7 : Designing Prototypes and Construction

IT4106 − User Experience Design (UXD)

**Level II - Semester 4**

Overview

- The goal of this topic is to introduce activities involved in progressing a set of requirements through the cycles of prototyping and construction.

Intended Learning Outcomes

- At the end of this lesson, you will be able to;
  - Describe prototyping and the different types of prototyping activities
  - Produce simple prototypes from the models developed during the requirements activity
  - Produce a conceptual model for a product and justify your choices
  - Explain the use of scenarios and prototypes in design
  - Explain how users can be involved in design

Introduction

- Falls within the Develop phase of the double diamond of design
  - Solutions or concepts are created, prototyped, tested, and iterated

- Two aspects to design
  - Conceptual Design
  - Concrete Design

- To evaluate the design, designers prototype their ideas
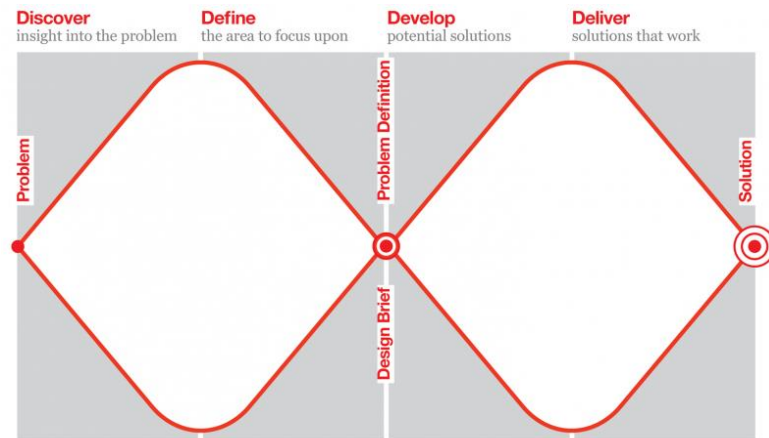
1.1 Prototyping

- **Prototyping** allows designers to communicate their ideas and users to try them out.
  - allows stakeholders to interact with it and to explore its suitability

- It is often said that users can't tell you what they want, but when they see something and get to use it, they soon know what they don't want.

1.1 Prototyping

- Prototypes take many forms
  - a scale model of a building or a bridge
  - a piece of software that crashes every few minutes.
  - a paper-based outline of a display
  - a collection of wires and ready-made components
  - a digital picture
  - a video simulation
  - a complex piece of software and hardware
 - a three-dimensional mockup of a workstation.

A prototype can be anything from a paper-based storyboard to a complex piece of software

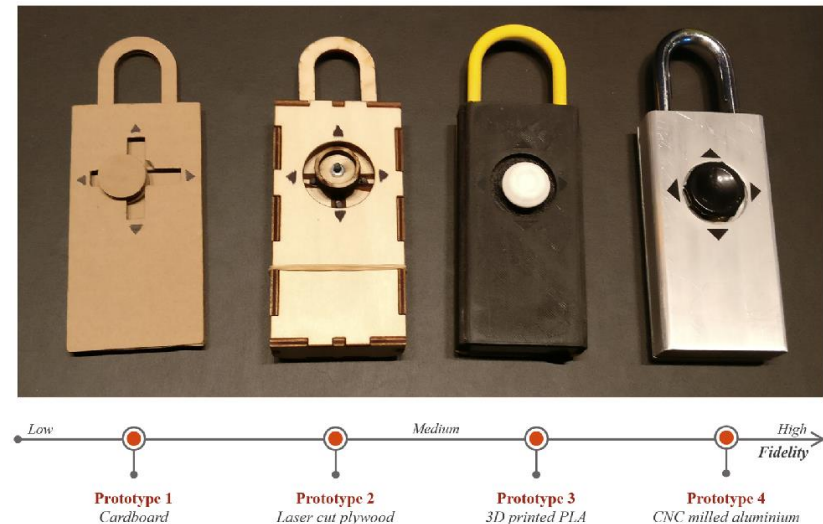The PalmPilot wooden prototype with the actual device

Why Prototype?

- Prototypes answer questions and support designers in choosing between alternatives.

- Prototypes uses to test the technical feasibility of an idea, to clarify some vague requirements, to do some user testing and evaluation, or to check that a certain design direction is compatible with the rest of product development.

- The purpose of a prototype will influence the kind of prototype that is appropriate to build.
    - E.g. to clarify how users might perform a set of tasks and whether the proposed design would support them in doing this, a paper-based mockup might be produced.
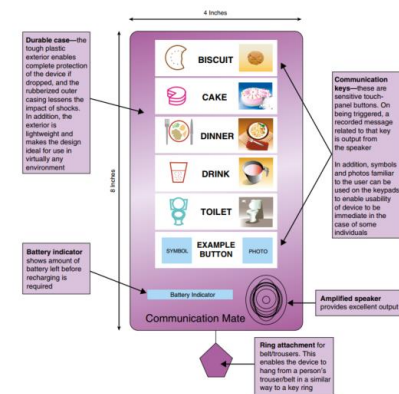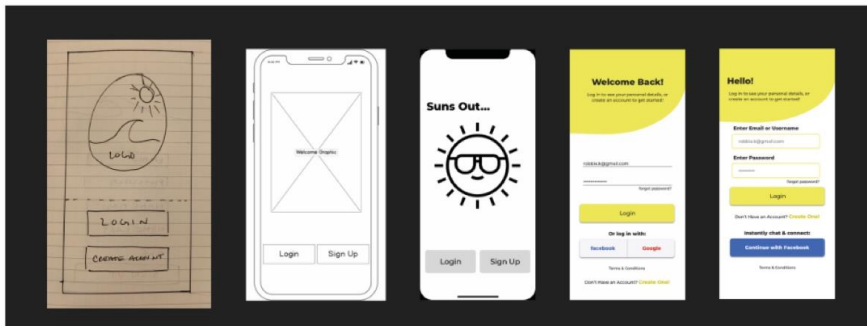
A paper-based prototype of a handheld device to support an autistic child

Fidelity of Prototypes

- The fidelity of a prototype refers to how it conveys the look-and-feel of the final product
  - The level of details and functionality built into a prototype
- There are many types of prototypes, ranging anywhere between these two extremes: Low Fidelity – High Fidelity

| Low		Medium		High
				Fidelity
Prototype 1	Prototype 2	Prototype 3	Prototype 4	
Cardboard	Laser cut plywood	3D printed PLA	CNC milled aluminium	

Low-Fidelity Prototyping

- A low-fidelity prototype does not look very much like the final product, nor does it provide the same functionality.
  - For example, it may use very different materials, such as paper and cardboard rather than electronic screens and metal
- It may perform only a limited set of functions, or it may only represent the functions and not perform any of them.
- Low-fidelity prototypes are useful because they tend to be simple, cheap, and quick to produce.

Storyboards

- **Storyboarding** is one example of low-fidelity prototyping that is often used in conjunction with scenarios.
  - Consists of a series of sketches showing how a user might progress through a task using the product under development.
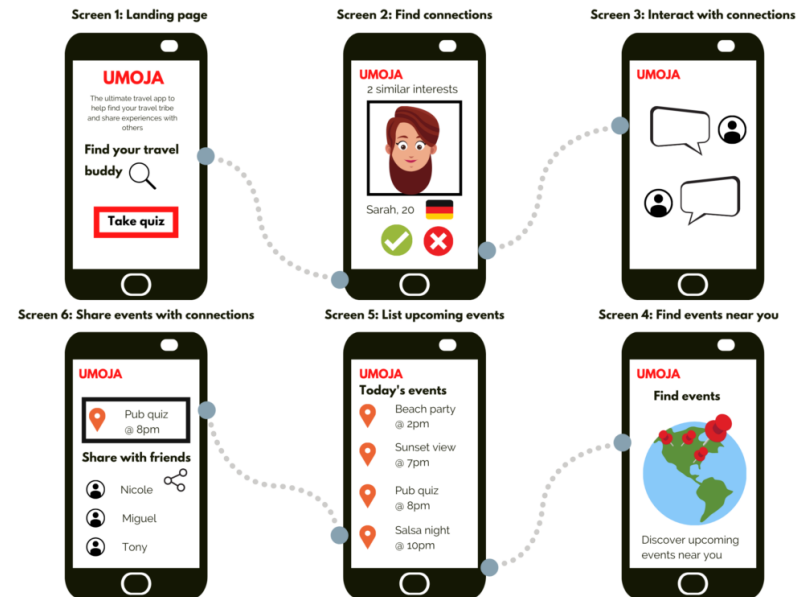
Different levels of storyboards

Generating Storyboards

- A storyboard represents a sequence of actions or events that the user and the product go through to achieve a goal.

- A *scenario* is one story about how a product may be used to achieve that goal.

- A storyboard can be generated from a scenario by breaking the scenario into a series of steps that focus on interaction and creating one scene in the storyboard for each step.

Prototyping with card-based prototypes

- Using **index cards** (small pieces of cardboard about 3 × 5 inches) is used for developing a range of interactive products

- Commonly used to capture and explore elements of an interaction.
  - These cards can be shown to potential users of the system or fellow designers to get informal feedback
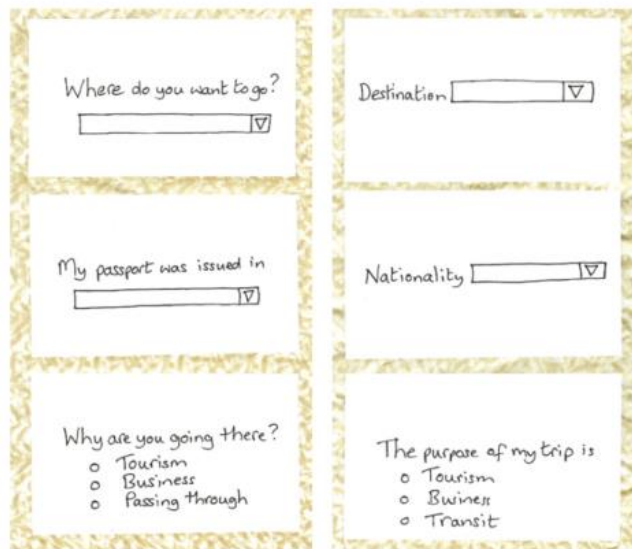

Figure 12.14 Cards 1–3 of a card-based prototype for the travel organizer

Prototyping with card-based prototypes- design maps

- A set of card-based prototypes that cover a scenario from beginning to end may be the basis of a more detailed prototype
  - may be used in conjunction with personas to explore the user's end-to-end experience
  - Known as design maps, or customer journey map or an experience map

- Illustrate a user's path or journey through the product or service and are usually created for a particular persona and based on a particular scenario.

- Two main types of representations
  - The wheel (left)- used when an interaction phase is more important than an interaction point
  - The Timeline (right) – used when a service is being provided that has a recognizable beginning and end point
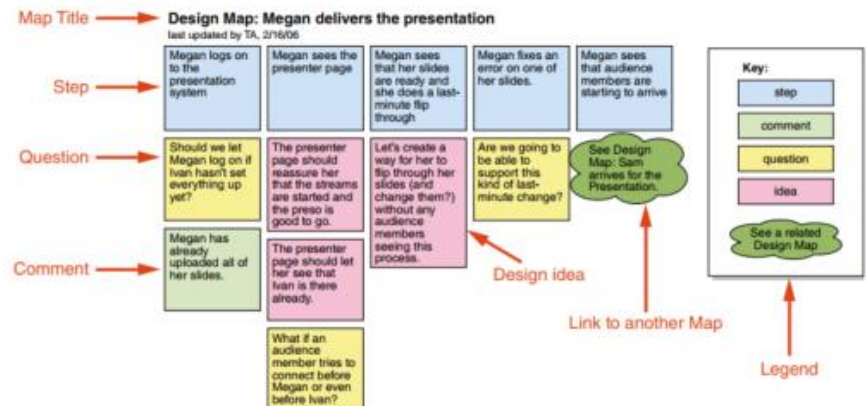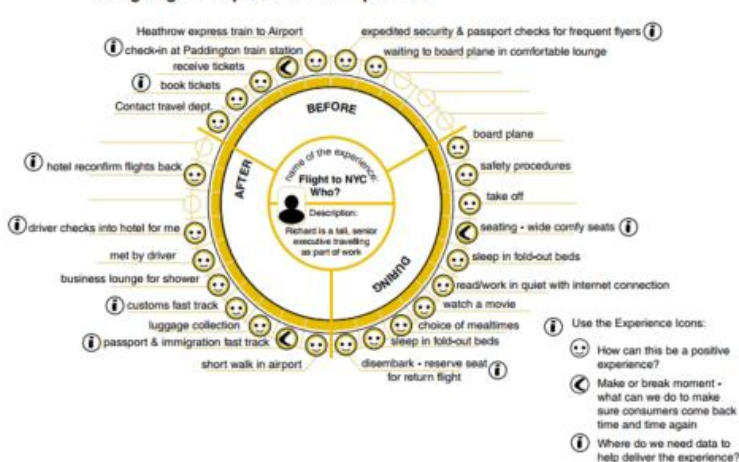
Generating Card-Based prototypes

- Card-based prototypes are commonly used to capture and explore elements of an interaction, such as dialog exchanges between the user and the product.

  - Storyboard focuses on the screens can be translated almost directly into a card-based
  - Generate from a use case output from the requirements activity

Wizard of OZ

- Wizard of Oz assumes that you have a software-based prototype
  - user interacts with the software as though interacting with the product
  - however, a human operator simulates the software's response to the user
- Applications:
  - analyzing gestural behavior and when studying dialogues between children and virtual agents.
  - human-robot interaction studies

Wizard of OZ example

User will be sitting in the chair and write notes inside the box, the purpose of the box is to prevent them from looking. The wizard will be sitting under the table, see the writing of user from the phone that on top of the box via facetime.

the final set-up so user will not see the wizard underneath the table

https://hcde498processlog.wordpress.com/2015/05/11/wizard-of-oz-a-pen-that-corrects-you-when-you-write-off-line/

High-Fidelity Prototyping

- A representation of the product in its closest resemblance to the final design in terms of details and functionality
    - For example, a prototype of a software system developed in Python or other executable language is higher fidelity than a paper-based mock-up
    - sometimes referred as high-fi or hi-fi
- Covers the user interface (UI) of the product as well as the user experience (UX) aspects.
- Can be developed by modifying and integrating existing components
    - developer kits and open source software, etc.

High Fidelity vs Low Fidelity

Type	Advantages	Disadvantages
Low-fidelity prototype	• Quick revision possible • More time can be spent on improving the design before starting development • Evaluates multiple design concepts • Useful communication device • Proof of concept	• Limited error checking • Poor detailed specification for development • Facilitator-driven • Limited usefulness for usability tests • Navigational and flow limitations
High-fidelity prototype	• (Almost) complete functionality • Fully interactive • User-driven • Clearly defines navigational scheme • Use for exploration and test • Look and feel of intended product • Serves as a "living" or evolving specification • Marketing and sales tool	• More resource-intensive to develop • Time-consuming to modify • Inefficient for proof-of concept designs • Potential of being mistaken for the final product • Potential of setting inappropriate expectations

Low Fidelity to High Fidelity Prototype
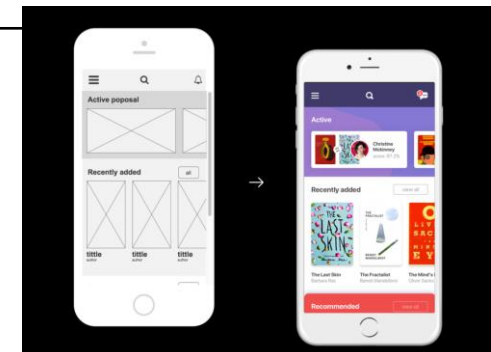
Different development philosophies

- *Evolutionary prototyping:*
  - a prototype evolves into the final product and is built with these engineering principles in mind. In an evolutionary prototyping approach, each stage will be subjected to rigorous testing; for throwaway prototyping, such testing is not necessary.

- *Throwaway prototyping:*
  - uses the prototypes as steppingstones toward the final design. In this case, the prototypes are thrown away, and the final product is built from scratch.

Tools available for prototyping

- creating a quality prototype is an important part of the UX design process
  - Having the right prototyping tool is key for a quality prototype
- Some prototyping tools are designed to support early user testing and a basic demonstration of user flows.
- Others are full-stack which allows to design prototypes or wireframes, simulate realistic and rich user interactions, collaborate with team, and even generate code
- Tools
  1. Adobe XD
  2. InVision
  3. Sketch
  4. Figma
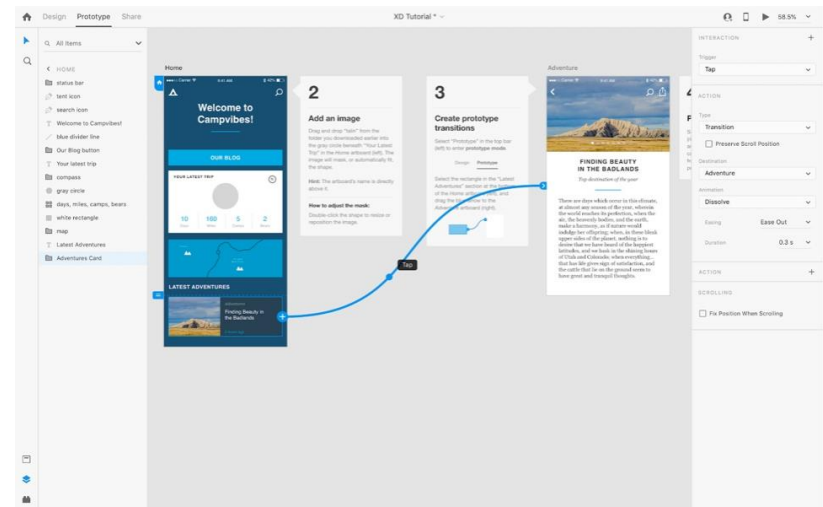
Conceptual to concrete design

Conceptual Design

- A *conceptual model* is an outline of what people can do with a product and which concepts are needed for the user to understand how to interact with it.
  - will emerge from an understanding of the problem space and the current functional requirements.
    - Which concepts are needed to understand how to interact with the product depends on a
      - who the user will be
      - what kind of interaction will be used
      - what kind of interface will be used
      - terminology
      - Metaphors
      - application domain, and so on?

Conceptual Design

- The first step in developing a conceptual model is to empathize with users
    - contextual interviews
    - Wall walking through affinity diagrams

Walking the wall. (a) Affinity notes have been moved the A3 sheets of paper to form the affinity wall, (b) people slowly start discussing the contents of each category, (c) moving several notes at a time when there are enough categories, (d) verbalizing the act of moving a note to the wall, and (e) user statements in first person are written on larger yellow sticky notes

Conceptual Design

- Once captured, ideas are tested against other data and scenarios, discussed with other design team members, and prototyped for testing with users.

- Using different creativity and brainstorming techniques to explore ideas with other members of the team can help build a picture of the users and their goals.

- Gradually, a picture of the desired users' experience will emerge and become more concrete.

- The availability of ready-made components increases the ease with which ideas can be prototyped, which also helps to explore different conceptual models and design ideas.

Developing an Initial Conceptual Model

- The core components of the conceptual model are
  - metaphor and analogies,
  - the concepts to which users are exposed
  - the relationship between those concepts
  - the mappings between the concepts and user experience being supported

Conceptual Design : Interface Metaphors

- Interface metaphors combine familiar knowledge with new knowledge in a way that will help users understand the product.
    - For example, consider an educational system to teach 6-year-olds mathematics.
        - One possible metaphor is a classroom with a teacher standing at the front.
        - But considering the users of the product and what is likely to engage them, a metaphor that reminds them of something enjoyable is more likely to keep them engaged, such as a ball game, the circus, a playroom, etc.
- Once the metaphors are identified, they need to be evaluated .
    - How much structure does the metaphor provide?
    - How much of the metaphor is relevant to the problem?
    - Is the interface metaphor easy to represent?
    - Will your audience understand the metaphor?
    - How extensible is the metaphor?
    - Does it have extra aspects that may be useful later?

Conceptual Design : Interaction Types

- After the metaphors are identified and evaluated, the suitable interaction type must be identified
  - instructing, conversing, manipulating, exploring, and responding
- Type of interaction is best suited to the current design depends on the application domain and the kind of product being developed.
  - For example, a computer game is most likely to suit a manipulating style, while a software application for drawing or drafting has aspects of instructing and conversing

Initial conceptual models may be captured in *wireframes*—a set of documents that show structure, content, and controls. Wireframes may be constructed at varying levels of abstraction, and they may show part of the product or a complete overview.

Concrete Design

- Conceptual design develops an outline of what people can do with a product and what concepts are needed to understand how to interact with it, while concrete design specifies the details of the design such as layout and navigation

- Conceptual design and concrete design are closely related.
  - during design, conceptual issues will sometimes be highlighted, and at other times, concrete detail will be stressed

- Need to balance the range of environmental, user, data, usability, and user experience requirements with functional requirements.

Concrete Design- Considerations

- There are many aspects to the concrete design of interactive products:
  - Visual appearance
  - Interface types together with their associated design considerations, guidelines, principles, and rules.
  - issues related to user characteristics and context
    - accessibility and inclusiveness
      - Accessibility refers to the extent to which a product is accessible to as many people as possible, while inclusiveness means being fair, open, and equal to everyone.
    - designing for different cultures
      - Cross- cultural design : se of appropriate language(s), colors, icons
        and images, navigation, and information architecture (Refer case study 12.2)

Involving Users in Design through Participatory Design

- Participatory design is an approach where all the stakeholders i.e. employees, customers, end-users, partners, designers, and researchers are actively involved in the design process.
  - Users as full participants in the design process, which goes beyond simple involvement of users, but extends to understanding the user's point of view, and regarding what users know as being important
  - Mutual learning between users and designer

Participatory Design Involves
Designers, Developers, End Users and Stakeholders in Design Process.

Design Thinking

- Another modern approach to involve users in design

- Use to understand users, challenge assumptions, redefine problems and create innovative solutions to prototype and test.

- Design teams use design thinking to tackle ill-defined/unknown problems (aka wicked problems) because they can reframe these in human-centric ways and focus on what's most important for users.

The Five Stages of Design Thinking

- a non-linear, iterative process with five stages
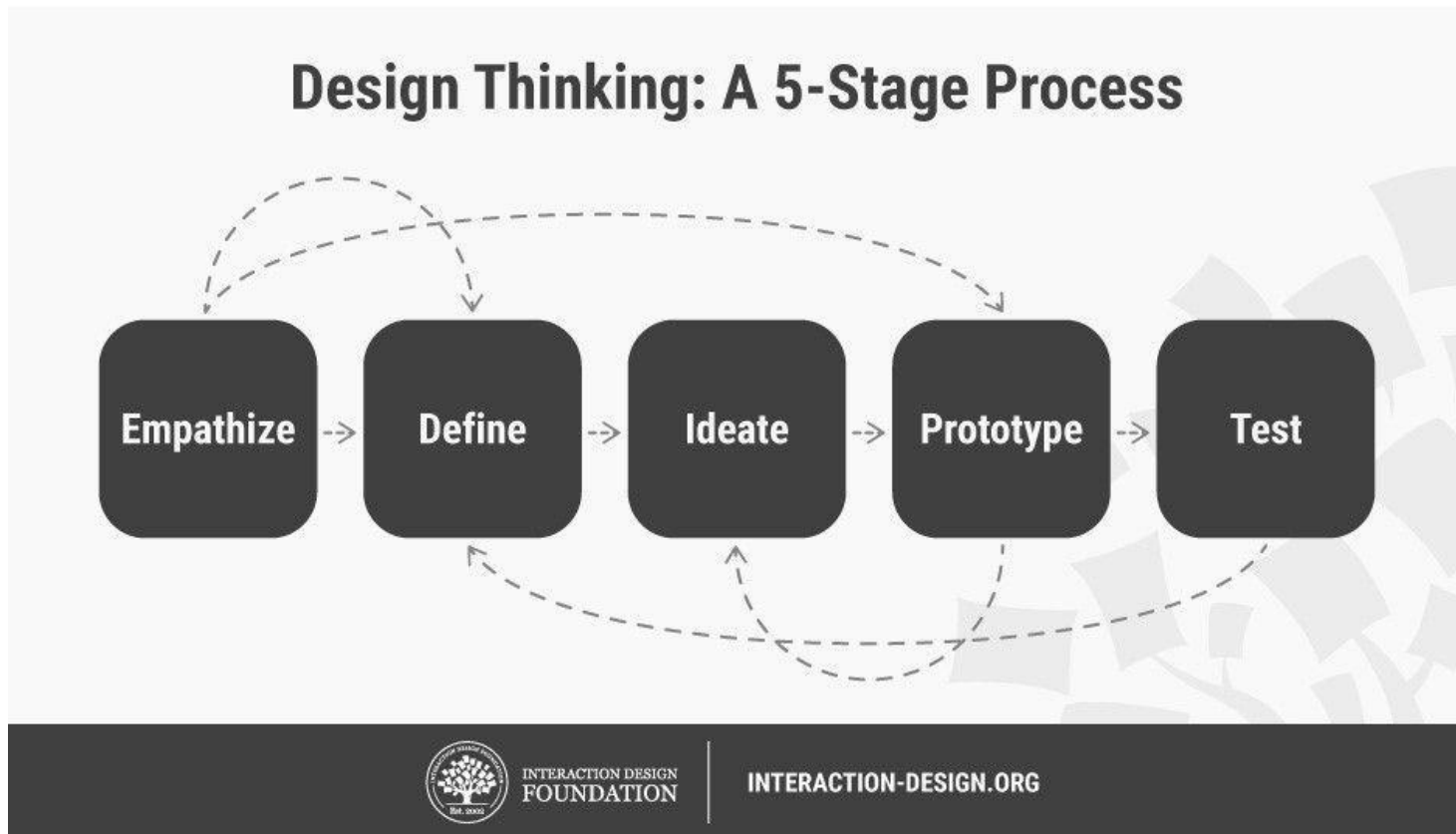
The Five Stages of Design Thinking

- **Stage 1: <u>Empathize</u>—*Research Your Users' Needs***
- **Stage 2: Define—*State Your Users' Needs and Problems***
- **Stage 3: Ideate—*Challenge Assumptions and Create Ideas***
- **Stage 4: Prototype—*Start to Create Solutions***
- **Stage 5: Test—*Try Your Solutions Out***

Summary

- Prototyping may be low fidelity (such as paper-based) or high fidelity (such as software based).

- Low-fidelity prototypes are quick and easy to produce and modify, and they are used in the early stages of design.

- Ready-made software and hardware components support the creation of prototypes

- There are two aspects to the design activity: conceptual design and concrete design.

- Conceptual design develops an outline of what people can do with a product and what concepts are needed to understand how to interact with it, while concrete design specifies the details of the design such as layout and navigation.

- Have explored three approaches to help you develop an initial conceptual model: interface metaphors, interaction styles, and interface styles.

- An initial conceptual model may be expanded by considering which functions the product will perform (and which the user will perform), how those functions are related, and what information is required to support them.

- Scenarios and prototypes can be used effectively in design to explore ideas.

- Can and should involve users in design preferable through a proven framework such as participatory design or design thinking.