Evaluation - Dates

Tests:
• T1: November 18, 15h
• T2: January 12, 14h

Mandatory lab classes:
• Prototype testing day: October 28 and 29, 2020
• Heuristic evaluation
• Project presentation

Testing Day
October 28/29

Sketching

The role of design

- Explicit design process
  - Preproduction in film making
  - Development of a new automobile
- Need to insert a design process at the front end of product development
  - The cost and time lost due to this additional stage will be significantly less than the cost and time lost due to the poor planning and overruns that will result if it is not included.
- Dangerous assumptions:
  - We know what we want at the start of a project
  - We know enough to start building it

The role of design

- Problem setting
  - What is the right thing to build?
- Problem solving
  - How do we build this?

- You must **get the right design** as well as **the design right**.

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Sketching

- Communicate ideas

- Aid of thought

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Sketching

Attributes of sketches:

- Quickly / Timely
- Inexpensive / Disposable
- Plentiful
- Clear vocabulary
- Minimal detail
- Appropriate degree of refinement
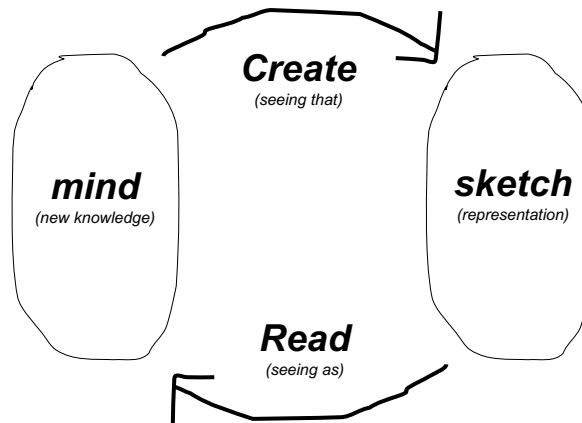- Suggests and explore rather than confirm
- Ambiguity

Sketching

- To get the most out of a sketch, we need to leave big enough holes

- Ambiguity creates the holes

- It enables a sketch to be interpreted in different ways, even by the person who created it.

Sketching

Create
(seeing that)

mind
(new knowledge)

sketch
(representation)

Read
(seeing as)

From Sketching user experiences, Buxton, 2007

Sketching

"…designers do not draw sketches to externally represent ideas that are already consolidated in their minds. Rather, they draw sketches to **try out ideas**, usually vague and uncertain ones. By examining the externalizations, designers can **spot problems they may not have anticipated**. More than that, they can see new features and relations among elements that they have drawn, ones not intended in the original sketch. These unintended discoveries **promote new ideas and refine current ones**. This process is iterative as design progresses."

Suwa and Tversky, 2002

Sketching

"The best way to a good idea is to have lots of ideas"

Linus Pauling

- Exercising the imagination and understanding (mental and experiential)

- Chose appropriate materials

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Sketches and prototypes

Ceramic class

Group 1 – Quantity
> *How many pots of which level of quality?*

Group 2 – Quality
> *One pot… one perfect pot (?)*

Who produced the highest quality work?

From Bayles and Orland, 2001

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Sketching

IF	Sketching is Fundamental to Design
AND	We are Designing Interactive Systems
THEN	How do you sketch interaction?
	What are the fundamental skills?
	What is the fundamental process?

Sketching in interaction design can be though of analogous to traditional sketching. Sketches need to be able to capture the essence of design concepts around transitions, dynamics, feel, ...
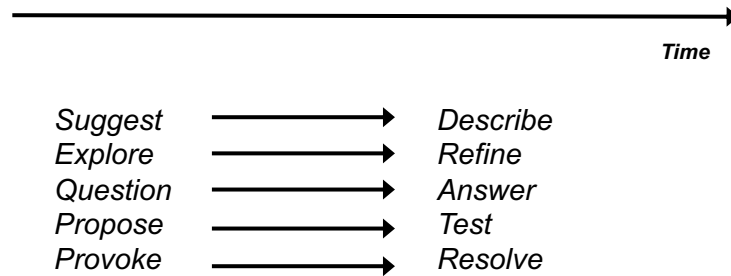
13

Sketching

Sketching in Interaction Design

- Analogous to traditional sketching
- Shares all of the same key attributes
- More feel than look
- Must accommodate time & dynamics

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Sketches and prototypes

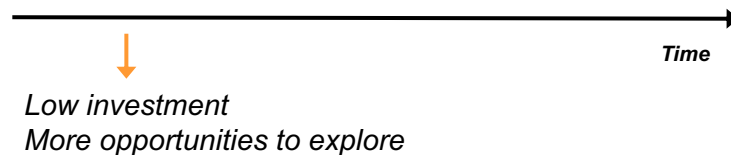***Sketching***   ***Prototyping***

→ *Time*

Suggest →	*Describe*
Explore →	*Refine*
Question →	*Answer*
Propose →	*Test*
Provoke →	*Resolve*

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Sketches and prototypes

Sketching   ***Prototyping***

→ *Time*

Low investment
More opportunities to explore

Fail early … and learn

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Sketches and prototypes

- Objective:
  - design products that people want, need, like and can use.

- Mean
  - earlier iterative user involvement
    - → user input should begin early enough to influence the design

Sketches and prototypes

Controlled convergence
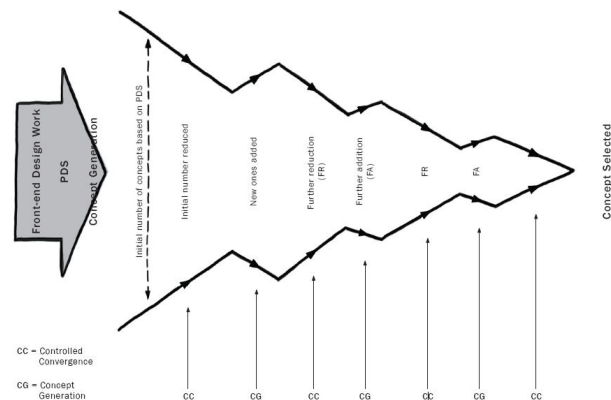
Pugh, 1990

Prototyping

Prototyping

- The requirements of an interactive system can not be completely specified on the first SLC activity.
- To be sure about some potential design functionalities, you have to build and test them with real users.
- The design can then be modified in order to correct some false assumptions revealed during the tests.
- Iterative design:
  - "a purposeful design process which tries to overcome the inherent problems of incomplete requirements specification by cycling through several designs, incrementally improving upon the final product with each pass."

  Human-Computer Interaction, Alan Dix et al., 1998

Prototyping

- Why?
  - Faster development, earlier feedback
  - Cheap
  - Makes parallel design easier
  - Easy to modify and throw away
  - The activity of building prototypes encourages reflection in design
  - User-centered design
    - "Experience shows that it is not possible to involve the users in the design process by showing them abstract specification documents, since they do not understand them nearly as well as concrete prototypes". From Jakob Nielsen, Usability Engineering, 1993
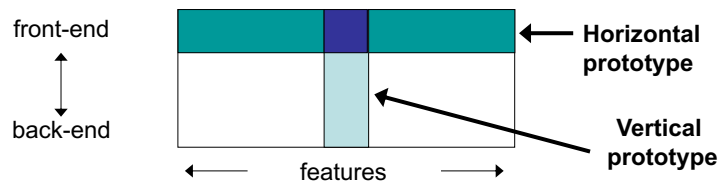
Prototyping

- Fidelity
  - Low: omits details, uses cheap materials.
  - High: more like the final product.
  <u>Dimensions</u>
  - Breadth: Number of features in the prototype
    - Only enough features for certain tasks
  - Depth: Implementation degree of each feature
    - conditioned responses, no error handling
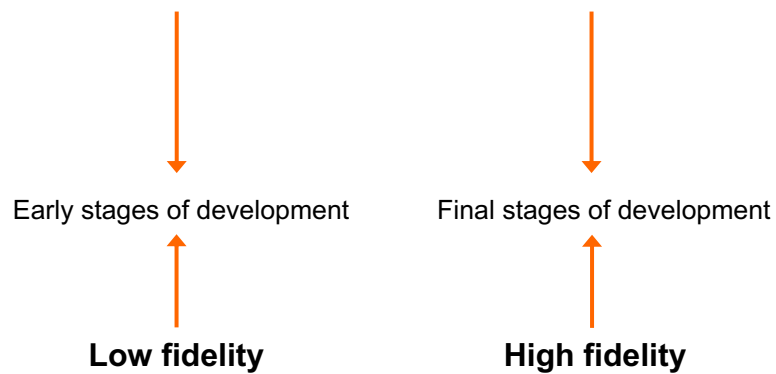
Prototyping

- Fidelity

  <u>Dimensions</u>
  - "Look": Appearance, graphic design

  - "Feel": Sensation, physical method of interaction
    - Point and write ≠ mouse and keyboard

Prototyping

- <u>Non-computational</u> vs <u>computational</u>

Early stages of development   Final stages of development

Low fidelity   **High fidelity**

Prototyping

- Prototypes can be produced faster by:
  - placing less emphasis on the efficiency of the implementation
  - accepting less reliable or poor quality code
  - using simplified algorithms
  - wizard of Oz approach
  - using low-fidelity media
  - using fake data and other content
  - using paper mock-ups instead of a running computer system

Prototyping

- 3 approaches to prototyping:

  - "Throw-away"
  - Incremental
  - Evolutionary

Prototyping

- "Throw-away":
  - The prototype is built and tested. The knowledge gained by this exercise is used to develop the final product, but the prototype is thrown away.
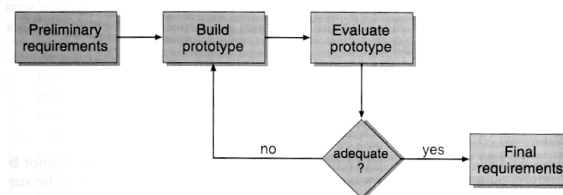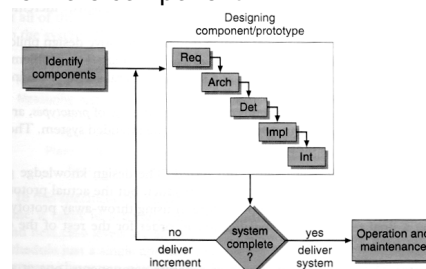

Prototyping

- Incremental
  - The final product is built as separate components, one at a time. There is one overall design for the final product, it is partitioned into independent and smaller components. The final product is then released as a series of products, each subsequent release including one more component.
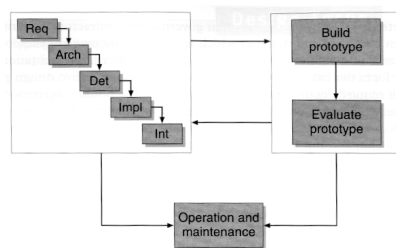
Prototyping

- Evolutionary
  - The prototype is not discarded and serves as the basis for the next design iteration. The system is seen as evolving from a very limited initial version to its final release.

Papel prototyping

- Interactive paper mock-up
  - Sketches of screens appearance
  - Paper pieces showing interface elements, such as windows, menus, dialog boxes
  - Allows for the expression of the first design ideas.

- Natural interaction
  - Point with a finger → mouse click
  - Write → typing

- The designer simulates the computer's behaviour
  - Rearranging the interface elements
  - Writing answers
  - Describing effects that are difficult to demonstrate on paper

- Low fidelity in look and feel
- High fidelity in the number of features and implementation degree (depth – person simulates the computer).

Papel prototyping

- Why?
  - Faster to build (Sketch vs. program)
  - Easy to change
    - During user tests or between user tests
    - No code investment, can be thrown away
  - Focuses on the global design
    - Designer don't waste time on details
    - User makes more creative comments and suggestions (less reluctant in asking for changes)
  - Allow parallel design
  - Everyone can make a contribution

Papel prototyping

- Tools

  - Poster paper
  - Paper (A4)
  - Post-it
  - White correction tape
  - Overhead transparencies
  - Pens, pencils, scissors, tape
 - Photocopier

Papel prototyping

- Building
  - Bigger than real size
  - Markers are better than pencil
  - Monochrome
  - Large fonts sizes and dark lettering
  - Replace visual effects by audible explanations
    - Tooltips, animations, progress bar: 20%, 50%, 100%).
  - Keep pieces organized
    - Folders and envelops
  - ... Rehearsal

Papel prototyping

- Building

  - Hand-sketching or computer drawn (or an hybrid approach)?

Papel prototyping
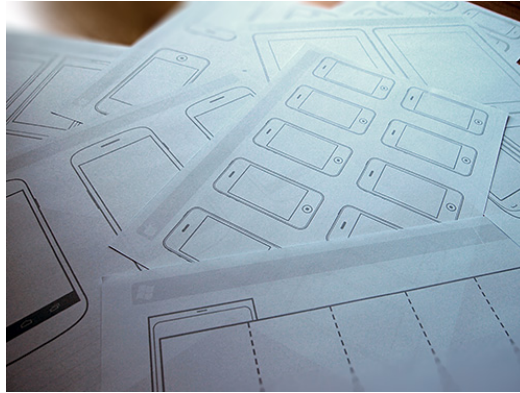
Papel prototyping

- Test
  - Roles for design team:
    - Computer
      - Simulates the prototype
      - Doesn't give any feedback that the computer wouldn't
    - Facilitator
      - Presents the interface and the tasks to the user
      - Encourages the user to think aloud by asking questions
      - Leads the test
    - Observer
      - Makes no comments
      - Observes and takes notes

Papel prototyping

- Organizing the results

  – Sort comments and suggestions by priorities

  – Create a written report with the results

  – Change and iterate

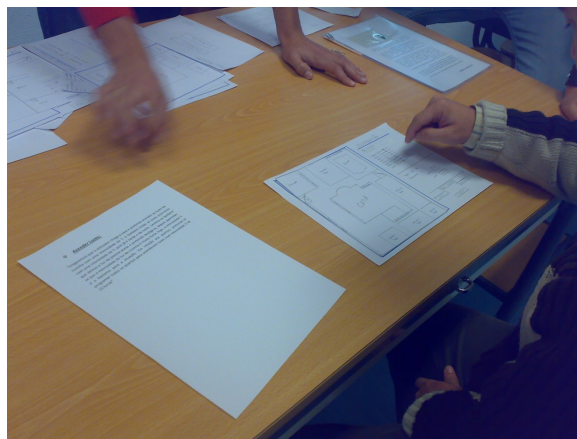# Papel prototyping

- Results
  – Conceptual model
    - Do users understand it?
  – Functionality
    - Does it do what is needed? Missing features?
  – Navigation and task flow
    - Can users find their way around?
    - Are information pre-conditions met?
  – Terminology
    - Do users understand labels?
  – Screen contents
    - What needs to go on screen?

Papel prototyping

- Limitations
  - Look: colour, font, ...
  - Feel: Fitt's law issues
  - Response time
  - Dynamic feedback: animations, progress bar, mouse-over events,...
  - Context of use
  - Slight changes (subtle feedback)
    - Even the more subtle change in a paper prototype is noticed by the users.
  - Users tend to think much more before acting when interacting with a paper prototype.

Papel prototyping

Papel prototyping

Papel prototyping

Hanmail paper prototype
http://www.youtube.com/watch?v=GrV2SZuRPv0

Trouble paper prototype
http://www.youtube.com/watch?v=dTR7gbsF7Os

Paper protype usability test
http://www.youtube.com/watch?v=ppnRQD06ggY

UX Design TimeOut and Primark
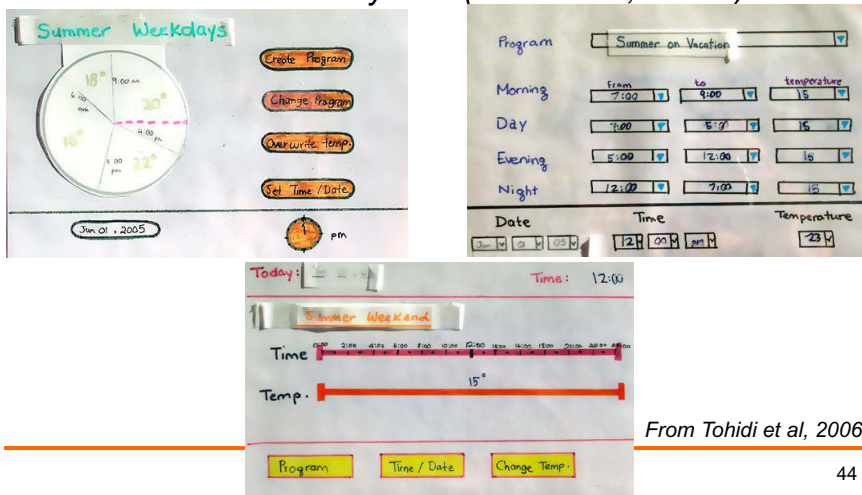**https://www.youtube.com/watch?v=3oBebzxbnGk**

Papel prototyping

Hallway
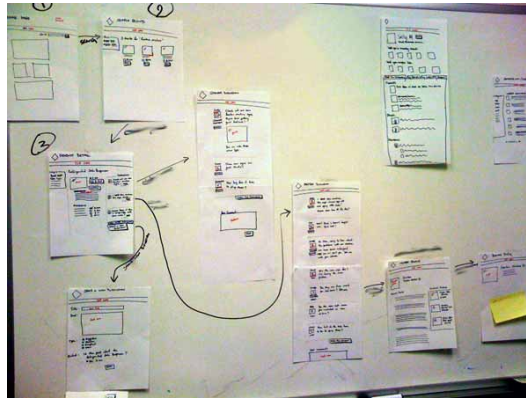
Paper interfaces

- *Home climate control system (Tohidi et al, 2006a)*

From Tohidi et al, 2006a

Paper interfaces

- *Distinct design language…*

- *… but same level of resolution and same functionality*

- *A group of users performed the same set of tasks on all interfaces (distinct order)*
- *Other groups saw only one interface*
- *They all performed the same set of tasks and answer the same questionnaire*

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Paper interfaces

- *Comparing the ratings given to the lowest rated interface of the three, as judges by users who had seen all three, that rating was significantly lower than the rating given to that same interface by users who saw only that interface.*

- *Paper interfaces allows parallel testing of alternatives. they make it affordable to make and compare alternative design solutions through the design process.*

- ***We should not commit to a design too soon***

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Paper interfaces

- *People are reluctant to be critical of designs*

- *It is easier to rate several designs (comparing) than to rate one single design solution.*

- *Constructive solutions… (Tohidi et al., 2006b)*

  - *ask users to make a simple sketch of their ideal home climate interface*
  - *users have original ideas about alternative designs*
  - *…let them communicate them in the appropriate language.*

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Dynamic paper interfaces
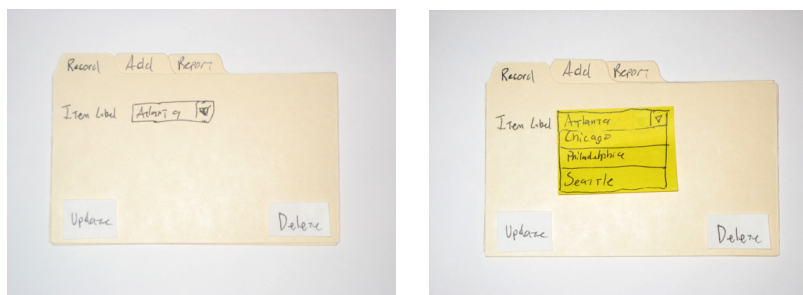
48

Dynamic paper interfaces

- *Quickly explore a concept and show it to colleagues*
    - *designer is both the user and the facilitator*
    - *changes on-the-fly, based on comments* *Sketching*
- *Informal testing*
    - *designer as facilitator and a representative user*
    - *changes on-the-fly, based on comments* *Sketching*
- *Usability testing*
    - *more to uncover errors and determine usability than to come up with new design concepts*
    - *several users*
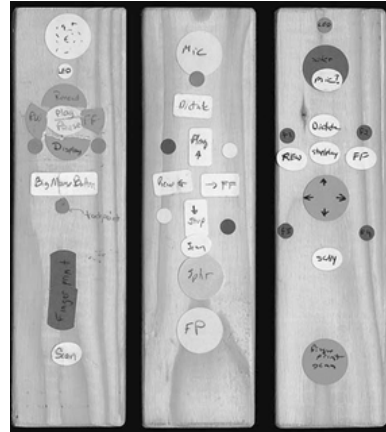   - *interface can't be changed during test* *Prototyping*

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Paper interfaces

- *Sketches are not prototypes (remember sketches attributes)*

- *Sketching ≠ using inexpensive prototypes to do usability engineering.*

- *Sketching is what you use, how, when, where and why you use it.*

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Physical mock-ups

3 versions of a remote control

Mixing styles

The limiting factor is your imagination…

There is always a way to express an idea appropriately within your means.

Phone graffiti

Hybrid photo-graphic composition

*The main drawbacks of conventional sketching has to do with its limitations in **capturing time and dynamics**– temporal experience related issues.*

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Interaction dynamics

Make three sketches that capture the literal representation of:

1. *the physical nature of your mobile phone*   Easy

2. *the behaviour of the user interface of your mobile phone*   Difficult

3. *the experience of using your mobile phone*   Almost impossible

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Interaction dynamics

- *We need to use more than one image to tell the story*

  - *Storyboard and comics (image sequence)*

  - *State transition diagram (global view)*

  - *"PowerPoint" slide show*

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Interaction dynamics

- *Storyboard – time is distributed in space and you can see all screens simultaneously.*

- *Slide show – screens are seen sequentially*

Interaction dynamics

Transitions

- *use of arrows to describe the motion*

- *Why not just use video or animation?*
  - *dynamic is much better captured, but….*
  - *comics/storyboard approaches are faster, cheaper and enable to explore more alternatives in a given amount of time.*

Interaction dynamics

- *picture-driven-animation (Baecker, 1969)*

  - *use hand-draw line to define both objects and motion paths along which those objects move.*

  - *using this technique in PowerPoint to animate a sketch of Fitzmaurice Chameleon technique to view a map.*
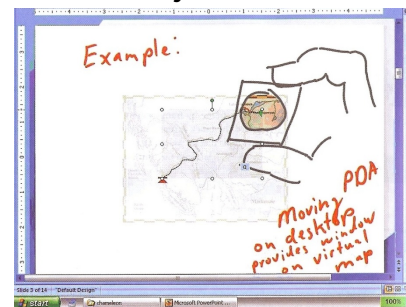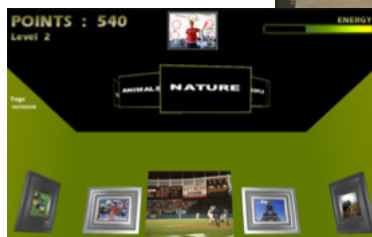

From Buxton, 2007

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Prototyping Interaction Dynamics

Tag Around
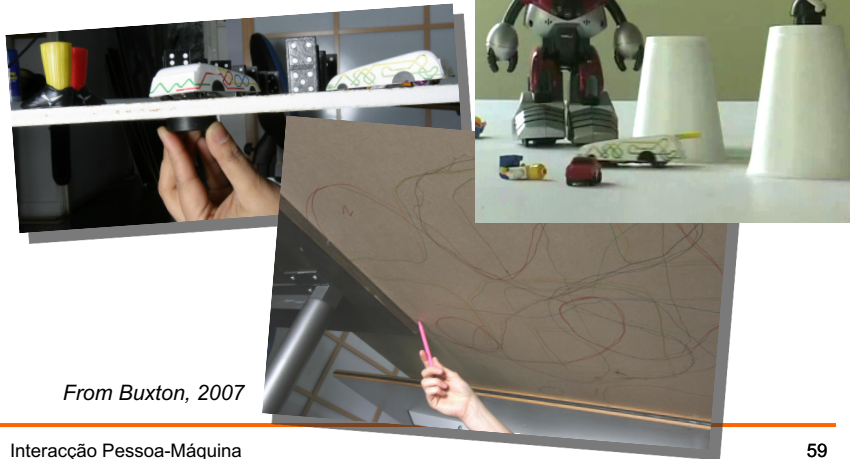*(Duarte Gonçalves, Margarida Piriquito, Nuno Valente)*

Interacção Pessoa-Máquina

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Prototyping Interaction Dynamics
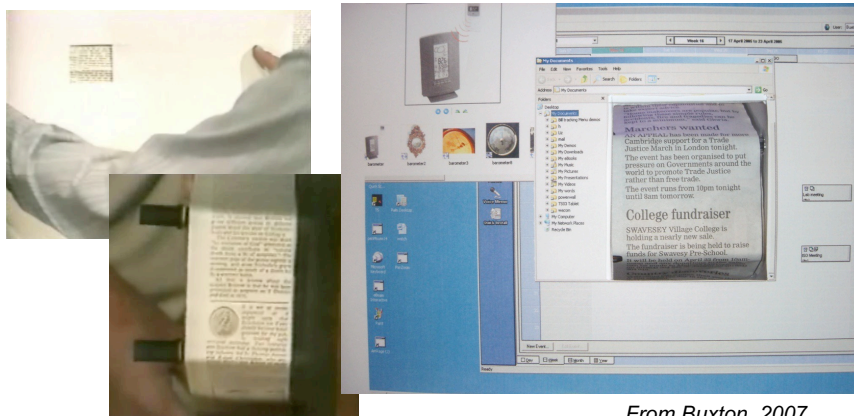
Sketch-A-Move (2004)

From Buxton, 2007

Interacção Pessoa-Máquina

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Prototyping Interaction Dynamics

Bifocal Display *(Apperley and Spence, 1982)*
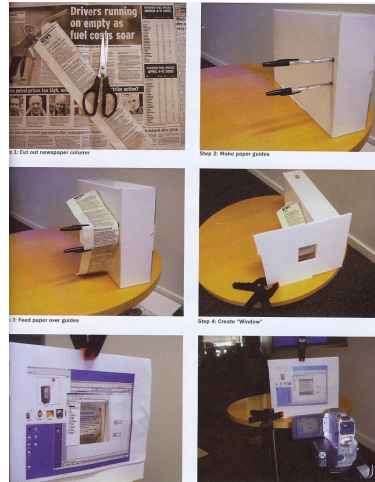

From Buxton, 2007

Interacção Pessoa-Máquina

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Prototyping Interaction Dynamics

Bifocal Display
(Apperley and Spence, 1982)

http://www.youtube.com/watch?v=qlzlA17ZN5o

From Buxton, 2007

Interaction dynamics

## Bifocal Display *(Apperley and Spence, 1982)*

This way you can explore different aspects of the concept by manipulating:

- *% flat display vs % receding display*
- *the impact on different media (text, images,…)*
- *Horizontal scroll vs vertical scrolling*
- *Receding angle*

Design is choice

- *The purpose of design is to establish the trajectory*
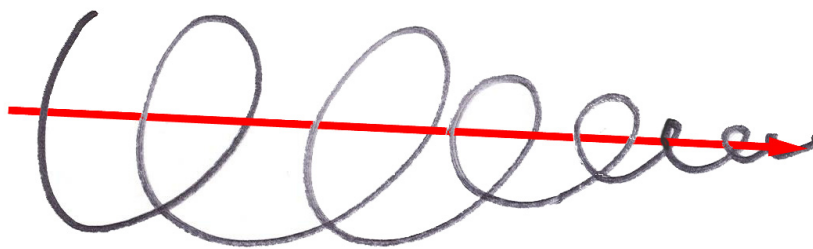- *Precedes usability engineering and is complement to it*
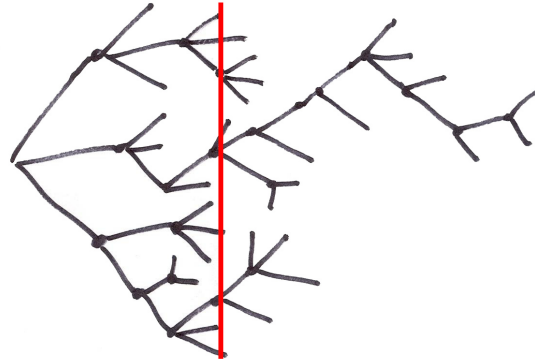
From Buxton, 2007

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Usability engineering

- *The trajectory is already established (by the basic design already done)*
- *Iterative process that converges on a complete product (iterations allow testing and refinement of implementation)*

From Buxton, 2007

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Design / Usability

- *The role of **design** is to **get the right design***

- *The role of **usability engineering** is to **get the design right***

Computational prototypes

- Interactive simulation of software

- High-fidelity look and feel

- Horizontal (low-fidelity in depth)

Computational prototypes

- Results
  - The same as from the paper prototypes + :
    - Screen layout
      - Is it clear, overwhelming, complicated?
      - Interface components are easy to find and distinguish?
    - Colours, fonts, icons, ...
      - Well chosen?
    - Interactive feedback
      - Do users notice the status bar messages, cursor changes or other interface feedback?
    - Fitt's law
      - Control size, distance between controls,...

Computational Prototyping

- Prototyping techniques
  - Storyboards tools
    - Sequence of screen, possibly connected by hyperlinks
  - Form builders
    - tool for drawing real, working interfaces by dragging widgets from a palette and positioning them on a window.
  - Wizard of OZ
    - Human operator simulates and controls the system in the backstage.

Computational Prototyping

- Prototyping techniques
  - Storyboards tools
    - PowerPoint
    - Mockingbird
    - Balsamic
    - POP (Prototyping On Paper)

    - Scripting languages (transitions)
    - For high fidelity look, take screenshots

Computational Prototyping

- Prototyping techniques
  - Storyboards
    - Advantages
      - You can draw anything, be creative

    - Disadvantages
      - No text entry
      - Widgets aren't functional
      - "hunt for the hotspot"

Computational Prototyping

- Prototyping techniques
  - Form builders
    - tool for drawing real, working interfaces by dragging widgets from a palette and positioning them on a window.

    - HTML
    - Java GUI builders
    - Visual Basic
    - Mac Interface Builder
    - Qt Designer
   - …

Computational Prototyping

- Prototyping techniques
  - Form builders
    - Advantages
      - Working widgets, not just static pictures
      - Implementation languages allow backend development

    - Disadvantages
      - Limits creativity (fixed palette of standard widgets)
      - Not so useful for prototyping rich graphical interfaces.

Wizard of OZ

- Human operator simulates and controls the system in the backstage.

- "Wizard of OZ" = "man behind the curtain"
  - The wizard is hidden

- Create systems that let users have a real and valid experience before the system exists.

- The person using it is unaware that the system functions are performed by a human operator hidden "behind the curtains".

Wizard of OZ

- Often used to test new or future technologies
  - Gould, Conti and Hovanyecz, Composing letters with a simulated listening typewriter, CACM v.26, n. 4, Abril, 1983.
  - Suede - A Wizard of Oz Prototyping Tool for Speech User Interfaces
  - OMS

- 2 interfaces (user and wizard)
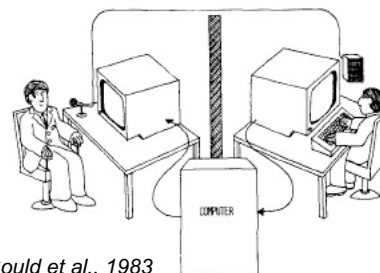
From Gould et al., 1983

Prototyping tools

- Justinmind - http://www.justinmind.com/

- Mockingbird - http://gomockingbird.com/mockingbird

- POP – Prototyping On Paper -
https://marvelapp.com/pop/

- Denim - http://dub.washington.edu:2007/denim/

- Balsamiq - http://balsamiq.com/products/mockups

Recommended reading

- Marc Rettig, Prototyping for Tiny Fingers.
Communications of ACM, v.37 n.4, 1994.
http://portal.acm.org/citation.cfm?doid=175276.175288

Further reading
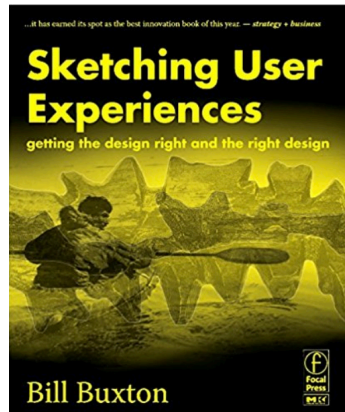
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- *Gonçalves, D., Jesus, R., Grangeiro, F., Romão, T. and Correia N., Tag Around: A 3D Gesture Game for Image Annotation, in Proceedings of ACM ACE 2008, Tokyo, Japan, 3-5- December, 2008, pp. 259-262.*
- Gould, Conti and Hovanyecz, Composing letters with a simulated listening typewriter, CACM v.26, n. 4, Abril, 1983.
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- Tohidi, M., Buxton, W., Baecker, R. and Sellen, A., Getting the right design and the design right: Testing many is better than one. Proceedings of ACM CHI, 2006, pp. 1243-1252.
- Tohidi, M., Buxton, w., Baecker, R. and Sellen, A., User sketches: a quick, inexpensive, and effective way to elicit more reflective user feedback. Proceedings of NordiCHI, 2006, pp. 105-114.

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