Prototyping

Human Computer Interaction

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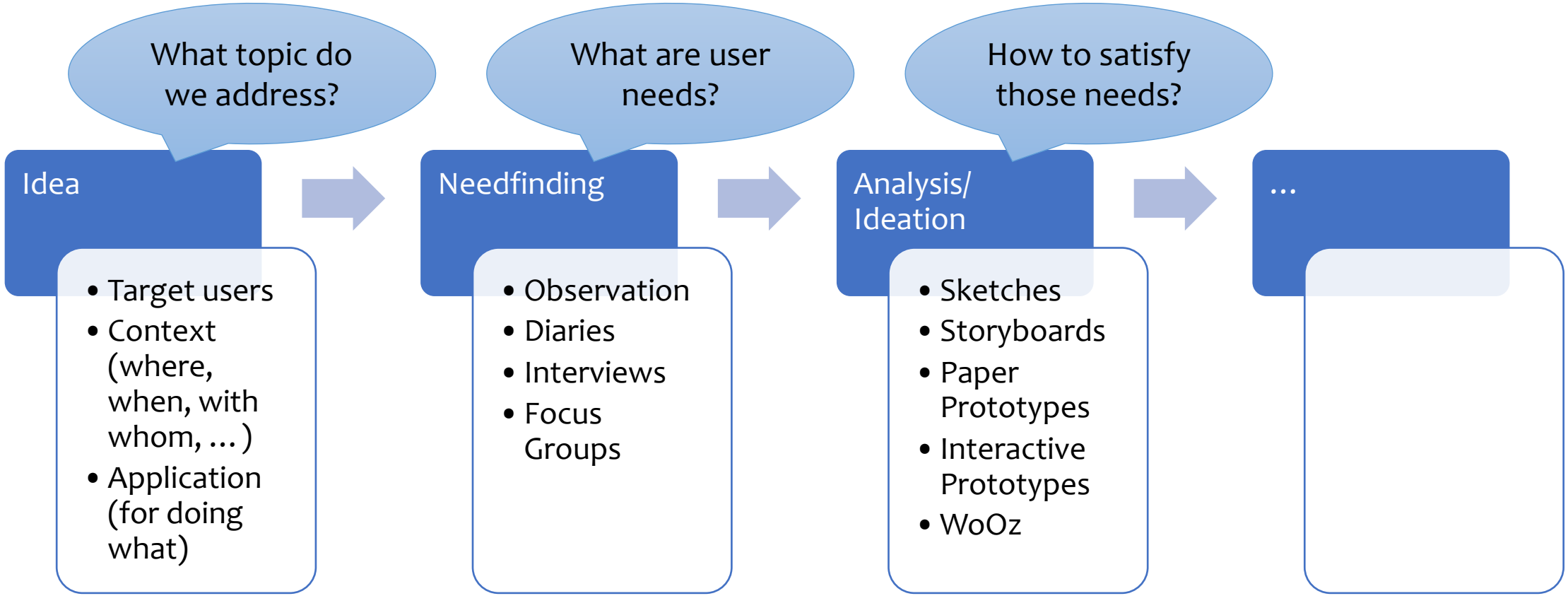
Academic Year 2020/2021

Process recap



Previous steps

- After the project **idea:**
  - We want to help <<TYPE OF USER >>
  - When he is in <<LOCATION>> at <<TIME>> with <<OTHER USERS>>
  - While he is doing <<ACTION>>
  - To accomplish <<USER GOAL>>
  - Using <<DEVICES>>
- After **needfinding:**
  - All user needs emerging from observation and interviews
  - The most insightful 3-4 needs
  - How the project would address 1-2 deep user needs, and the strategies

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

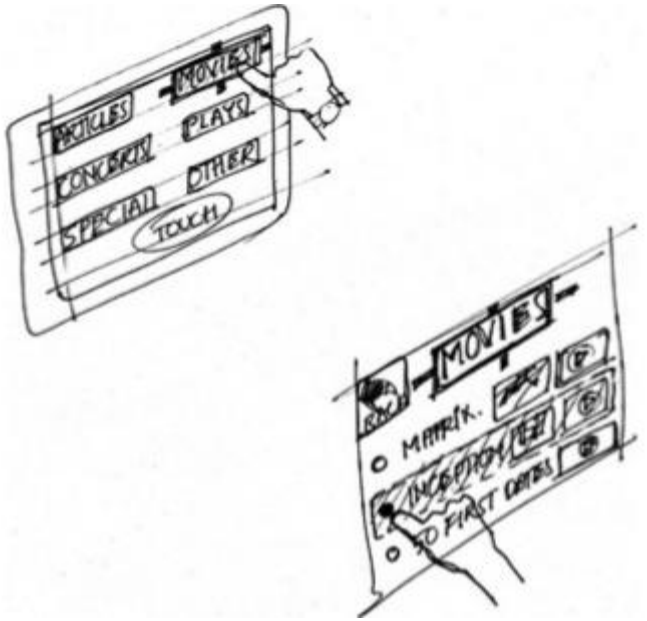
- Sketches
- Maps
- Scenarios
- Storyboards
- Paper prototypes
- Video Prototypes
- Hi Fidelity Prototypes

Sketches and Snapshots

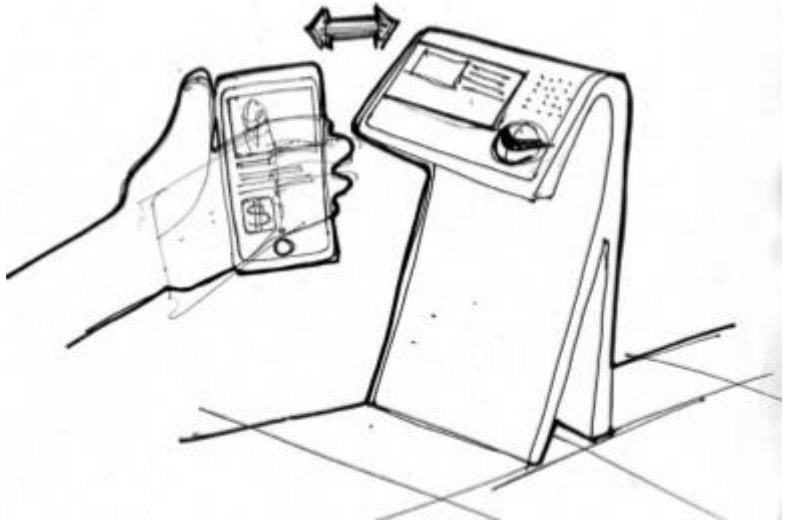
Quick drawings to convey a part of the interface, or a feeling about a device

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 (e.g., a storyboard)



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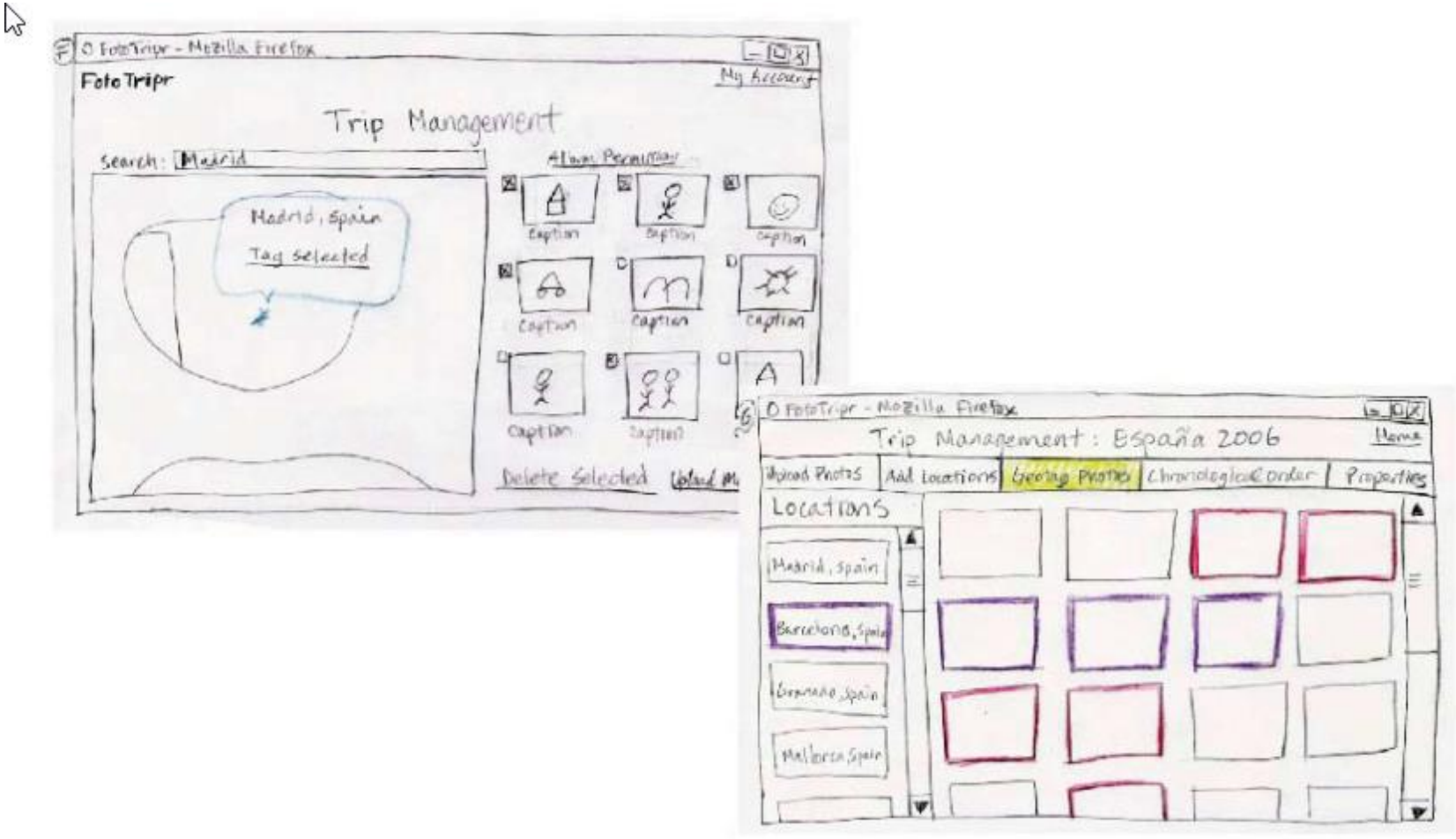
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Home
Upload Photos
Add Locations
Geotag Photos
Chronological Order
Properties
Locations
Madrid, Spain
Barcelona, Spain
Mallorca, Spain

Maps

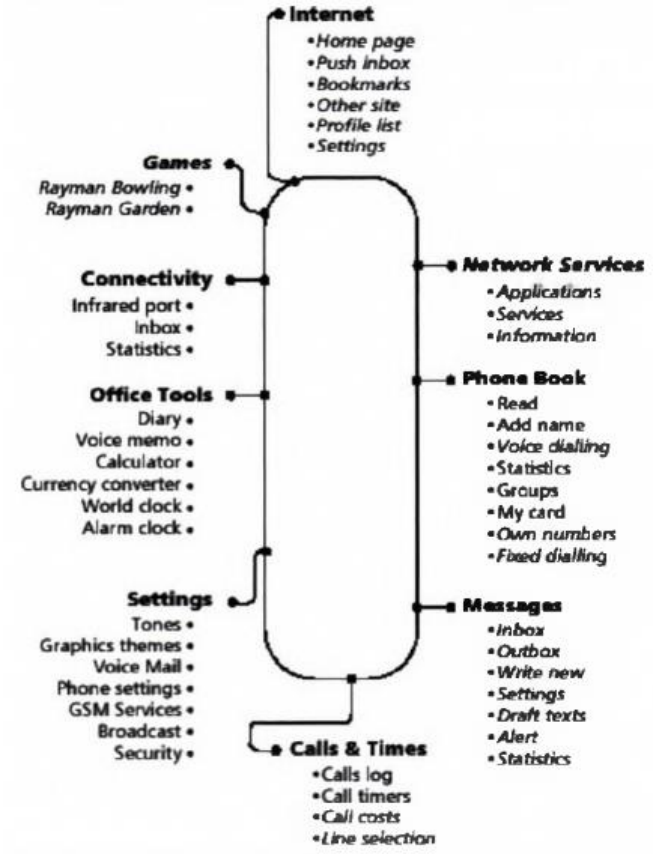
Visual overviews of navigation paths

Navigation Map

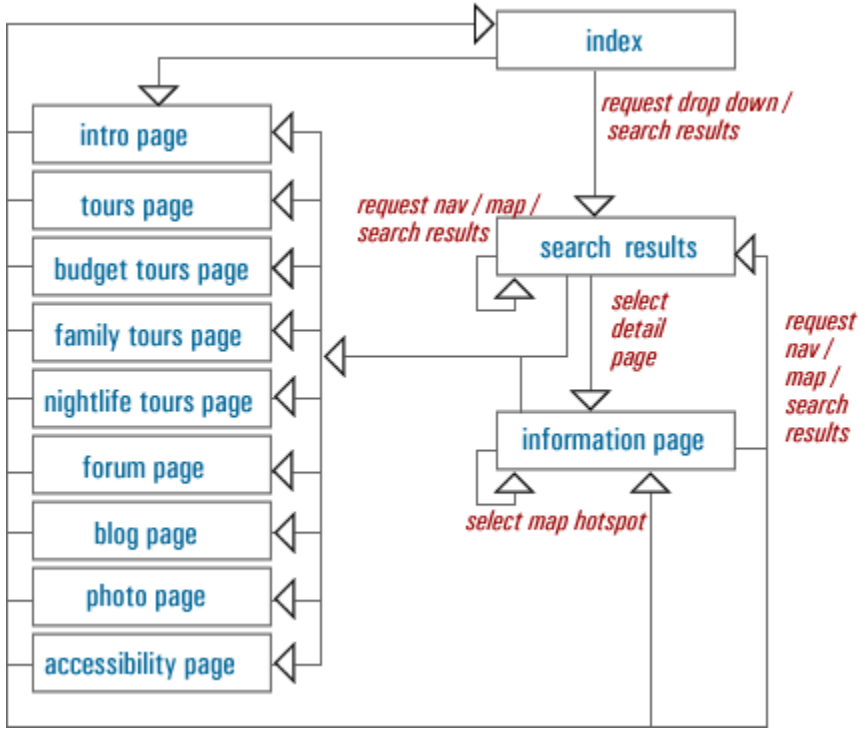
- A high-level view for the major structure of the interface
- Focus on how people move throughout the application
- Does not show the pages, only their organization and hierarchical relationship
- Related to the “information architecture” of the application

Map examples

Old-style mobile phone menus



Website 'sitemap'



Scenarios

Possible sequences of actions for reaching user goals

Scenario

- Scenarios are stories for design: rich stories of interaction
- Description of how the user engages the interactive system to solve a specific task/goal
- Formats:
  - Written summary, Use Case
  - Graphical sketches (→ Storyboard)
  - Flowcharts, Transition Diagram…

Level of details in scenarios

- **Stories**
  - From needfinding
  - Use for understanding what people do and what they wand
- **Conceptual** (abstract) **Scenarios**
  - Use for generating ideas and specifying requirements
  - Abstracts tasks from stories
  - No reference to technology
  - May lead to different concrete scenarios
- **Concrete Scenarios**
  - Use for envisioning ideas and evaluation
  - One possible solution to a Conceptual Scenario (may try many alternatives)
  - Shows how technologies are used in the user context
  - Key design features are included
- **Use Cases**
  - Use for specification and implementation (→software engineering)

Storyboards

Comic book – like representation of user scenarios, with emphasis of how the system supports users in the development of the task

Storyboard

- «A graphical depiction of the outward appearance of the intended system, without any accompanying system functionality»
- A hand-drawn comic that features the execution of a task (like a concrete scenario)
- With a few panels (sequence of sketches) it conveys what a person may accomplish
  - Always include people
- They communicate **flow**, showing what happens **at key points** in time
- No artistic skills are required
  - Not about “nice pictures”
  - About communicating ideas

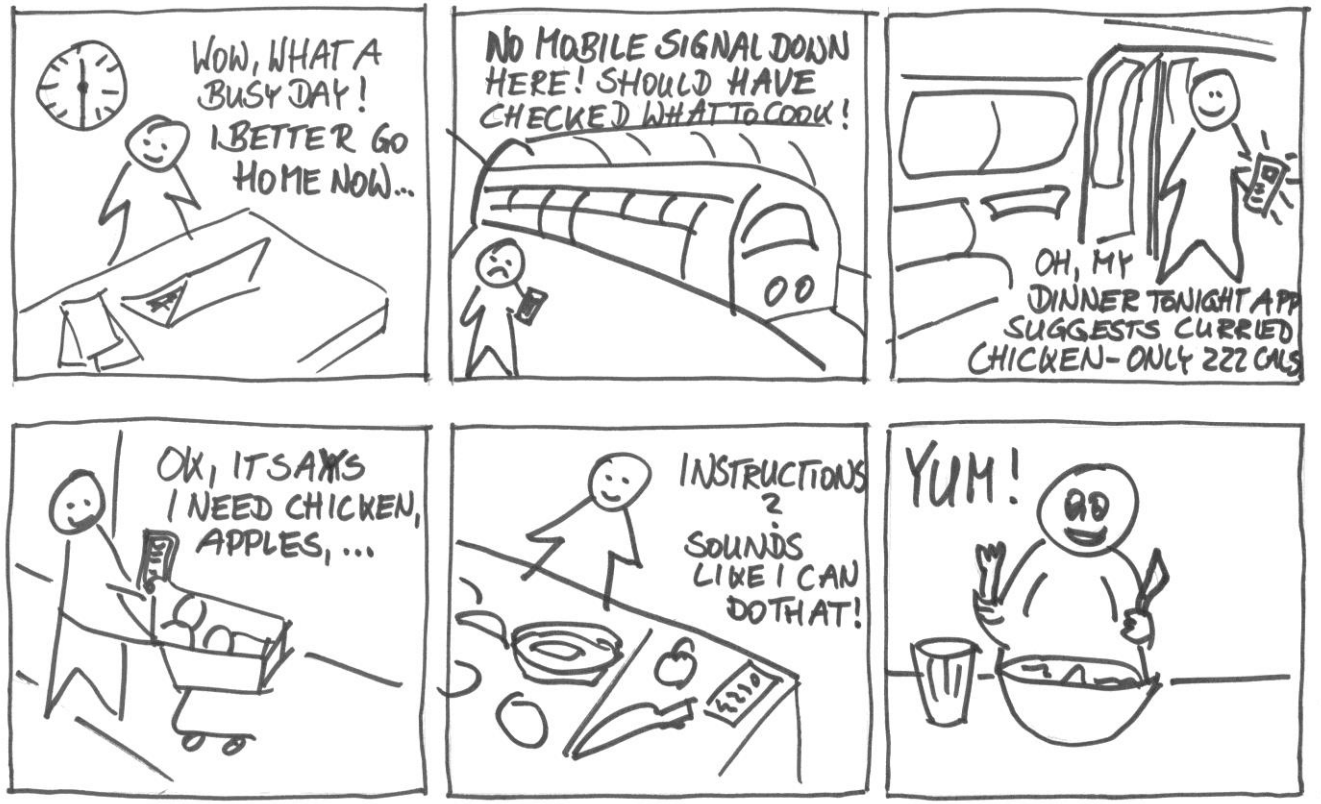
What to find in a storyboard

- Illustrate a goal (for the task)
- How a task unfolds (people interacting among themselves and with devices)
  - Repeated for all significant steps
- At the end, how they accomplish their goals (satisfactory outcome)

- Storyboards are **all about tasks**

Example

This storyboard illustrates how the app had already downloaded the daily recipe to the user's smartphone, so he could look it up and check the shopping list while on the underground, before shopping for ingredients and making a healthy meal.



http://alexmevissen.com/2014/07/16/storyboarding/

Example

This storyboard illustrates how the app can show the user that a home cooked meal can be quicker than ordering food delivery, using left over ingredients in the fridge.

http://alexmevissen.com/2014/07/16/storyboarding/

Storyboards should convey

- Setting
  - People involved
  - Environment
  - Task being accomplished
- Sequence
  - What steps are involved?
    - Not the detailed UI
    - What role the UI plays in helping users achieve their goal?
  - What leads someone to use the system?
    - The “trigger” for the task
  - What task is being illustrated?
- Satisfaction
  - What’s the motivation for the user?
    - The end point to reach after all the steps
  - What’s the end result?
  - What need are you “satisfying”?

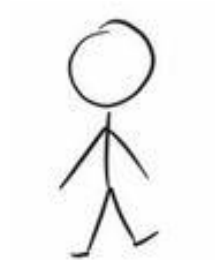
Handling dynamicity in storyboards

- Traditional storyboarding
  - “Comic book” conventions: actors, speech bubbles, background
  - Notes attached to each scene explaining what is happening
- Scored storyboards
  - When the user interface is highly dynamic, or contains specific media elements
  - Add specific annotations focusing on movement, colors, sounds, …
- Text-only storyboards
  - When the interaction behavior is too complex to compact into an illustration, use a longer text description

Why hand-drawn?

- Quick
  - No need to spend time in graphics tools (they would "push" you to focus on details, too
  - Able to experiment different scenarios
- Imprecise
  - Users feel free to express more comments and suggestions w.r.t. a more "polished" version
  - Focus on the content (the graphics is obviously ignored)
  - No distraction by fonts, colors, icons, …

~~Drawing~~ Sketching People



Stick People

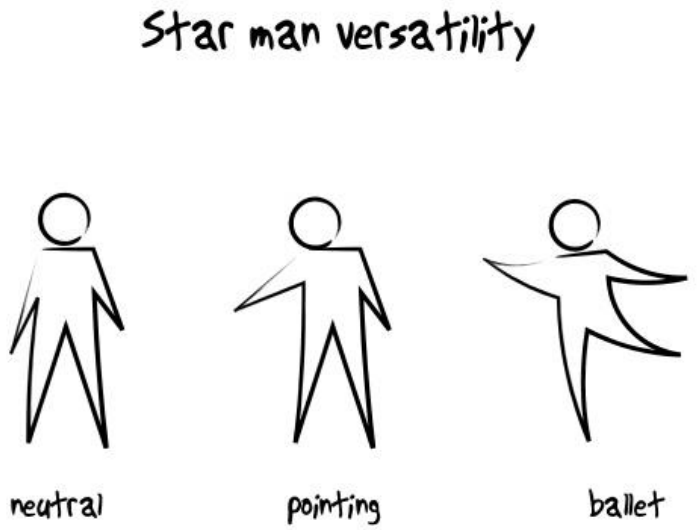
Block People

Blob People

Star People

Triangle People

Use Your Imagination



Benefits of Storyboards

- Emphasize how an interface accomplishes a task
- Focus the conversation and feedback on user tasks
- Get everyone on same page about the app's goals
- Avoid nitpicking about user interface details (buttons etc)

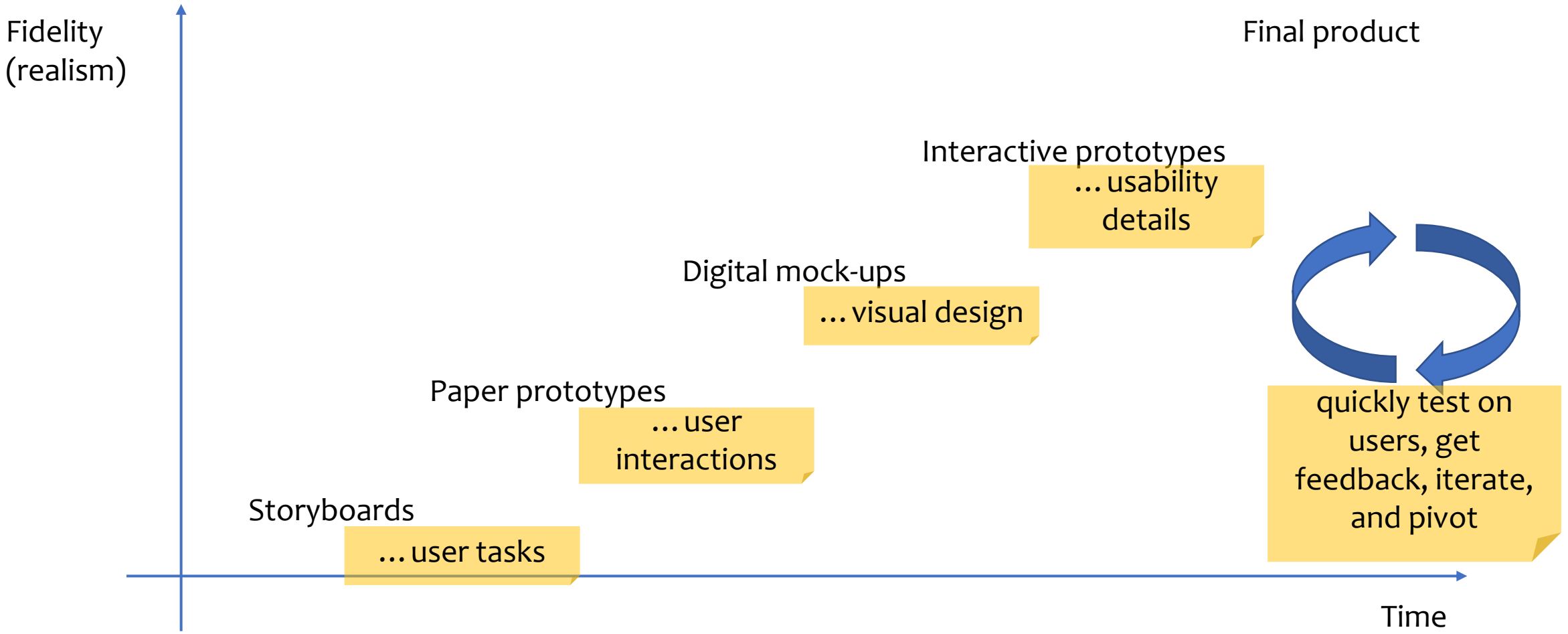
Prototypes

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)

Prototypes facilitate conversations about…

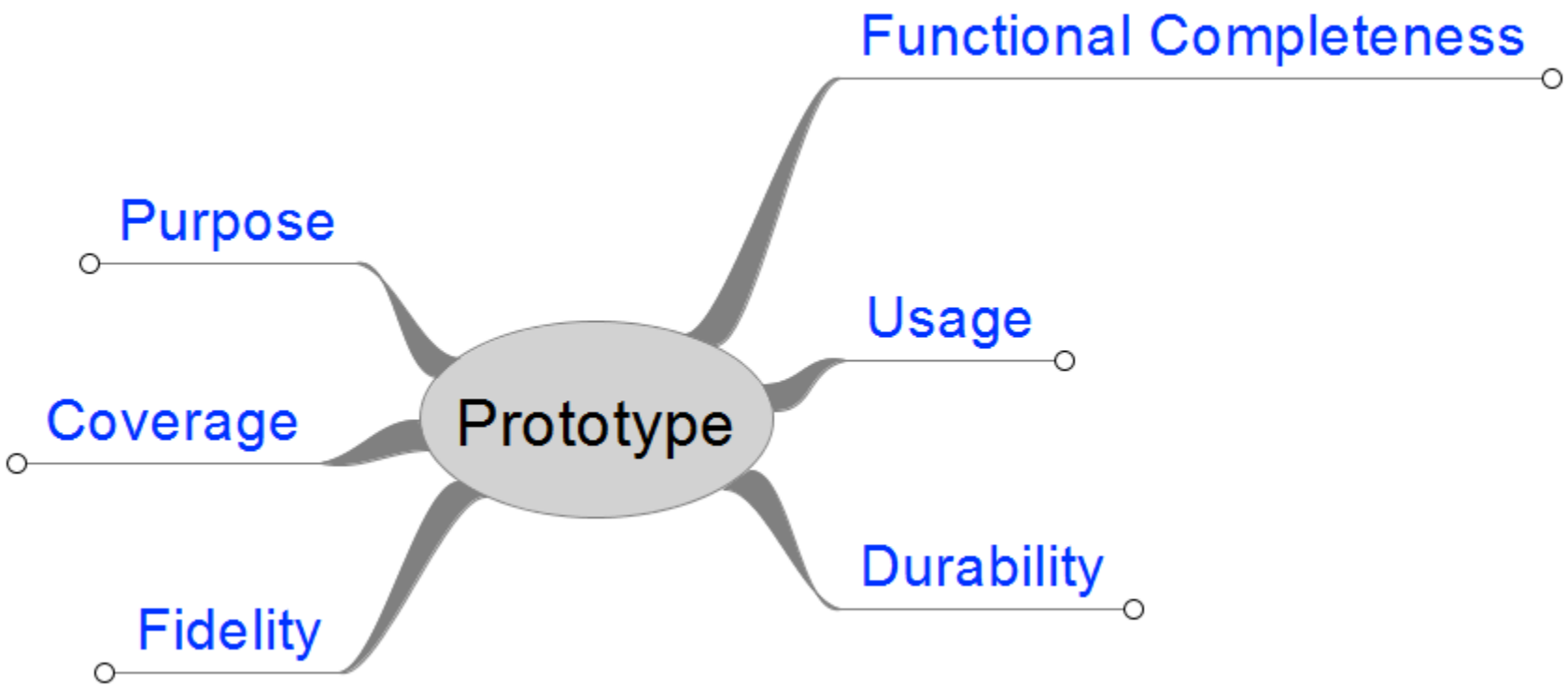


Prototypes

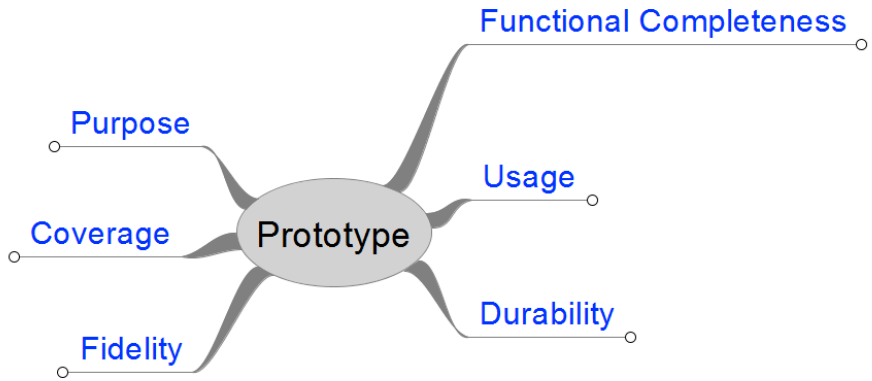
What

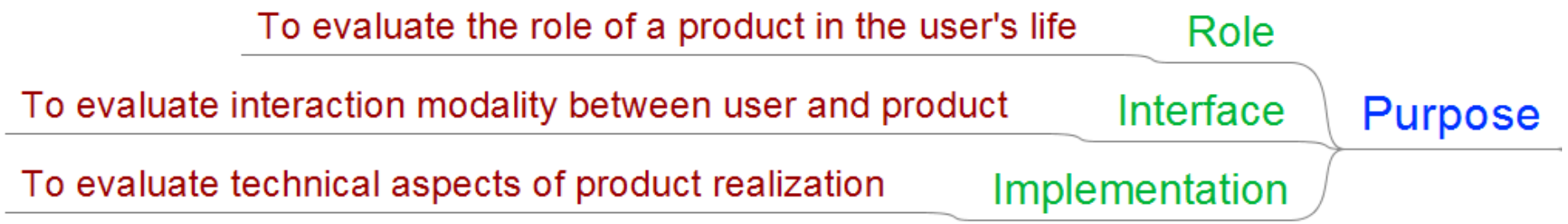
- Paper designs
- Video prototypes
- Wizard-of-Oz
- Mockups
  - Low-fidelity
  - High-fidelity
- Preliminary versions

Characteristics of Prototypes



Characteristics of Prototypes

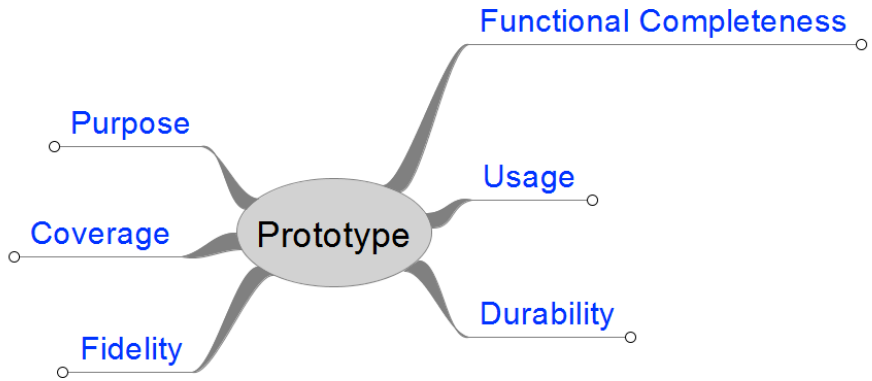


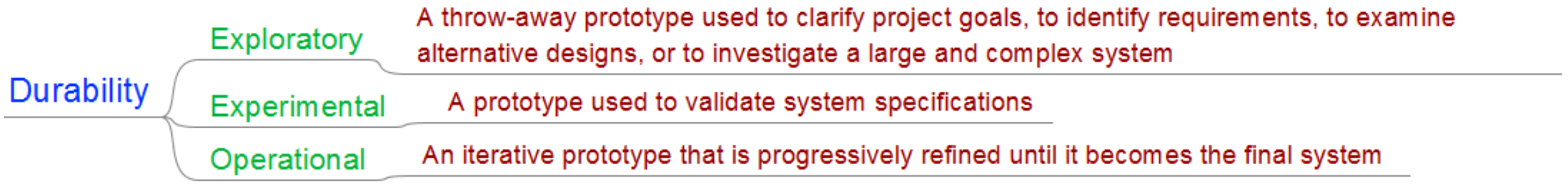


Possible purposes for a prototype

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

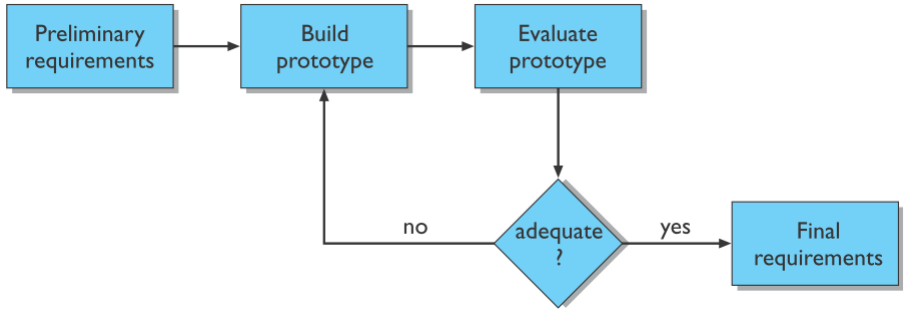
Characteristics of Prototypes



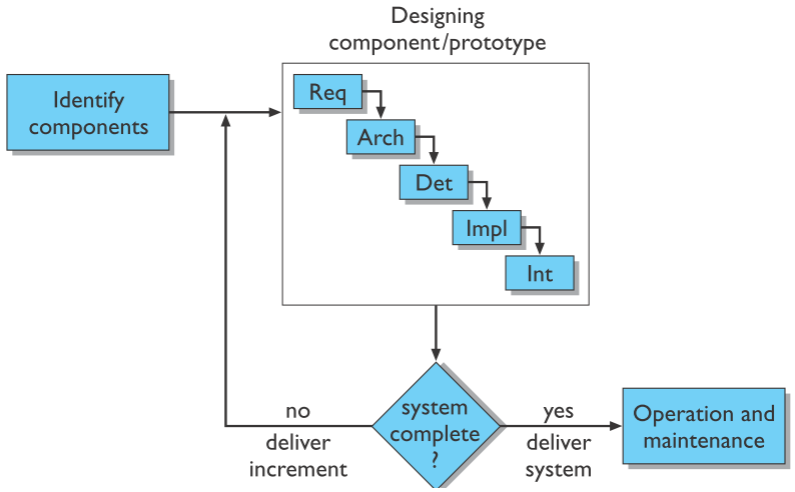


Durability (1)

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

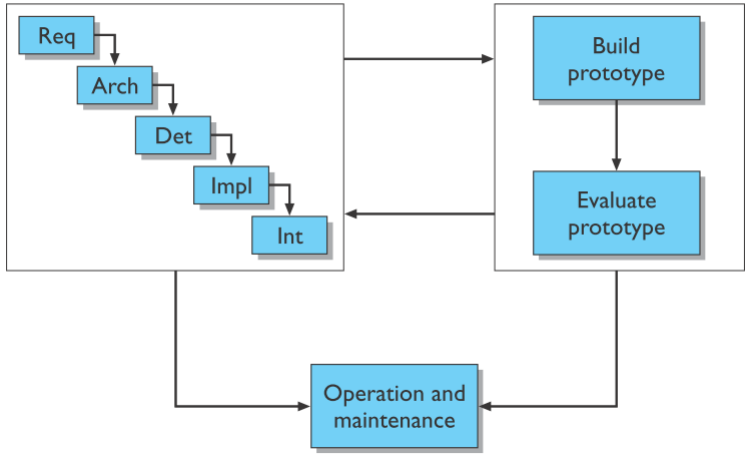


- **Incremental prototype:** the system is developed as incremental modules, each of them released in a separate step

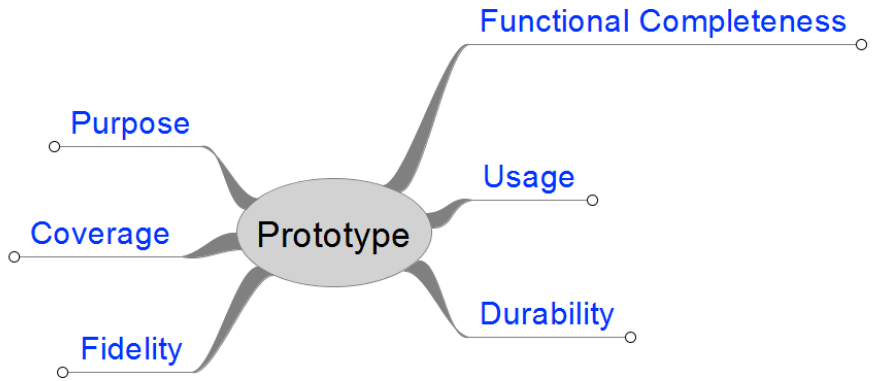


Durability (2)

- **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

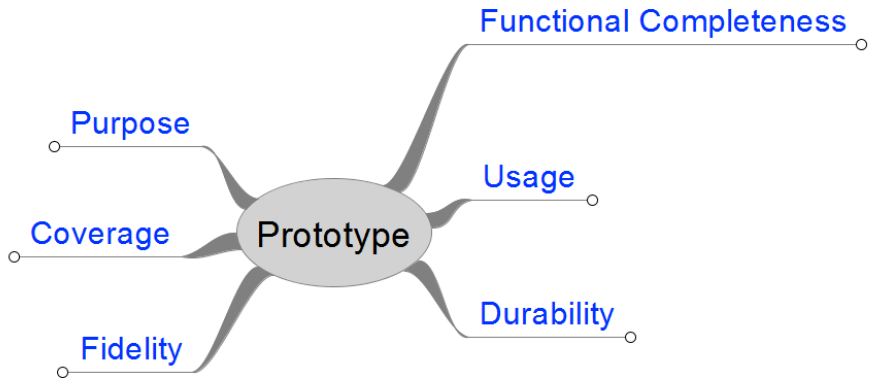
A prototype that models few features but with much detail

- 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



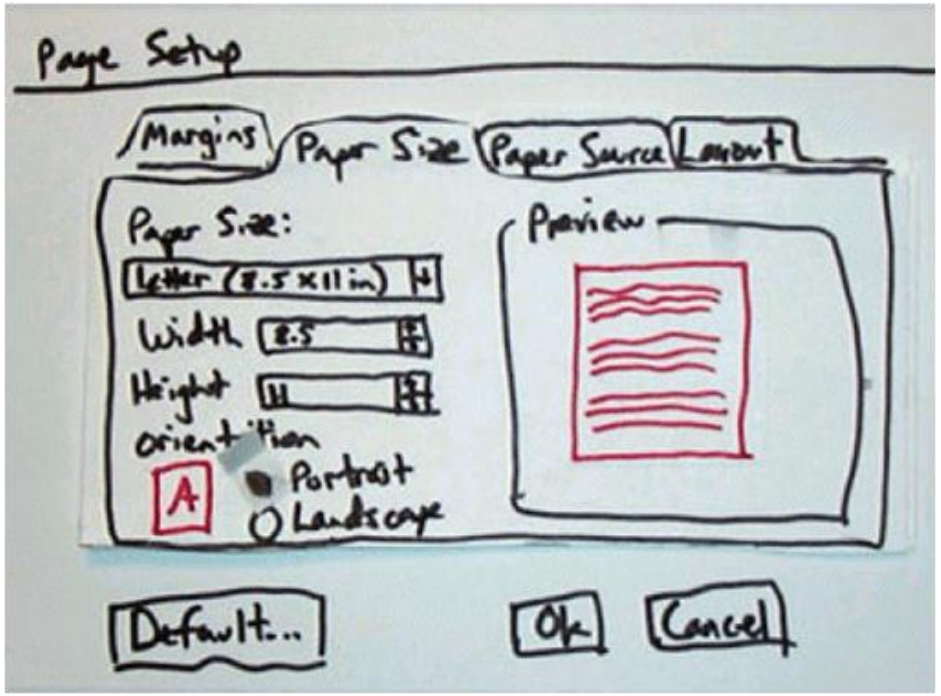
Fidelity

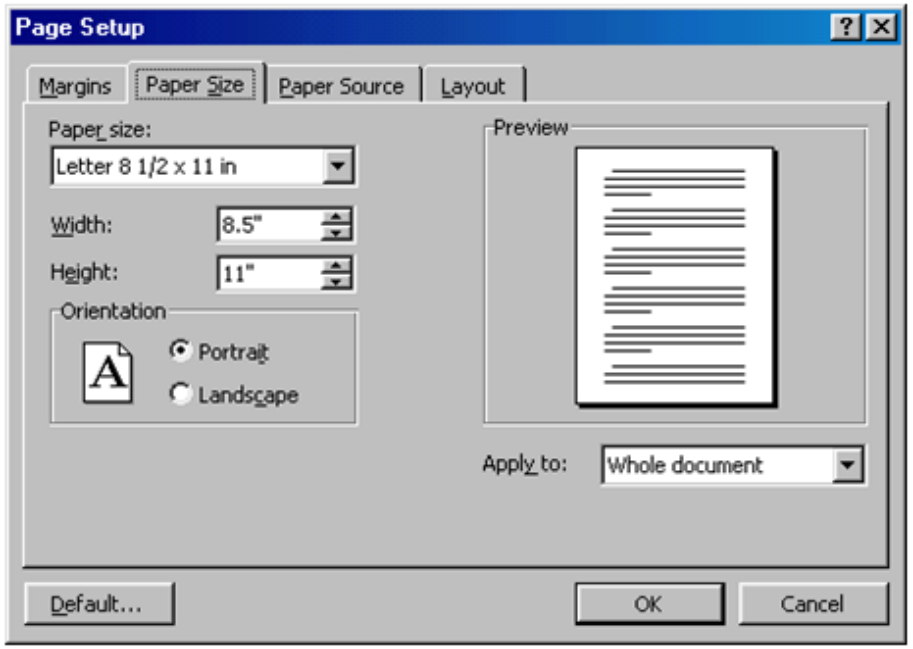
- **Low**: A set of drawings (e.g., storyboard) that provide a static, non-computerized, non-working mock-up of user interface for the planned system
- **High**: A set of screens that provide a dynamic, computerized, working model of the planned system

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





Paper 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

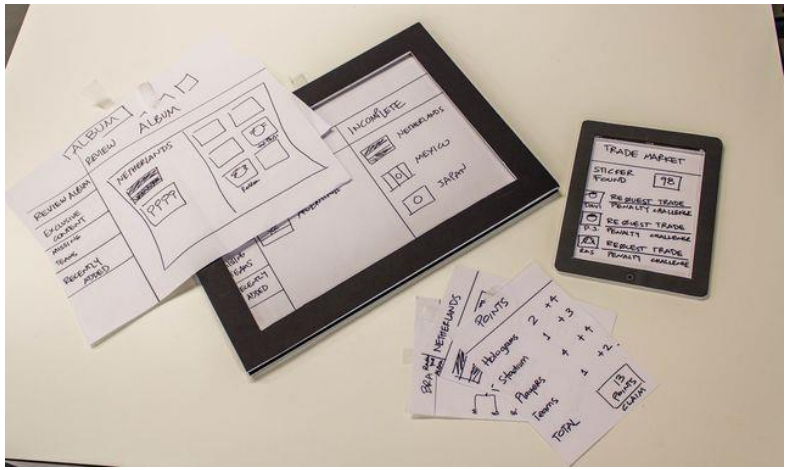
- Paper, Transparent paper
- Pens, Markers
- Post-It notes
- Glues, scotch tape, scissors
- Photocopies
- UI Stencils
- Reusable UI components
- Printouts of screenshots

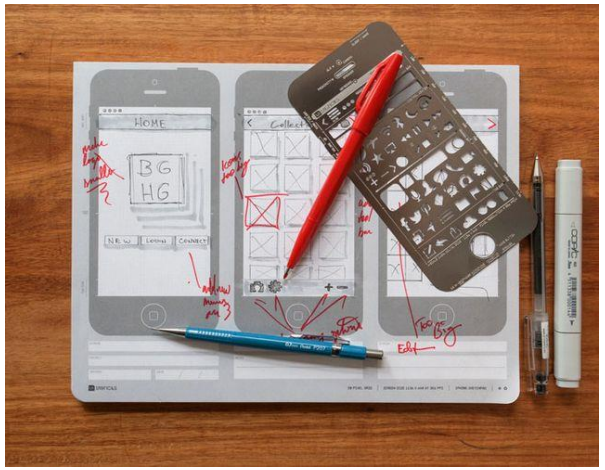
Why Paper Prototyping?

- 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
- Nonprogrammers can help
  - Only kindergarten skills are required

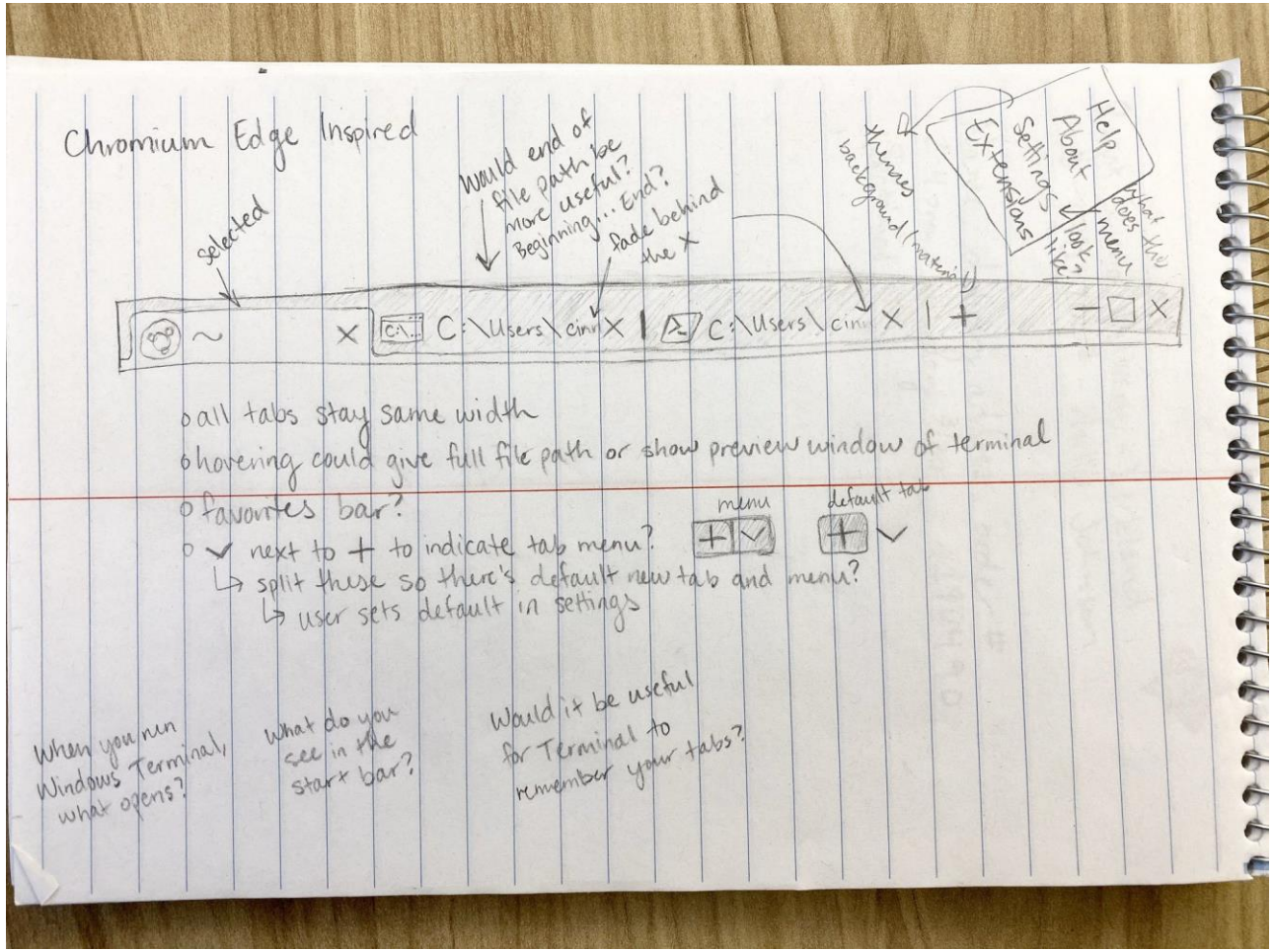
http://web.mit.edu/6.813/www/sp18/classes/11-prototyping/

Paper prototypes: examples



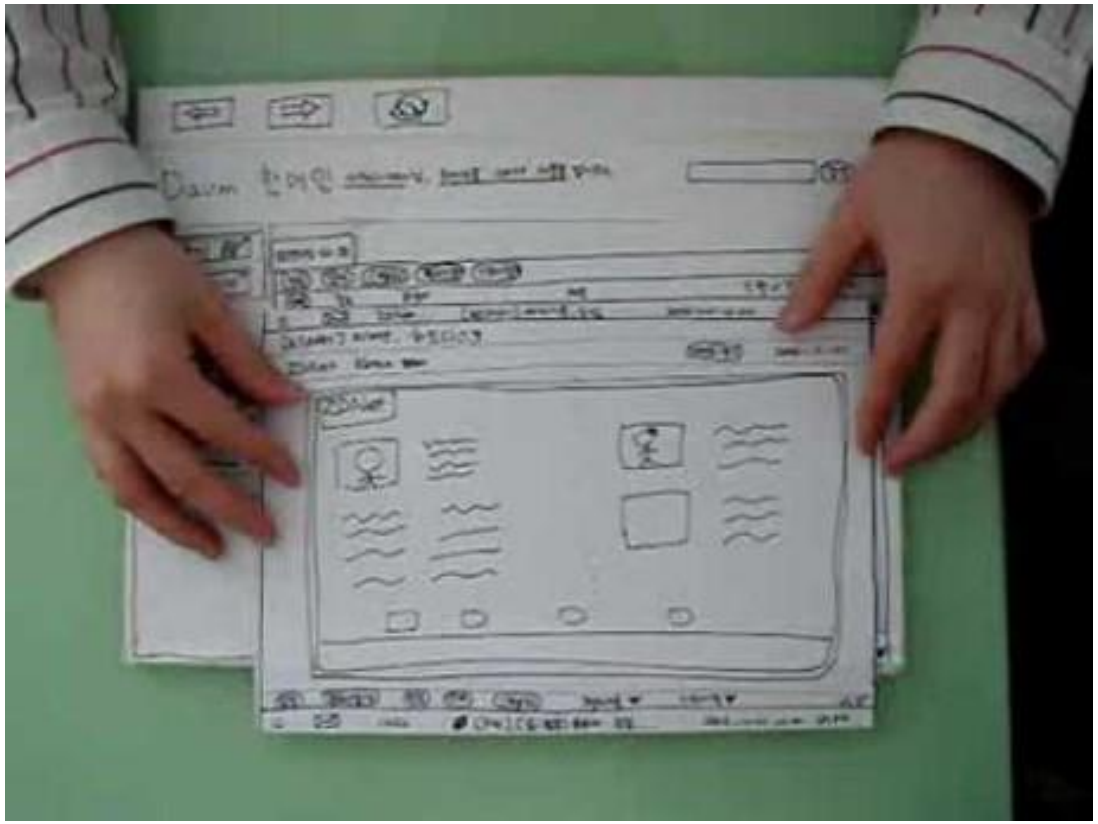


First ever mockup of the Windows Terminal tab bar



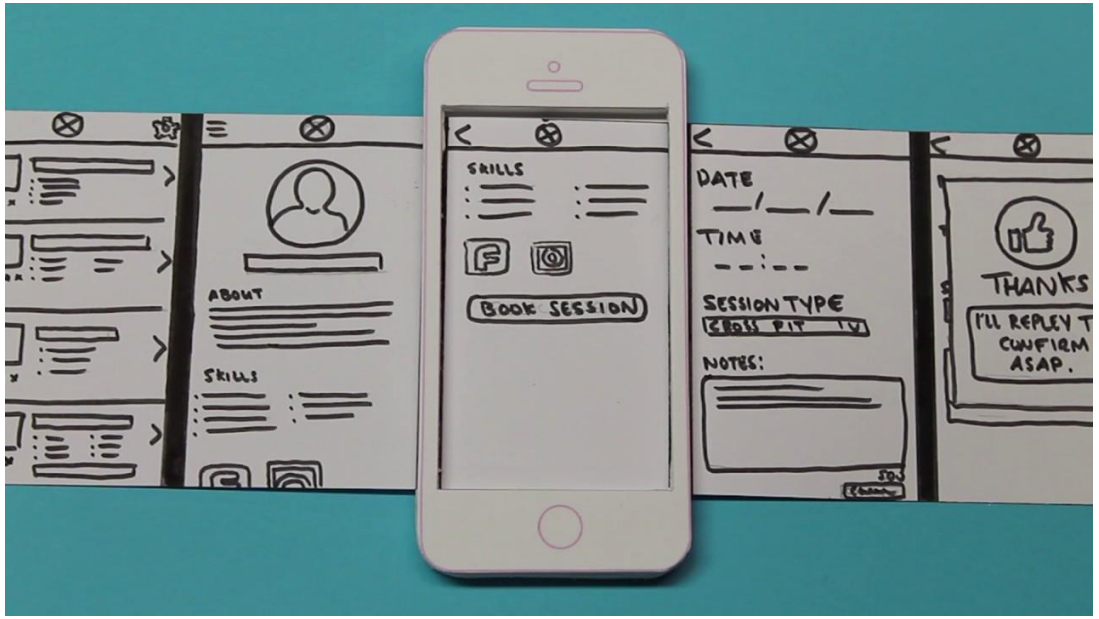
https://twitter.com/cinnamon_msft/status/1190015862201176065?s=20

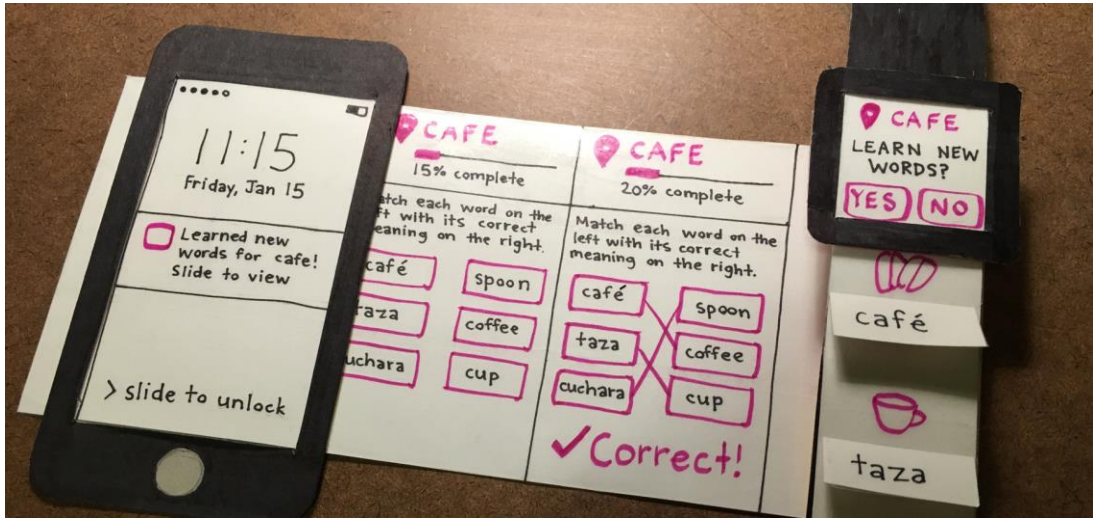
Creating flows with paper prototypes



https://youtu.be/GrV2SZuRPvo

“Dynamic” Screens





How to Test a Paper Prototype

- The Design Team should cover these roles
- ‘Computer’ actor
  - Simulates prototype
  - Doesn’t give any feedback that the computer wouldn’t
- 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?

Can't 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, 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

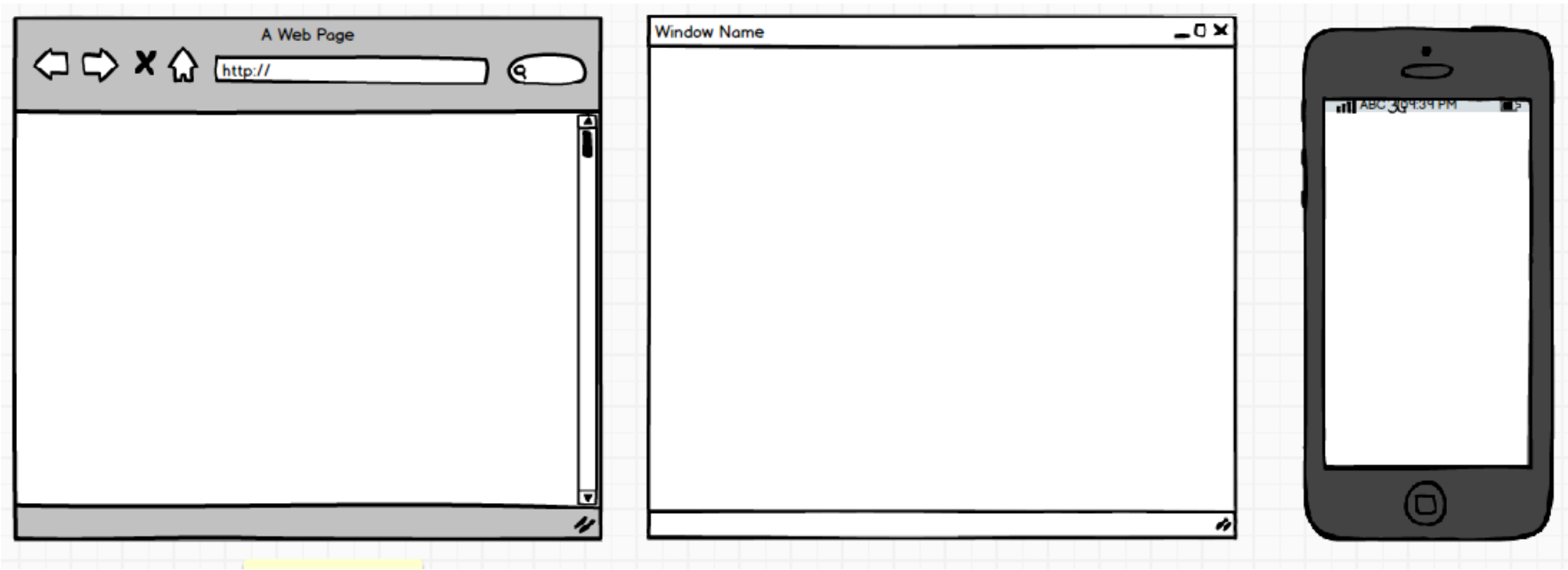
Computer prototypes

- 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

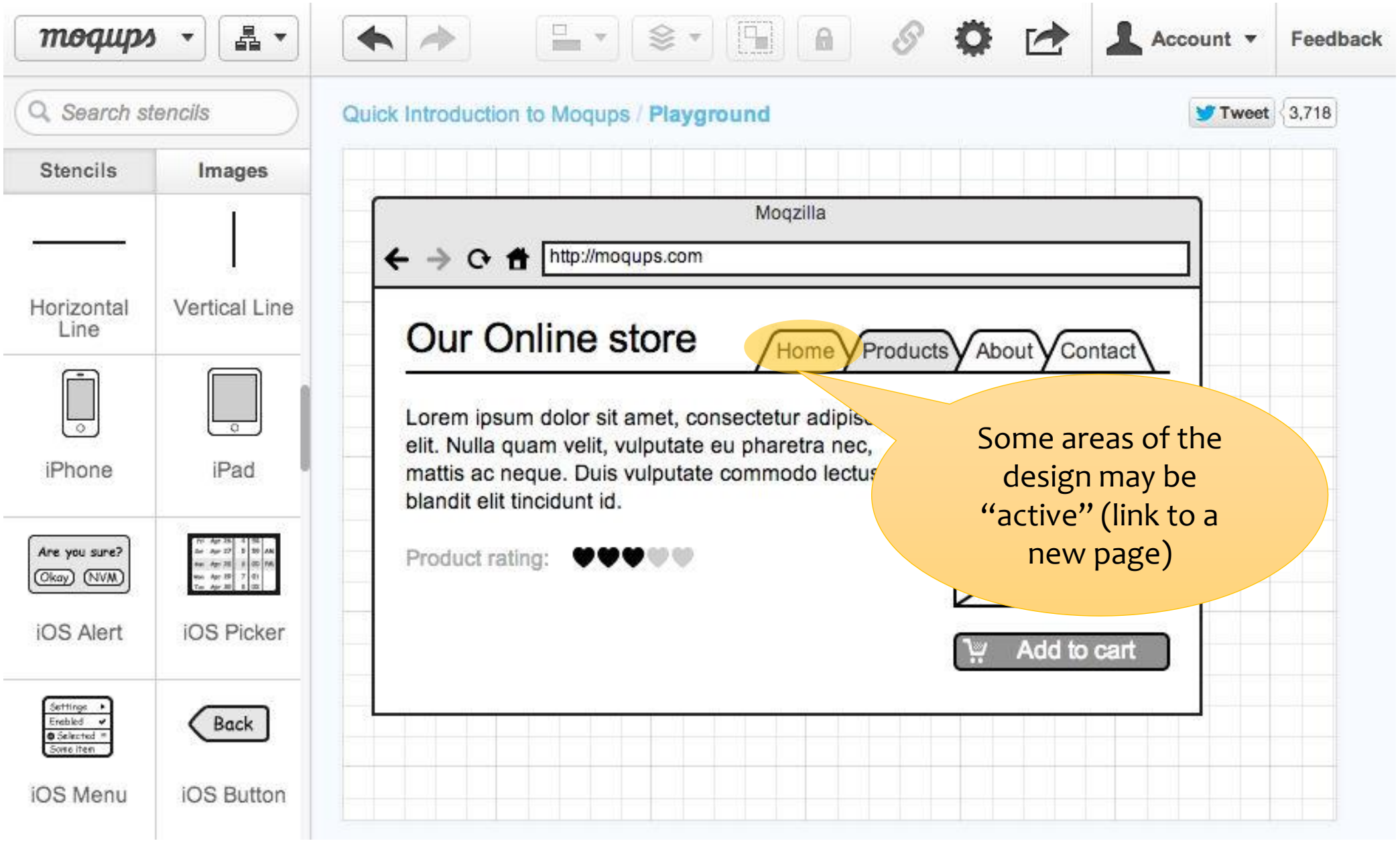
Medium-fidelity

- 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
  - Black and white
- Usually static information (predefined pages, only)
- May suggest user device

Wireframes for the 3 interfaces



Web Desktop Mobile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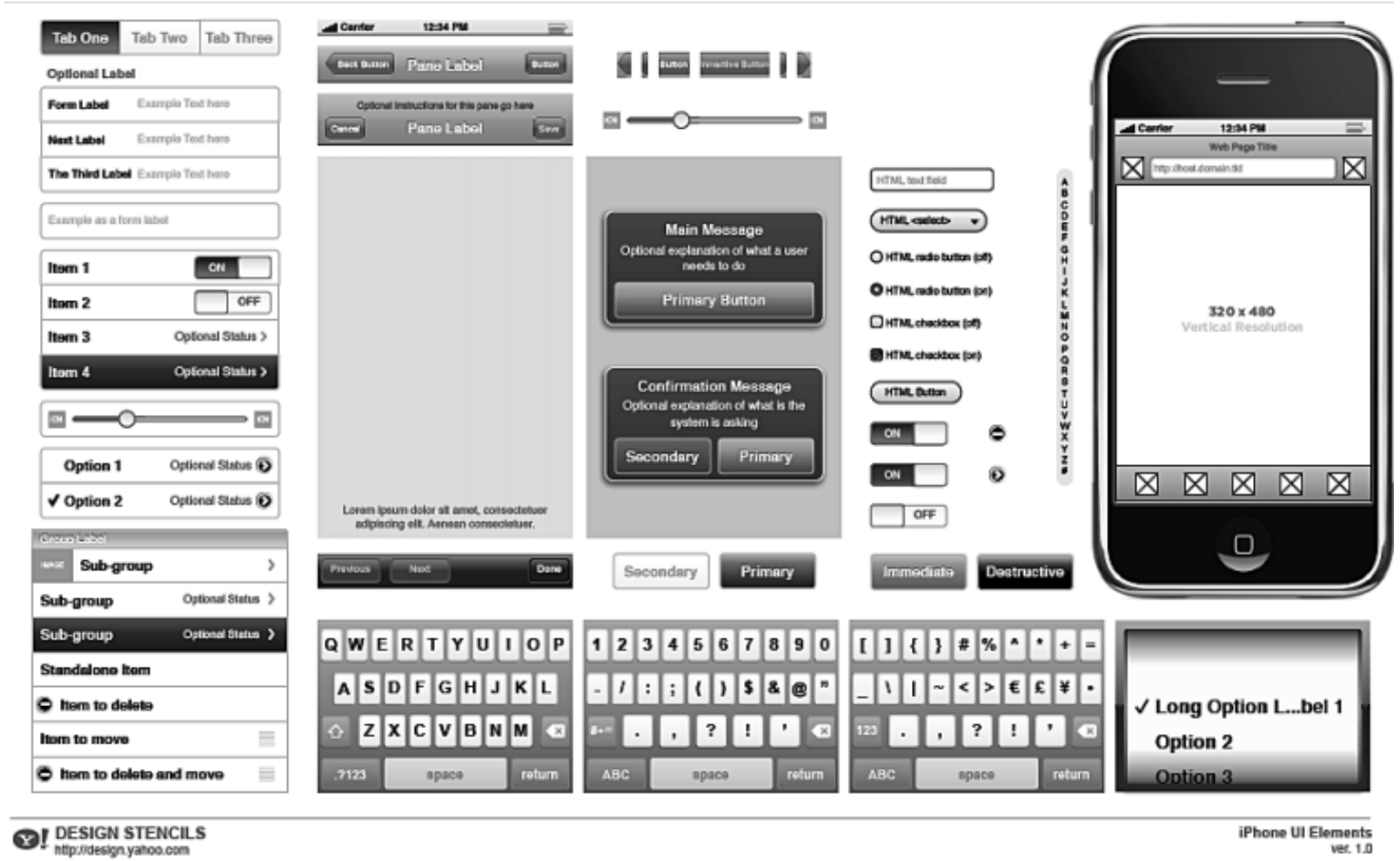
Product rating:
Add to cart
Some areas of the design may be "active" (link to a new page)

UI Design libraries

Stencils for UI elements



Some tools for wireframing

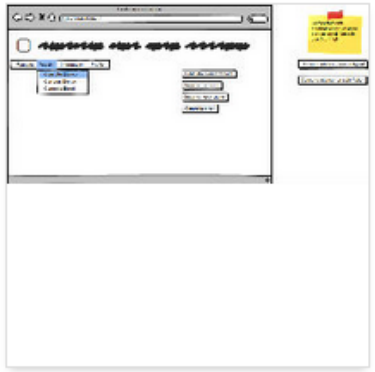
https://balsamiq.com/wireframes/
https://balsamiq.cloud/

https://moqups.com/

https://www.mockplus.com/

https://gomockingbird.com/

Example

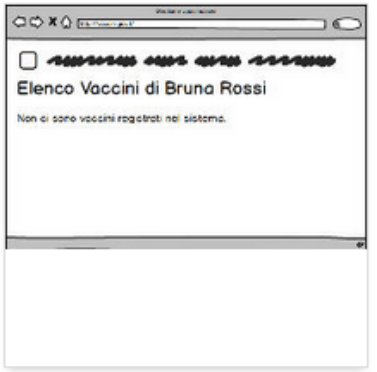


Step 1 e B-Step 1

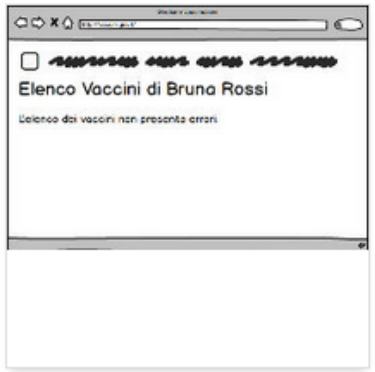
Step 2 3

Step 4 5a

Step 2a



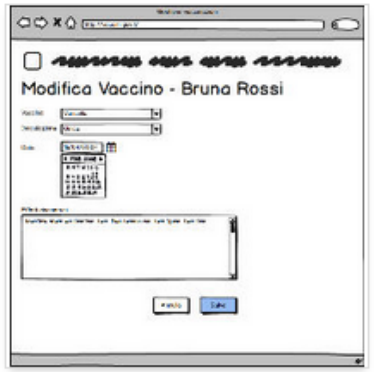
Step 4b



B-Step 6

B-Step 5a1 5a2

B-Step 5a3 5a4



B-Step 5c1 5c2

B-Step 5c3 5c4

Powerpoint-based Interactive mockups

Wireframing 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

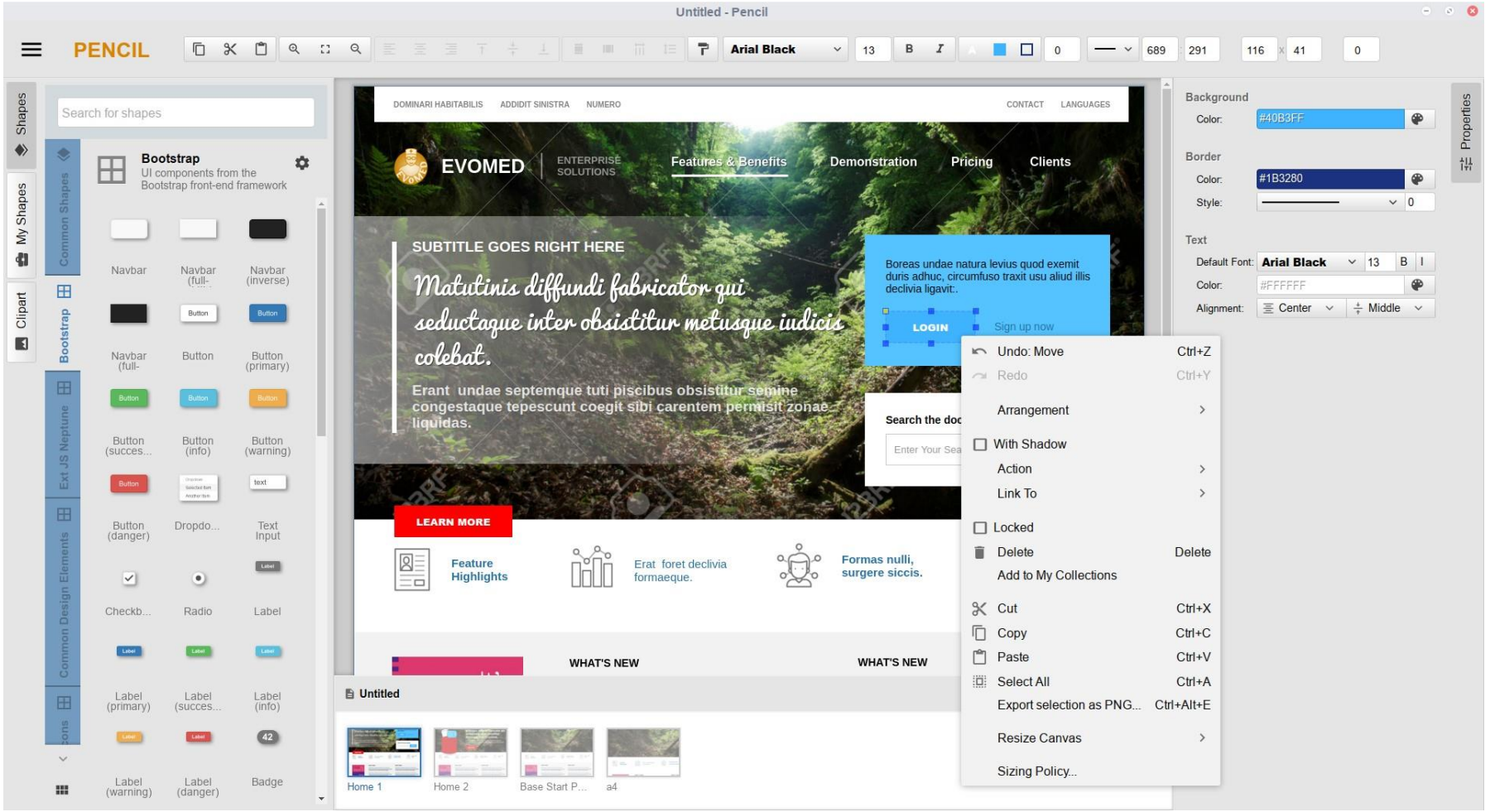
Hi Fidelity Prototypes

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

Hi-Fi Prototypes (Digital Mock-ups)

- 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

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

https://www.invisionapp.com/

https://www.figma.com

https://froont.com/

https://webflow.com/

https://principleformac.com/

Wizard-of-Oz techniques

Faking a technology, or filling-in for missing functionality

Goal

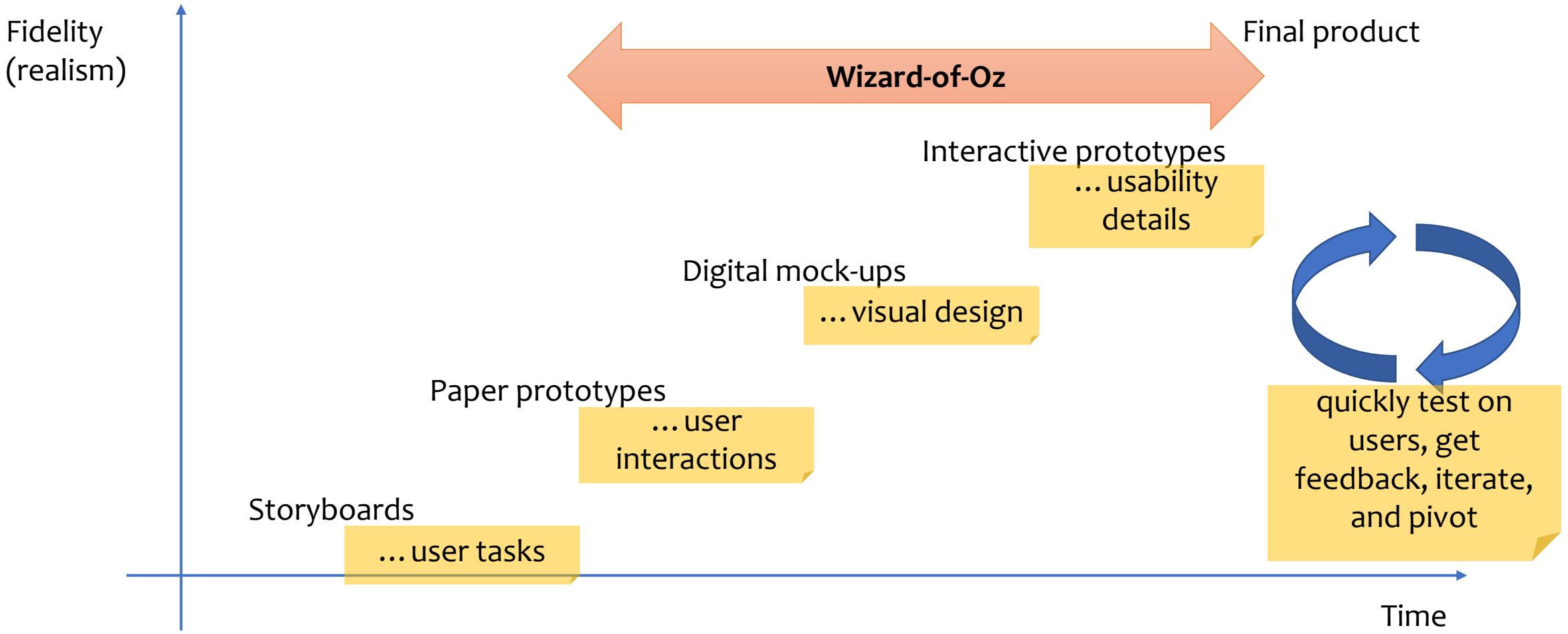
- How to test an application that is really complete…
  - With finalized user interface
  - With finalized algorithms
  - Also including stuff that we still aren't able to implement
- …but without actually writing the code
  - Except for a semi-interactive 'dumb' prototype

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

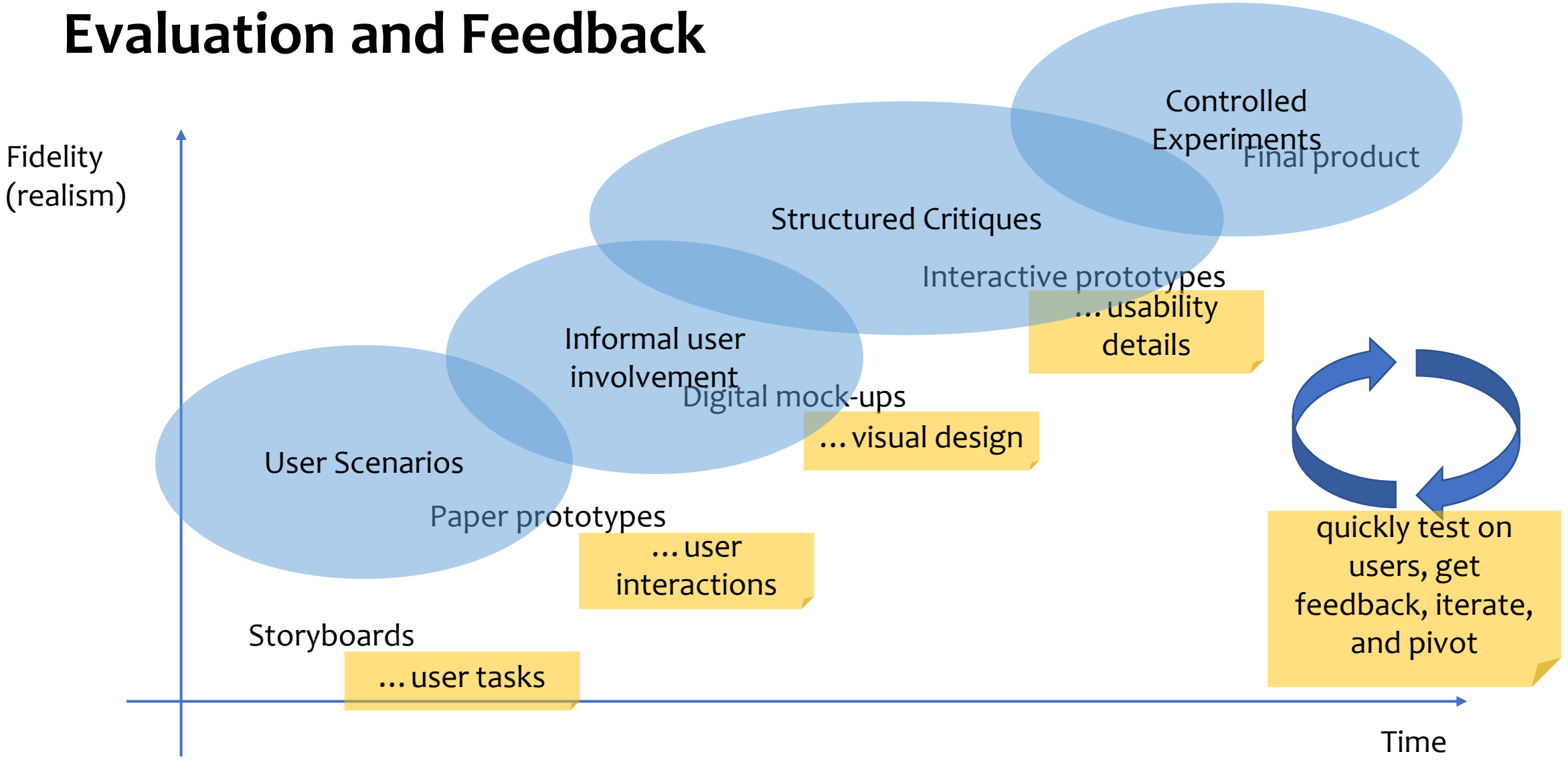
Risks

- 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 2 researchers

Wrap-up

Many different techniques, applicable to different goals and contexts

Evaluation and Feedback



References

- 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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