User Interface Design
COMP1650

Prototyping Digital Products

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Lecture Overview

- What is Prototyping?
- Prototyping Tools
- Low-,Mid- and High-fidelity prototypes
- Five different dimension of fidelity of prototypes
- The Prototyping Process

Learning Outcomes

The activities in this lecture are linked to the course learning outcome

- B. Demonstrate an awareness of human-computer interface standards and guidelines;
- C. Apply the principles, concepts and models of user-centred design methods to the development and evaluation of interactive system interfaces;

Context

A large number of new smart objects, products and services are continually being developed and launched to the market.

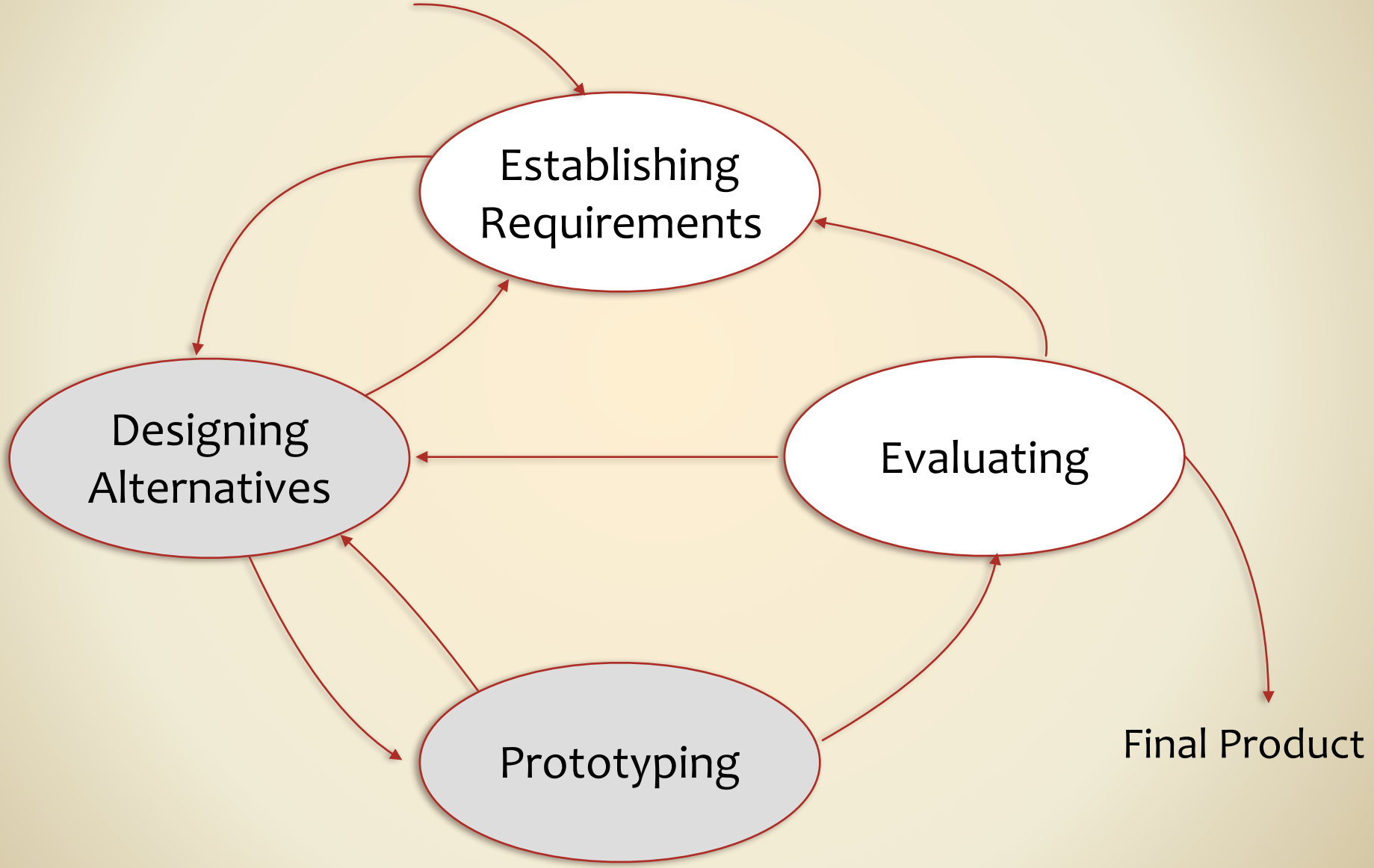
Given the competition, how do you know that your idea will be influential and that people will buy it?

Context cont.

Given the competition, how do you know that your idea will be influential and that people will buy it?

- User Research
- Prototyping
- Evaluation

User Centred Design -Lifecycle



What is a Prototype?

"A first or preliminary version of a device or vehicle from which other forms are developed."

Oxford Dictionary

What is a Prototype?

"**a manifestation of an idea** into a format **that communicates the idea to others** or is **tested with users**, with the intention **to improve that idea over time**."

McElroy (2017)

What is a Prototype?

"**Prototypes** provide the **means** for **examining design problems and evaluating solutions.** Selecting the focus of a prototype is the art of identifying the most important open design questions."

Houde and Hill

What is a Prototype?

Prototype Introduction Video

Why do we prototype?

1. To understand
2. To communicate
3. To test and improve
4. To advocate

Source: The following slides are adapted from McElroy 2017

1. Prototypes - to understand

- help us to understand the problem we are trying to solve
- Validating the problem space
- problem discovery early on to enable pivoting

1. Prototypes - to understand

- exploration of alternative solutions to solve a particular user or design problem
- to validate user flows (see scenarios)
- to better understand your users as part of a User-Centred Design process
- inputs from persona and scenario development

2. Prototypes - to communicate

- making ideas visible to users, stakeholders and other team members
- to align expectations - everybody has their own mental model
- take prototypes to meetings with different stakeholders to focus the discussion
- choose the right fidelity for a prototype
- create a prototype culture

3. Prototypes - to test and improve

- iterative testing of your assumptions through prototypes
- integration of user feedback
- start early and iterate frequently
- test with first time and repeat users
- Design prototypes to test single assumptions (e.g. if users can find their way to a specific feature)

4. Prototypes - to advocate

- for the user experience (UX)
- to demonstrate value
- to justify design decisions to stakeholders
- to be the champion for your users
- to take team members (from other functions) assumptions into account and test them were useful

Some Prototyping Tools

- Video
- Paper and Cardboard
- Powerpoint/Keynote
- Bespoke Prototyping Tools (e.g. Gliffy, Balsamiq, Axure)
- Web/Mobile Development frameworks (e.g. Ruby on Rails, Django, Ionic) + Front-end (e.g. Bootstrap, Pure.css) Frameworks
- Microcontroller (Arduino, Raspberry Pi)
- hardware- or sensor based approaches e.g. Kinect

Fidelity of Prototypes

- Choosing the right fidelity for a prototype during different design stages is important. *Fidelity of a prototype means how closely a prototype looks and is in terms of implementation to the final product.*

Fidelity of Prototypes

1. Low-fidelity Prototypes

2. Mid-Fidelity Prototypes

3. High-fidelity Prototypes

Low-Fidelity Prototypes

- A l**ow-fidelity** prototype is one that does not look very much like the final product, e.g. a paper/cardboard model (rather than an electronic screen), storyboarding, sketching, Wizard of Oz experiments.

- Low-fidelity prototypes are useful because they tend to be simple, cheap, and quick to produce and modify. They are for exploration only (throw away).

Mid-Fidelity Prototypes

- A mid-**fidelity** prototype starts to look like your final prototype in at least one dimension. These prototypes have a good balance between cost and money;

- Mid-fidelity prototypes are useful because they allow to test interactivity and provide more context to users.

High-Fidelity Prototype

- A **high-fidelity prototype** is a prototype that is close to the final product in detail and functionality. This enables to examine usability in detail and to make conclusions about how behaviour will relate to use of the final product.

High-Fidelity Prototype

- **Throw away** - the prototyping is done in a separate development environment. Then system development proceeds as normal in parallel.

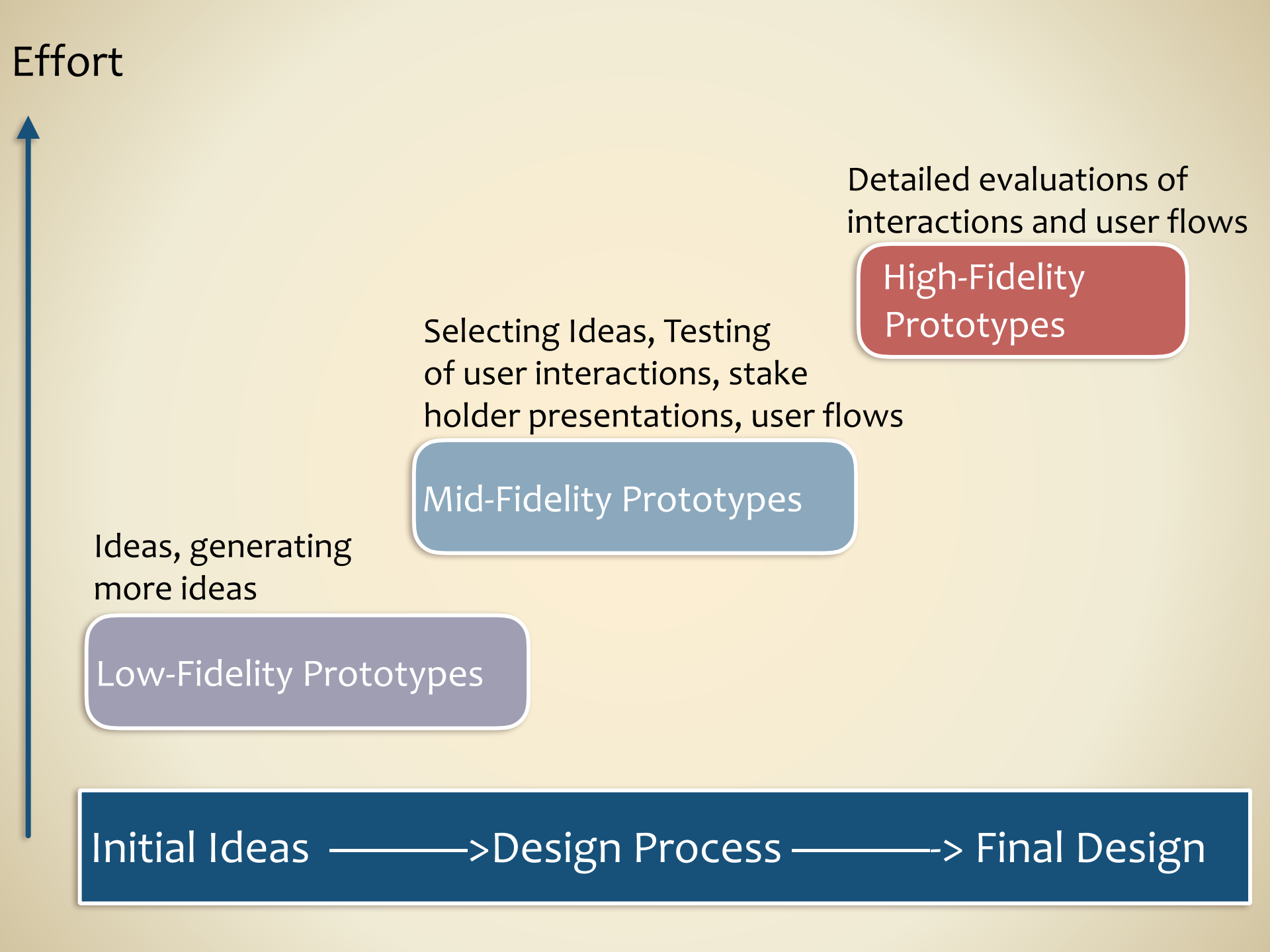
- **Evolutionary** - the final system gradually evolves from a series of prototypes. The prototyping and development environment are the same.

Prototype Examples

Low-fidelity Prototype

Mid-fidelity Prototype

High-fidelity Prototype


Effort
Detailed evaluations of interactions and user flows
High-Fidelity Prototypes
Selecting Ideas, Testing of user interactions, stake holder presentations, user flows
Mid-Fidelity Prototypes
Ideas, generating more ideas
Low-Fidelity Prototypes
Initial Ideas ——>Design Process ——-> Final Design

Five dimensions of prototype fidelity

1. Visual Refinement
2. Breadth
3. Depth
4. Interactivity
5. Data Model

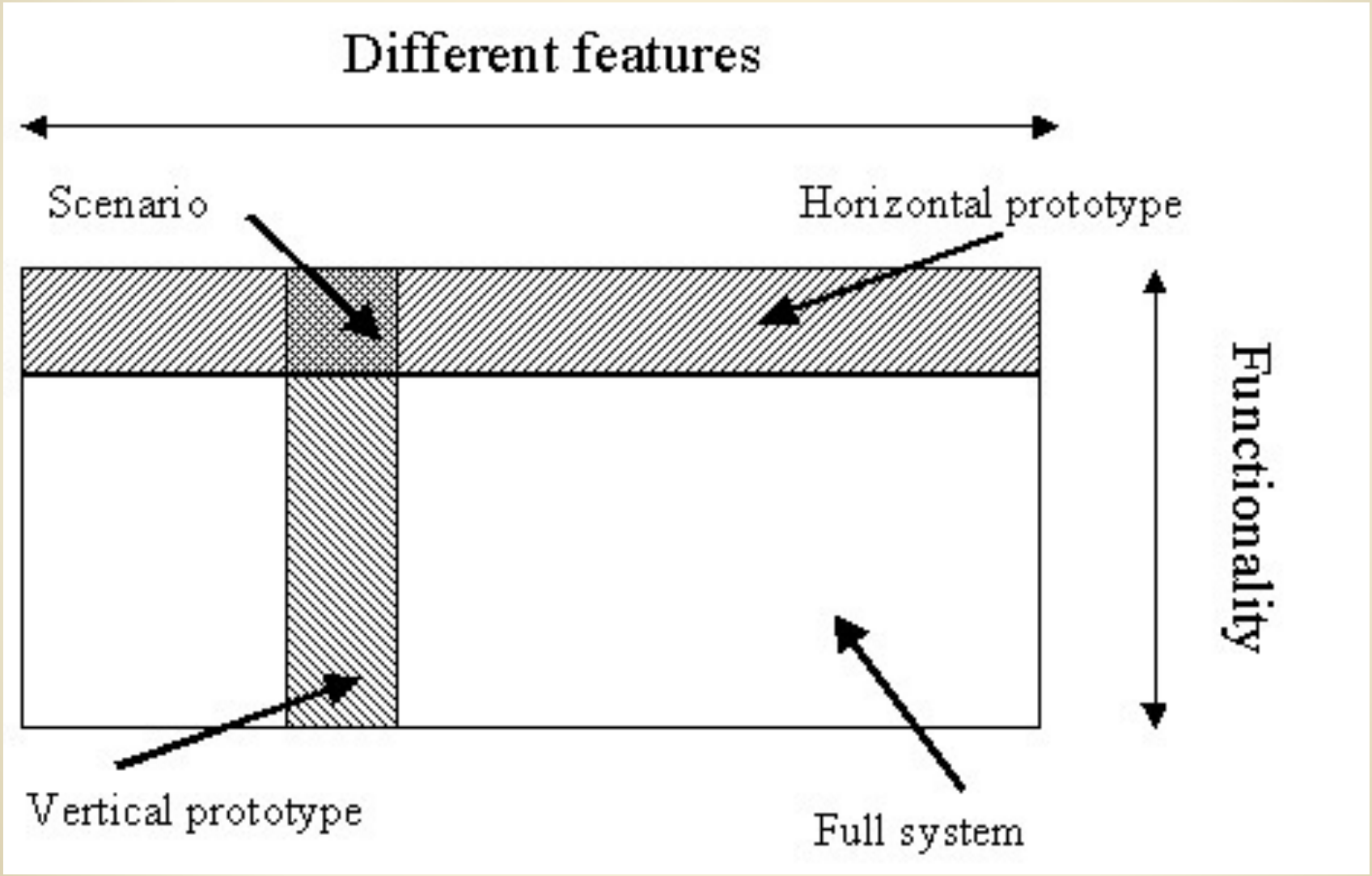
Visual Refinement

- Typography
- Colours
- Visualisations and Graphics
- Contrast
- …

Breadth and Depth of a Prototype

- Developers often use either ***horizontal prototyping*** (wide range of functions with little detail) or ***vertical prototyping*** (lots of detail for only a few functions). Once you have decided on the type you need to select one of two main development philosophies.

Breadth and Depth of a Prototype



Source: Nielsen, 1993

Interactivity

- How the user interface reacts to user input
- Interactive input elements e.g. menu slider
- Animations and Transitions
- Confirmations and Prompts
- Visible outputs
- Audio outputs
- …

Data Model

- Actual content versus “Lorem ipsum…”
- Use of Real data or at least simulated data in the correct format

	Low-fidelity Prototype	*Mid-Fidelity Prototype*	*High-fidelity Prototype*
What for?	*Good for ideation and exploring different ideas; Testing of high-level concepts e.g. navigation;*	*Testing of specific user interactions; Testing of user flows; Stakeholder presentations;*	*Detailed user testing and testing of interaction flows; Stakeholder presentations;*
Pros?	*Fast, Cheap, Used with easily available materials; Creating alternative designs;*	*More context; Good time/quality balance; Enable user testing; Easier "to read" for users and stakeholders;*	*Testing of very detailed interactions; Visual design looks like final product; Complete design;*
Cons?	*Limited interactions; Lack of detail; Can not test user flows; Can lack context a user may require;*	*More time intense; Still not fully functional;*	*Expensive; Time-consuming; Advanced coding and prototyping skills required;*

Process of Prototyping

Define the purpose of your prototype:

- Minimum Viable Prototype
- Exploration-centric: Generate a number of different solutions for a particular problem
- Audience-centric: used for communicating or advocating, focuses on your audience
- Assumption-centric: testing of a question or assumption

The purpose of the prototype impacts on your process.

Source: McElroy, 2017

General Process of Prototyping

- Step 1 Identify the users and their problems (see lecture on personas)
- Step 2 create a user flow that outlines the journey of a user to achieve their goal.

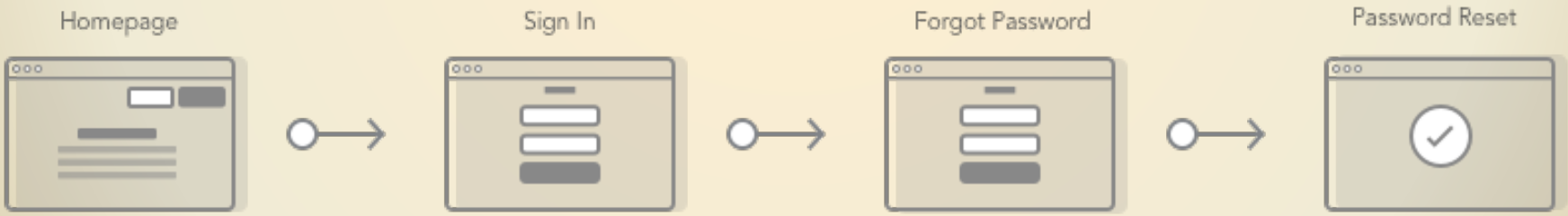


Image Source: https://uxplanet.org/ux-glossary-task-flows-user-flows-flowcharts-and-some-new-ish-stuff-2321044d837d

General Process of Prototyping cont.

- Step 3 Make a prototype to address the user flow
- Step 4 Test, analyse and revise

If you prototyping for ideation and exploration then you'd repeat the last two steps with prototypes for different design solutions which you then analyse (e.g. group and prioritise) .

Prototyping for a particular audience

- Determine your goal
- Define the audience (e.g. stakeholders, designers, developers, clients)
- Define the level of fidelity that works best for a particular audience

Prototyping Digital Products

- Screens!
- Responsive Design, Mobile First Design (separate lecture)
- Designing for different interaction types (e.g. keyboard and mouse, touch interfaces, voice interaction)
- Accessibility
- Animations

Low-fidelity Digital Products

- Information Architecture (IA) and user tests for IA make sense to be tested with low-fidelity prototypes
- Paper Prototypes
- Clickable low-fidelity prototypes (e.g Axure, proto.io, InVision)

Mid-fidelity Digital Products

- Clickable and animated mid-fidelity prototypes in prototyping software (e.g Axure, proto.io, InVision) or specific development/coding environment (e.g. Ruby on Rails, Node.js) especially if you do evolutionary prototyping

- Increases fidelity in at least one of the discussed dimensions (Visual Refinement, Breadth, Depth, Interactivity, Data Model) e.g. higher fidelity visuals that include information about typography, colours, spacing

High-fidelity Digital Products

- Typically tested at this level through a coded and functional high-fidelity prototype
- End to end experience of a product
- Real data and content
- High-fidelity visual design

Session Summary

- Discussion of different forms of prototypes and how they can be used during ideation, to design alternatives and to carry out evaluations and usability tests with end users
- Contextualisation of the application of prototypes as part of the UCD cycle
- We discussed the different layers of fidelity of a prototype and how to decide on the right fidelity level
- A typical prototyping process has been outlined

References

- Prototyping for Designers: Developing the Best Digital and Physical Products (McElroy, 2017)
- The User Experience Team of One (Buley, 2013)
- Designing for the Digital Age (Goodwin, 2009)
- Designing Interactive Systems (Benyon, 2014)
- Usability Engineering (Nielsen, 1993)