HCI 2022

Prototyping

Human Computer Interaction

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Academic Year 2022/2023

Hall of Fame or Shame?

User Needs Edition

Beware: we are missing the general context here!

- Users need a faster horse
- Users need to have financial help
- Users needs a way to move faster from one place to another
- Users need to have more tools
- Users need to practice more with the appropriate tools
- Users need to be able to run faster

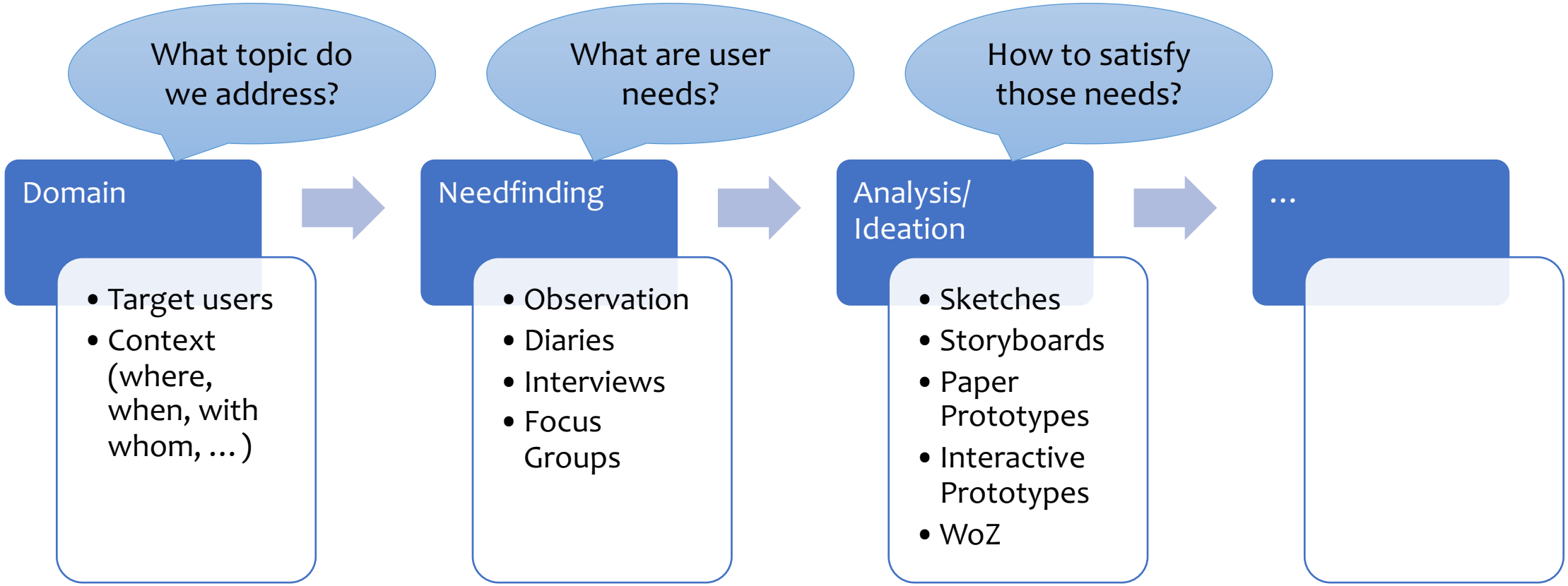
From Assignment 1:

"Needs are human emotional or physical necessities. […]

Needs are verbs (activities and desires with which your user could use help), not nouns (solutions). […]

It can be helpful to use the phrases 'needs a way to' or 'needs to be able to' in your list of user needs."

Process Recap



The Goal

- **Envisionment**: making ideas visible
  - Generating new ideas
  - Evaluating new ideas (within the design group)
  - Testing new ideas (with users)
- Different tools and techniques, according to
  - The stage of design (early, …, advanced, final)
  - The intended audience (designers, test users, clients, management, …)
- **Error to avoid**: focusing on the user interface before focusing on the task that the user has to accomplish

The Method

- Techniques to **explore** different design **alternatives**
- Explore
  - Flows of action
  - Devices and their roles
  - Interfaces
- Alternatives
  - More than one possible design
  - Impossible to get it right the first time
  - Find the best possible solution

Techniques

- Sketches
- Maps
- Low Fidelity (paper) prototypes
- Video Prototypes
- Medium Fidelity Prototypes
- High Fidelity Prototypes

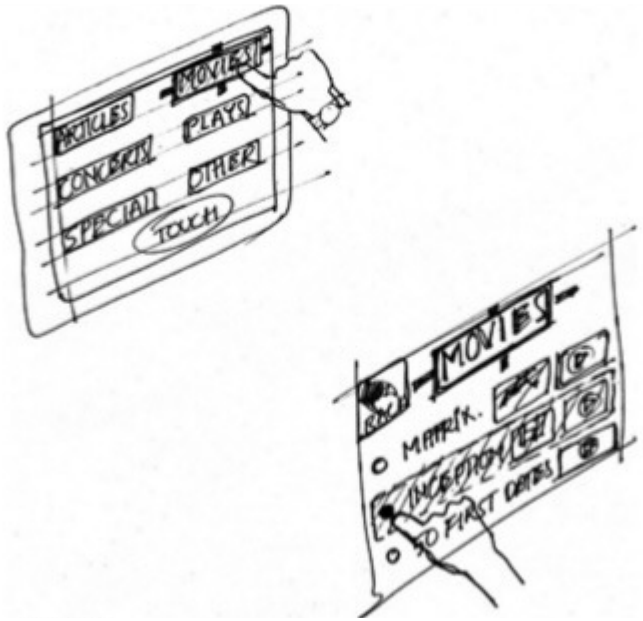
“If a picture is worth a thousand words, a prototype is worth a thousand meetings” — IDEO

Sketches and Snapshots

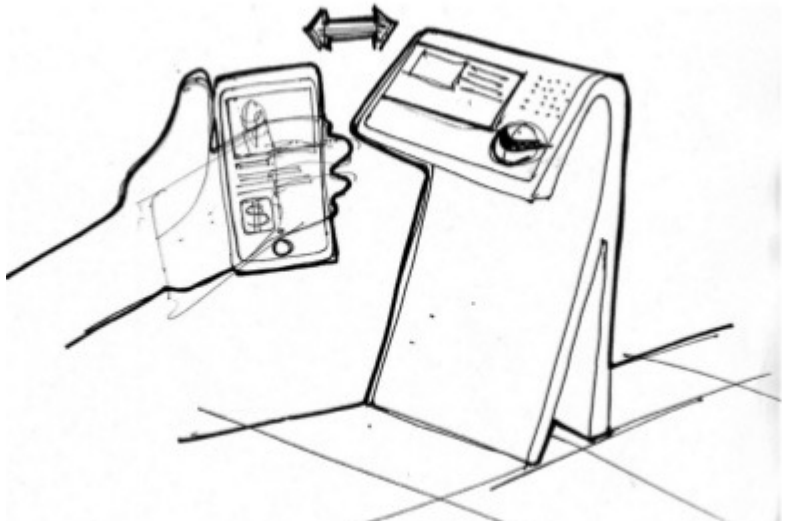
Quick drawings to convey a part of the interface, or a feeling about a device

Sketch

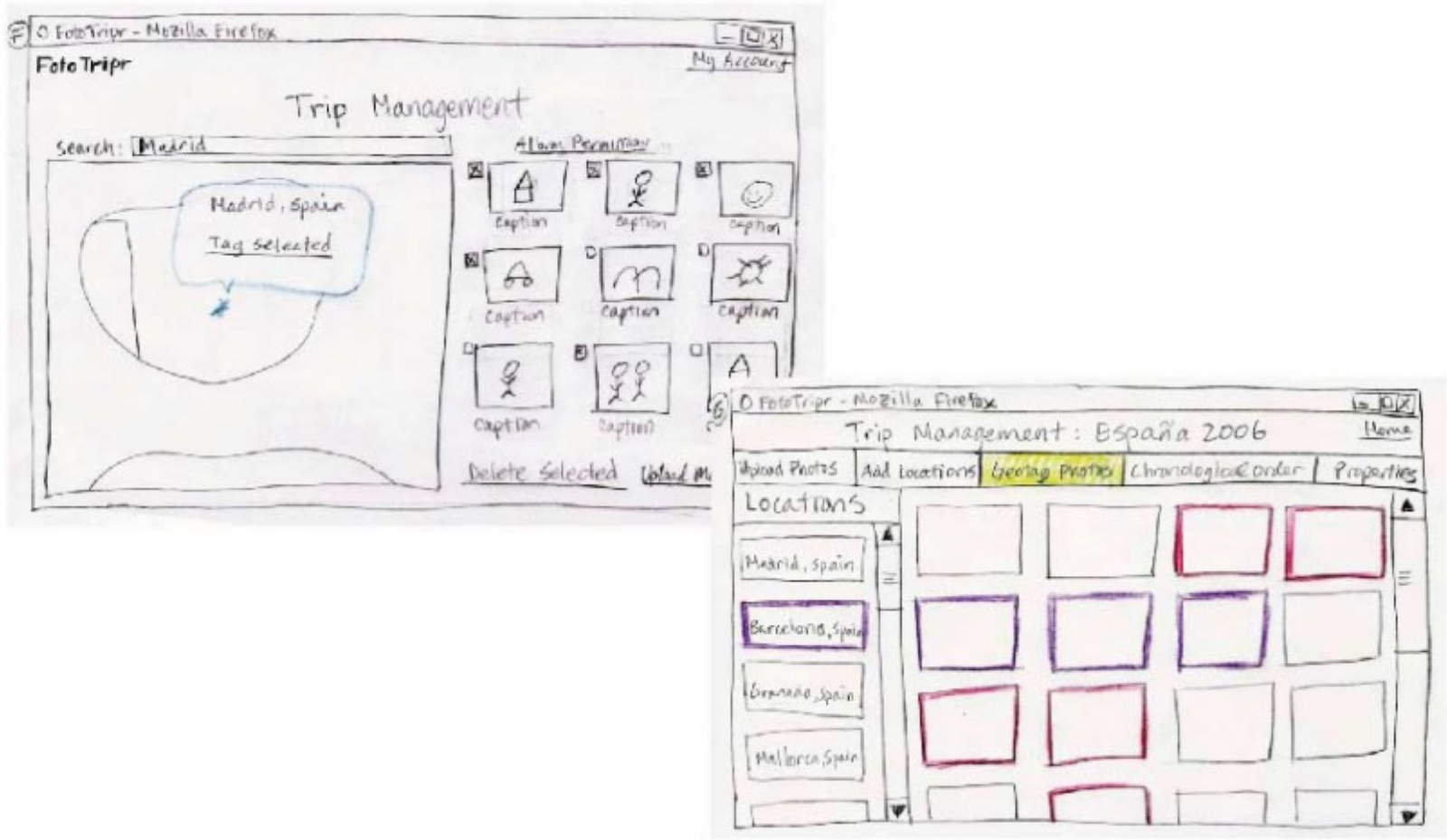
- An individual drawing showing
  - A single user interface screen
  - A drawing of an artifact part of the system
  - The shape of an interaction object



- Gives a static view of a possible interaction
- Helps setting the interaction context
- Often, part of a longer representation



Examples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FotoTripr
My Account
Trip Management
Search: Madrid
Madrid, Spain
Tag selected
Caption
Delete Selected
FotoTripr - Mozilla Firefox
Trip Management: España 2006
Home
Upload Photos
Add Locations
Geotag Photos
Chronological Order
Properties
Locations
Madrid, Spain
Barcelona, Spain
Mallorca Spain

Maps

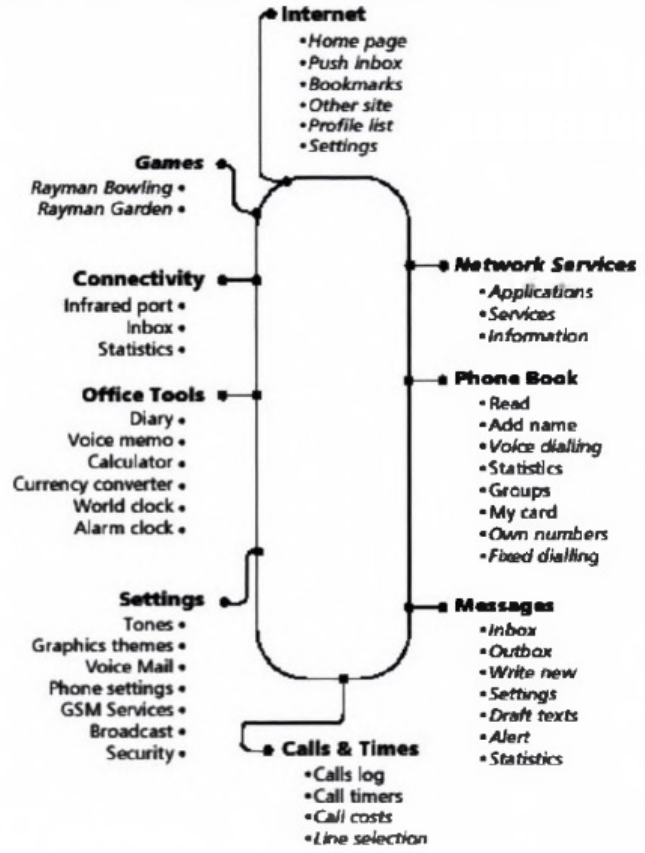
Visual overviews of navigation paths

Navigation Map

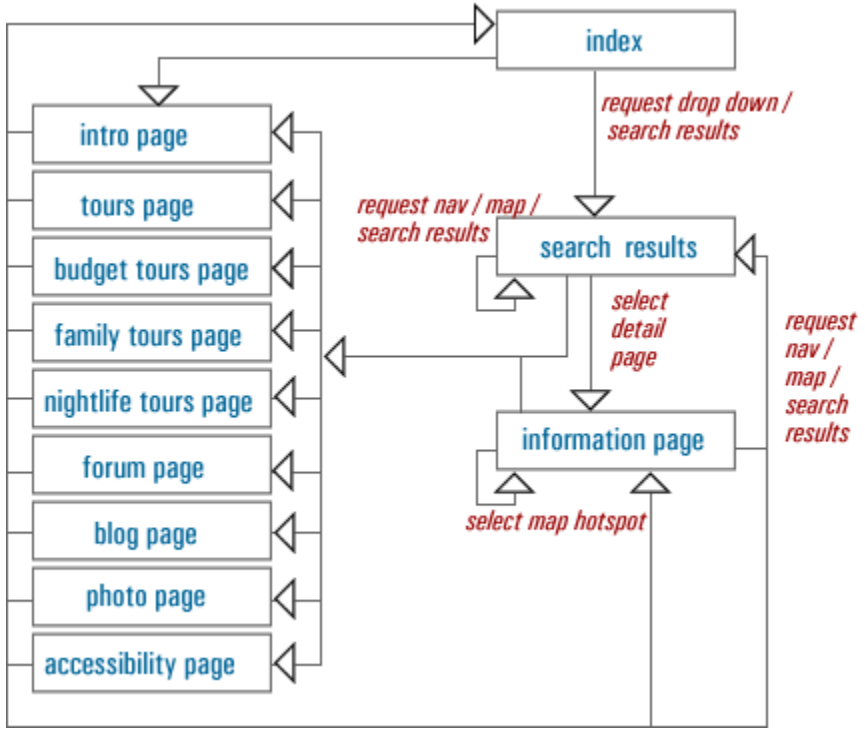
- A high-level view for the major structure of the interface
- Focus on how people move throughout the application
- Does not show the pages, only their organization and hierarchical relationship
- Related to the “information architecture” of the application

Map Examples

Old-style mobile phone menus



Website 'sitemap'

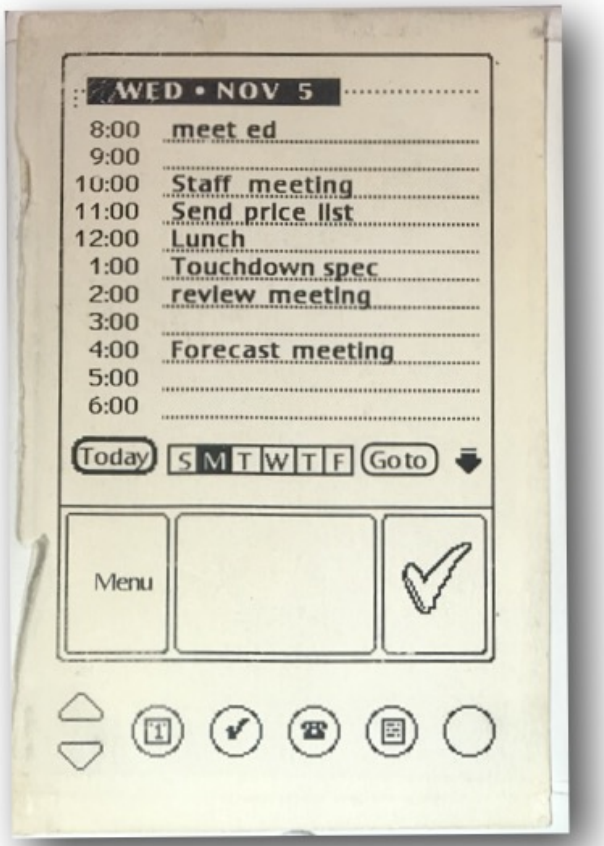


Prototypes

Tangible approximations, at various levels, of system behavior and appearance, to cheaply and quickly evaluate and explore design decisions

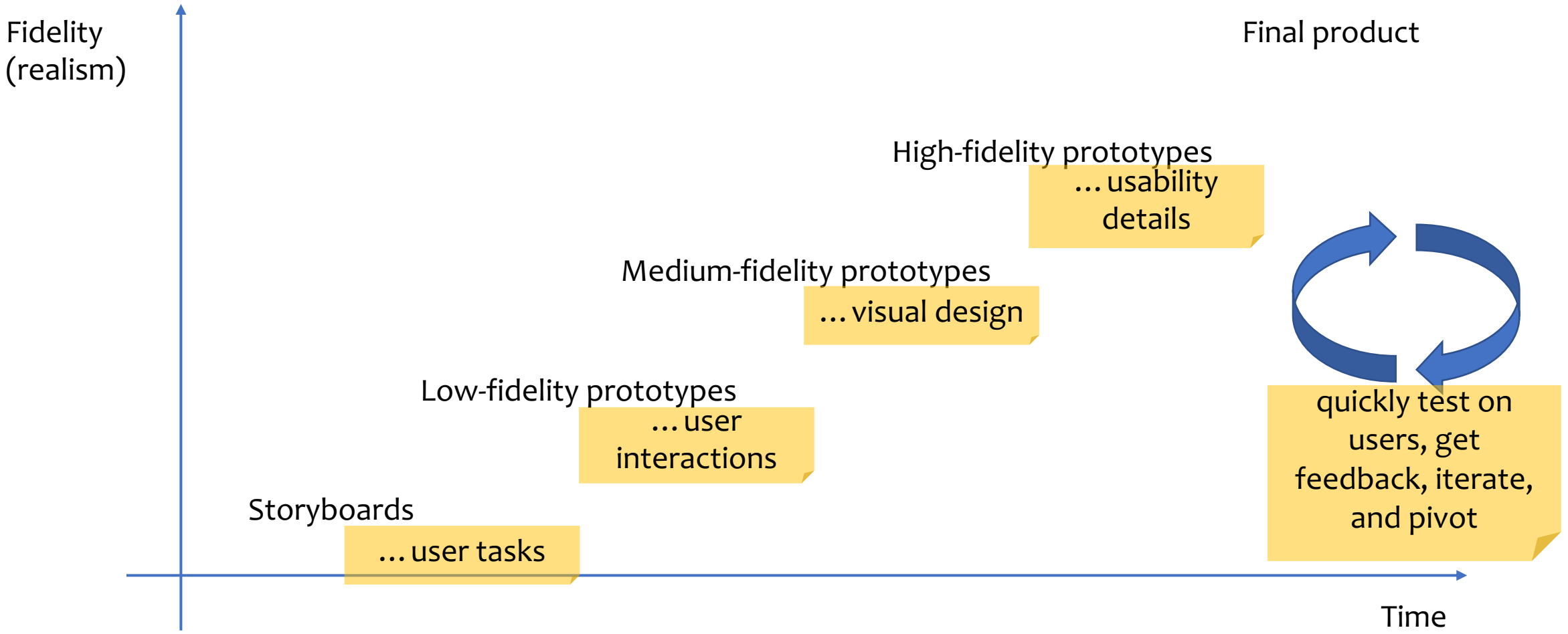
Prototypes

- «A prototype is a concrete but partial representation or implementation of a system design»
- «An easily modified and extensible model (representation, simulation or demonstration) of a planned software system, likely including its interface and input/output functionality»
- One of the most powerful tools for design exploration, visualization, and testing
- They let us ‘see’ and ‘feel’ interactivity (simulated or real)



source: https://albertosavoia.medium.com/the-palm-pilot-story-1a3424d2ffe4

Prototypes Facilitate Conversations About…

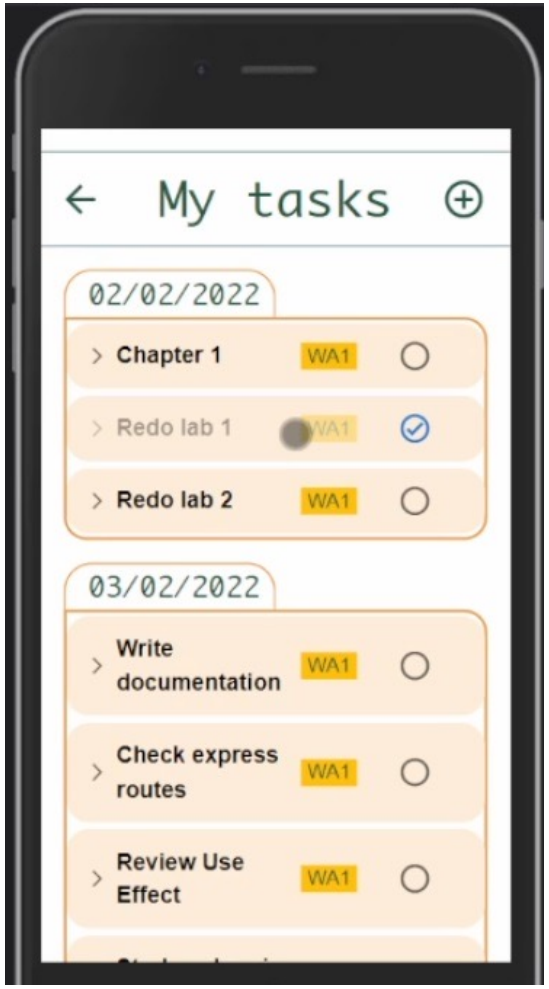


Low to High Fidelity Prototypes

Low-fi

- Lays out the *main* information, interactions, and design choices
- With many missing details

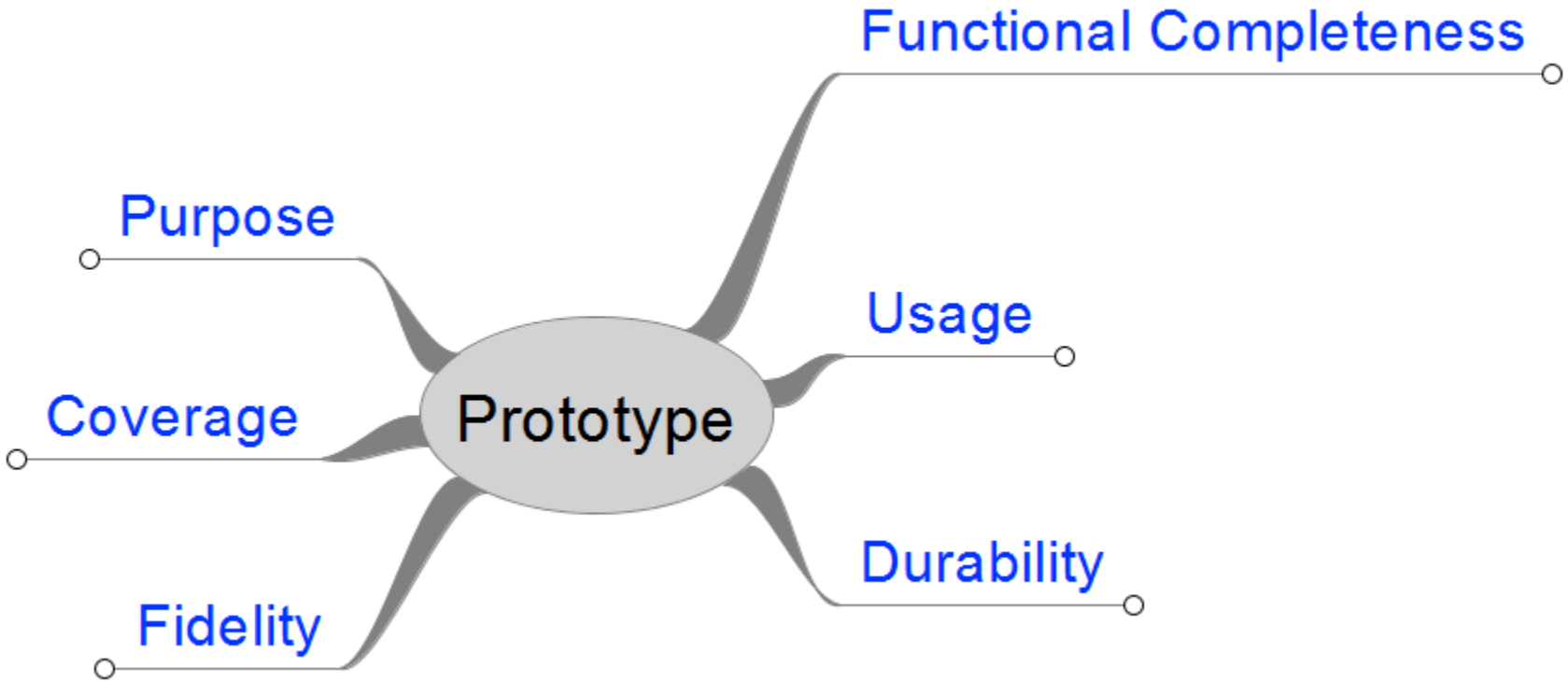
Low to High Fidelity Prototypes



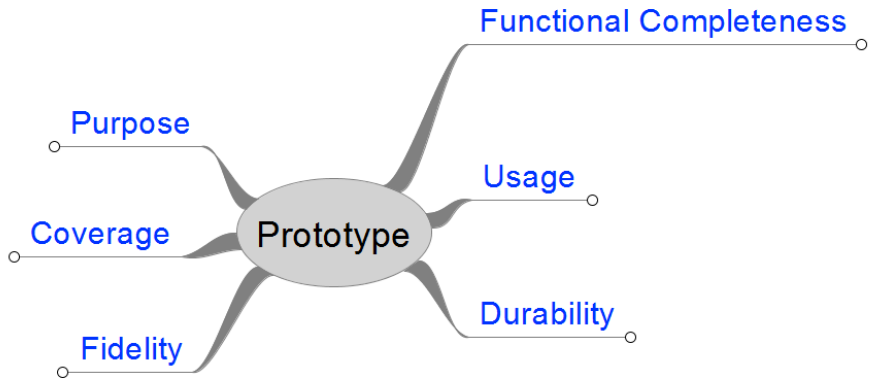
Hi-fi

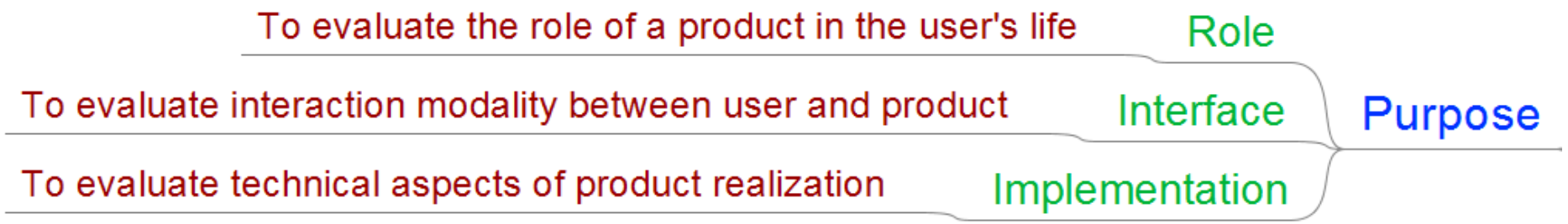
- It *looks like* the final product

Characteristics of Prototypes



Characteristics of Prototypes

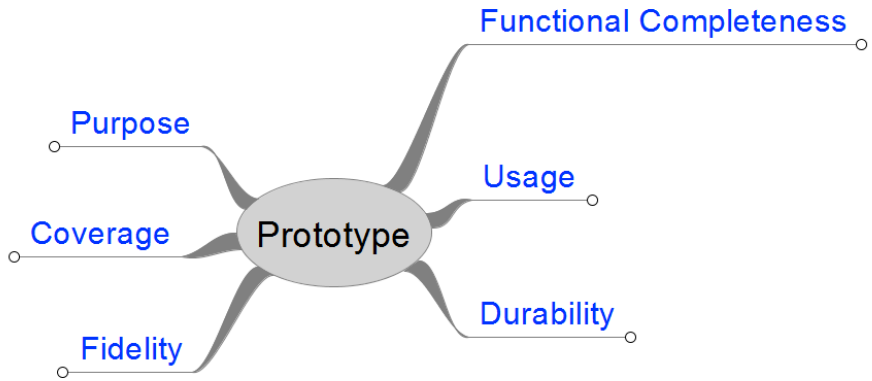


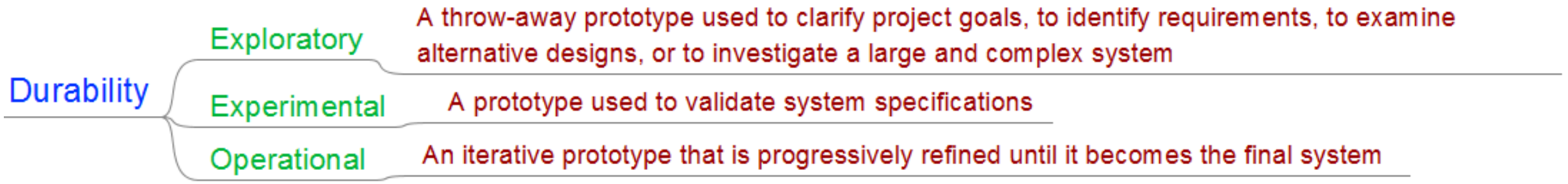


Possible Purposes For a Prototype

- Expert analysis
- Check with design rules and guidelines
- Involve users in a controlled experiment
- Involve users “in the wild”
- …

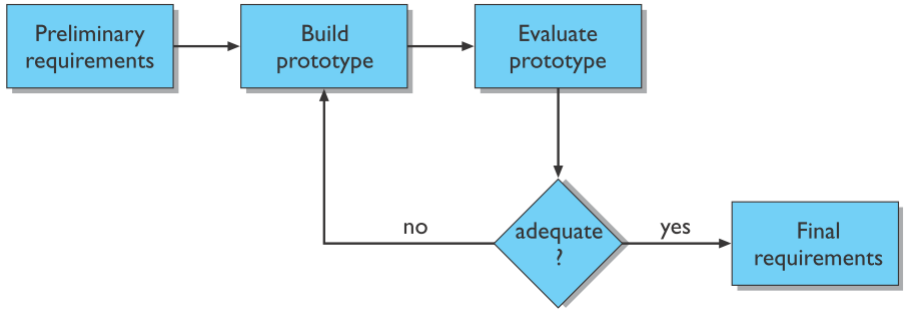
Characteristics of Prototypes



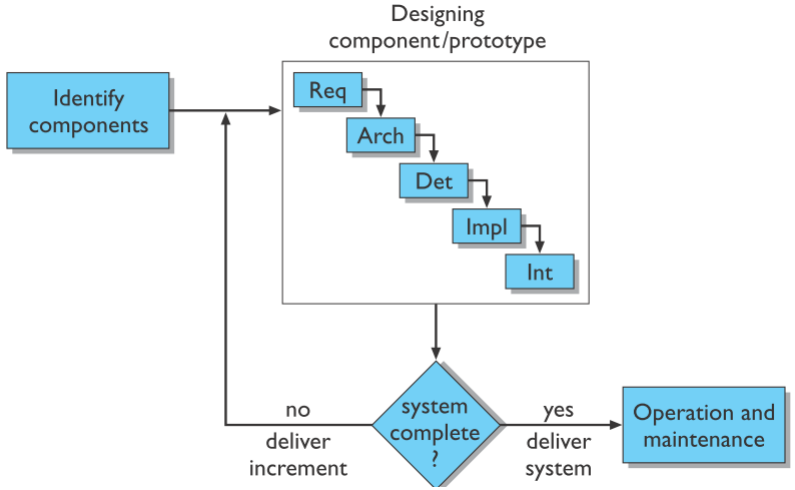


Durability (1)

- **Throw-away prototype:** used to assess some qualities of the system (gain knowledge), then discarded

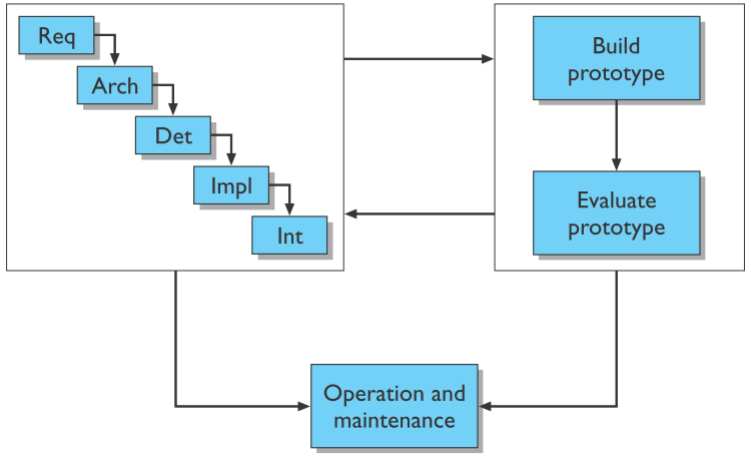


- **Incremental prototype:** the system is developed as incremental modules, each of them released in a separate step

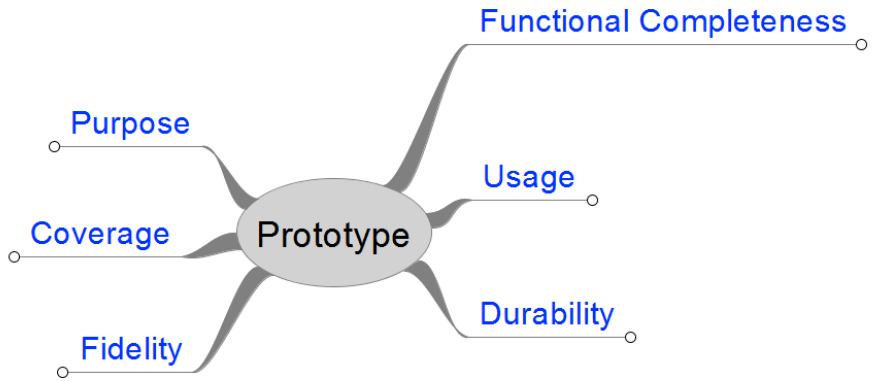


Durability (2)

- **Evolutionary prototype:** the prototype *becomes* the product; each product iteration builds upon the previous one



Characteristics of Prototypes



Coverage

Global

A prototype of the entire system

- an expanded horizontal prototype
- models a greater number of features
- covers multiple levels of the system's structure chart
- useful throughout the design process

Local

A prototype of a single usability-critical system component

- a vertical prototype that is focused on one feature
- useful at some specific stage of the design process

Functional Completeness

Horizontal

A prototype that models many features but with little detail

- a horizontal slice of a system's structure chart from thetop down to a specific depth
- most useful in the early stages of design
- purpose is to test the overall interaction metaphor, so includes common functions that the user is expected to perform frequently

Vertical

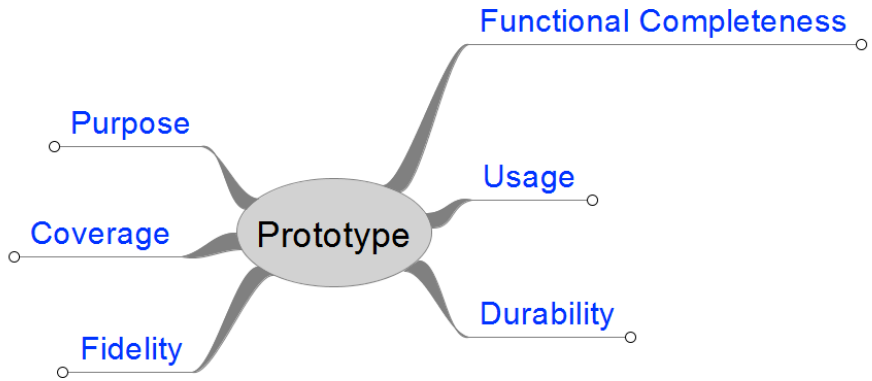
A prototype that models few features but with much detail

- a vertical slice of a system's structure chart from top to bottom
- most useful in the later stages of design
- purpose is to test details of the design

Diagonal

A prototype that is horizontal down to a particular level, then vertical below that point

Characteristics of Prototypes



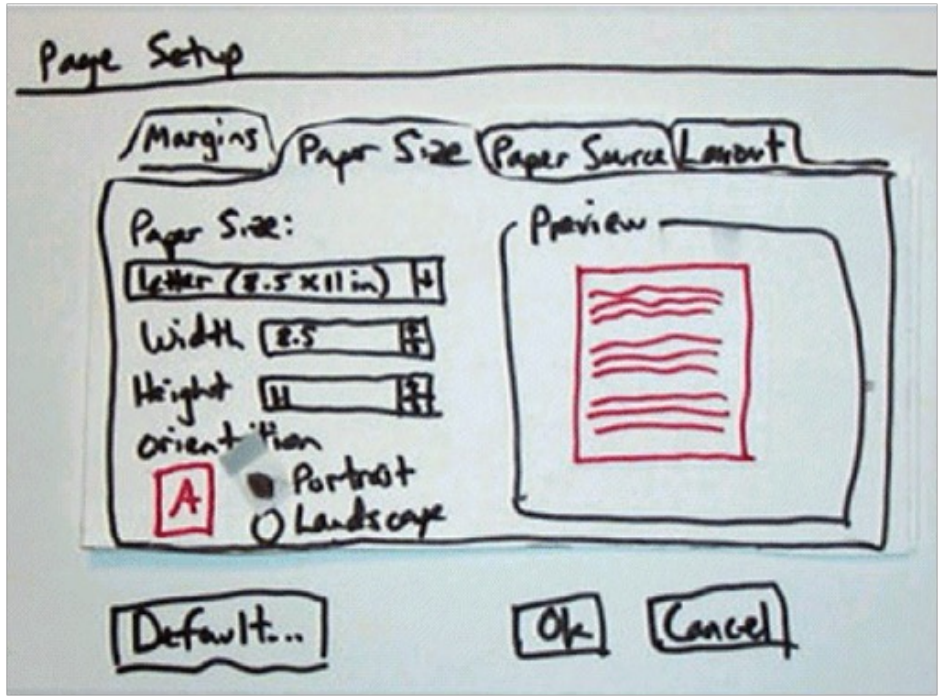
Fidelity

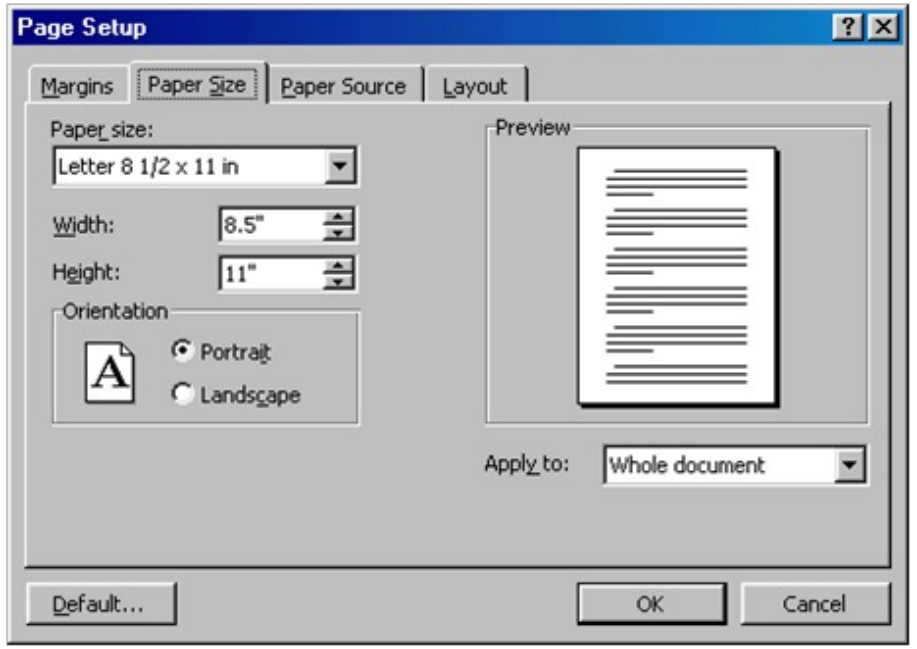
- **Low**: A set of drawings (e.g., storyboard) that provide a static, non-computerized, non-working mock-up of user interface for the planned system
- **High**: A set of screens that provide a dynamic, computerized, working model of the planned system

Usage

- **Static**: Static representation of the product (storyboards, diagrams, ...)
- **Dynamic**: Dynamic (but not interactive) representation of the product (e.g., video)
- **Interactive**: Allows users to test the usage of the system, even if in an approximate and simplified way

Fidelity: Different Information Is Conveyed



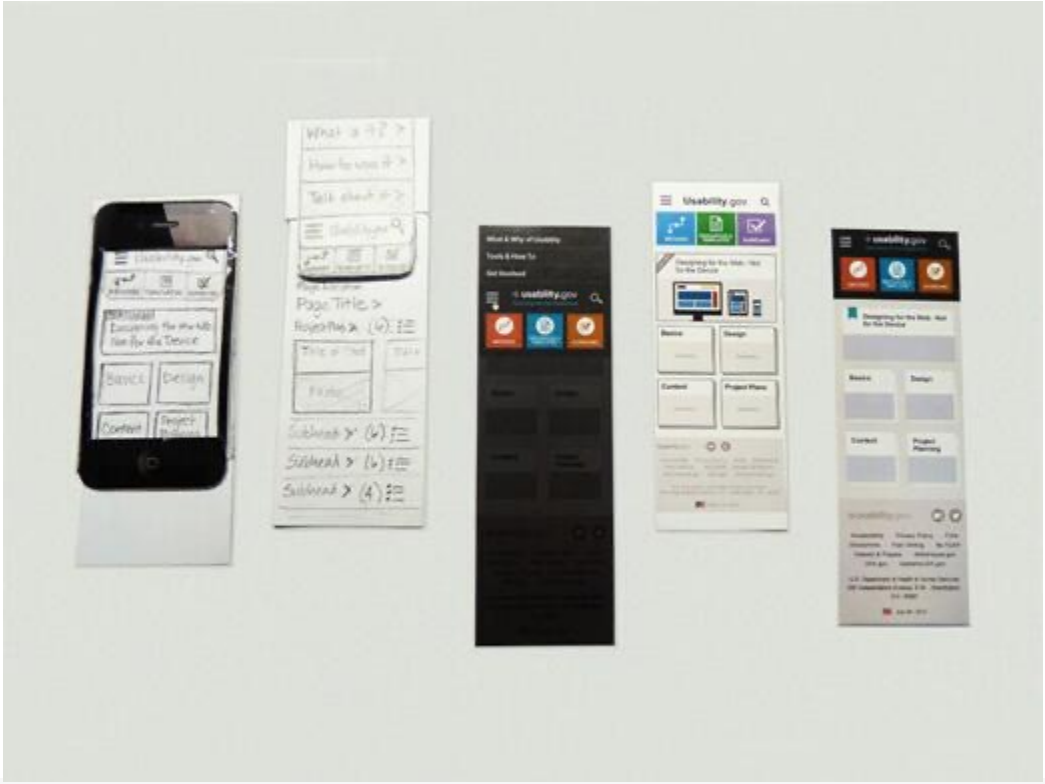


Low Fidelity Prototypes

How to start using an application, months before implementing it

Paper Prototypes

- A hand-drawn mock-up of the user interface (usually) on multiple sheets of paper of varying sizes



Key Features for Paper Prototypes

- Interactive paper mockup
  - Sketches of screen appearance
  - Paper pieces show windows, menus, dialog boxes
- Interaction is natural
  - Pointing with a finger = mouse click
  - Writing = typing
- A person simulates the computer's operation
  - Putting down & picking up pieces
  - Writing responses on the "screen"
  - Describing effects that are hard to show on paper
- Low fidelity in look & feel
- High fidelity in depth (person simulates the backend)

http://web.mit.edu/6.813/www/sp18/classes/11-prototyping/

Materials

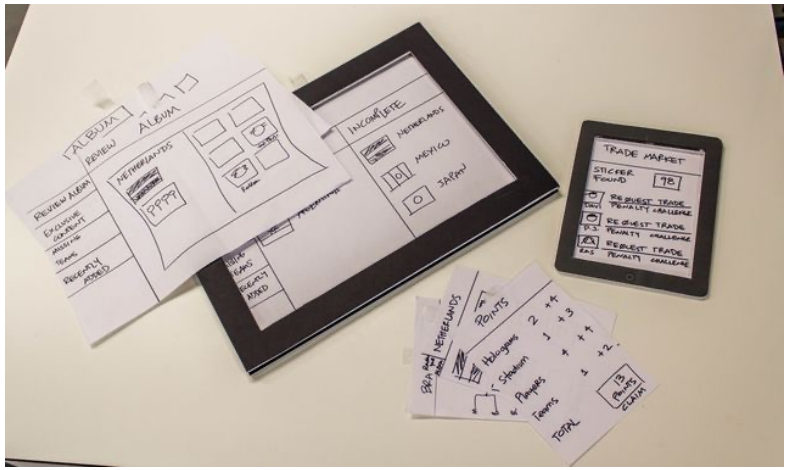
- Paper, Transparent paper
- Pens, Markers
- Post-It notes
- Glues, scotch tape, scissors
- Photocopies
- UI Stencils
- Reusable UI components
- Printouts of screenshots

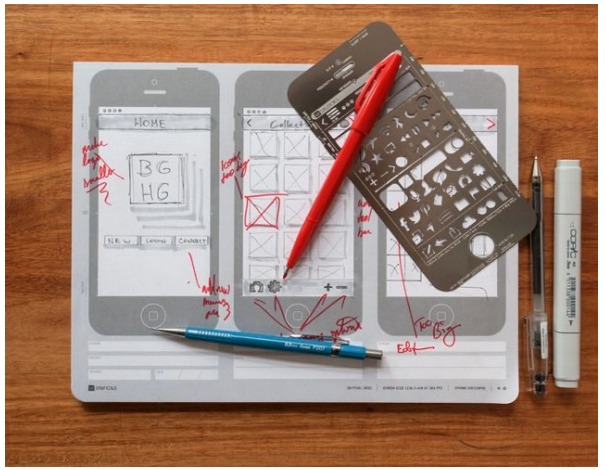
Why Paper Prototyping?

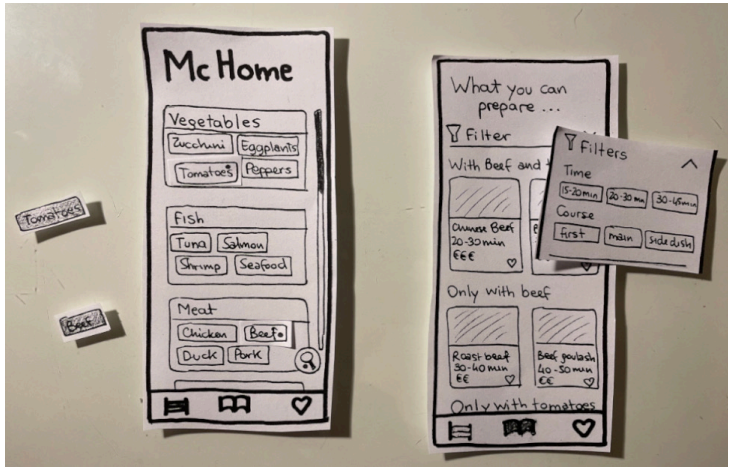
- Faster to build
  - Sketching is faster than programming
- Easier to change
  - Easy to make changes between user tests, or even **during** a user test
  - No code investment - everything will be thrown away (except the design)
- Focuses attention on big picture
  - Designer doesn't waste time on details
  - Customer makes more creative suggestions, not nitpicking
- Non-programmers can help
  - Only kindergarten skills are required

http://web.mit.edu/6.813/www/sp18/classes/11-prototyping/

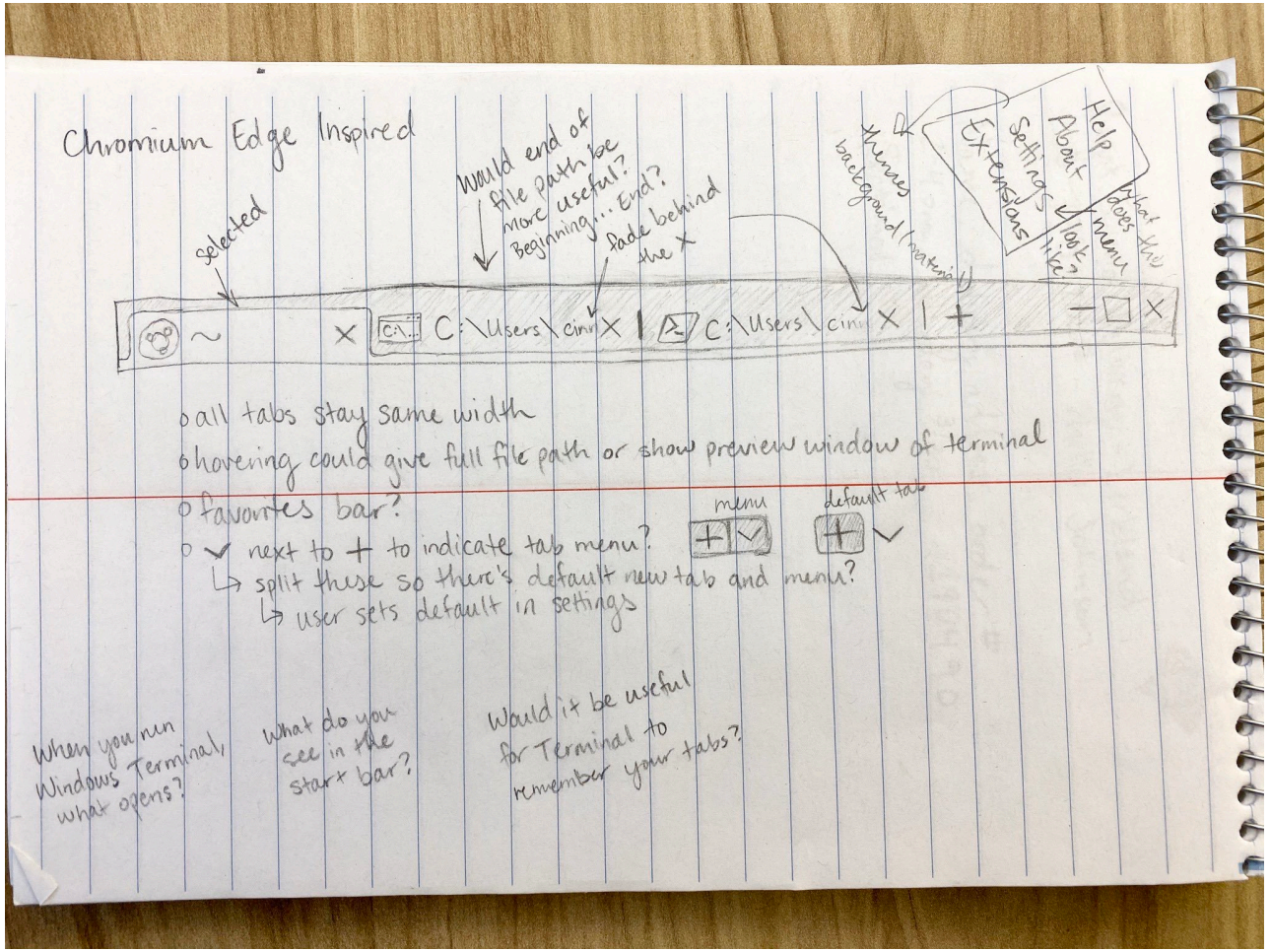
Paper Prototypes: Examples







First Ever Mockup of the Windows Terminal Tab Bar

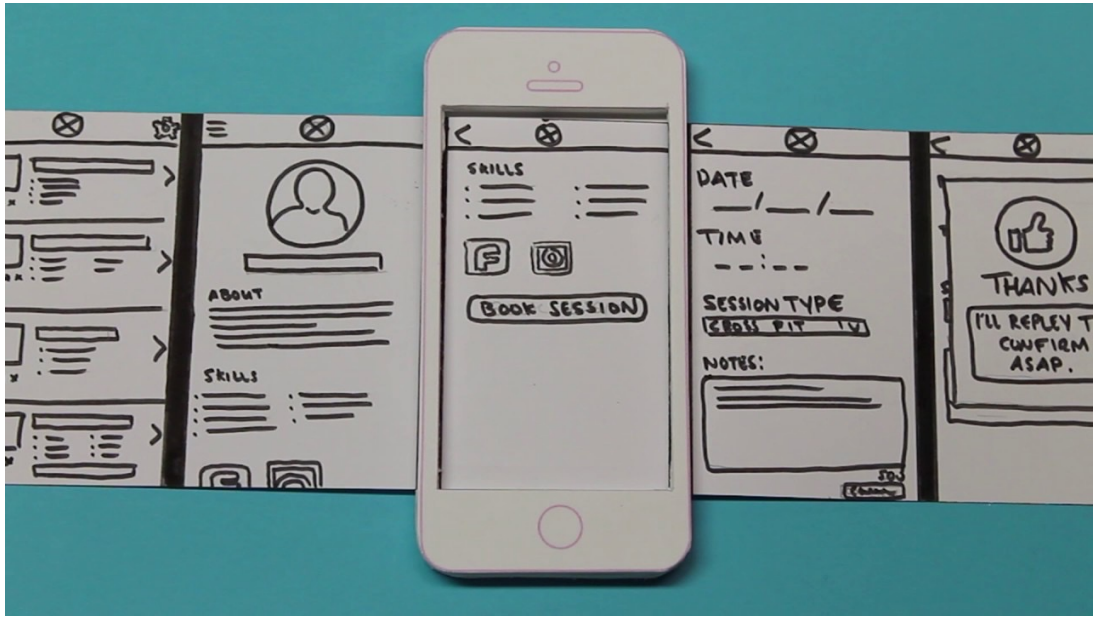


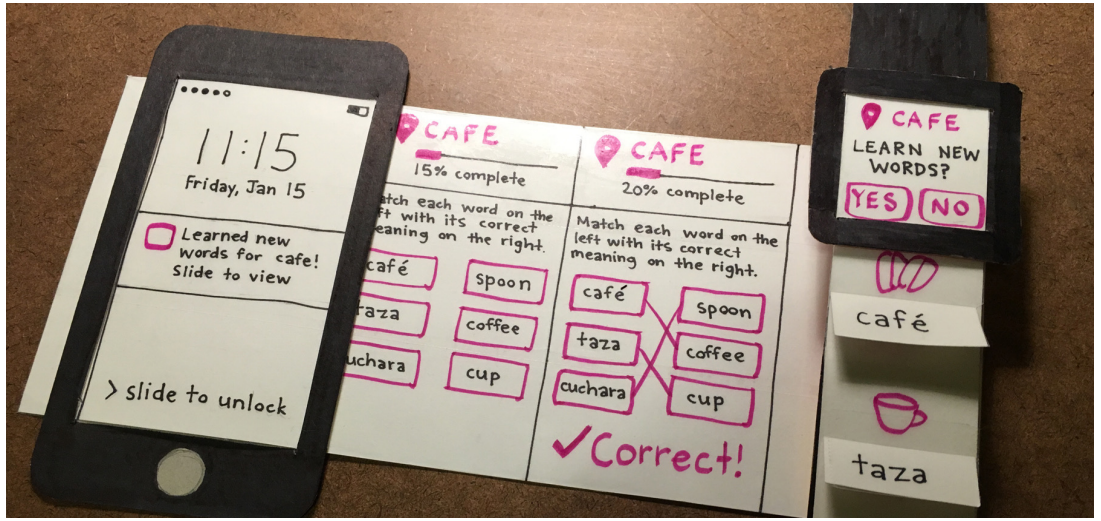
https://twitter.com/cinnamon_msft/status/1190015862201176065?s=20

Creating Flows With Paper Prototypes

https://youtu.be/GrV2SZuRPv0

“Dynamic” Screens





How to Test a Paper Prototype

- The Design Team should cover these roles
- ‘Computer’ actor
  - Simulates prototype
  - Does not give any feedback that the computer would not
- Facilitator
  - Presents interface and tasks to the user
  - Encourages user to **“think aloud”** by asking questions
  - Keeps user test from getting off track
- Observer
  - Keeps mouth shut
  - Takes copious notes

Learnable Lessons From Paper Prototypes

Can Learn

- Conceptual model
  - Do users understand it?
- Functionality
  - Does it do what's needed? Missing features?
- Navigation & task flow
  - Can users find their way around?
  - Are information preconditions met?
- Terminology
  - Do users understand labels?
- Screen contents
  - What needs to go on the screen?

Cannot Learn

- Look: color, font, whitespace, etc
- Feel: efficiency issues
- Response time
- Are small changes noticed?
  - Even the tiniest change to a paper prototype is clearly visible to user
- Exploration vs. deliberation
  - Users are more deliberate with a paper prototype; they don't explore or thrash as much

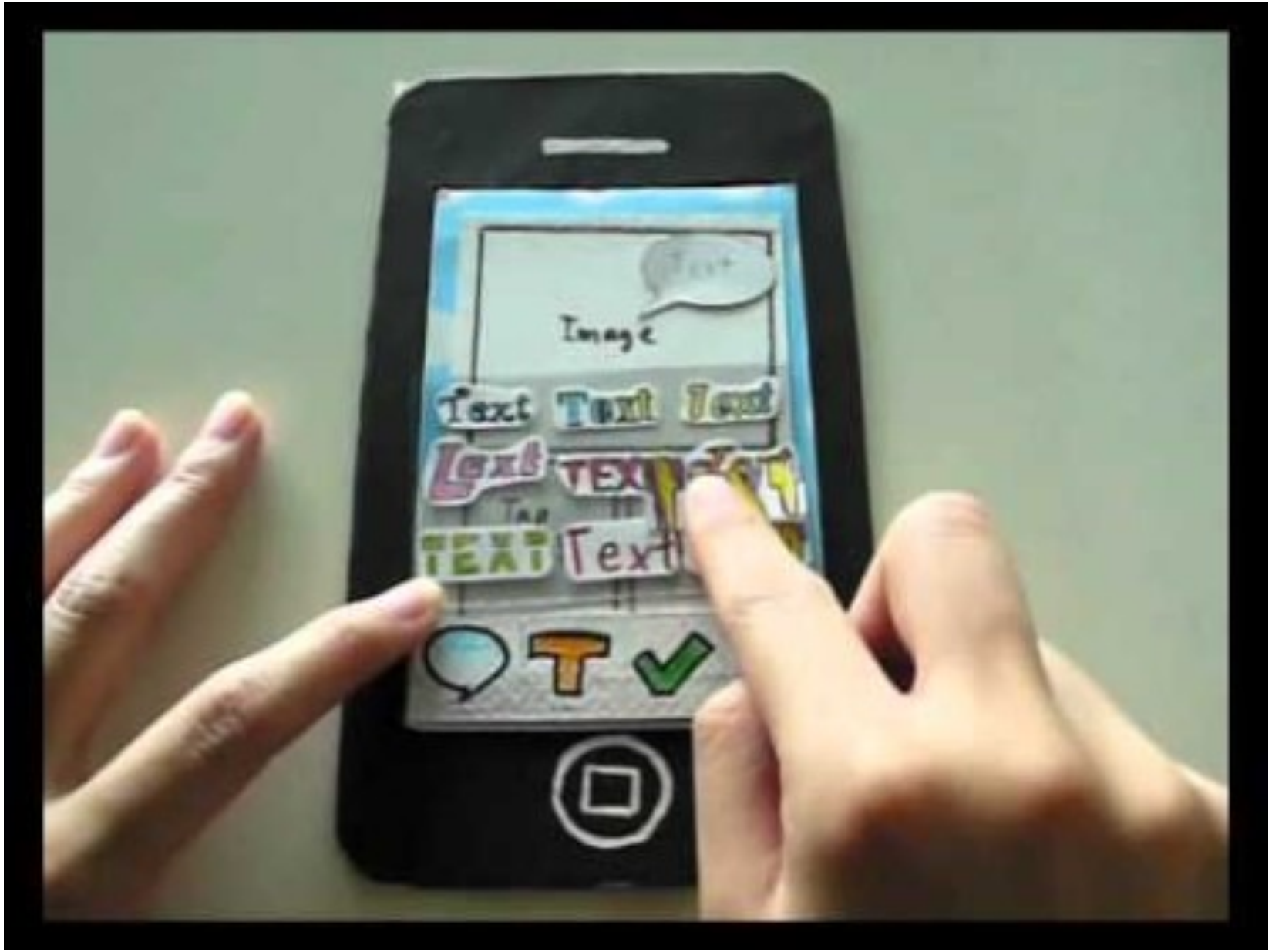
Video Prototypes

Sharing a rich experience of your prototype

Video Prototype

- A video that conveys your storyboard and/or paper prototype concepts

Example



https://youtu.be/wbiYAqbZryA

Example

https://youtu.be/kWsBvUnvCmg

Video Prototype Fidelity

- Informal, still low fidelity
  - Just for brainstorming
  - A few minutes to create
- Medium fidelity
  - Starting with paper prototype
  - One-two hours to create
- High fidelity
  - Need to get support from organization or client
  - Expensive

Required Content

- Show the whole task (like a storyboard), including motivation and success
- Choose important tasks, that show cases when your system is performing really well
  - Tasks that you have observed
  - Key tasks in the application
- Defines the scope for an MVP: the shown tasks are the features of the first launch
- Defines the topics for the design team to ~~argue~~ discuss

Creating a Video Prototype

- Define an outline
  - Or pick one of the storyboards
- Use minimum technology
  - High-quality equipment may become distraction
  - Reduce post-production and editing to a mininum
- Establish context
  - Choose representative users
  - Choose a meaningful location
- Focus on the message, not on the production quality

Tips For Production

- Bad audio is annoying and distracting
  - May also be a silent movie with “title cards” to explain what’s happening
- Choose the amount of interface you want to show in the video
  - Real-looking interactive prototype
  - Paper prototype
  - No interface at all (just users)
- Show both success and failure

Benefits

- Cheap and fast
- Can more vividly inspire people's imagination – Great communication tool
- Clean & self-explanatory – just share a YouTube link
  - More portable than a paper prototype!
  - Good for "pitching" or "selling" to management
- Shows context of use: helps achieve common ground
- Can serve as a 'spec' for developers
- Ties interface design to user tasks
  - Ensure you develop all that is needed, nothing extra

Medium Fidelity Prototypes

Wireframes, PowerPoints, Sketching tools

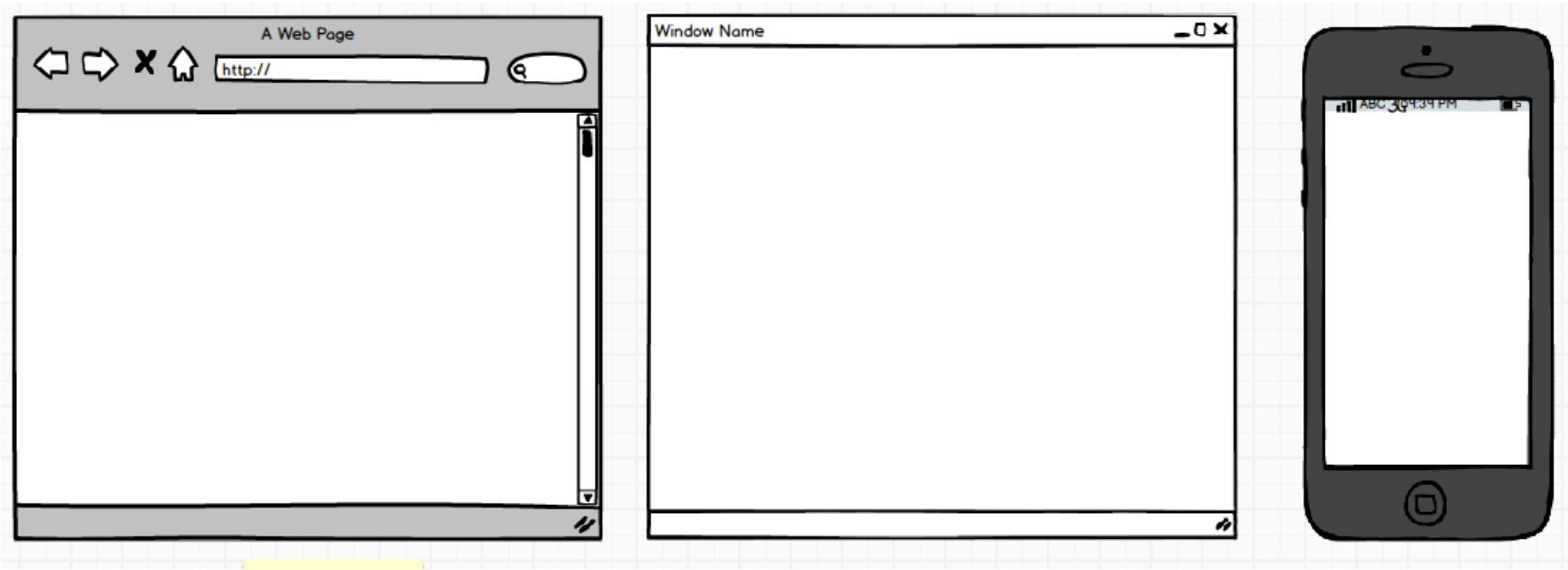
Computer Prototypes

- Interactive software simulation
  - Renders user interface
  - Accepts some user input
  - Responds by switching pages
- Medium-fidelity or High-fidelity in look & feel
- Low-fidelity in depth
  - The human operator in paper prototyping is aware of the algorithms

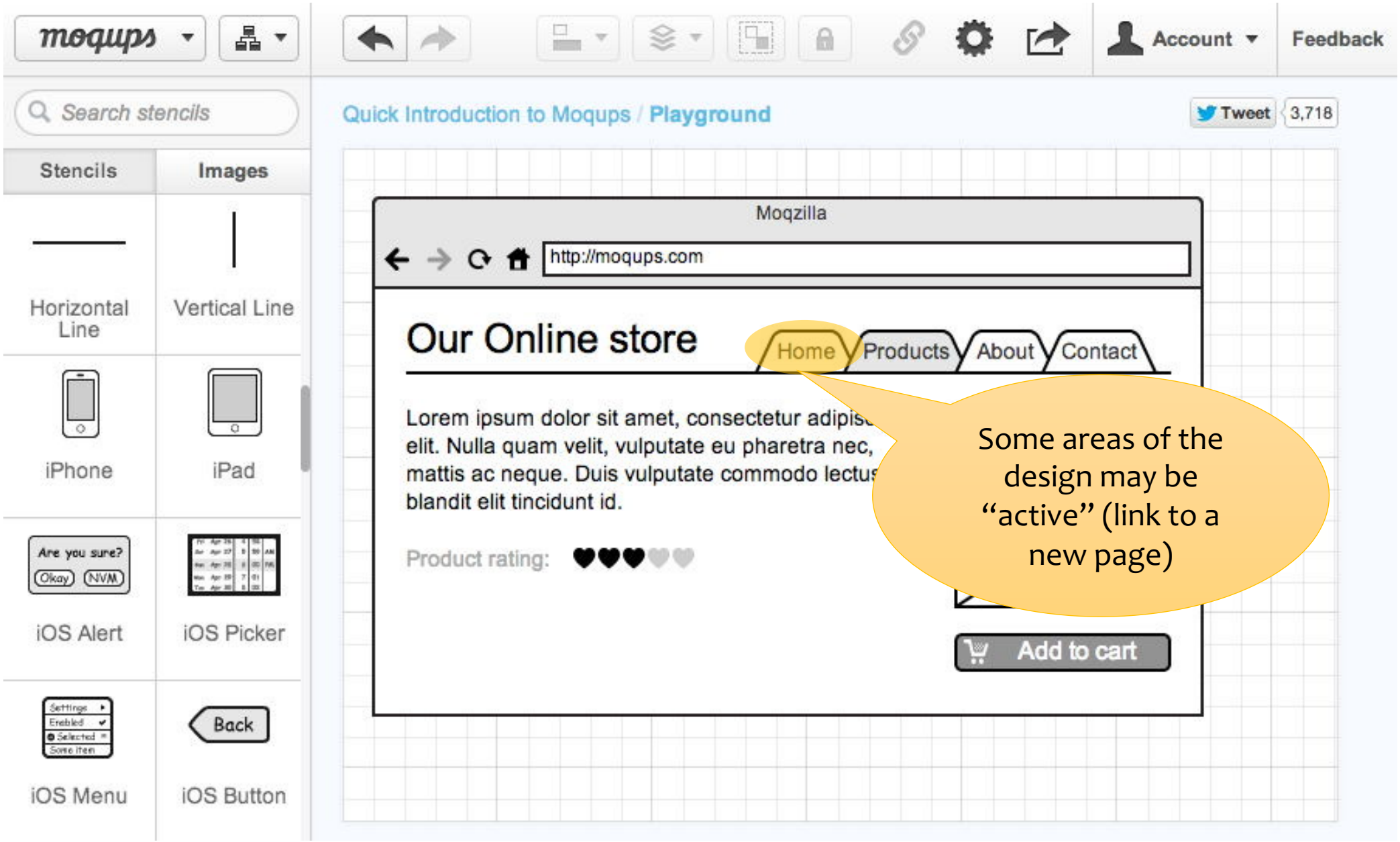
Medium-fidelity

- Also known as “Mockups” or “Wireframe interface”
- Design of a single screen or a set of connected screens (following a task)
- “Wavy” or “imprecise” drawing (inspired by hand drawing)
  - Want to convey the impression that the design is still preliminary
  - Mostly gray scale (or black and white)
- Usually static information (predefined pages, only)
- May suggest user device

Wireframes For The Three Interfaces



Web Desktop Mobile


moqups
Account
Feedback
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Stencils
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Horizontal Line
Vertical Line
iPhone
iPad
Are you sure?
Okay
NVM
iOS Alert
iOS Picker
Settings
Enabled
Selected
Some item
iOS Menu
Back
iOS Button
Quick Introduction to Moqups / Playground
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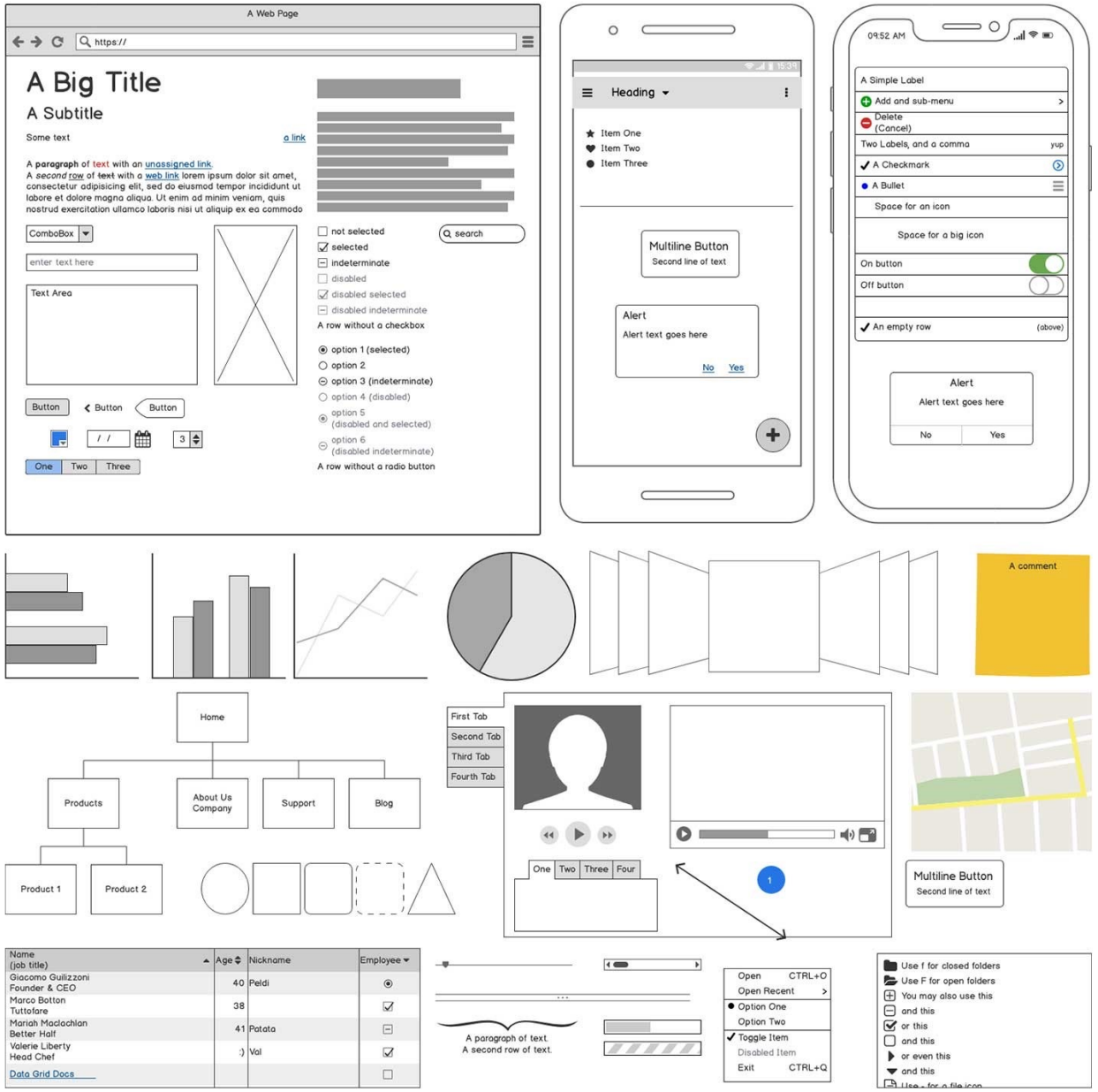
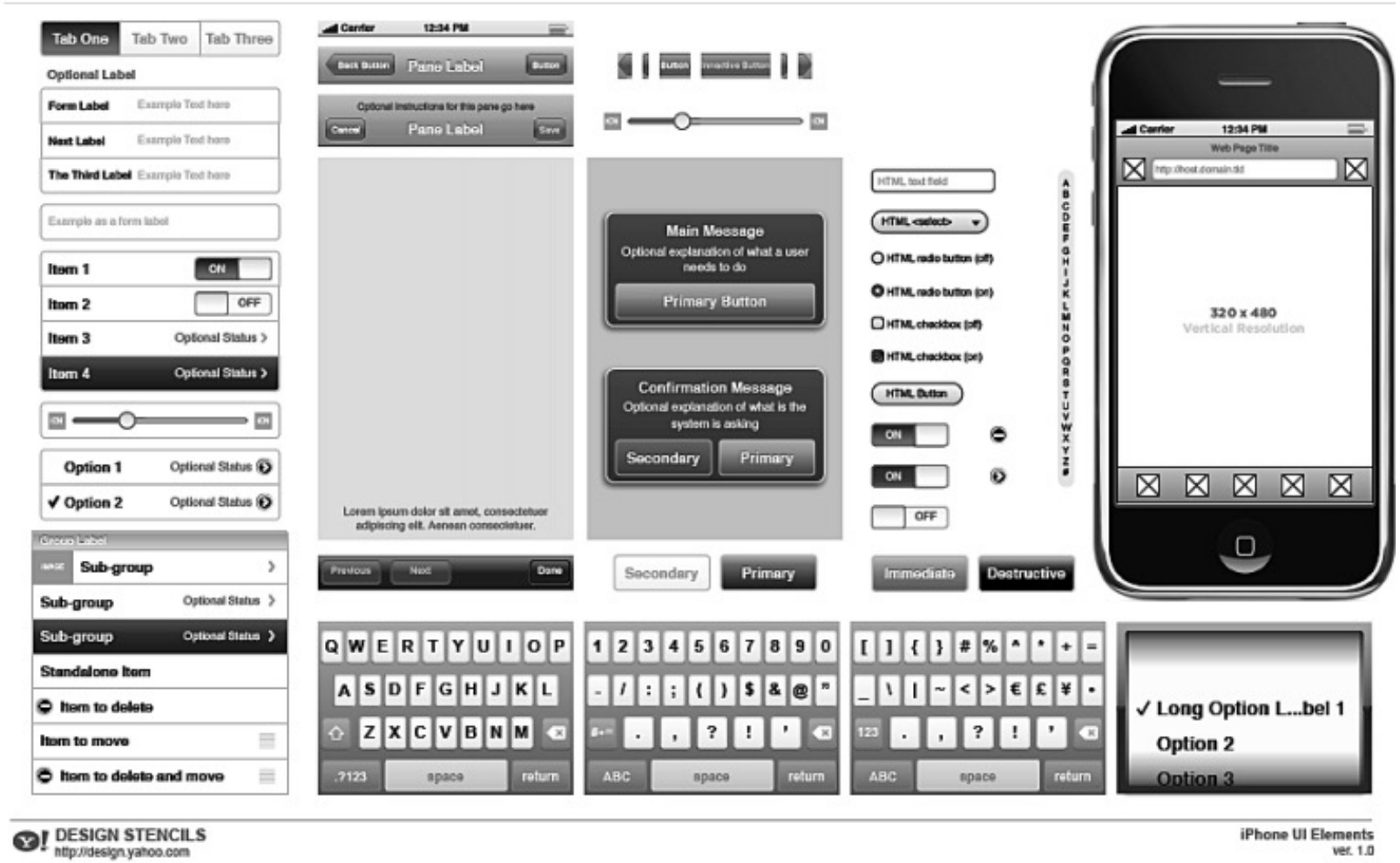
Product rating:
Add to cart
Some areas of the design may be “active” (link to a new page)

UI Design Libraries



Stencils For UI Elements



Some Tools For Med-Fidelity Prototyping

https://www.figma.com
https://www.figma.com/education/

https://balsamiq.com/wireframes/
https://balsamiq.cloud/

https://moqups.com/

Example

Step 1 e B-Step 1

Step 2 3

Step 4 5a

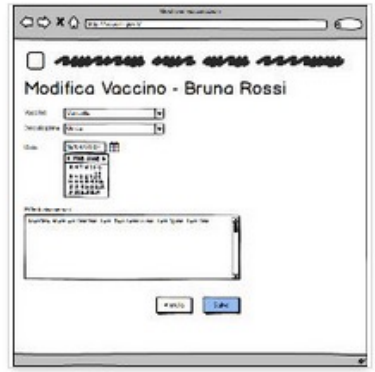
Step 2a

Step 4b

B-Step 6

B-Step 5a1 5a2

B-Step 5a3 5a4



B-Step 5c1 5c2

B-Step 5c3 5c4

PowerPoint-based Interactive Mockups

Chiamata da contatto

Chiamata da sconosciuto

SMS ricevuto

Chiamata persa

Tools' Drawbacks

- Click, not interact
  - No text entry, no data entry, no real selection of listed data
  - Widgets aren't active
- Paths are static
- The tester is engaged in a "hunt for the hotspot", to find the (few) only widgets that really clickable
  - Good for testing understanding of the UI and the workflow
  - Not good for testing the UI behavior

High Fidelity Prototypes

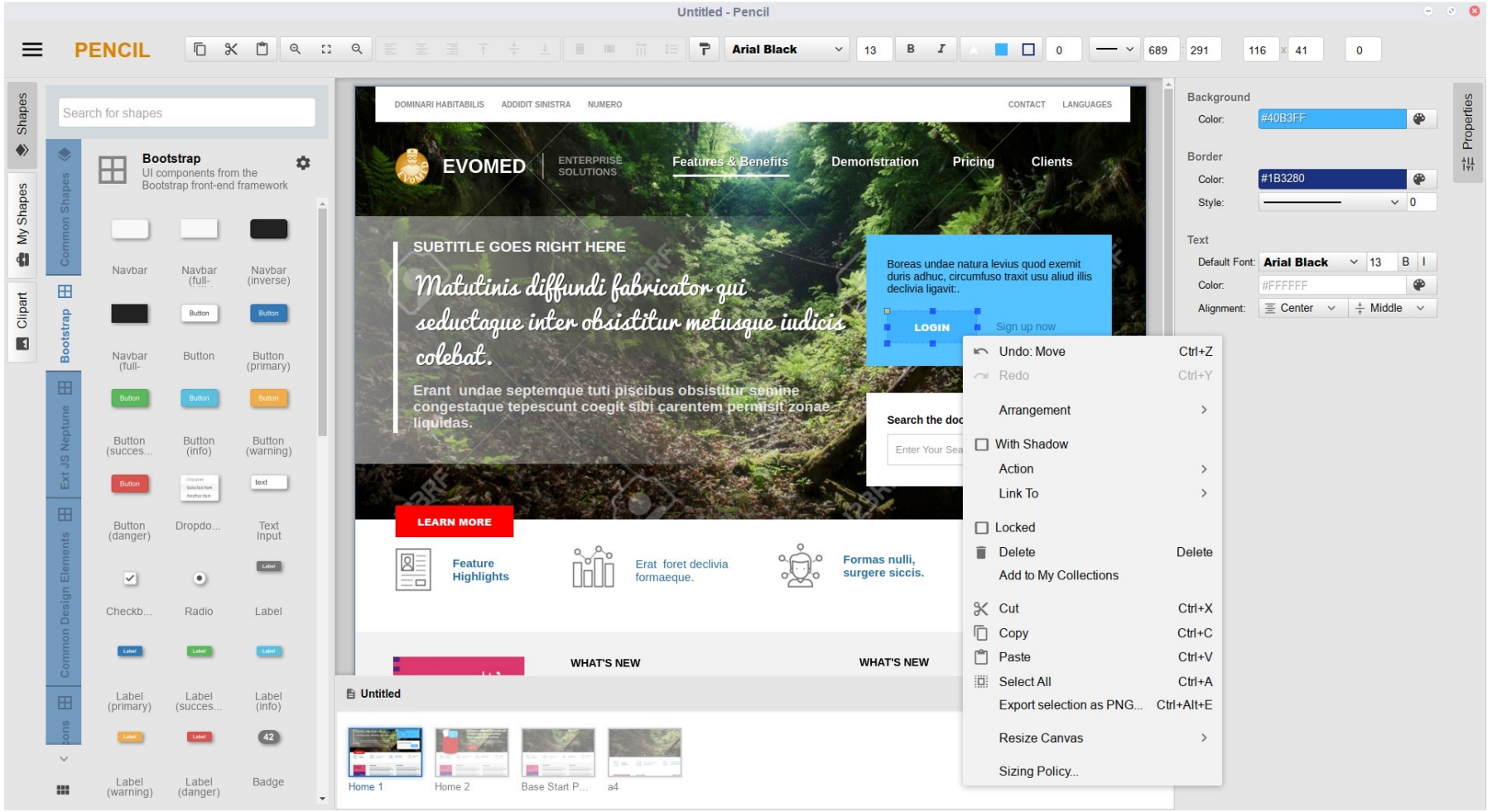
They look like the real thing. Widget behave realistically. But it’s still an illusion.

Hi-Fi Prototypes

- Actual computer application, with final-looking layout, colors, and graphics
  - May use design prototyping tools
  - May use real application code
- Much more expensive to build
- More time is spent with graphic design than interaction design
- When tested, people will mostly comment about colors, fonts, …
  - representation communicates “finished”

High-fidelity Computer Prototypes

Semi-interactive



What Can We Learn From Hi-Fi Interactive Prototypes?

- Screen layout
  - Is it clear, overwhelming, distracting, complicated?
  - Can users find important elements?
- Colors, fonts, icons, other elements
  - Well-chosen?
- Interactive feedback
  - Do users notice & respond to status bar messages, cursor changes, other feedback
- Efficiency issues
  - Controls big enough? Too close together? Scrolling list is too long?

Suggested Video

- **Prototyping: fake it till you make it**
- By Apple Design Team
- https://youtu.be/3lqh-A5Jy4Q

Some Tools For Interactive Hi-Fi Prototypes

No-Code

https://www.invisionapp.com/

https://www.figma.com

FROONT

https://froont.com/

webflow

https://webflow.com/

https://principleformac.com/

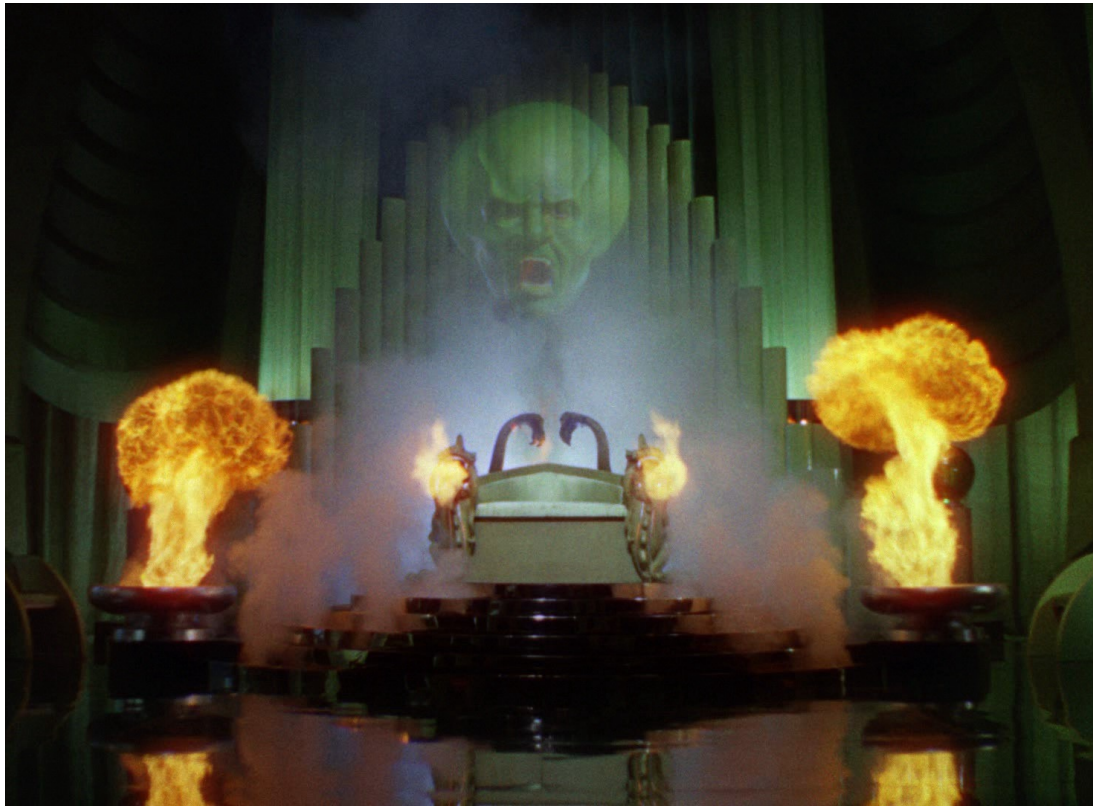
Wizard-of-Oz Techniques

Faking a technology, or filling-in for missing functionality

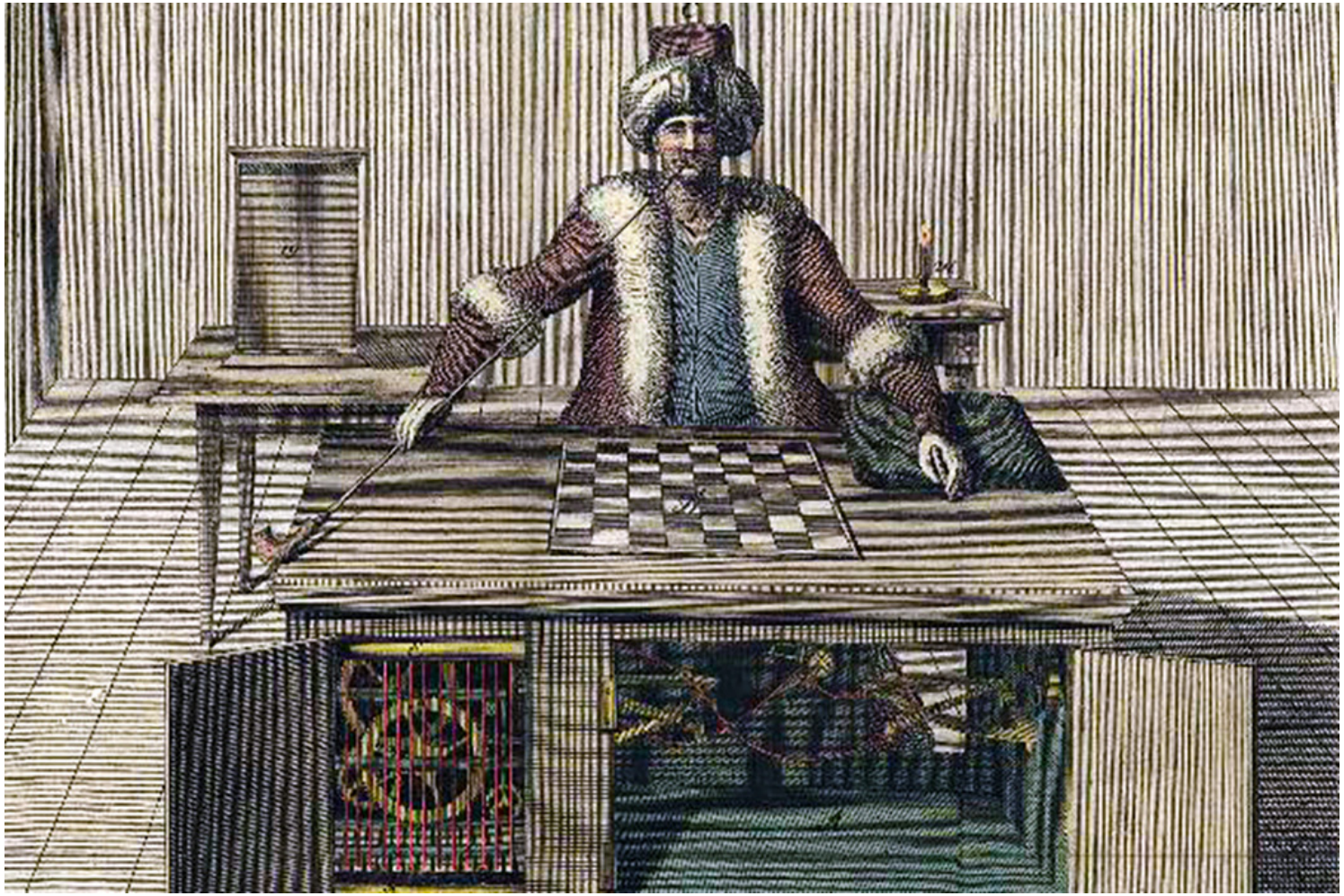
Goal

- How to test an application that is really complete…
  - With finalized user interface
  - With finalized algorithms
  - Also including stuff that we still are not able to implement
- …but without actually writing the code
  - Except for a semi-interactive ‘dumb’ prototype

Remember The Man Behind The Curtain?



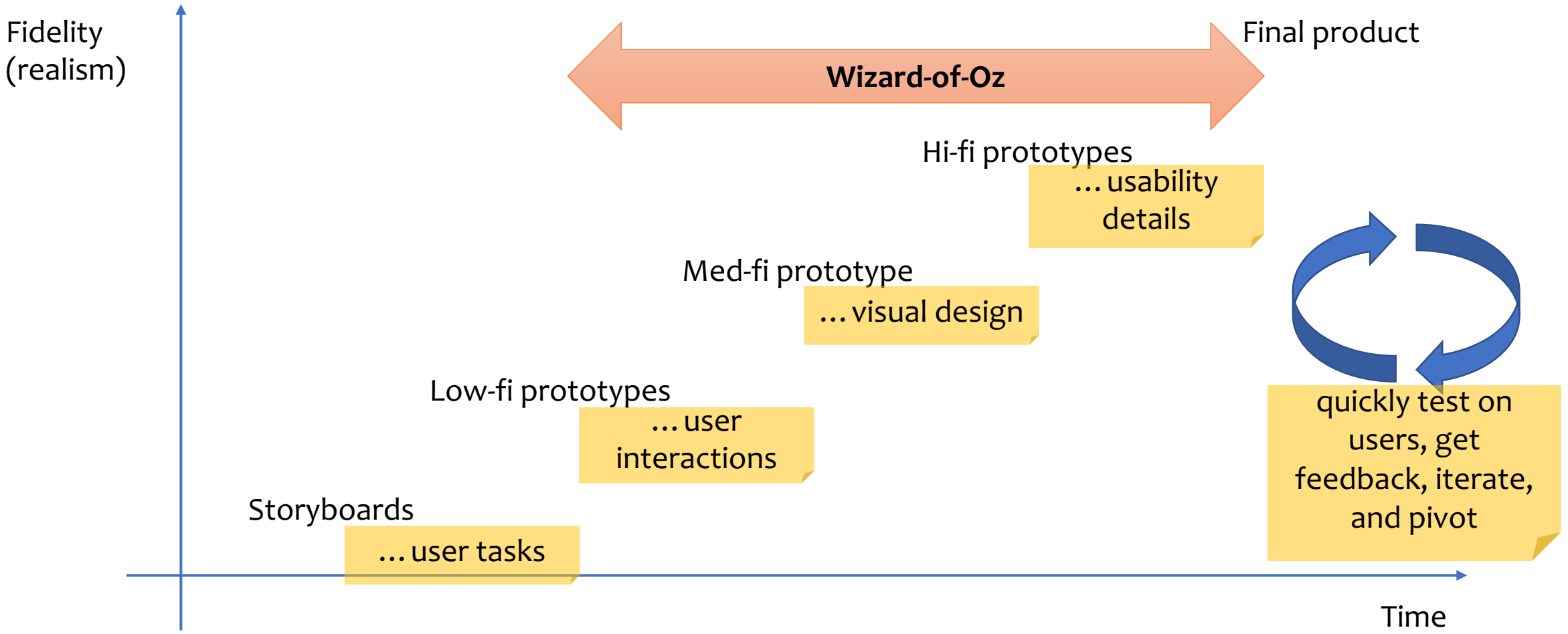
Remember the Mechanical Turk?



Wizard-of-Oz

- Software simulation with a human in the loop to help
- "Wizard of Oz" = "man behind the curtain"
  - Simulates the machine behavior with a human operator
  - Wizard is usually but not always hidden
- Often used to simulate future technology
  - Speech recognition
  - Learning
- Wizard may be hidden or visible
  - Must always be revealed, at least at the end

Prototypes Facilitate Conversations About…



Implementing a Wizard-of-Oz Prototype

- Choose supported tasks and scenarios
- Create User Interface mock-ups
  - Implement a part of the system
  - Leave “hooks” for the Wizard’s actions
- Implement a back-office interface for the Wizard
- Define “rules of behavior” for the Wizard
  - When he should respond
  - How it should respond (the “algorithm”)

Benefits

- Faster and cheaper than most interactive prototypes
- More “real” than paper prototyping
- Creating multiple variations is easy
- Identifies bugs and issues with current design
- Can envision applications that are difficult to build
- Playing wizard allows a better understanding of algorithmic requirements

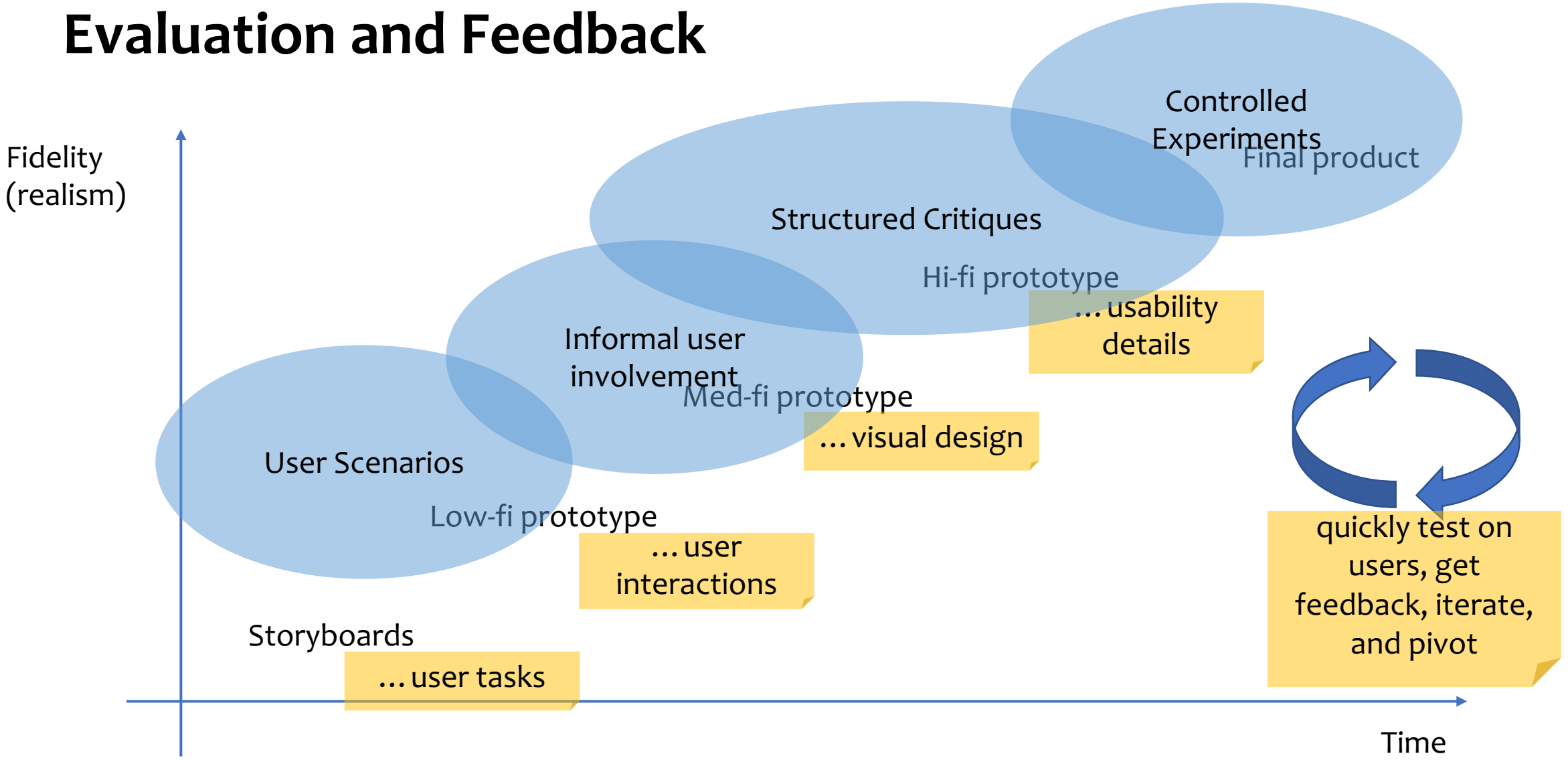
Risks

- May be over-optimistic
  - Speech recognition that always works (instead of having an error rate)
  - Super-intelligence (that will never exist)
- Wizard behavior is difficult
  - Take into account system limitations
  - Emulate expected system response
  - Within acceptable timing
- Needs at least two researchers

Wrap-up

Many different techniques, applicable to different goals and contexts

Evaluation and Feedback



References and Acknowledgments

- Google, Begin Today With Rapid prototyping, https://www.youtube.com/playlist?list=PL9KVIdeJ2K8NDpsiyYpcbB_qifd3y5CYZ
- MIT, http://web.mit.edu/6.813/www/sp18/classes/11-prototyping/#reading_11_prototyping
- Scott Klemmer, Storyboards, Paper Prototypes, and Mockups, https://youtu.be/z4glsttyxw8
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