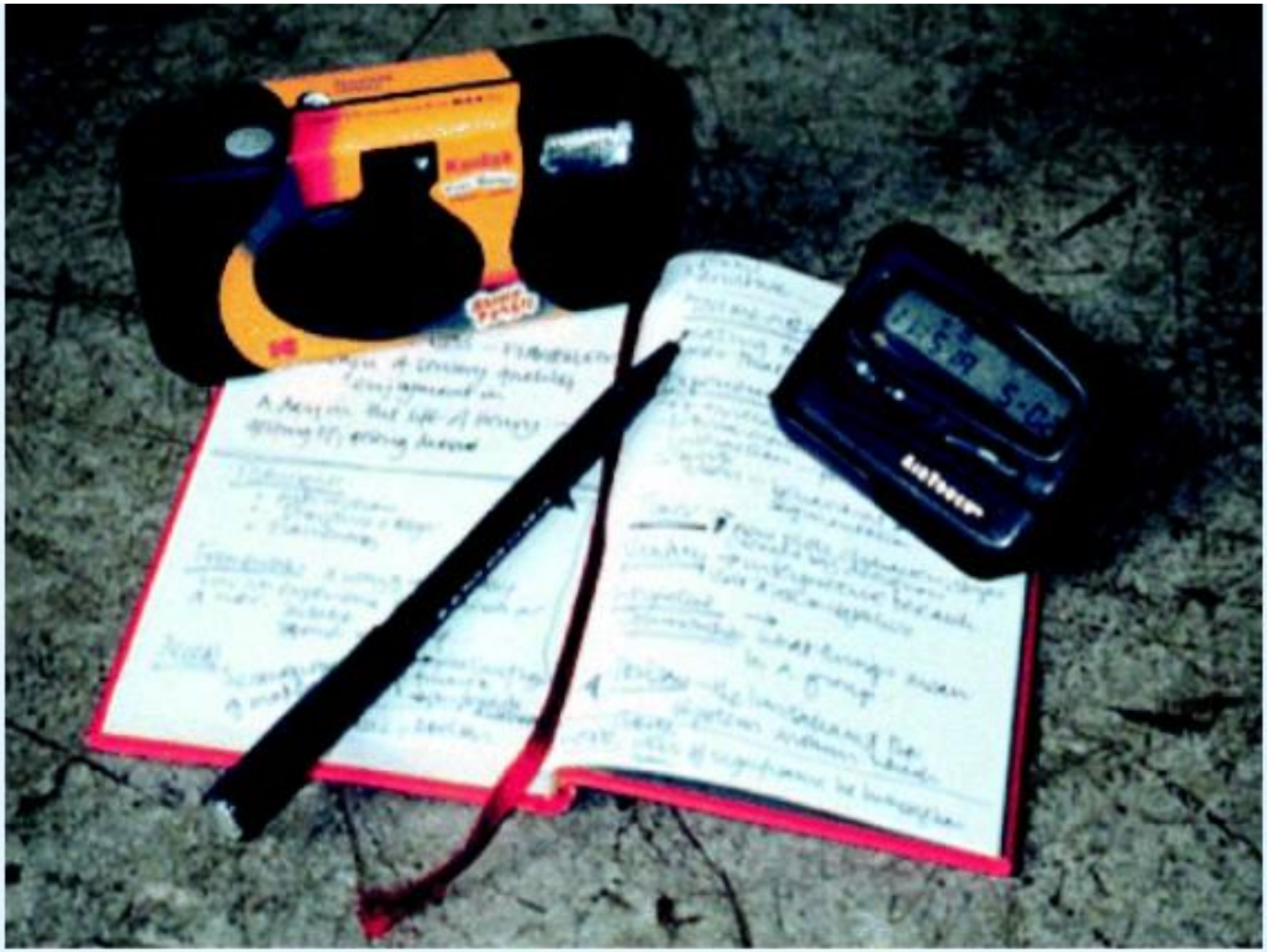


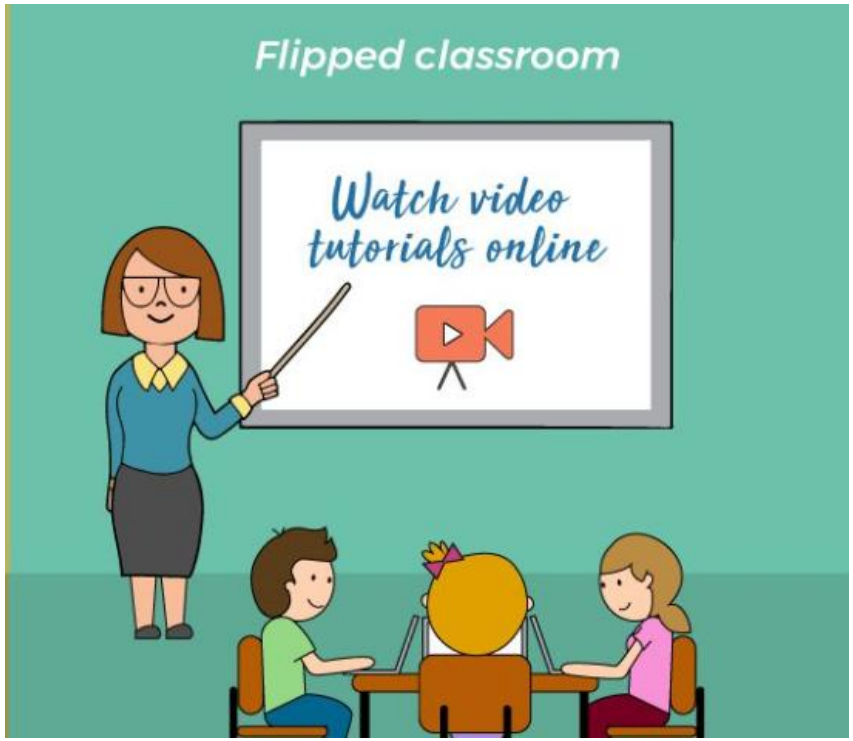
Figure 11.8 The patient kit for experience prototyping

Really understand the users' experience

Figure 11.9 The Third Age empathy suit helps designers experience the loss of mobility and sensory perception

Is there a suitable metaphor?

- Interface metaphors combine familiar knowledge with new knowledge in a way that will help the user understand the product.
- Example:



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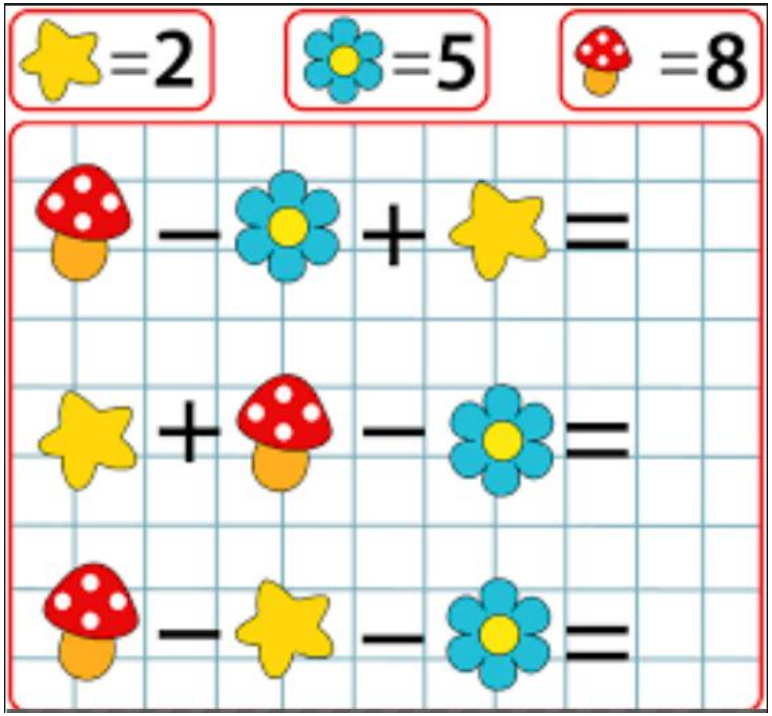
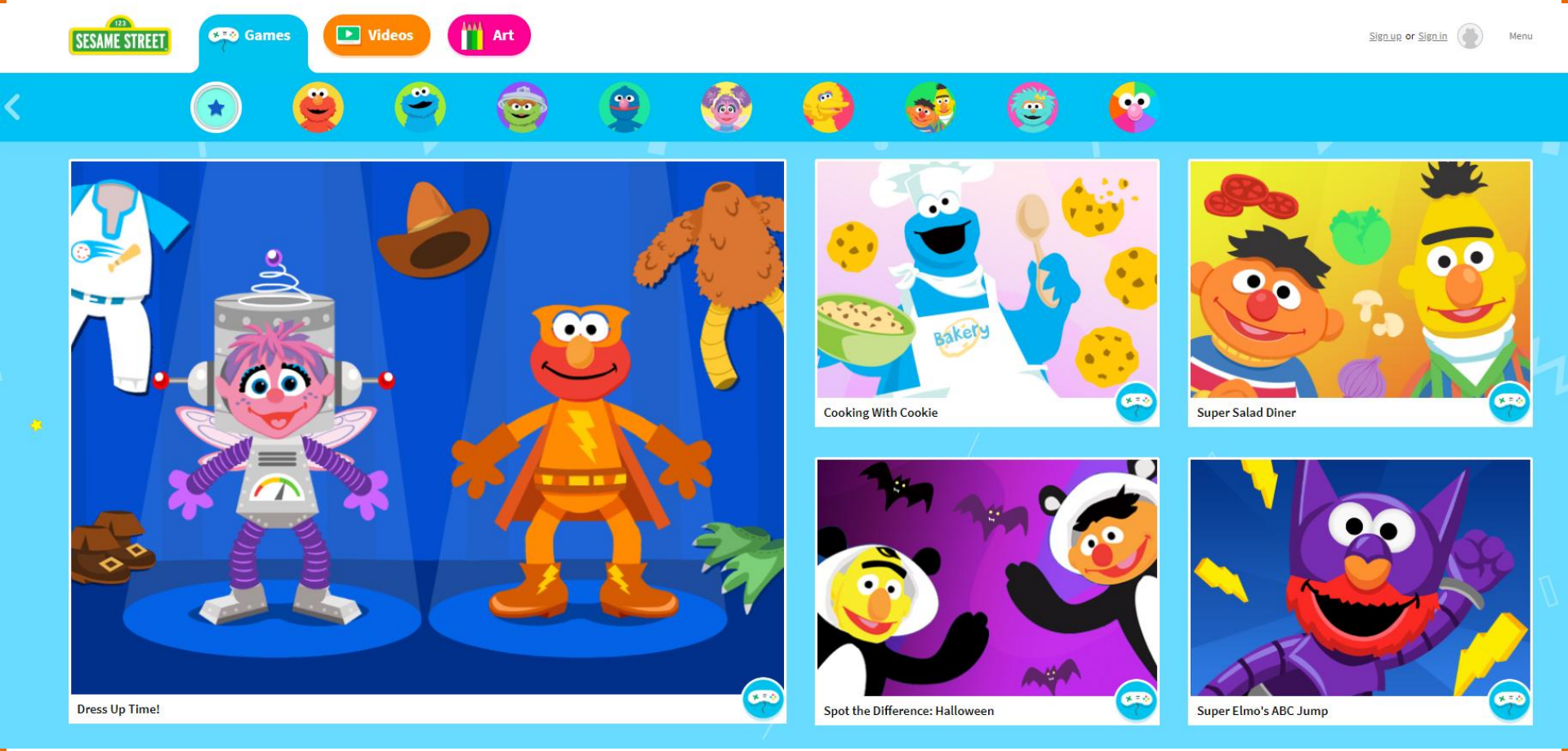


Microsoft Window Hình tượng window trong CNTT có phải là 1 metaphor hay không?



Is there a suitable metaphor?

- Three steps to choose a good interface metaphor:
  - understand functionality requirements,
  - identify potential task cause problems/complicated/critical
  - generate metaphors
- Evaluate metaphors:

  How much structure does metaphor provide?

  How much of the metaphor is relevant to the problem?

  Is it easy to represent (with visual/audio/words)?

  Will the audience understand the metaphor?

  How extensible is the metaphor?

Another example of suitable metaphor – a printed travel brochure

1. Does it supply structure?
2. How much of the metaphor is relevant?
3. Is it easy to represent?
4. Will your audience understand the metaphor
5. How extensible is the metaphor?

Activity 11.2

- Another possible interface metaphor for the travel organizer is **the travel consultant**
- Ask the five questions above of this metaphor.

Considering interaction and interface types

Interaction type - How the user invokes actions

- Instructing (ra chỉ thị/mệnh lệnh):
  - typing in commands,
  - selecting options from menus in a windows environment or on a multitouch screen
  - speaking aloud commands,
  - gesturing,
  - pressing buttons,
  - or using a combination of function keys.
- Conversing (đối thoại)

  - users have a dialog with a system.

  - users can speak via an interface or type in questions to which the system replies via text or speech output.
- Manipulating
- Exploring

Considering interaction types

- Manipulating
  - where users interact with objects in a virtual or physical space by manipulating them (e.g. opening, holding, closing, placing).
- Exploring
  - where users move through a virtual environment or a physical space.
  - Ex: explore the interior of a building
  - Ex: virtual universities
  - Ex: fantasy worlds where people wander around different places to socialize (e.g. virtual parties)

Example of “exploring interaction”

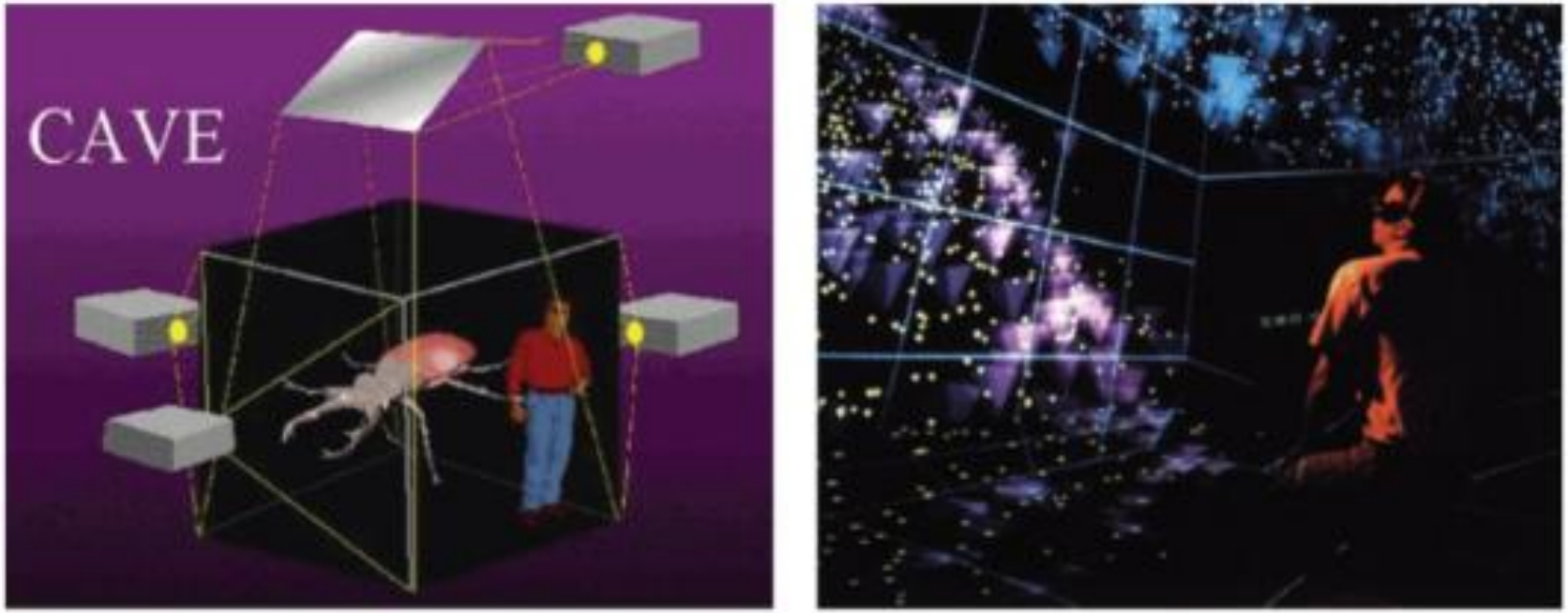


Figure 2.8 (a) A CAVE that enables the user to stand near a huge insect, e.g. a beetle, be swallowed, and end up in its abdomen; and (b) NCSA's CAVE being used by a scientist to move through 3D visualizations of the datasets

Considering interface types

- **Shareable**
- **Tangible (next slides)**
- **Augmented and mixed reality,…:**
  - Ex: replace physical brochure by others

https://www.nguoiduatin.vn/quan-ca-phe-su-dung-nhan-vien-la-robot-o-ha-noi-a351582.html

https://dantri.com.vn/suc-khoe/cham-soc-nguoi-cao-tuoi-xin-kieu-nhat-ban-20171103152004941.htm

Activity 11.3

Xem xét dịch vụ cho thuê phim…

1. Identify tasks associated with this product that would best be supported by each of the interaction types instructing, conversing, manipulating, and exploring.

2. Pick out two interface types from Chapter 6 that might provide a different perspective on the design

Expanding the initial conceptual model

- What functions will the product perform?
  - What will the product do and what will the user do (task allocation)?
  - Which function to hard-wire into the product, which to leave under software control?
- How are the functions related to each other?
  - Sequential or parallel? (temporally)
  - Categorisations, e.g. all actions related to privacy on a smartphone
  - The relationships between tasks
- What information is needed?
  - What data is required to perform the task?
  - How is this data to be transformed by the system?

11.4 Concrete design

- Many aspects to concrete design
  - Color and graphics, icons, buttons, interface types, interaction devices etc.
- User characteristics and context
- Accessibility, cross-cultural design

11.5 Using scenarios

- Express proposed or imagined situations
- Stakeholders are involved in producing and checking through scenarios for a product. Roles of scenarios:
  - as a basis for overall design
  - concrete examples of tasks, for technical implementation
  - as a means of cooperation within design teams
  - as a means of co-operation across professional boundaries
- Plus and minus scenarios to explore extreme cases

Example plus and minus scenarios

- https://www.youtube.com/watch?v=iKeGKYBOK50&t=212s

Activity 11.4

- Consider an augmented reality in-car navigation system that takes information from a GPS and displays routes and traffic information directly onto the car windscreen. Suggest one plus and one minus scenario.
- For the plus scenario, think of the possible benefits of the system.
- For the minus scenario, imagine what could go wrong

11.6 Generating prototypes

Low – fidelity prototypes:

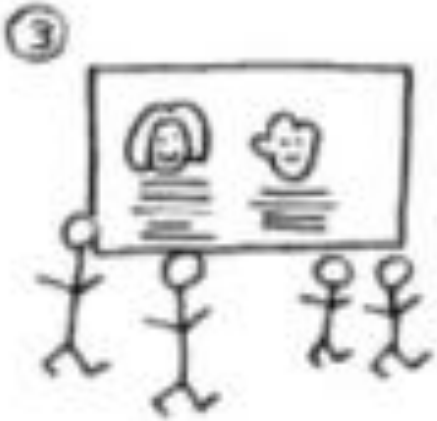
- Generating Storyboards from Scenarios
- Generating Card-Based Prototypes from Use Cases

Example of travel organizer

1. The Thomson family gather around the organizer and enter a set of initial requirements.
2. The system's initial suggestion is that they consider a flotilla trip but Sky and Eamonn aren't happy.
3. The travel organizer shows them some descriptions of the flotillas written by young people.
4. Will confirms this recommendation and asks for details.
5. The travel organizer emails the details.

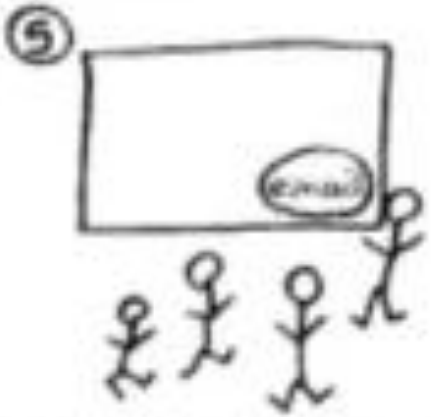
Thomson family gather around

System suggests flotilla



System shows descriptions

Will asks for details



Details emailed

Activity 11.5

- Activity 10.3 asked you to develop a futuristic scenario for the one-stop car shop. Using this scenario, develop a storyboard that focuses on the environment of the user.
- As you are drawing this storyboard, write down the design issues you are prompted to consider.

Used Car Showroom One Stop Car Shop

Select Make | Min Price | Transmission
Select Model | Max Price | Fuel Type
Search | Reset

1 2 3 4 5 6 7 ... 14 15 › »

Sort

LAND ROVER RANGE ROVER SPORT 4.4 AUTOBIOGRAPHY DYNAMIC 5DR AUTOMATIC

2014 (64) | 48,000 miles | Automatic
Grey | Estate | Diesel

BEAUTIFUL CONDITION WITH TWO TONE LEATHER INTERIOR FULL PANORAMIC ROOF RETRACTABLE SIDE STEPS RED CALIPERS BLACK ALLOYS AND ALL USUAL AUTOBIOGRAPHY EXTRAS TWO KEYS FULL SERVICE HISTORY 12 MONTHS MOT DIRECTORS CAR SO VIEW BY APPOINTMENT WE ARE PROUD TO OFFER THE UNIQUE "ONE STOP CAR BUYING EXPERIENCE." PLEASE CALL ONE OF OUR SALES CONSULTANTS FOR A NO OBLIGATION TEST DRIVE. CARS CAN BE RESERVED FOR UP TO 3 DAYS FOR... READ MORE

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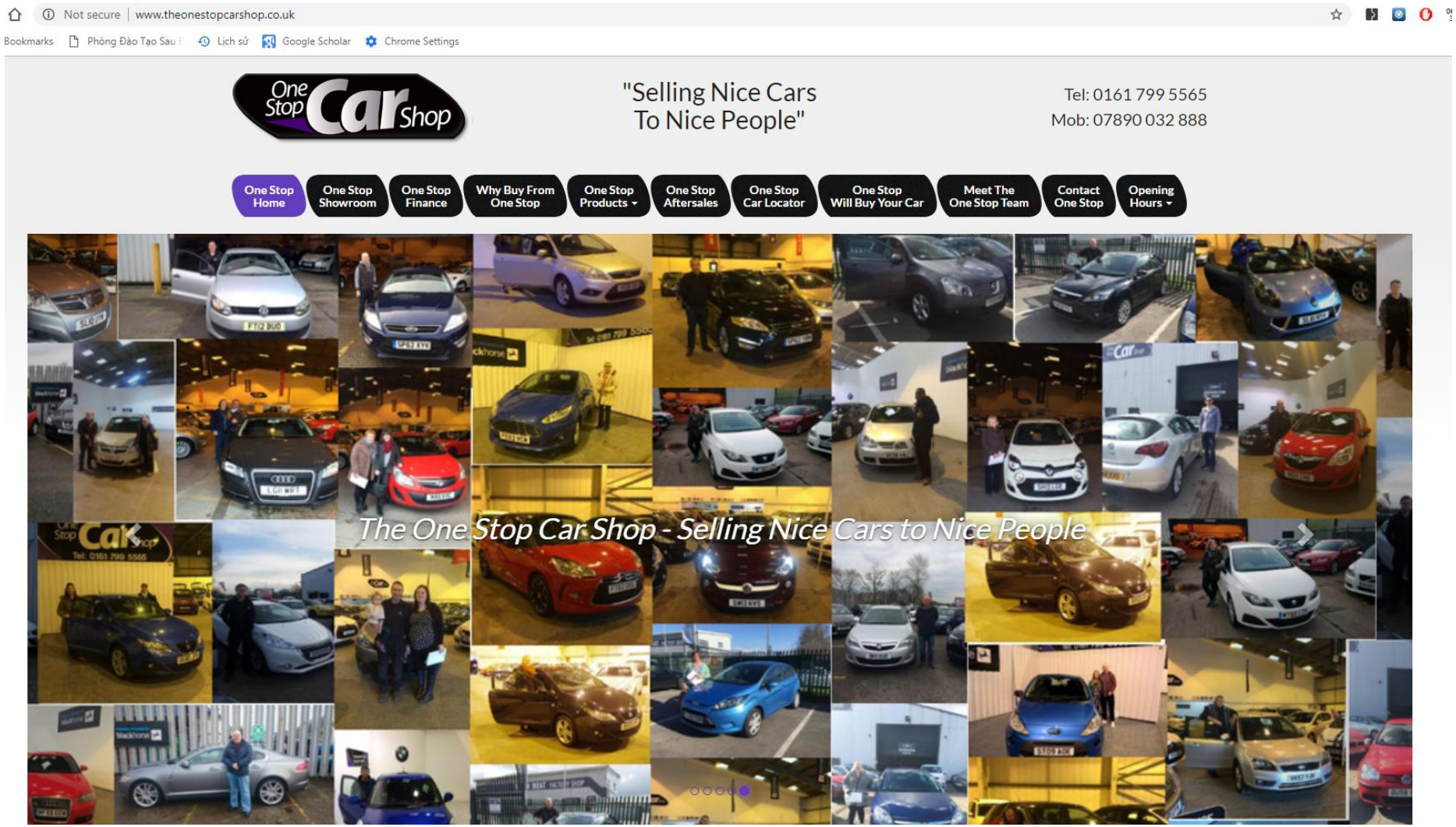

11.7 Construction: physical computing

- Build and code prototypes using electronics
- Toolkits available include
  - Arduino
  - LilyPad (for fabrics)
  - Senseboard
  - MaKey MaKey
- Designed for use by wide range of people

Physical computing kits

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

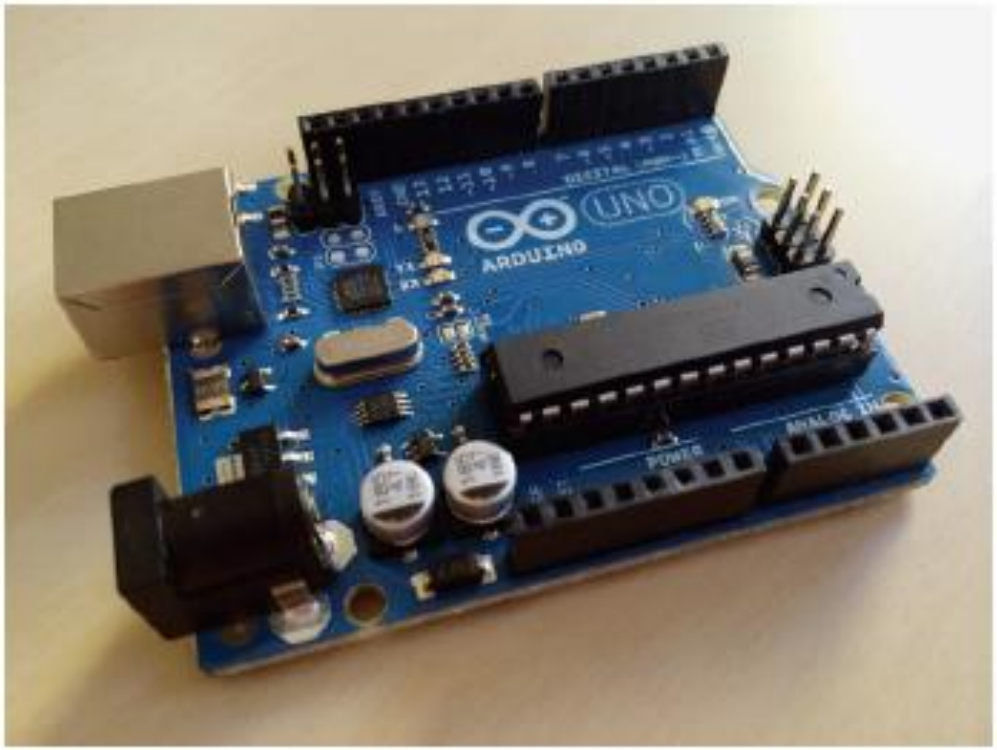

Figure 11.22 The Arduino board

Source: Courtesy of Nicolai Marquardt

Physical computing kits

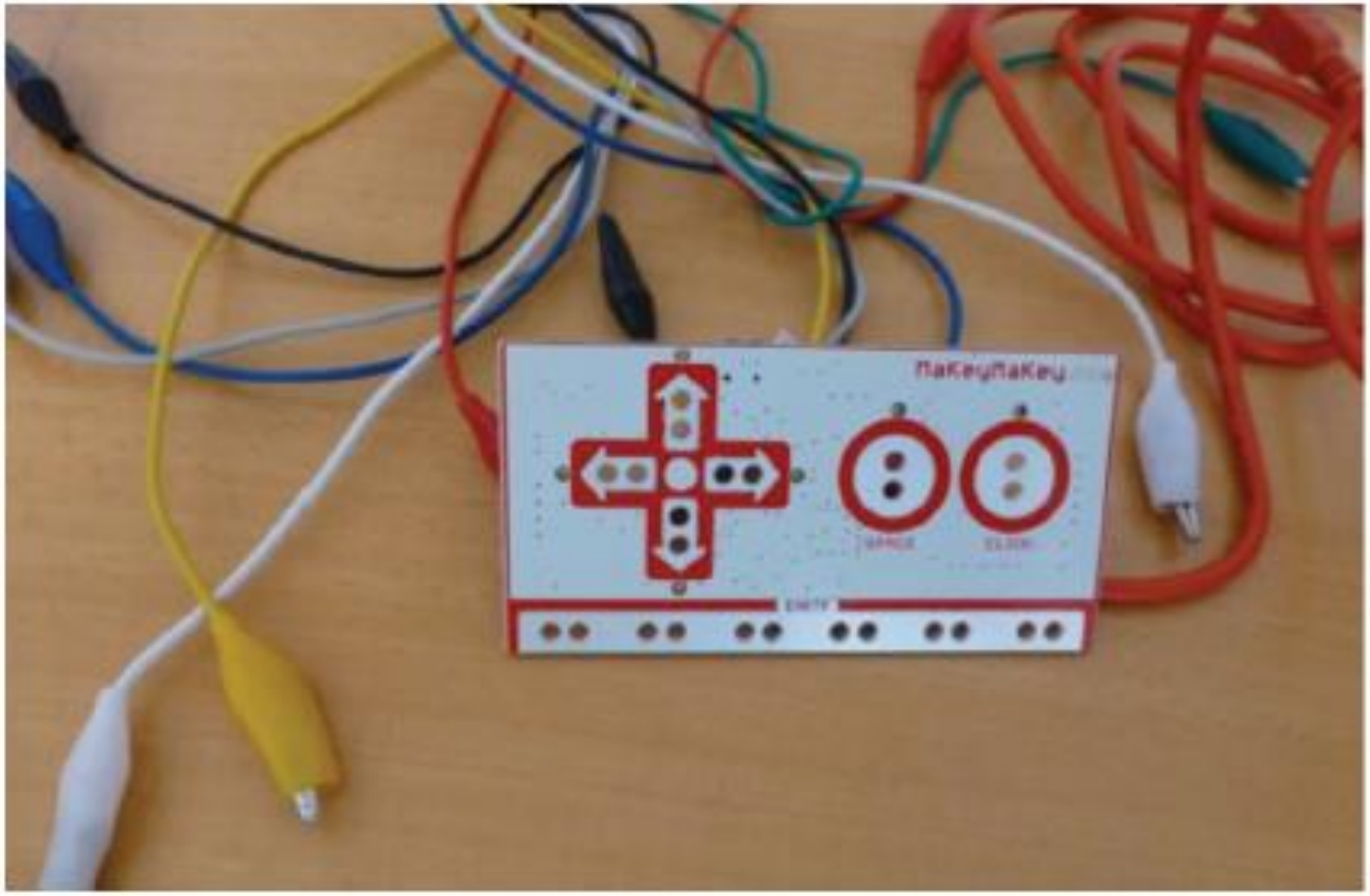

Figure 11.24 The MaKey MaKey toolkit

Physical computing kits

Figure 11.25 A group of retired friends playing with a MaKey MaKey toolkit

Construction: SDKs

- Software Development Kits
  - programming tools and components to develop for a specific platform, e.g. iOS
- Includes: IDE, documentation, drivers, sample code, application programming interfaces (APIs)
- Makes development much easier
- Microsoft's Kinect SDK has been used in research

Summary

- Different kinds of prototyping are used for different purposes and at different stages
- Prototypes answer questions
- The final product must be engineered appropriately
- Two aspects of design: conceptual and concrete
- To generate conceptual design, consider interface metaphors, interaction types and interface types
- Storyboards can be generated from scenarios
- Card-based prototypes can be generated from use cases
- Physical computing kits and SDKs facilitate transition from design to construction