Design Thinking and Advanced Prototyping

ELEC-C9821 – Final lecture

Aalto University
School of Electrical
Engineering

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Today’s agenda

09:15 - 10 Lecture

1. Feedback on learning goals and requirements
2. Recap of the course final requirements
3. Custom session schedules for V8
4. PdP course promo

10:30 - 12 Workshop

4. Fixing the V2 + V3 learning goals & requirements

Concept Design (or Design Thinking)

Concept Design is a Learning Process

- **Project-specific learning about a design opportunity**
- **Prototype-driven learning, where the prototype is a learning tool**
  - With specific learning goals for each iteration
- **The learning through the whole project is displayed in the Design Concept Presentation**
  - It should crystallize the most important points that, based on what you have learned, should be considered about a specific product opportunity

Learning goals and requirements for a prototype

Design principles – based on reflecting on your work

- **Learning goals**
  - Project-specific
  - Minimal
  - Dependable
- **Requirements**
  - Dependent
  - Specific
  - Testable

Learning goals: Project-specificity

Challenges in defining the learning goals: Project-specific

Example:

"Learn to find the best shape of physical prototype for our project".

Challenges in defining the learning goals: Project-specific

Example:

"Learn to find the best shape of physical prototype for our project".

This is a generic concepting skill, not project specific.

Let’s make it project specific!

Challenges in defining the learning goals: Project-specific

Example:

"Learn what is the best shape of physical prototype for our project".

Now it is project specific.

Learning goals: Minimalism

Challenges in defining the learning goals: Minimal

Example:

"Learn what is the best shape of physical prototype for our project".

Is the aim to learn the best shape for

- a prototype, or
- the product?

The best shape for a prototype

Considerations

- The components in the prototyping may differ dramatically in physical aspects (size, locations, connectors) from the real product
- The manufacturing of the physical form may use a completely different process and materials from the real product
- Some sizes (detailed small mechanics), and material combinations (e.g. aluminium and glass, custom coating) are not practically feasible in a technically functioning electronic prototype
- Some forms that are not feasible in the product may be possible in the prototype, e.g., due to 3D printing.

The best shape for a product

Considerations

- **The best shape for the product may be quite different from that of a prototype (including size, forms, connectors)**
- **In concept design, the best possible shape may require visionary work that also challenges traditional manufacturing processes.**

Challenges in defining the learning goals: Minimal

Example:

"Learn what is the best shape of physical prototype for our project".

Let us re-phrase this.

Challenges in defining the learning goals: Minimal

Example:

"Learn what is the best shape of physical prototype for our project".

-> "Learn what is the best physical shape for our design concept."

Now it is project-specific and minimal.

How dependable is it for the requirements definition?

Challenges in defining the learning goals: Minimal

Example:

"Learn what is the best physical shape for our design concept."

Dependability:

- **Can you derive testable requirement(s) from this?**

Learning goals: Dependability

Challenges in defining the learning goals

Example:

"Learn what is the best physical shape for our design concept."

How can you know what is the best shape?

- **You need to test multiple shapes**
  - You need to create multiple shapes
- **You need to clarify the meaning of what is the 'best'**
  - Do you mean use, performance, manufacturing, sales…

Challenges in defining the learning goals

Example:

"Learn what is the best physical shape for our design concept."

Let us re-phrase the goal in order to make it dependable for defining the requirements.

Challenges in defining the learning goals

Example:

"Learn what is the best physical shape for our design concept from the users' point of view".

Now, this is project-specific, minimal, and dependable.

Requirements: Dependent

Requirements: Dependent

Requirements should be dependent on the learning goals, not vice versa

Requirements: Dependent

An example:

Learning goal: “Learn how to make a user interface that meets the requirements of our prototype.”

The problem:

The learning goal is derived from the requirements, and not the other way round, as should be.

Let us fix this – and also make the goal project-specific.

Requirements: Dependent

If you set requirements for the UI, what must it do?

For example, “Users must be able to see how many desks are free at a given time.”

Re-phrasing the goal:

“Learn what kind of presentation enables users to see how many free desks there are at a given time.”

Requirements: Dependent

This enables to define requirements, which are dependent on the goal.

Goal: “Learn what kind of presentation enables users to see how many free desks there are at a given time.”

Requirement: “100% of the users must understand how many free desks there are at a given time.”

Requirements: Specific

Requirements: Specific

Requirements should be specific about which learning goal they are dependent on:

1. Learning goal

1.1 Requirement

1.2 Requirement

2. Learning goal

2.1 Requirement

Requirements: Specific

A1. Learning goal: Learn what kind of presentation enables users to see how many free desks there are at a given time

A1.1 100% of the users must understand how many free desks there are at a given time.

P2. Learning goal: Learn what is the best physical shape for our design concept from the users' point of view

P2.1 The device must be attachable under a typical restaurant seat

P2.2 The device must not distract or draw attention

P2.3 The installer must be able to install the device in 60 seconds

Requirements: Testable

Requirements: Testable

Example:

Requirement: “Mock-up physical design".

This is too vague and cannot be tested.

It does not tell what the prototype should have or do.

Requirements: Testable

P2. Learning goal: Learn what is the best physical shape for our design concept from the users' point of view

P2.1 The device must be attachable under a typical restaurant seat

P2.2 The device must not distract or draw attention

P2.3 The installer must be able to install the device in 60 seconds

It is easy to think of possible tests for these requirements!

Deadlines next week:
Proto V2 tests + periodical diaries

Update your goals & requirements

- **If you have received a ‘revised’ in the assignment, you need to revise it according to the feedback.**
- **The specification of the learning goals and requirements, and learning to test and report according to them is a more important design thinking skill than building interactive electronic prototypes.**
- **So, if you need to balance between prototype’s functionality vs deeper thinking, prefer thinking.**

Posters – How to prepare

Posters

- **Height: 914 mm**
- **Width: 645 mm**
- **Format PDF**
- **Submit your poster via MyCourses by 24th of May midnight**
  - Printing is done by a janitor, who is doing the printing alongside many other duties.Thus, the deadline is a week before the presentations.

Graded deliverables

Graded deliverables

- **Group deliverables**
  - Final presentation
  - Poster
  - Report
  - Demo
  - Custom topic session (V8) [“done/not”]
- **Individual deliverables**
  - Learning diaries

Final Presentation – Why?

- To show what you have achieved in the course in terms of a concrete conceptual design project outcome as well as an interactive demonstrator
- To enforce a strict deadline for the project work, and thus, to facilitate the learning of project management and teamwork skills
- To rehearse your presentation skills and visual communication

Final Presentation – How?

Concept, +2pt

Process, +1pt

Demo, +1pt

Show, +1pt

Final Presentation

Concept argumentation, +2pt

- **Name, Purpose, Unique value**
- **Desirability:** Why should we believe that this is what users want/helps them to achieve what they want?
- **Feasibility:** What makes it technically feasible (CAPE aspects covered)?
- **Viability:** What would be the price point, and why would it make sense in terms of the cost of goods sold (COGS) and Cloud service costs?

Final Presentation

Process explanation, +1pt

- **Research/exploration**
  - User research
  - Technology research
  - Viability research
- **Justification for your design choices based on above research**

Final Presentation

Demo, +1pt

- **Does the demonstrator (proto or video of it) work as intended**
- **NOTE: Video of the demonstrator will be required for the report**

Final Presentation

Show, +1pt

- **Coherence**
  - Does it look like a sensible whole or like a mess?
- **Clarity**
  - Does the presentation progress clearly?
  - Do we see and hear what is intended?
  - (Presentations are in the Atrium)

Poster – How?

1. The name and the main purpose of the design concept are shown, +1pt
2. The unique quality/value of the design is communicated, + 1pt
3. An image of the ‘IoT product concept’ is shown, +1pt
4. An image of the overall product architecture is shown (e.g. in Cloud, App, Physical, Embedded style), +1pt
5. The poster follows (i.e. does not conflict) with the visual design principles given in the ‘visual design’ lecture, +1pt

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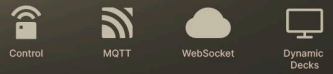
Take back control

Cloud-based remote control for all your dynamic decks

Salu Yli-risku, Carl Pellja, Shahram Barai, Aleksi Zubkovski



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Take back control

Cloud-based remote control for all your dynamic decks

Final documentation

Report – Why?

- **To leave a shareable online document of your project, which is usable, e.g. in your own CV**
- **To show inspiring examples to DTAP students when they start this course**
- **The report will be public by default and set out online**
  - You may opt out and leave your name unmentioned, if you wish
  - If you are not happy to publish your work, we can discuss

Report – How?

- **+0.5pt to your overall grade**
- **Wiki page that contains a simpler version of your Final Presentation**
  - The information is presented as text, images and video
  - Purpose, value, architecture and demonstrator must be included
  - Source code & 3D models are optional
  - See example: https://wiki.aalto.fi/display/DTAP/Example+DTAP+Project+Report+Page

Wiki page

https://wiki.aalto.fi/display/DTAP/DTAP23+Project+Gallery

V8 Teams

V8 Teams – the next steps

1. **Define the learning goals and requirements for the Prototype V3**
2. **Prepare your custom session**
   - Team 7 + Team 1, 26.4.
   - Team 2, + Team 6, 3.5.
   - Team 3, 10.5.
   - Team 4, 17.5.
   - Team 5, 24.5.

Custom sessions - inspiration

Custom topic session – Why?

- **To improve your conceptual thinking, presentation and facilitation abilities**
- **To encourage to dig a bit deeper into a specific topic of your own interest (related to IoT innovation / Design Thinking)**
- **The underlying process is similar to design thinking**
  - You will need to ‘have a point’ (i.e. do research and present)
  - You will need to argue that ‘this point is important’
  - You will facilitate discussion/activity about ‘how should we think or deal with this issue/point’

Custom topic session – How?

- **10% of grade for V8 teams, +0.5pt for final grade**
- **Pass/Fail**
  - Team will get a ‘pass’ (=+0.5pt) if you at least try this
- **Presentation 10-15 mins + dialogue (maybe activity together), from 15 min up to 45 min in total**
  - Less than initially introduced on lecture 1

-- Presence Check --

Project work

Circuit Shop Schedule

We have a scheduler on MyCourses to help you to distribute across the week so that the small space does not get too full.

Circuit Shop (piiripaja) is located in front of the Electronics Workshop (Sähköpaja).

Available times are during the regular exercise times (may be adjusted if needed)

This week

- **Project: Test and report your Proto V2**
- **Diary: Return it by Friday next week.**
- **Exercises (mini project) (Fri 14-16, Mon 14-16, Tue 10-12)**
  - VOLUNTARY!