

# Design Thinking and Electronic Prototyping

Week 08



Aalto University  
School of Electrical  
Engineering

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25.10.2022

# Salu records the lecture

You need to also record your attendance!

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Write the password (on side screens)



# Course Outline – Period I

1. L: Introductions
  2. L: Design Thinking and Context Mapping
  3. L: Electronics for Experience
  4. L: Interactions with Users
  5. L: Problems and Requirements (User Needs)
  6. L: Design Concept (Key Design Requirements)
- SEMESTER BREAK / Exam Week --

# Course Outline – Period II

**7. L: Prototyping and Testing (25.10.)**

8. L: Finalising the Design Concept (8.11.)

Presentation Rehearsals with Susan Gamache (21.-25.11.)

9. Final Presentations (29.11. 10-15, AS2)

# Today's learning goals

- Learn what kinds of learning purposes prototypes can serve
- Learn to define a list of requirements for a prototype

# Prototype Is a Learning Tool

# What would you like to learn with your prototype?

# What would you like to learn?

1. That you are creating the right product
2. That you have appropriate idea of the size and shape
3. That you have outlined the right functionalities
4. That users understand how your design works (usability stuff)
5. That people find your product desirable
6. That the functionality works as intended
7. That the structure holds together and works as intended
8. That the mechanical parts work as intended



# **What you might like to learn – but we are NOT learning in this course**

- 1. What would be the proper materials to create a real product (even the minimal viable product, MVP) of your design concept**
- 2. How small you could squeeze the size of your electronics**
- 3. What would be the cost of manufacturing 1000 pcs of your product**
- 4. How much power your design would need, and how long the battery would last**

# Prototype and Requirements

# Why do we need requirements?

When do we need them?

# You want to learn

## 1. That you are creating the right product

How do you learn this? Do we need requirements?

- **Communicate the idea appropriately**
  - Sketches, scenarios (stories), mock-ups
- **Ask for feedback**

# You want to learn

2. That you have appropriate idea of the size and shape

How do you learn this?

# Dilemma

**Do you create the physical prototype to learn about the desirable finished product, or possible size and shape of your functional prototype?**

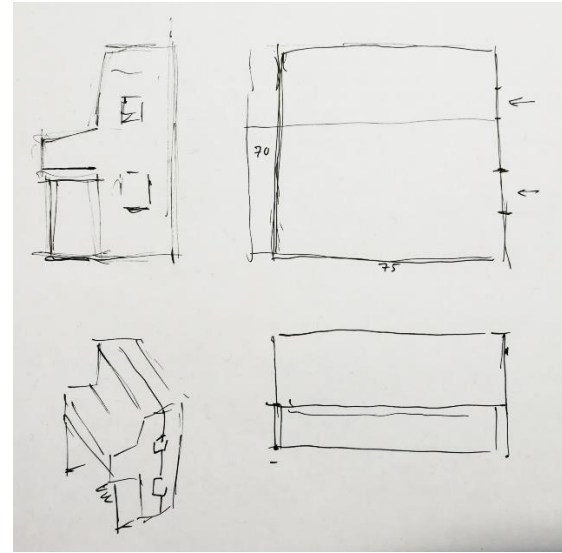
- **One prototype for one purpose!**
  - Functional prototype has different size, shape and appearance than the functional prototype (at least during the early iterations)

# You want to learn

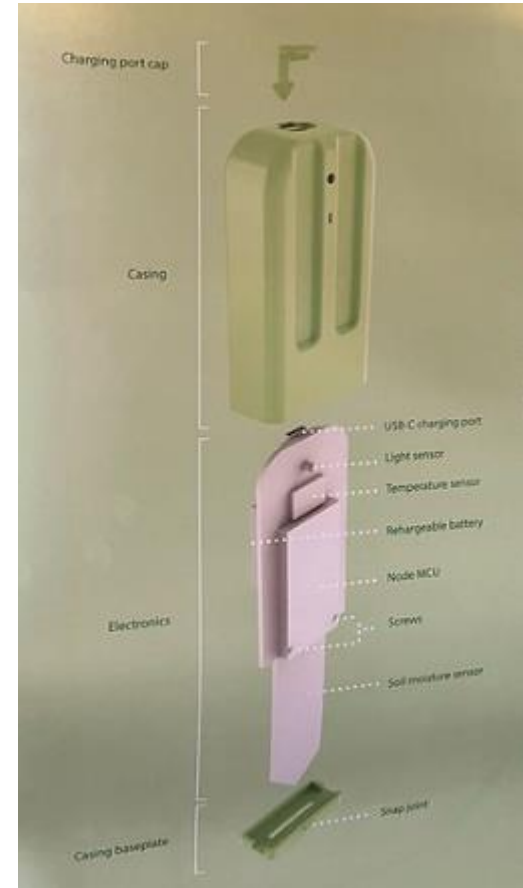
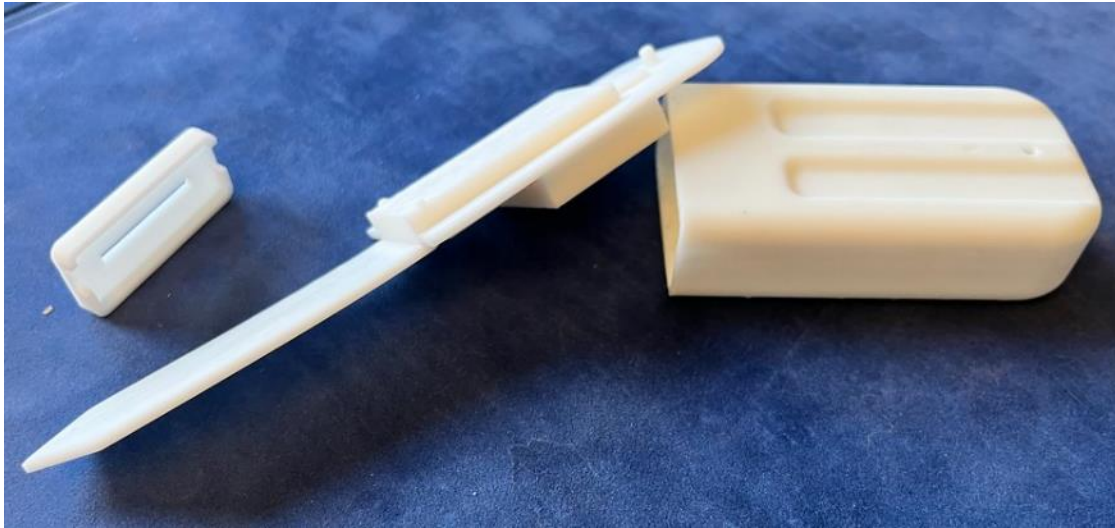
## 2. That you have appropriate idea of the size and shape

### How do you learn this? Requirements?

- **Make it physical and test**
  - Use cardboard, foam, etc materials
  - Make sure the size is realistic
    - First, sketch in life-size 1:1 from top, front and side angles
    - Include envisioned electronics (the power source too!) into to sketches



# Size, Shape and Architecture Prototype





# You want to learn

## 3. That you have the right functionalities

How do you learn this? Do we need requirements?

- **With scenarios (stories), yes**
- **But, you may need to build it**
  - Prioritize before building – what is the most important one?
  - Make a list of the key requirements

**What does this list look like?  
(prioritized list of required functionalities)**

# **What does this list look like?**

## **(prioritized list of required functionalities)**

- 1. Measuring temperature of a hot plate or pan (40 - 500 C) without touching the object**
- 2. Displaying the temperature in Celsius**
- 3. Be hand-held, lightweight, and cordless**

# You want to learn

**4. That users understand how your design works (usability stuff)**

**How do you learn this?**

- **Make an interactive test**
  - Paper prototype, physical mock-up, wizard-of-oz test, semi-functional prototype

# You want to learn

5. That people find your product desirable

# You want to learn

**5. That people find your product desirable**

**Who are the 'people'?**

- **Users, your boss, or financiers?**

**The Design Concept is for this -> Next lecture**

# Prototype in 2 weeks

# Let's try to think

**If you would have now only 2 weeks to prototype your idea, what would be your requirements for the prototype?**



# Sketches, Mockup & Requirements

## Deadline on Friday

- **Life-size sketches (scale 1:1)**
  - Include all electronics for the first prototype (the first interactive prototype due in 2 weeks)
- **Life-size mock-up (scale 1:1)**
  - Use cardboard, foamboard, Styrofoam/XPS, plasticine, whatever..
- **Requirements list**

# Let's go for the Quick'n'Dirty Functional Prototype

You will learn a lot beyond a single prototype:

- Cardboard modelling, 3D modelling, 3D printing
- Working with different sensors, actuators & boards

Deadline in 2 weeks:

- Your first prototype that helps you learn
- Requirements for this are due this Friday

# This week's tasks

**1. Diary – Deadline on Friday 23:59 (delays, -1pt/day)**

**2. Reading: End of Chapter 4, begin Chapter 5 until p. 141-170**

- Knowing What to Do: Constraints, Discoverability, and Feedback
  - Constraints That Force the Desired Behavior
  - Conventions, Constraints, and Affordances
  - The Faucet: A Case History of Design
  - Using Sound as Signifiers
- Human Error? No, Bad Design
  - Understanding Why There Is Error,
  - Deliberate Violations

**3. Project**

1. Sketches, Mock-up and Requirements for 1<sup>st</sup> proto – DL Friday
2. 1<sup>st</sup> functional prototype – with physical mock, DL Friday next week

**Next week:**

**No lecture - Work on your project!**