Design Thinking and Advanced Prototyping

ELEC-C9821 – Reporting Prototyping Tests

Aalto University
School of Electrical
Engineering

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Today’s agenda

09:15 - 10 Lecture (Salu)

Reporting the tests

10:15 – 11 Custom session (Team 4)

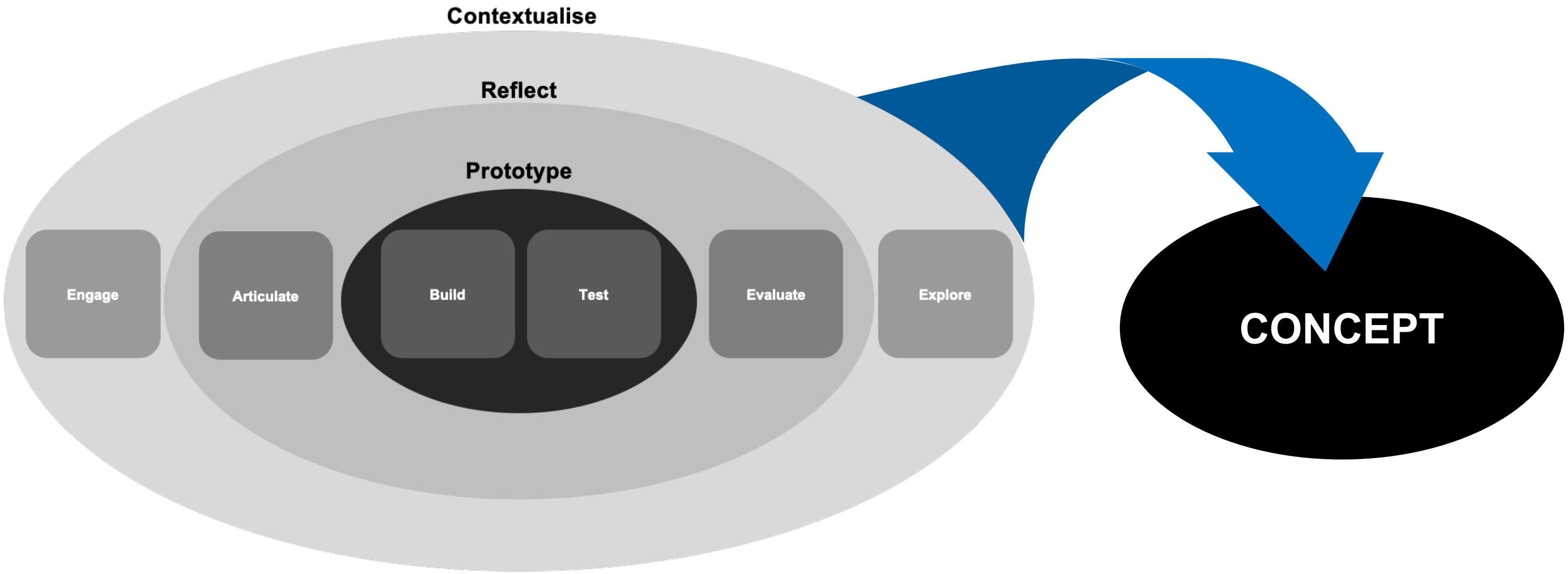
Concept Design
(or Design Thinking)

Concept Design is a Learning Process

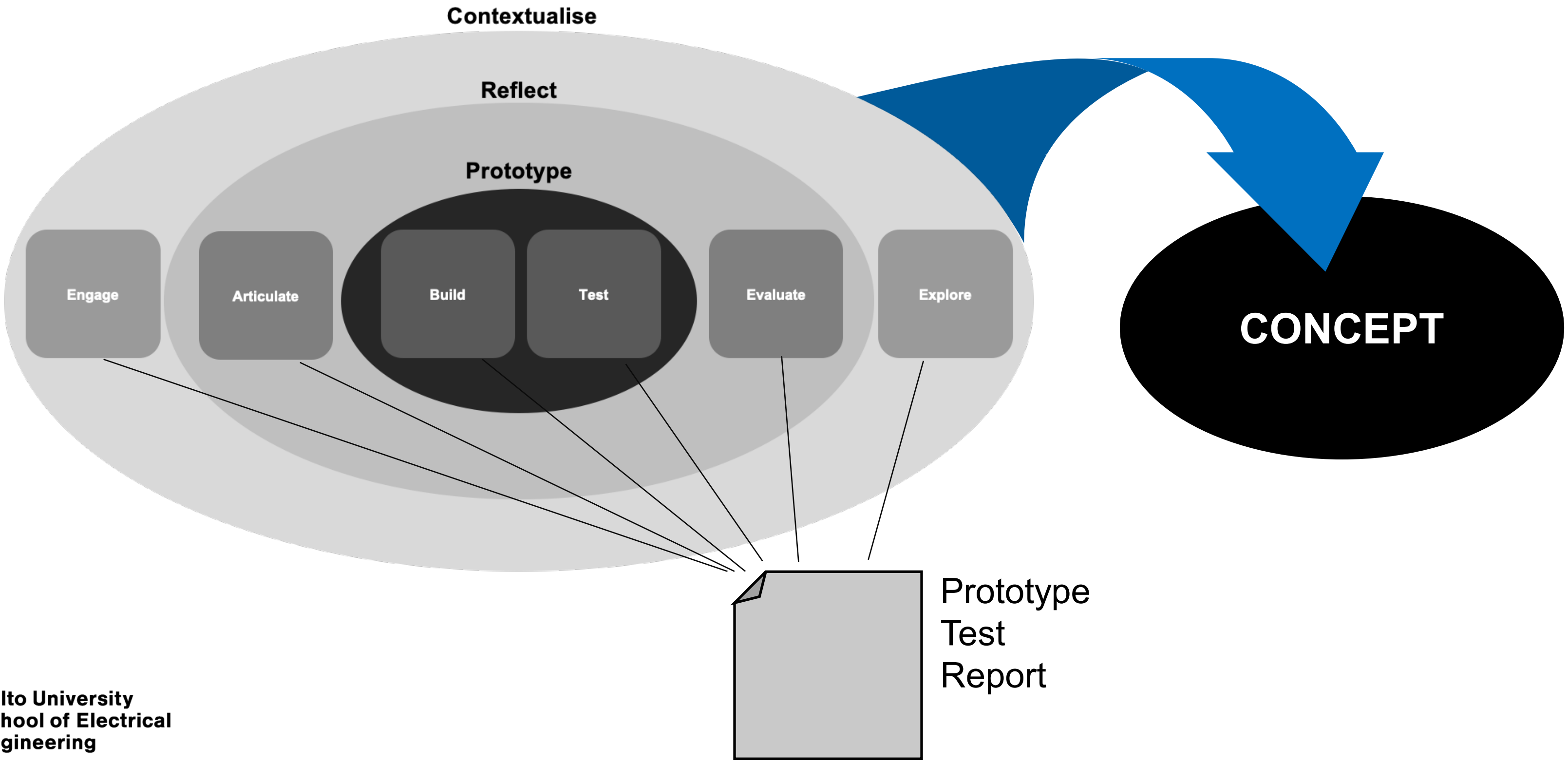
- **Project-specific learning about a design opportunity**
- **Prototype-driven learning, where the prototype is a learning tool**
    - With specific learning goals for each iteration
- **It is reflective learning process, where you try to develop a proposal for changing current situation for a preferred one**
    - The learning through the whole project is displayed in the Design Concept Presentation

Prototypes in the process

Design Thinking Model 3-2-1



Design Thinking Model 3-2-1



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Learning goals and requirements for a prototype

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Design principles – based on reflecting on your work

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

These are on Lecture 12 slides

Reporting the tests

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Your Prototyping Reports Fall into Five Types

1. Freeform text covering all areas (CAPE) with references
2. Hierarchical twin of the original requirements
3. The two above with added ‘progress’ section
4. The three above with added ‘success’ indicator
5. Rainbow reflection

Task for you

- **What are the benefits and problems of each of the identified ways of reporting prototyping?**
    - Think about the **team member** of the report who tries to make sense about the developments.
    - Think about a **manager** who needs to evaluate the level of success of the prototype.
    - Think about the **designer**, who is pondering on what to do next.

Freeform text covering all areas (CAPE) with references

- “CLOUD

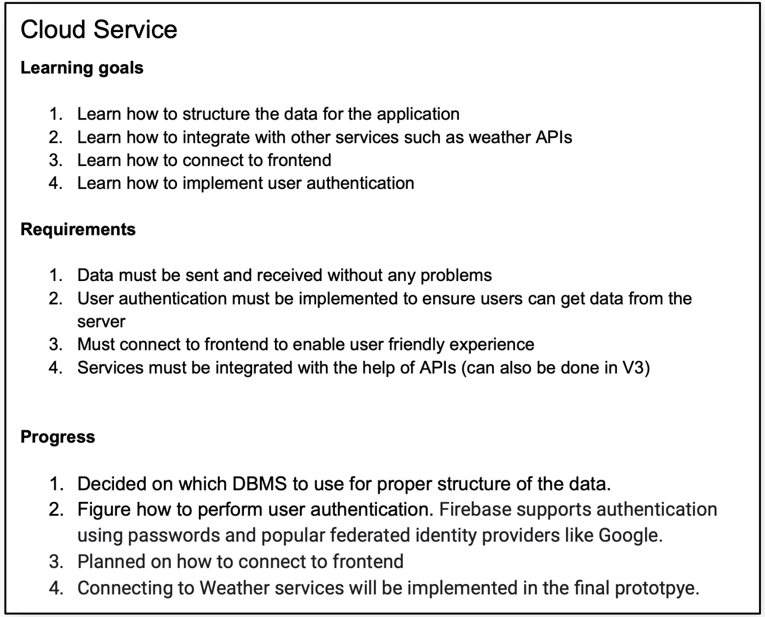
  While there wasn't enough time to implement caching (RC8), the server script is running in a systemd process which automatically reboots on failure (RC9), and captures logs in case something goes wrong.”

Hierarchical twin of the original requirements

- “CLOUD SERVICE DESIGN
  - i. Learn about data modelling
    1. I have done research into database design, especially how to convert an idea into a uml design and then a relational schema. Even though we will be using a NoSQL (document-oriented) database, I thought it would still be important to develop a schema, so that the data is well-structured.”

Types of reporting found in your documents

3. Adding a new section called “Progress” after Learning Goals & Requirements



Cloud Service

Learning goals

1. Learn how to structure the data for the application
2. Learn how to integrate with other services such as weather APIs
3. Learn how to connect to frontend
4. Learn how to implement user authentication

Requirements

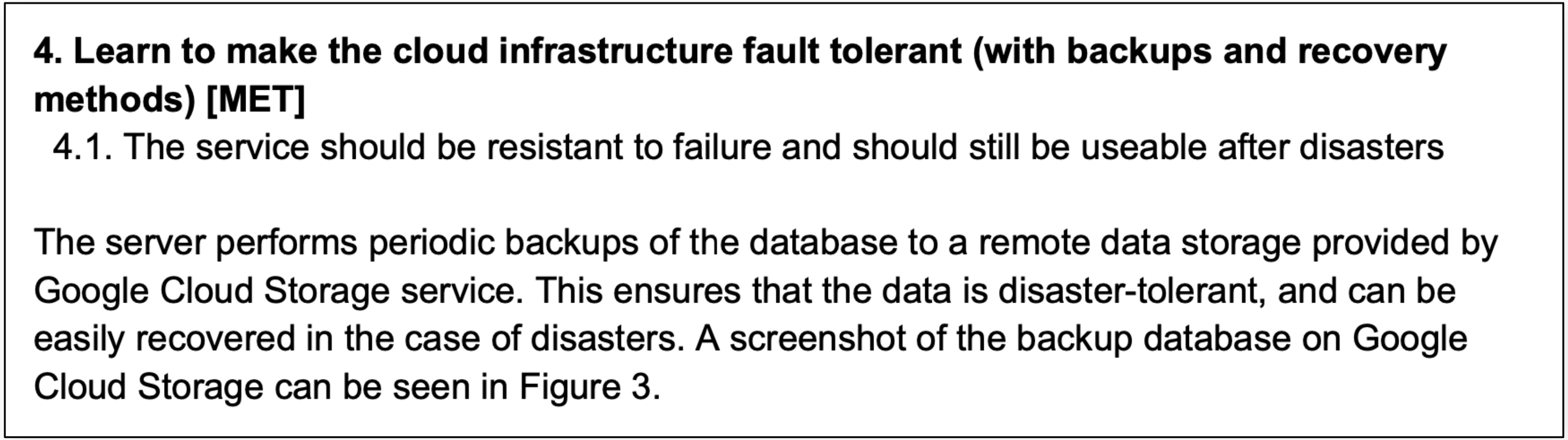
1. Data must be sent and received without any problems
2. User authentication must be implemented to ensure users can get data from the server
3. Must connect to frontend to enable user friendly experience
4. Services must be integrated with the help of APIs (can also be done in V3)

Progress

1. Decided on which DBMS to use for proper structure of the data.
2. Figure how to perform user authentication. Firebase supports authentication using passwords and popular federated identity providers like Google.
3. Planned on how to connect to frontend
4. Connecting to Weather services will be implemented in the final prototpye.

Types of reporting found in your documents

4. Combination of hierarchy, success markings, and freeform text



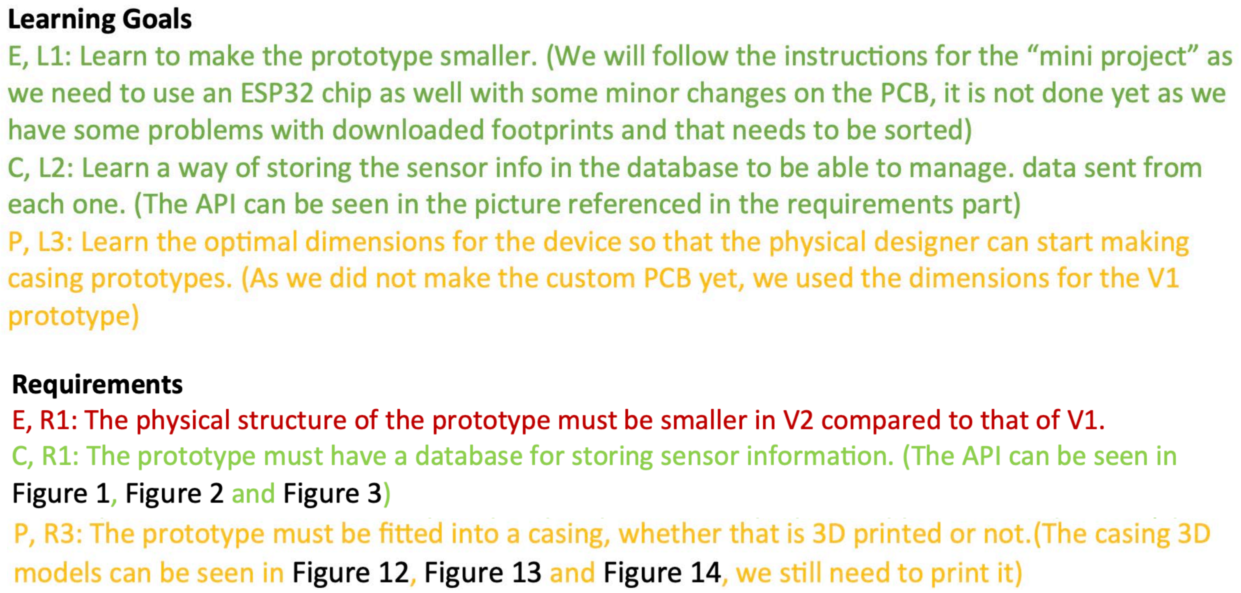
4. Learn to make the cloud infrastructure fault tolerant (with backups and recovery methods) [MET]

4.1. The service should be resistant to failure and should still be useable after disasters

The server performs periodic backups of the database to a remote data storage provided by Google Cloud Storage service. This ensures that the data is disaster-tolerant, and can be easily recovered in the case of disasters. A screenshot of the backup database on Google Cloud Storage can be seen in Figure 3.

Types of reporting found in your documents

5. "Rainbow" - Reflecting on both learning goals and requirements with colour to indicate success



Learning Goals

E, L1: Learn to make the prototype smaller. (We will follow the instructions for the "mini project" as we need to use an ESP32 chip as well with some minor changes on the PCB, it is not done yet as we have some problems with downloaded footprints and that needs to be sorted)

C, L2: Learn a way of storing the sensor info in the database to be able to manage. data sent from each one. (The API can be seen in the picture referenced in the requirements part)

P, L3: Learn the optimal dimensions for the device so that the physical designer can start making casing prototypes. (As we did not make the custom PCB yet, we used the dimensions for the V1 prototype)

Requirements

E, R1: The physical structure of the prototype must be smaller in V2 compared to that of V1.

C, R1: The prototype must have a database for storing sensor information. (The API can be seen in Figure 1, Figure 2 and Figure 3)

P, R3: The prototype must be fitted into a casing, whether that is 3D printed or not.(The casing 3D models can be seen in Figure 12, Figure 13 and Figure 14, we still need to print it)

Discussion

- **What are the benefits and problems of each of the identified ways of reporting the ~~tests~~ prototyping?**
  - Team member
  - Manager
  - Designer

Recap

1. Freeform text covering all areas (CAPE) with references
2. Hierarchical twin of the original requirements
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5. Rainbow reflection

How to document prototyping?

Learning through Testing vs Learning through Experiencing

- **Testing: Requirements are useful for getting detailed metrics from prototype tests**
  - They are useful for explicating concrete details about how things happen and give grounds for further reflection (analysis)
- **Experiencing: When you build and explore, you find new things, experience surprises, and come up with new ideas**
  - This requires detailed documentation, sense-making, and imagination (design)

Known vs. Unknown

- Requirements = Known
- Learning goals = Known
- Learning experiences = Expected and unexpected

- Expected = you just work and achieve the learning goals
- Unexpected = you work but experience novelties and surprises

How to document the process?

- **Learning goals – ‘Questions / hypotheses’**
- **Requirements – ‘Planned outcomes’**

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- **Test results – ‘Recorded / measured outcomes’**
    - Reflection on test results – ‘What works/not? Surprising results?’

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- **Development experiences – ‘Documented work’**
    - Lessons learned – ‘Implications for the concept’

-- Presence Check --