

# Can You Understand What I Mean?

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# Interactive System Design

Designing the **user interface** (UI), the means by which the user and the computer system interact

Involves knowing:

- ▶ Use adequate methods (**user-centred approach**)
- ▶ **Usability principles** (independent from technology)
- ▶ **Usability paradigms** (more technology dependent)
- ▶ **Repeat** until the **usability goals** are reached

# Summary

- ▶ User-centred Design Approach
  - ▶ Know the users and their motivations
    - ▶ **Personas**
  - ▶ Know where, when and how my system will be used
    - ▶ **Scenarios**
  - ▶ Know what features should my system provide
    - ▶ **Requirements**
  - ▶ Design how the interaction between users and machine will happen
    - ▶ ???

# Usability

**Usability** is, according to **ISO 9241-11**:

- ▶ “the extent to which a product can be used by **specified users** to achieve specified goals with **effectiveness, efficiency** and **satisfaction** in a **specified context of use**”
- ▶ Effectiveness + efficiency -> **ease of use**
- ▶ **Satisfaction** is also very important

# Usability

Main usability benefits:

- ▶ Higher user performance and satisfaction
- ▶ Lower development cost
- ▶ Lower support costs

# User Experience (UX)

- ▶ “**person's perceptions and responses** resulting from the use and/or anticipated use of a product, system or service”
- ▶ UX includes the **users' emotions, preferences, perceptions, physical and psychological responses**, ... occurring before, during and after use
- ▶ UX is **broader than usability**, including other aspects...
- ▶ Usability criteria can be used to assess aspects of user experience.

# Usability Paradigms

Refer to a general approach that takes advantage of the properties of a particular technology to provide interaction:

- ▶ Time-sharing (1960s)
- ▶ WIMP (Windows, Icons, Menus, Pointers, 1980s)
- ▶ WWW (world wide web)
- ▶ Ubiquitous computing (1990s)
- ▶ Wearable computing

**WIMP**





# Usability Principles

- ▶ Concepts that foster usability by taking into consideration **general characteristics of human action and reasoning** and **not the technology**

- ▶ Coherence
- ▶ Familiarity
- ▶ Simplicity
- ▶ Control
- ▶ Robustness
- ▶ Error protection
- ▶ Feedback
- ▶ Task compatibility
- ▶ ...



A vertical blue line with a horizontal arrow pointing from the list of usability principles to the usability goals.

## Usability goals:

Easy to learn and memorize  
Easy to use  
Satisfaction



# Usability Principles

**Nielsen's Heuristics** provide good examples of usability principles that should be considered for **ANY** interactive system



<https://www.nngroup.com/articles/ten-usability-heuristics/>

# Usability Principles

## Some examples

### ▶ **Visibility of System Status**

- ▶ Provide information about the current state of the system
- ▶ Provide feedback to user actions, e.g., show progress while copying files

### ▶ **Match between the system and the real world**

- ▶ Whenever possible make a match between what is performed in the system and similar actions in the real world, e.g., supermarket checkout vs online store checkout

# Usability Principles

## Some examples

### ▶ **User control and freedom**

- ▶ Allow the user to escape from potentially unwanted action
- ▶ E.g., allow “undo” and “redo”, allow “cancel”

### ▶ **Consistency and standards**

- ▶ If something is done in a particular way, e.g., in other popular software, keep it consistent
- ▶ Avoid calling the same thing different names

# Usability Principles

## Some examples

### ▶ **Recognition rather than recall**

- ▶ Users have limited short-term memory
- ▶ Provide users with the relevant information on the interface, rather than make them remember
- ▶ E.g., Show the order contents when asking to confirm the order

### ▶ **Aesthetic and minimalist design**

- ▶ Do not use unnecessary distractor elements
- ▶ Keep the UI simple and the most important features clearly identifiable

# Usability Principles

## Some examples

### ▶ **Error prevention**

- ▶ Try to avoid potentially error prone designs
- ▶ E.g., ask for confirmation for any critical action and provide default values

### ▶ **Help users recognize, diagnose and recover from errors**

- ▶ Tell users what went wrong in understandable language
- ▶ E.g., “you need to provide your email to proceed” instead of “error 424: unspecified process parameter”

### ▶ **Help and documentation**



So,  
how do we design the UI?

# Designing the UI

- ▶ After obtaining the requirements, we **do not hide from users** until we have the final system.
- ▶ User-centred design entails that we get **user feedback along the development** process
- ▶ **Prototypes** are the different **continuously improved versions** of the interactive system



# Different Types of Prototypes

- ▶ Prototypes should be **adequate to the stage of development** and validation of the work
- ▶ We start by simple prototypes to validate the overall idea and **move to more sophisticated versions as the work progresses**
- ▶ How do we start?

# Different Types of Prototypes

- ▶ We **do not** start with the system already working in the computer or smartphone
- ▶ We need a way to **validate the basic aspects** of our solution, first:
  - ▶ Concepts
  - ▶ Navigation
  - ▶ Contents
  - ▶ Functionality
- ▶ **Low-fidelity prototypes**

# Low Fidelity Prototypes

- ▶ Cheap and Fast
- ▶ Obtain user feedback concerning general aspects
- ▶ Easy to modify and throw away, even during testing
- ▶ Test UI conceptual model

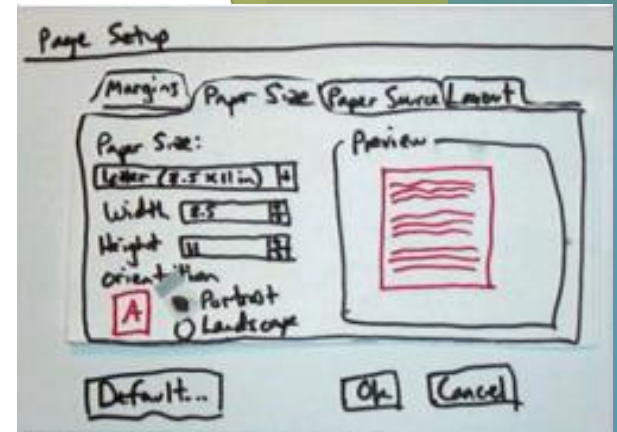
# Low Fidelity Prototypes

It **does not need to have much detail**, nor to be very realistic, e.g.:

- ▶ Text may be replaced by some lines
- ▶ Images may be replaced by words
- ▶ In general no colour is needed
- ▶ Sizes of windows, fonts, etc. don't need to be final

# 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)**



# Paper Prototypes

- ▶ Paper prototypes do not need to be very elaborate!

A hand-drawn paper prototype of a patient registration form. The form is titled "Patient no xxxxx" and includes a "System Logo" placeholder. The form fields are organized into sections: a top section for "Name", "Address", "Phone Number", "Email", "Identify Card", and "Birth Date"; a middle section for "Health System" and "No"; a bottom section for "Gender", "Height", "Weight", "Blood Group", and "Notes"; and a "Foto Photo" placeholder with an "upload" button. A "Continue >" button is located at the bottom right.

System Logo

Patient no xxxxx

Name

Address

Phone Number

Email

Identify Card

Birth Date

Health System

No

Foto Photo

upload

Gender

Height

Weight

Blood Group

Notes

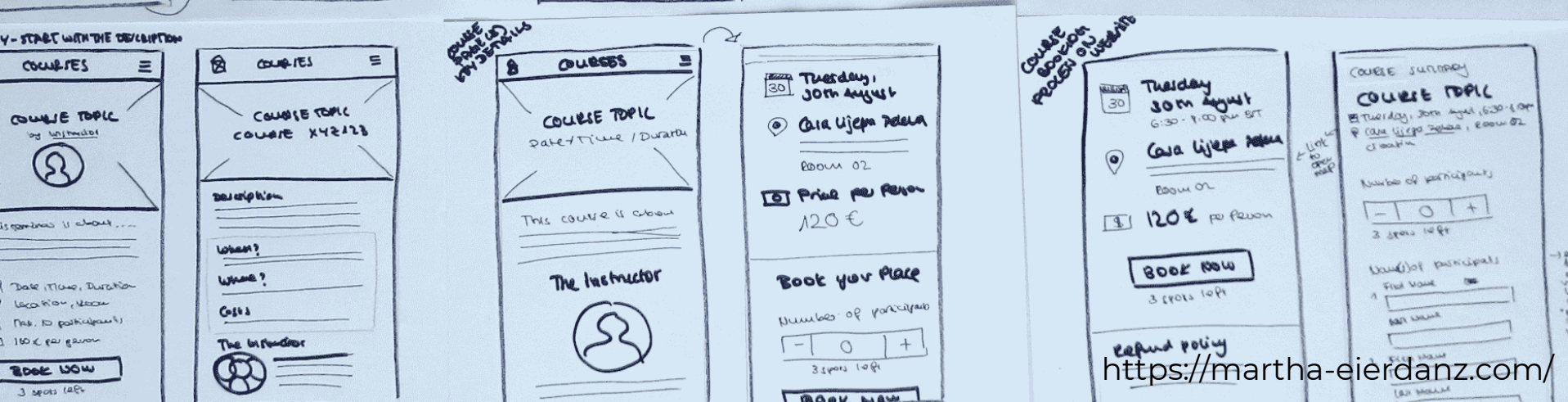
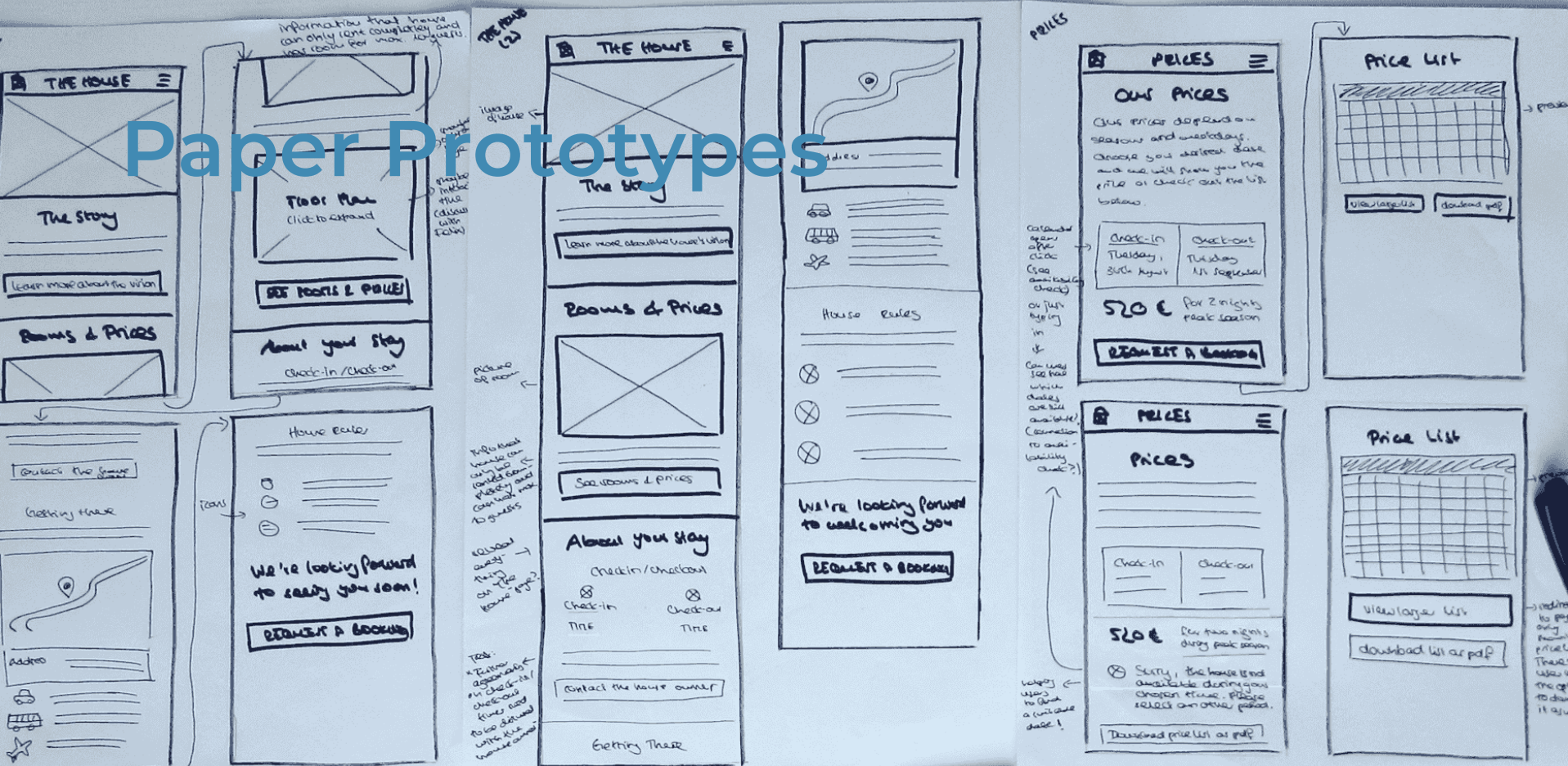
Continue >

# Paper Prototypes

- ▶ Fast to build
- ▶ Easy to change
- ▶ Foster a focus on big picture
- ▶ Does not need programming!

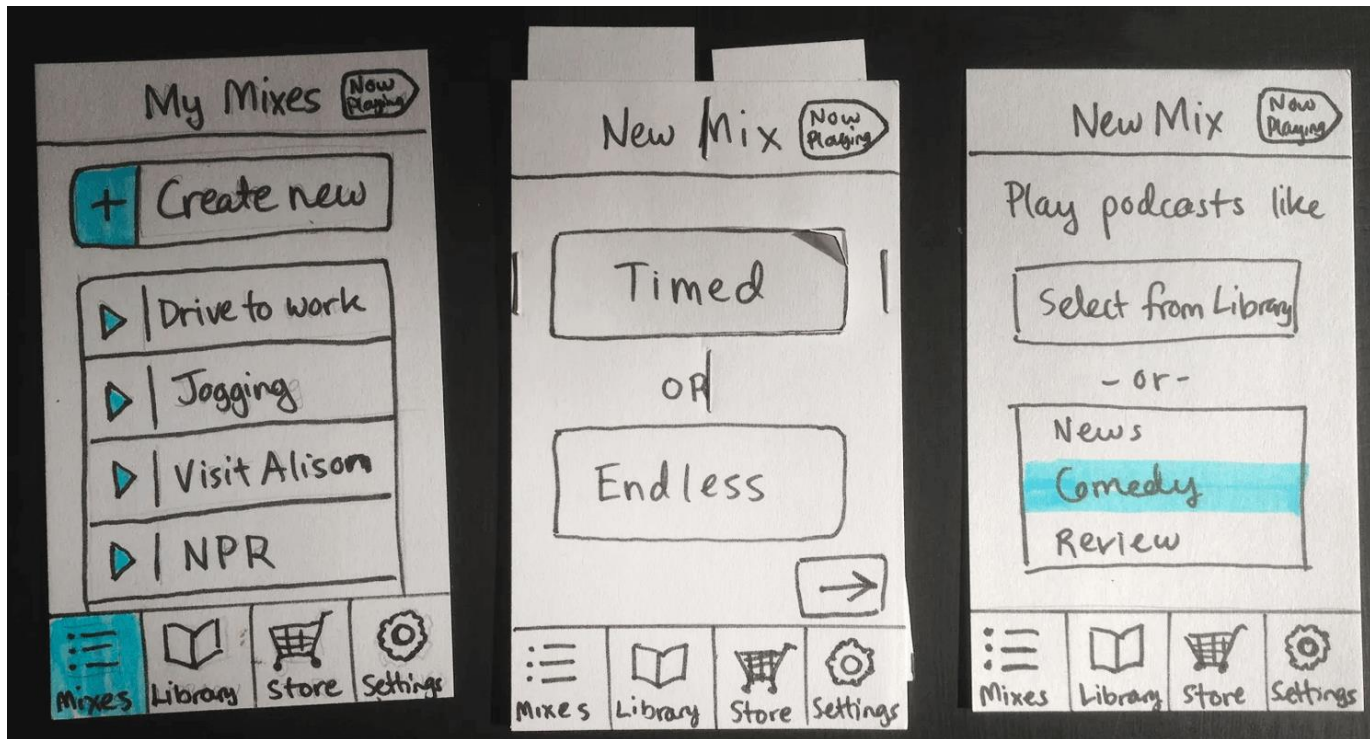


# Paper Prototypes





# Paper Prototypes



[www.justinmind.com](http://www.justinmind.com)

# Paper Prototype: What Can We 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?

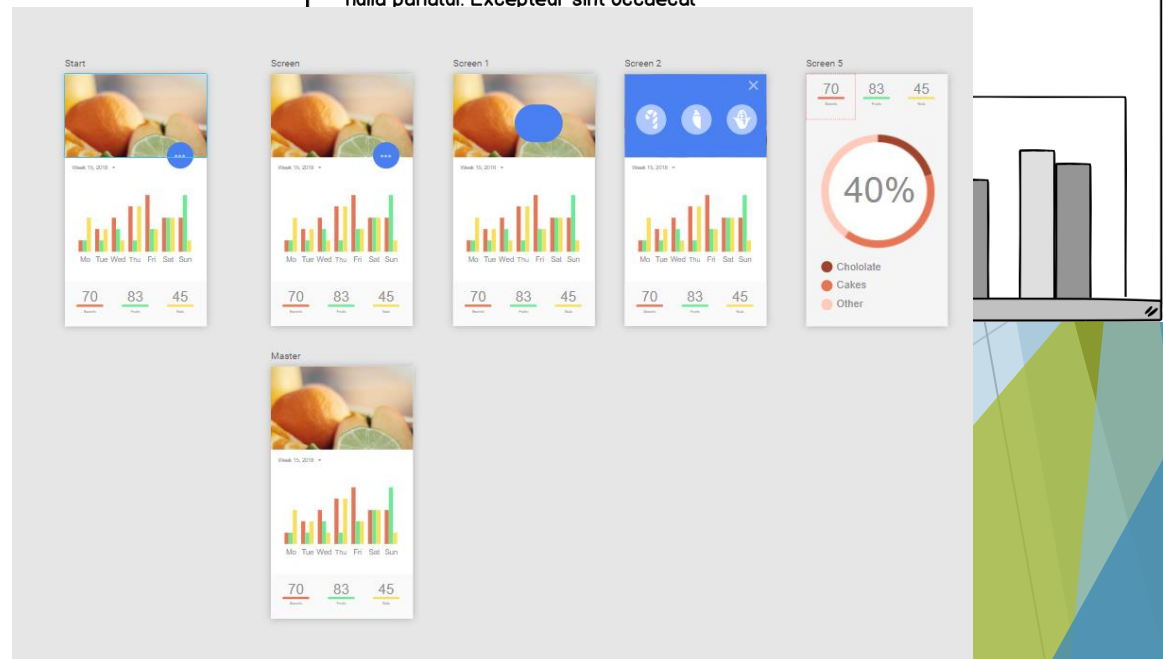
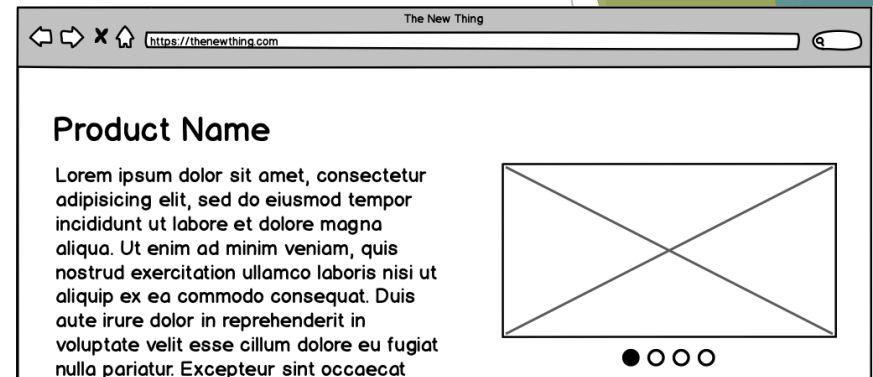


Other forms of prototyping?

# Storyboarding tools

## going beyond handmade prototypes

- ▶ Photoshop
- ▶ Balsamiq
- ▶ **Pencil**
- ▶ Mockingbird
- ▶ Proto IO
- ▶ **Quant UX**

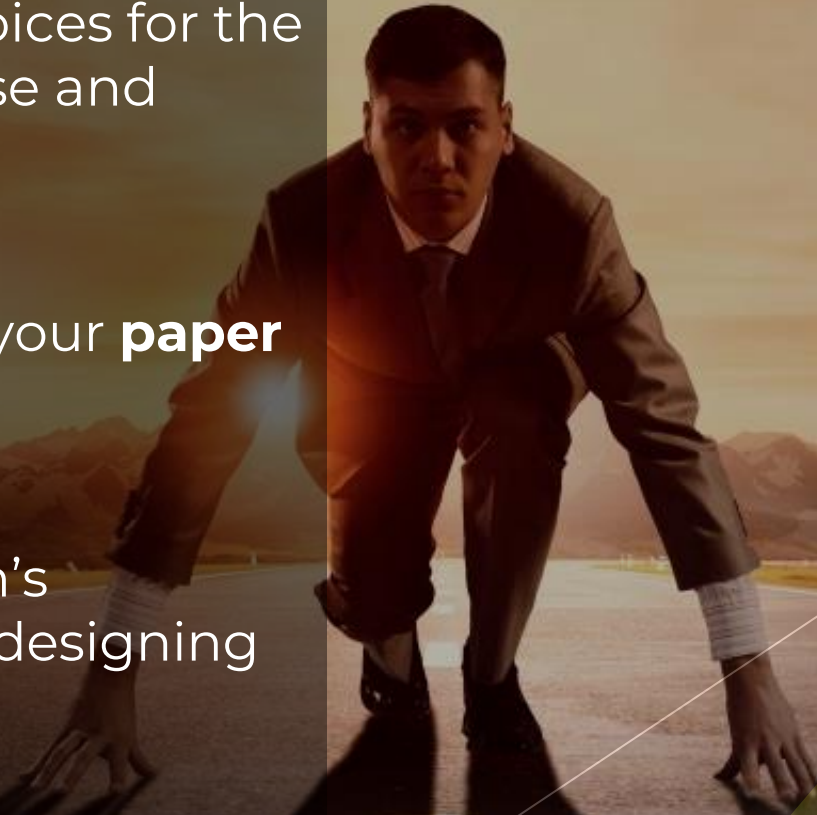


# Wizard of Oz

- ▶ A Human is “behind the curtain” and simulates the computer responses and actions
- ▶ Typically used to test innovative technologies or technologies that take some effort to implement (e.g., speech recognition)

# Task 05

- ▶ Discuss your requirements with the teacher and provide your choices for the technology to use and interaction
- ▶ Start designing your **paper prototype**
- ▶ Consider Nielsen's heuristics while designing your prototype





# Some reading you **MUST** do (~30 min)

- ▶ **Usability Principles**

- ▶ Nielsen's Heuristics

- ▶ **Paper prototyping**

- ▶ Design Thinking – Paper Prototypes

- ▶ Interaction Design Foundation – Paper Prototyping

# Standards

An informative note about the existence of standards for usability

- ▶ **ISO 9241-11 (1998) Ergonomic requirements for office work with visual display terminals Part 11 : Guidance on usability** Explains how to identify the information needed to specify or evaluate usability in terms of measures of: - performance - satisfaction
- ▶ **ISO 13407 -> ISO 9241-210 (2010) Human-centred design processes for interactive systems**
- ▶ And others related, e.g., **ISO 13.180 Ergonomics, ISO 9241-112:2017, ...**

# Standards

An informative note about the existence of standards for usability

**ISO 13407 addresses:**

- ▶ **... Four Principles of Human-Centred Design:**
  - ▶ active involvement of users
  - ▶ appropriate allocation of function to system and to user
  - ▶ iteration of design solutions
  - ▶ multi-disciplinary design
  
- ▶ **... and Four Human-Centred Design Activities:**
  - ▶ understand and specify the context of use
  - ▶ specify user and organizational requirements
  - ▶ produce more than one candidate design solution
  - ▶ evaluate designs against requirements

# Acknowledgements

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