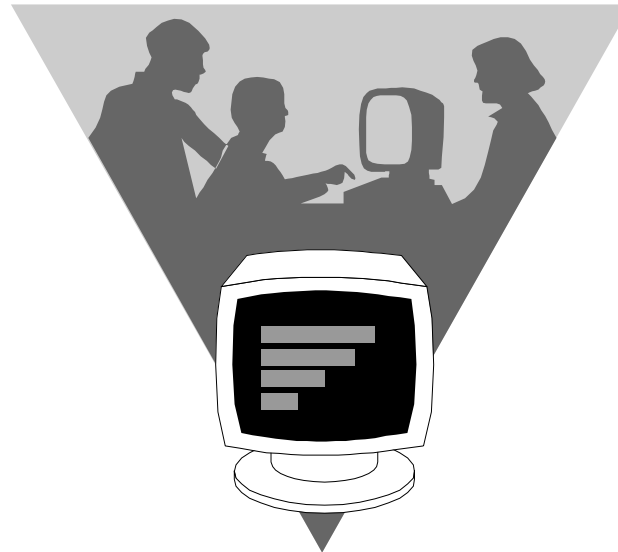


Lecture 12: Prototyping

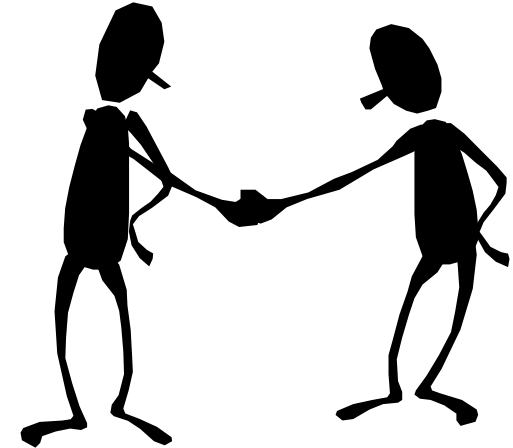
System Centered Design

- What can I easily built on this platform?
- What can I create from the available tools?
- What do I as a programmer find interesting?



User Centered System Design

- Design is based upon a user's
 - Abilities and real needs
 - Context
 - Work
 - Tasks
 - Need for usable and useful product



Golden rule of interface design: ***Know The User***

User Centered System Design

- ... is based on understanding the domain of work or play in which people are engaged and in which they interact with computer ...
- Assumption
 - The result of a good design is a satisfied customer;
 - The process of design a collaboration between designers and customers. The design evolves and adapts to their changing concerns, and the process produces a specification as an important byproduct;
 - The customer and designer are in constant communication during the entire process

Methods for involving the user

- At the very least, talk to users
 - surprising how many designers don't!
- Contextual interviews + site visits
 - interview users in their workplace, as they are doing their job
 - discover user's culture, requirements, expectations,...

Methods for involving the user (2)

- Explain designs
 - describe what you're going to do
 - get input at all design stages
 - all designs subject to revision
- Important to have visuals and/or demos
 - people react far differently with verbal explanations
 - this is why prototypes are critical

What is a prototype?

- For users to effectively evaluate the design of an interactive product, designers must produce an interactive version of their ideas, this activity is call **prototyping**.
- In other design fields, a prototype is a small-scale model:
 - a miniature car
 - a model of a building

What is a prototype? (2)

- In **interaction design** it can be
 - a series of screen sketches
 - a PowerPoint slide show
 - a video simulating the use of a system
 - a lump of wood, e.g. hand-held computer
 - a cardboard mock-up
 - a piece of software with limited functionality

Why Prototype?

- Evaluation and feedback: allows stakeholders to interact with an envisioned product, to gain some experience of using it in realistic settings and to explore imagined uses;
- Communication among team members: clarifies vague requirements;
- Validation of design ideas: test out the technical feasibility of an idea;
- Choosing between alternatives: provides multiple designs for the application

What to prototype?

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

Fidelity for Prototypes

- **Fidelity** means how closely the prototype looks and acts like the finished product.
- The proper fidelity level will focus the feedback you receive on the proper aspect of the design, so select your fidelity based on your goal for the prototype.

Fidelity for Prototypes (2)

- The prototyping process usually benefits from starting with **a low fidelity and slowly increasing the fidelity level** until most of your assumptions are tested and either proved or fixed.
- By choosing the proper fidelity, or by creating a mixed fidelity, for your point in the process and the goal of the prototype, you'll save time and get the proper feedback you need to improve your ideas.

Low-fidelity Prototyping

- Low-fidelity prototypes are best for
 - testing your core concepts;
 - getting over initial fears;
 - thinking through many ideas; and
 - catching potential problems before they get too big to fix.
- This type of prototype doesn't look like your final product at all; it's in a different medium, at a different size, and **is usually not visually designed**

Low-fidelity Prototyping (2)

- Does not look very much like the final product
- Uses materials that are very different from the intended final version, such as paper and cardboard rather than electronic screens and metal, e.g. palm pilot
- Used during early stages of development
- Cheap and easy to modify so they support the exploration of alternative designs and ideas
- It is never intended to be integrated into the final system. They are for exploration only.

Example of Low-fidelity prototyping

- Storyboards
- Sketching
- Index cards
- ‘Wizard of Oz’

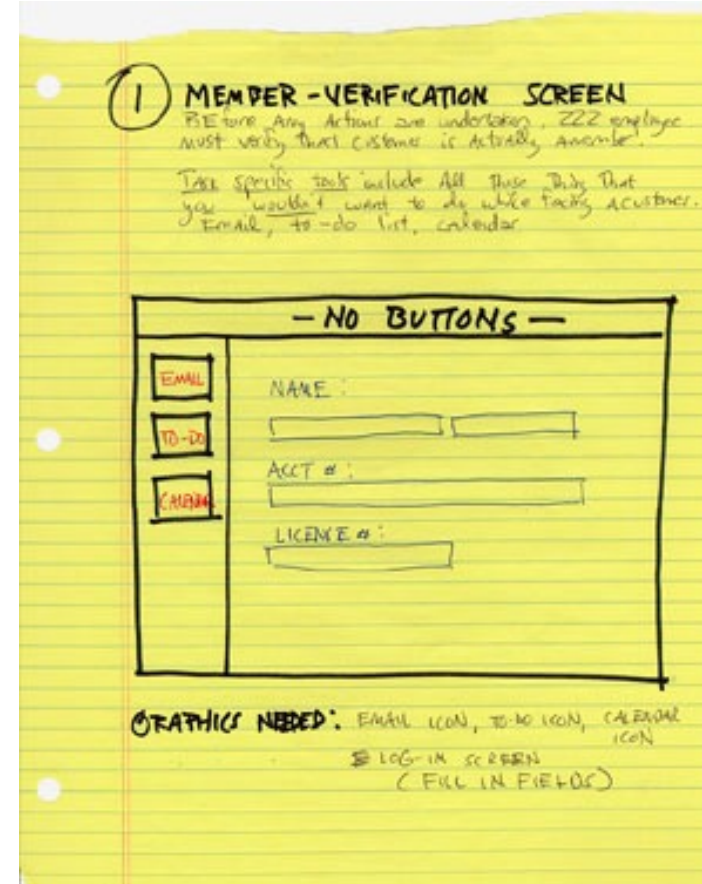
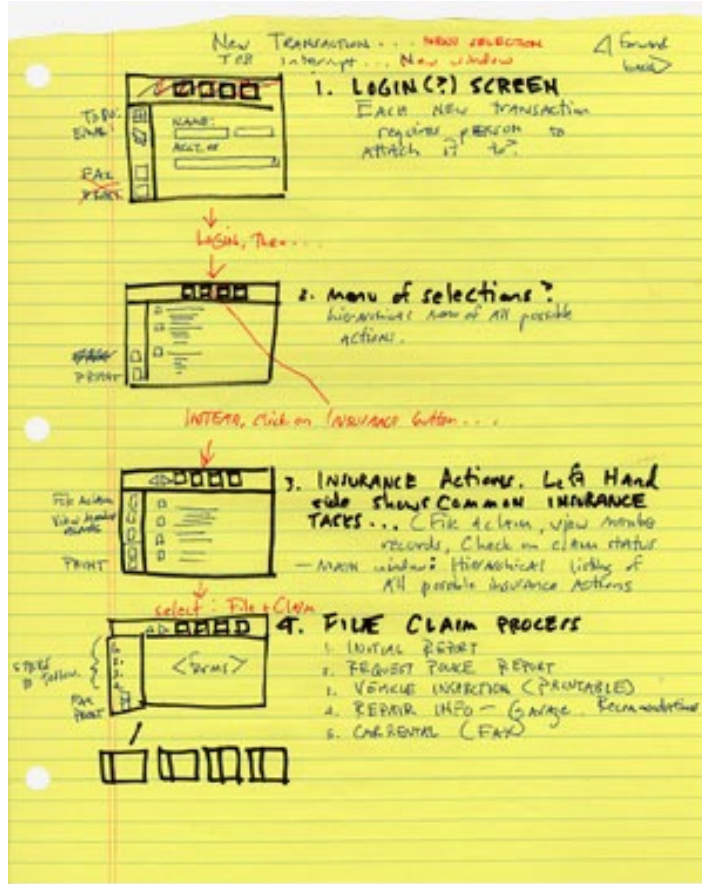
Storyboard (2)



Storyboard

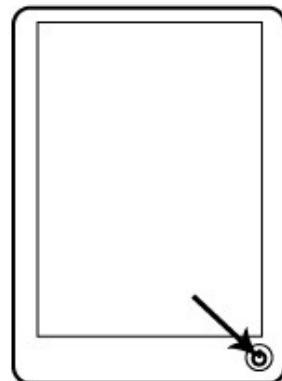
- Snapshots of the interface at particular points in the interaction;
- Series of sketches
 - Shows how a user can perform a task using the device
- Often used with scenarios
 - Brings more detail to the written scenario;
 - Offers stakeholders a chance to role play with the prototype, by stepping through the scenario;

Storyboard Example 1

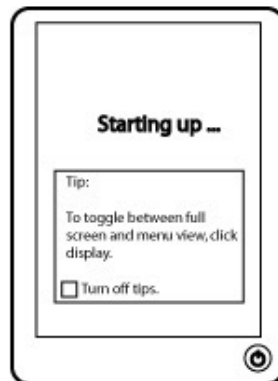


Storyboard Example 2

Storyboard 1
Task: User plays a streaming video



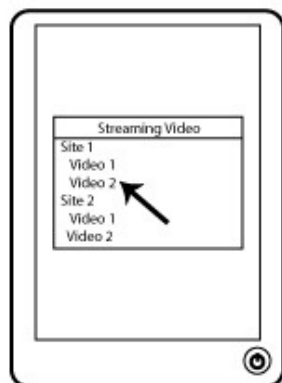
User pushes power button to turn device on.



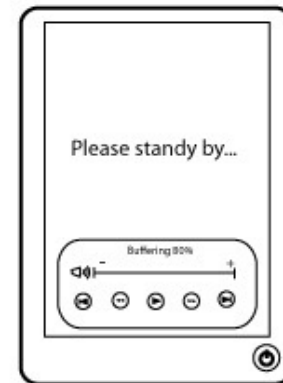
Device is in startup mode.



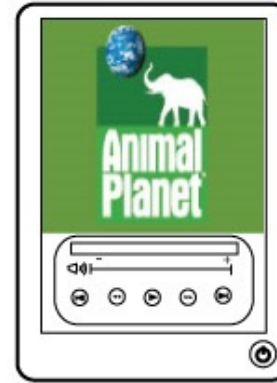
Main Menu appears and user clicks "Streaming Video."



Streaming Video menu appears and user clicks an item from the list.



Video player buffers streaming content.



Video player application starts and streaming video is played.

Sketching

- If you have a core idea for the flow of your product, you can begin to draw out the interface your user needs to accomplish their goals.
- Go through each step of your user flow and sketch out the different components and a few ideas of how they will be organized
- **Drawing skills are not critical**
 - symbols to indicate tasks, activities, objects
 - flowcharts for time-related issues
 - block diagrams for functional components

Sketching example

Sketch of a movie listing form:

Movies

Theater: Shattuck Cinemas
Phone: (510) 665-1342 Dist: 1.5 mi.
Address: 2122 Shattuck Ave
Berkeley, 94709
Cost: \$8.50 normal, \$6.00 senior, \$4.50 matinee

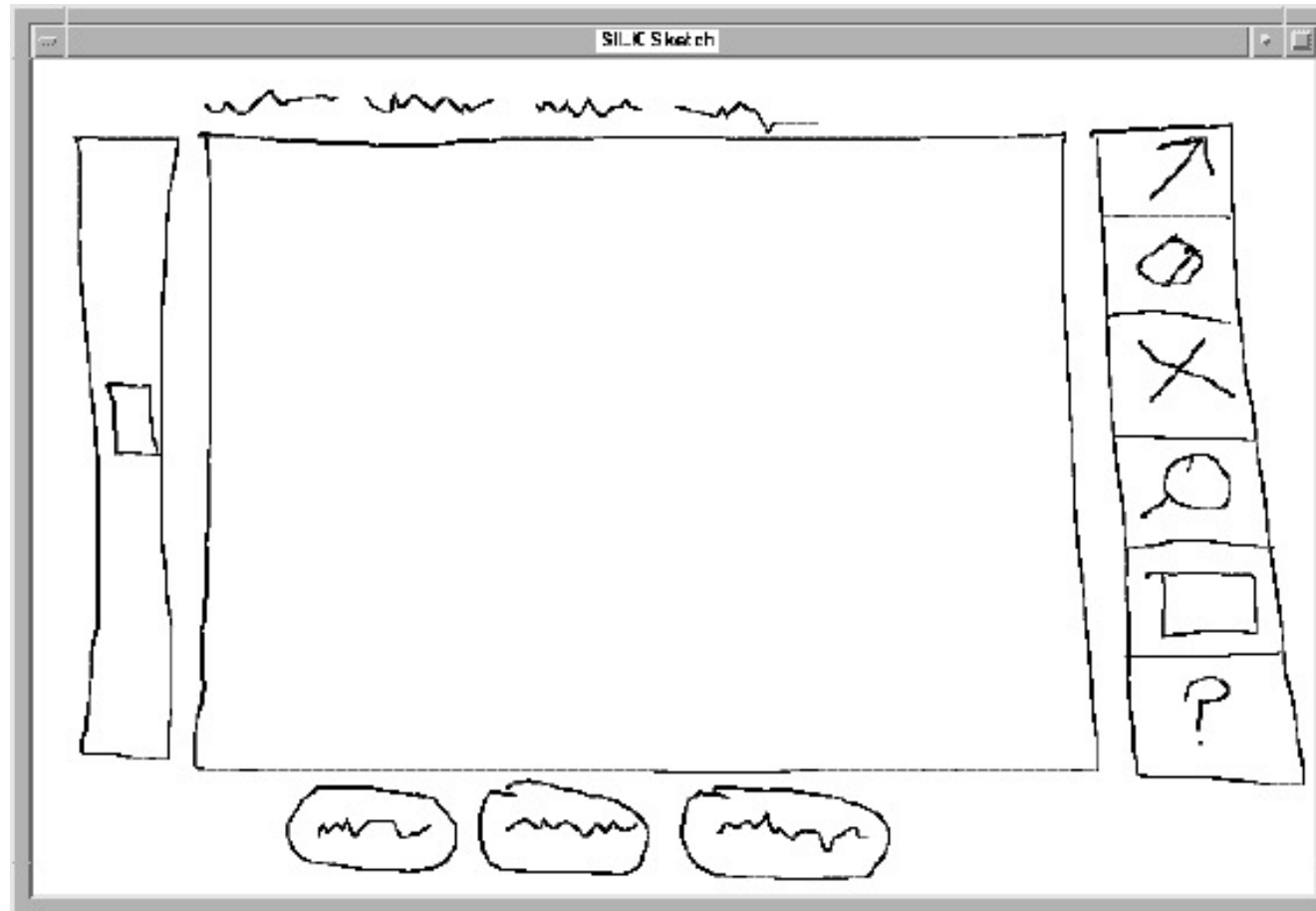
Map-I+

<u>Art of War</u>	☆☆☆
(10:00)-(1:00)-4:00-7:00-10:00	
<u>Bittersweet Motel</u>	☆☆☆☆
(11:00)-(1:30)-4:00-6:30-9:00	
<u>Godzilla</u>	☆☆
(10:30)-(2:00)-5:30-9:00	
<u>The Cell</u>	☆☆☆☆
(11:00)-(1:00)-3:00-5:00-7:00-9:00	

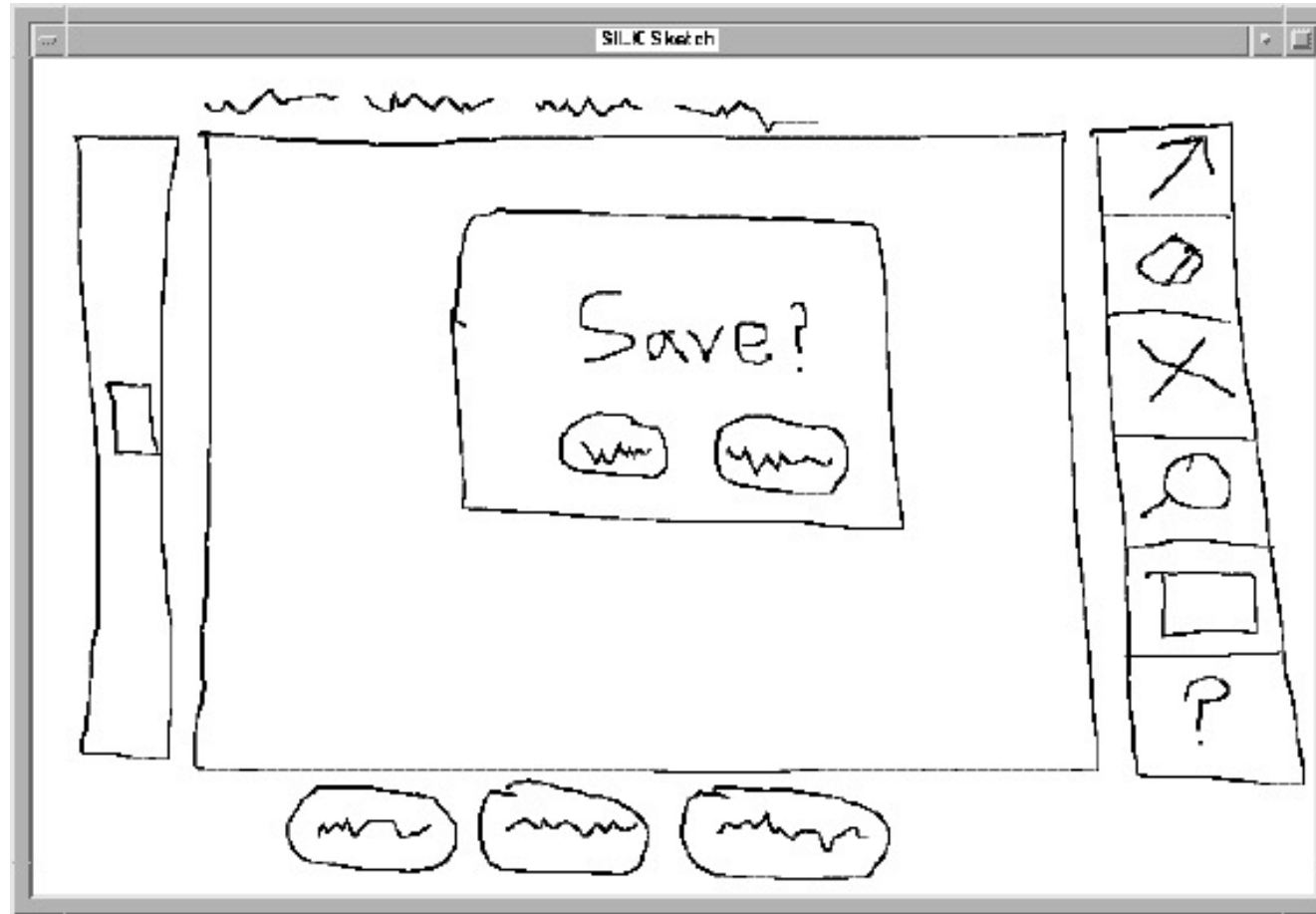
Index Cards

- Small cards (3 X 5 inches)
- Each card represents one screen
 - multiple screens can be shown easily on a table or the wall
- Thread or lines can indicate relationships between screens like
 - sequence
 - hyperlinks
- Often used in website development

Index Card Example (Screen 1)



Index Card Example (Screen 2)



High-fidelity prototyping

- Choice of materials and methods
 - similar or identical to the ones in the final product
- Looks more like the final system
 - appearance, not functionality
- Common development environments
 - Macromedia Director, Visual Basic, Smalltalk,
 - Web development tools
- Misled user expectations
 - users may think they have a full system

Difference

- Low-fidelity prototype



- High-fidelity prototype

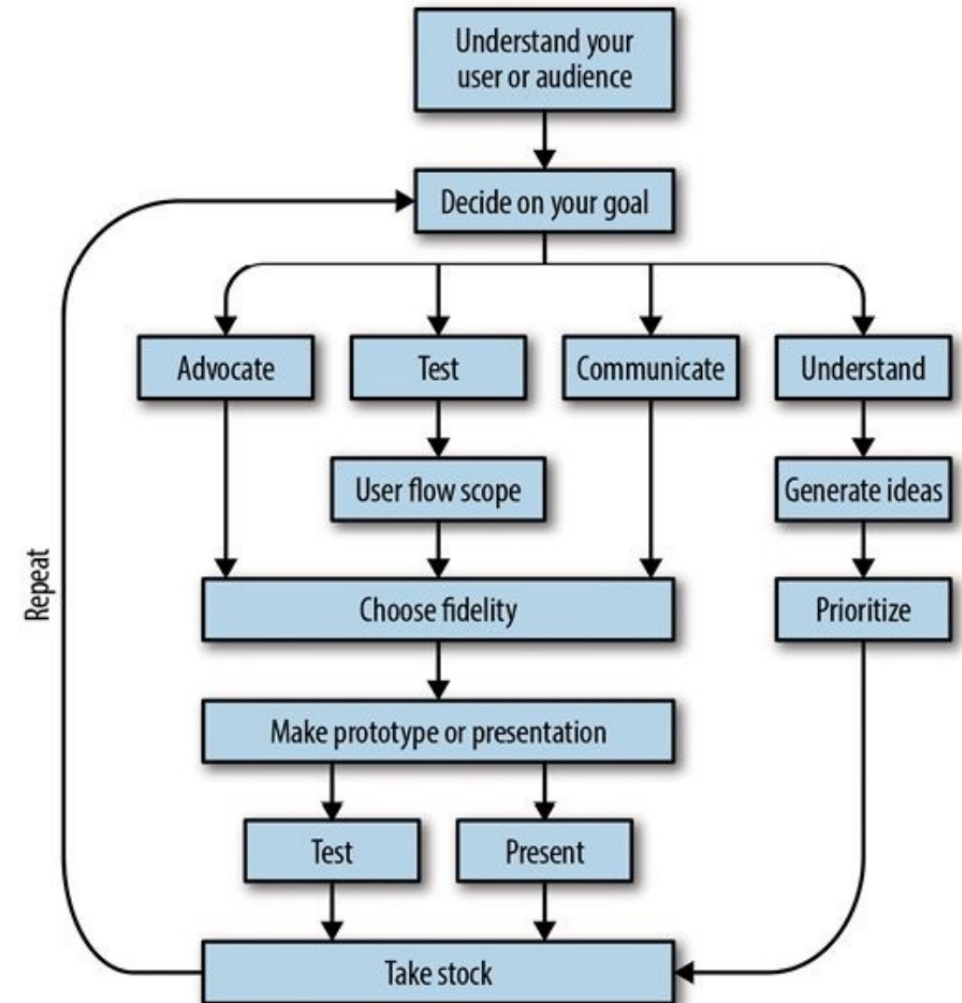


Advantages/Disadvantages

Prototype	Advantages	Disadvantages
Low-fidelity prototype	<ul style="list-style-type: none">- low developmental cost- evaluate multiple design concepts	<ul style="list-style-type: none">- limited error checking- navigational and flow limitations
High-fidelity prototype	<ul style="list-style-type: none">- fully interactive- look and feel of final product- clearly defines navigational scheme	<ul style="list-style-type: none">- more expensive to develop- time consuming to build- developers are reluctant to change something they have crafted for hours

The Process of Prototyping

- Your prototyping process will take a slightly different path depending on the purpose for each prototype, and the process can vary depending on your goals, audience, and assumption



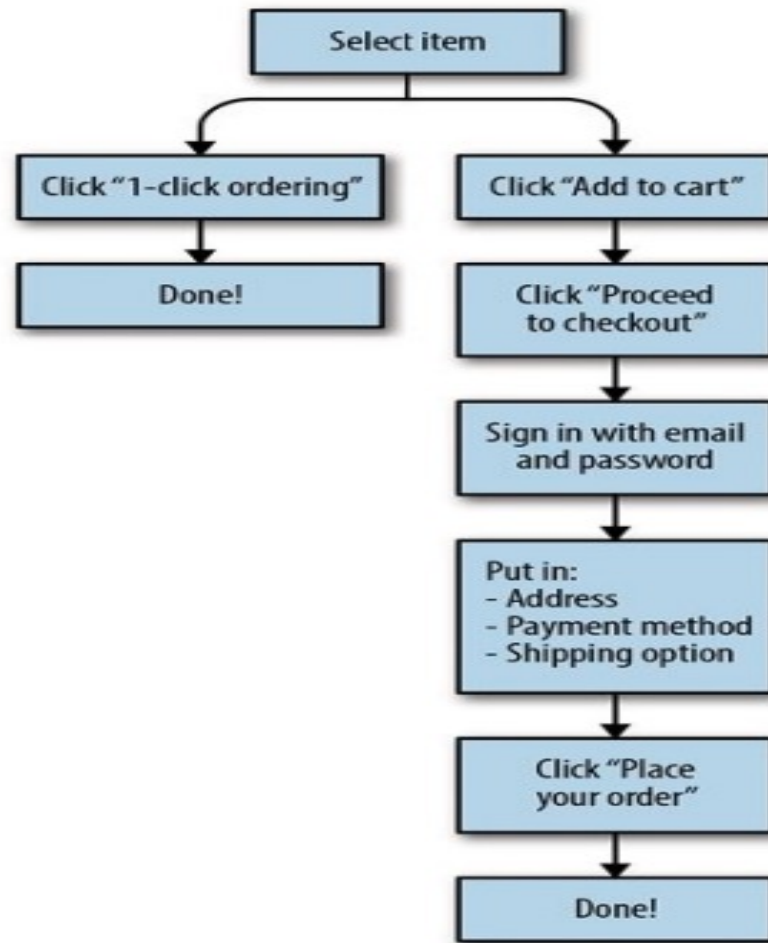
Minimum Viable Prototype

- A minimum viable prototype is the least amount of effort and a generalized approach to building a prototype.
- It will be the first step to becoming more comfortable with incorporating prototyping into your day-to-day work.

Minimum Viable Prototype (2)

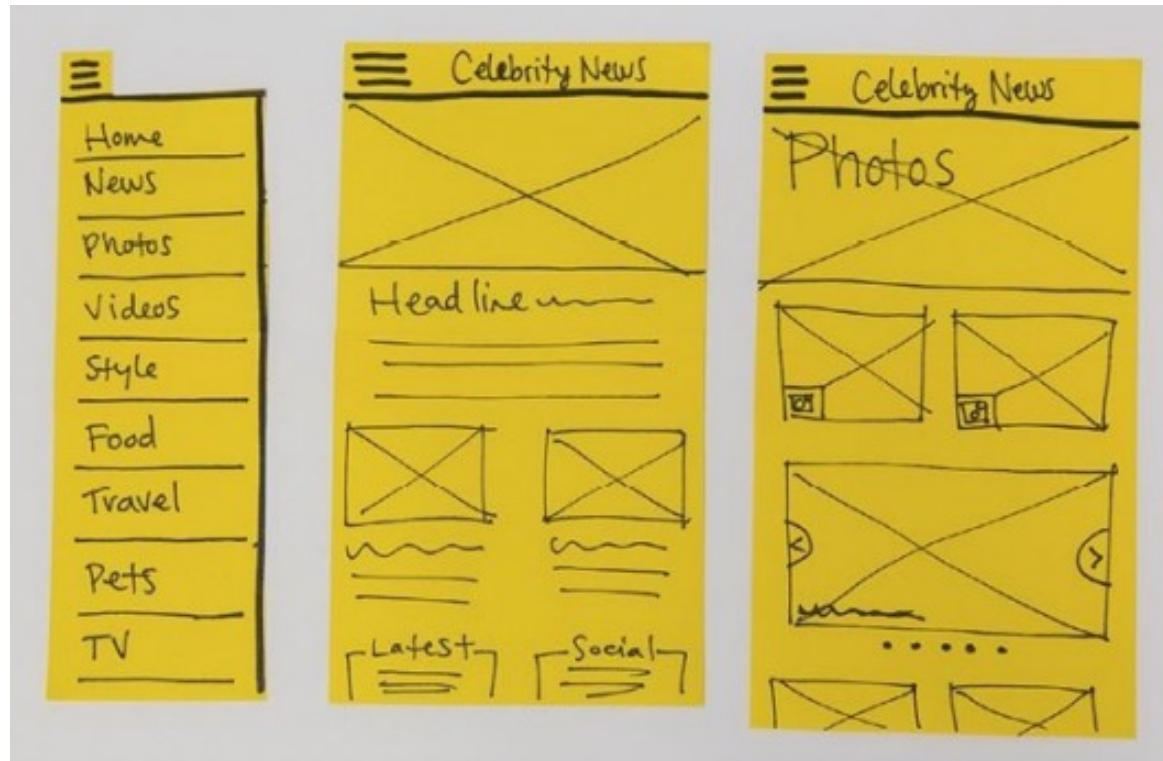
- STEP 1: Establish who your users are and identify their problem;
- STEP 2: Write out a user flow that solves their problem;
 - Now that you have a user, a problem, and a direction to solve it, you're ready to create the user flow that supports that direction.
 - A user flow is the journey the user takes to complete their goal. You can write it out in sentences, make a diagram, or draw it as a storyboard.

Minimum Viable Prototype (3)



Minimum Viable Prototype (4)

- STEP 3: Make the prototype to address the user flow



Minimum Viable Prototype (5)

- STEP 4: Test, take stock of results, and repeat
 - Write up your research plan, find a few users to test with, and observe what went well and what didn't. It's best to have an additional person help you with your user test so you can ask questions and they can take notes

Design Objectives

- Identify critical interaction aspects of the product
- Select the appropriate tools and methods to provide interactivity
- Realize that design of products usually involves several intermediate stages
- Consider the importance of early feedback for interaction design

Responsive Design

- If you're designing a web-based digital experience or a smartphone app, you must design it to be mobile-first and responsive. Smartphone browsing has exponentially increased in the last few years, and surpassed desktop browsing in 2014.
- With this in mind, it's crucial to **create prototypes for a variety of screen sizes, and even better to create responsive prototypes** that you can use to test both the desktop and mobile experience

Responsive Design (2)

- Responsive design means that as you increase the browser window or device size, the layout and design will change slightly to look and work the best at every screen size;
- To do this, you must choose **breakpoints** where, as you increase the size, the design breaks and looks terrible.
- At each breakpoint, you make minor changes to the layout of the design in order to have a good experience on any device. When you decide your breakpoints, try building and testing prototypes for each one.

Designing for Different Interaction Types

- With mobile and screen design comes the additional work of designing for touch and voice interactions.
- Some common gestures:
- Touch
 - Normal click or select, such as buttons. Have clickable elements in a different color or underlined as links to indicate that they are indeed buttons or selectable items, then follow through with the action that they would set off.

Designing for Different Interaction Types (2)

- Double touch, pinch open, and pinch closed
 - Typically used for zooming. Have a zoomed in and zoomed out version of the portion of your screen that is zoomable. When the user double touches or pinches, switch out that portion;
- Drag, swipe, or fling
 - Causes scrolling or dismissing of a notification. Have a longer piece of paper you can pull through the viewing pane to indicate a longer page, and have your notifications layered on the prototype so you can easily pull them off ;
- Two-, three-, or four-finger swipe
 - Can cause many different things. Decide what will happen and have additional screens for each scenario in case the user tries it.

Designing for Different Interaction Types (3)

- Two-finger tap
 - Typically zooms or opens “right-click menu” in macOS. See double touch for the zoom, or have the right-click menu available to put in frame if the user “right-clicks.”
- Two-finger press and rotate
 - Have the element be separate in the frame so that you can rotate it, or let the user rotate it normally.
- Hard touch (3D touch on iOS)
 - Causes extra menus to open. Have a quick actions pop-up menu ready or content preview to put into frame upon hard touch.

Designing for Different Interaction Types (4)

- Long press and swipe
 - Pick up and move. Have any moveable object be separate pieces of paper that can be dragged around by the user.
- Pull down at top
 - Choose what this action does for you, then show refresh screen (like Snapchat) or additional menu (like many websites).
- Edge swipes
 - Have any menus or additional screens ready to go so that you can put them in frame

Accessibility

- You should consider all types of users when you're designing software, web apps, or smartphone apps.
- **Accessibility** refers to designing **an interface that anyone can interact with**, no matter the device or assistive technology they use or their ability level.
- Some common design considerations include users with **visual**, **auditory**, **physical**, **speech**, or **cognitive impairment**; users with **color blindness**; and users using assistive technology such as **screen readers** and **keyboard-only inputs**.

Accessibility (2)

- For visual impairment and color blindness, the consideration for your design and prototypes is to test your contrast ratios and color choices, which you can do using the contrast ratio tool (<http://bit.ly/2hMgVo6>) ;

Accessibility (3)

- Color blindness specifically occurs in a green-type, red-type, and blue-type. The most common are green and red, and 8% of men worldwide have some form of color blindness. Fewer women do; about 4.5% of the entire world population have it. Try to avoid a few color combinations that directly affect those with color blindness; especially green and red, green and brown, blue and purple, and green and blue.

Accessibility (4)

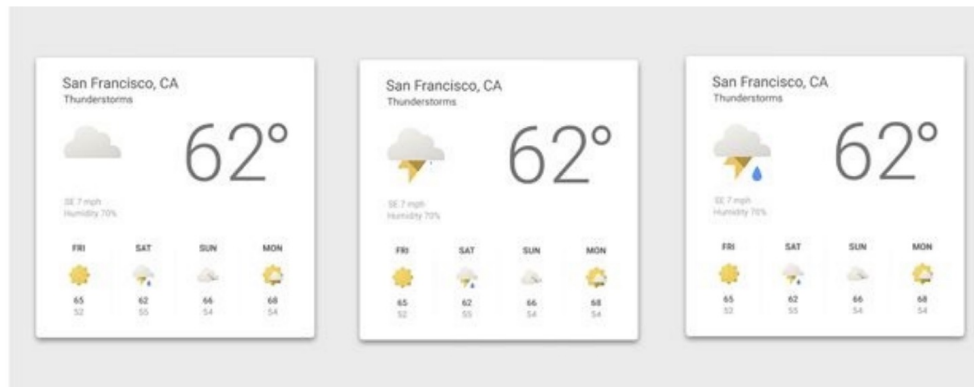
- Screen readers and keyboard-only inputs are another specific way that users interact with software.
- A screen reader converts the text and images of your page into synthesized speech and outputs it as audio. It may be used by someone who is blind, or heavily vision-impaired.

Animations

- Both physical and digital products have many interactive elements to test, but animation and motion are a necessary consideration for digital products specifically.
- Motion in an interface adds context and overall ease of understanding for users. It connects user actions to the system's outcomes, creating behavior definition and choreography through the experience.

Animations (2)

- As users move through your product, they can interpret motion as the intuitive body language of your design. It helps your users build their mental model of the product and adds personality to reinforce the brand identity.
- The motion that occurs between two screens is an opportunity to direct your user to the most important aspect of the next page.



Prototyping Tools

Name of Tool	Fidelity	User Testing	Pros	Cons
Axure	Medium-high	Average	Create complex interactions, works with any digital format, expansive library of widgets to build out screens	High learning curve, difficult to use existing mocks
Balsamiq	Low	Low	Quick, low-fidelity prototypes	Limited functionality and motion options
Framer	High	Average	High-fidelity animation and interactions, can import Sketch or Illustrator files	Code-based, steep learning curve

Prototyping Tools (2)

Name of Tool	Fidelity	User Testing	Pros	Cons
HotGloo	Low	Low	Good library of UI elements	No import options, no animation support
Indigo Studio	Medium	Average	Gesture-based interactions, can prototype any digital format	Doesn't import mock-ups, just images, moderate learning curve
InVision	Medium-high	Good	Easy to learn, great feedback and sharing system, easy to import from Sketch or Illustrator	No features for creating elements, must have file from other program, hotspots only

Prototyping Tools (3)

Name of Tool	Fidelity	User Testing	Pros	Cons
Justinmind	Medium	Good	Good animation and gesture tools, stimulates final device for testing	Moderate learning curve
Keynote	Medium	Medium	Low-skill animation prototyping	Limited functionality, not built specifically for prototyping
Marvel	Medium	Good	Easy to learn, fast to build with existing mocks, basic animations	No features for creating elements, limited interactions, hotspots only

Testing Prototypes with Users

- Planning the Research
 - The first step for successful user testing is to create a **research plan** that includes
 - exactly what assumptions you want to test,
 - the goal of the research,
 - a few basic questions to establish who the test subject is, and
 - the questions you need to ask or the tasks the user needs to accomplish to test the assumptions;

A SAMPLE RESEARCH PLAN

Goals and assumptions

Determine if a user can discover and choose a new meditation

Assume that they will find the catalog of meditations in the menu and will be able to choose one based on the provided information

User profile

Beginner or intermediate experience with meditation

Has meditated at least once in the past week

Establishing questions

Name

Job description

What role does meditation play in your life?

How often do you meditate?

What existing meditation apps or products do you currently use?

How did you come to choose those apps or products?

Tasks

You are a returning user to this meditation app, and you'd like to find a new meditation that fits your current mood. Please select a new meditation.

Once you've "listened" to the meditation, you want to come back and use it later. How do you accomplish this?

Now that you've finished, what were the top two things you like about this experience, and what were the two things you disliked about it?

Conducting the Research

- Finding Users
- The first thing you'll need to do is find users to test with. It may seem daunting to reach out to people to test a prototype, but there is a few tricks that make it easier.

Conducting the Research -- Finding Users

- If your user is the type that would work in a co-working space (entrepreneurs, start-ups, developers, etc.) you can pull off an intercept interview. I'll set up at a table with a sign asking for volunteers for testing sessions and timeslots that individuals can sign up for.



Conducting the Research -- Running the Session

- 1. Set up your research session for success by gathering the necessary materials before you start.
- 2. You'll need your company's NDA or consent form for your user to sign, such as this one from Usability.gov (<http://bit.ly/2gQP0mR>)
- 3. The prototype; a way to record at least the audio, if not a video or screencast of the session; and ideally, a second person to take notes while you pose the questions and tasks

Conducting the Research -- Running the Session

- Set up at least 30–60 minutes per user test in order to allow for enough time for the user to accomplish the tasks and discuss any additional questions and expectations they had afterwards.
- At the beginning of the session, give your user a proper expectation of what you need from them: that there are no right or wrong answers, and you want to get real, honest feedback from the users in order to improve the product.

Conducting the Research -- Running the Session

- At the beginning of the session, ask for permission to record the session, and make sure you record from the beginning to the very end.
- Keep an eye out for micro expressions, where the user looks confused, excited, frustrated, or even scared for a split second

References

- Prototyping for Designer: Developing the Best Digital and Physical Products
- <http://index-of.es/Varios-2/Prototyping%20for%20Designers.pdf>

