

Lezione 2 - Design Process

Outline

Design Process

- ↳ A simple design task
- ↳ Design Process Models
- ↳ Systematic Design

Design Specification

- ↳ Requirements and technical specifications
- ↳ ...

In the Product Design Cycle, the first step is always to identify the needs/problems, we will look at the two steps after

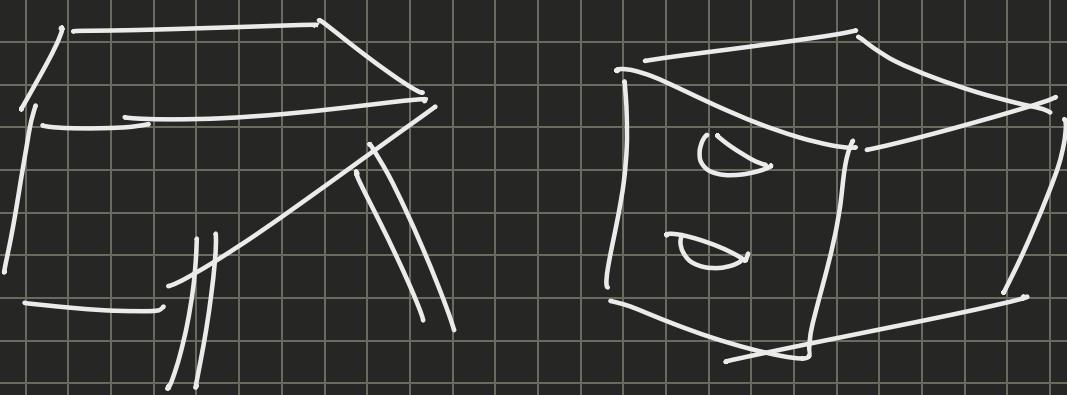
Steps of fundamental design activities:

- ↳ Definition of product requirements
- ↳ Product Conceptual Design
- ↳ Embodiment Design → Embodiment: Concept into matter.
- ↳ Detail Design

Practical Example

Device to carry backpack:

- ↳ I think immediately at bags at the front or the back since these are the more convenient places to exploit space, and there are many already existing similar device, all that would change is the latching system.



The first step we want to do is clarify the driver task, asking questions to people of interest to understand the intended purpose

- What kind bike?
- What kind of backpack?
- Where on the bike? → What are the consequences of it being put in some spaces rather than others.
- What sort of user?
 - This can also change where on the bike
 - If we want to make it for everyone
- What is the budget → final price?
→ for the project?

What we want to understand is who are the stakeholders?

- The user
- Bike producers
- Standards/Rules / Regulators

Factors to consider

- Requirements on the manufacturing side.
- Requirements on the sales (e.g. user experience in shop)

- ↳ Ease of shipping
- ↳ Requirements on installation, use or maintenance.
- ↳ Requirements of recyclability

There are a number of things that we have to consider.

To clarify what we need to make and make sure our client is happy.

When we start to formulate the solution we are able to clarify some things, we are able to find some clarifications on things which we might not have thought.

They help us explore the design space.

Design is an activity that

- ↳ affect almost all area of human life.
- ↳ uses the laws and insight of science
- ↳ builds upon special experience
- ↳ ...

Different phases of design:

↳ Conceptual Design: Analysis of the requirements, exploration of design space and definition of the functional architecture of the system. → e.g. how quick it does what it needs to do, is it waterproof.

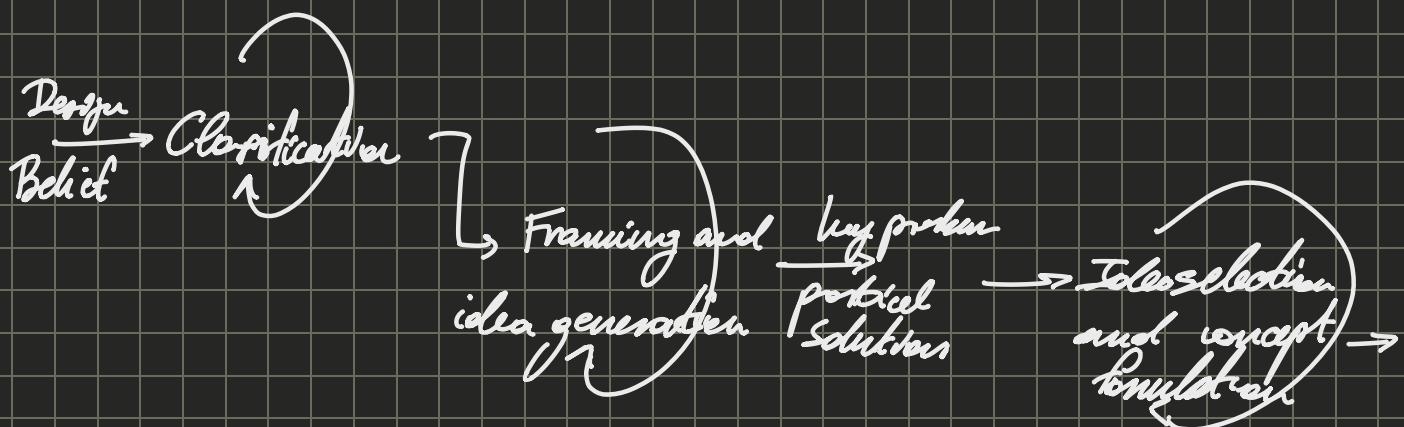
↳ Embodiment Design: Translation of the functional architecture conceived in the conceptual design phase into a set of sub systems suitable for carrying out each function and subfunction.

→ Detail Design: Definition of the geometric characteristics, processes, material, etc. of each part suitable to be produced and to satisfy the product specification.

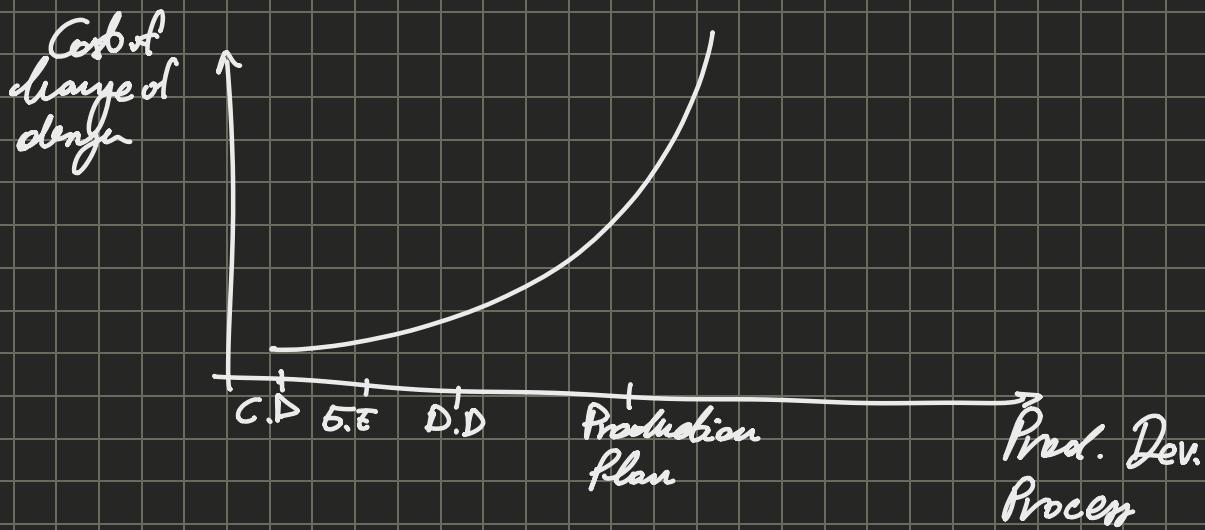
In each phase there are different stages in which we pass through:

→ Analysis → Synthesis → Evaluation →

Within each phase there are different iterations of the same stages



Iterations occur both within the design activity and among stages



We want to make sure we make all proper evaluations early on to not needlessly increasing the price.

Pahl & Beitz → show us that

- ↳ Between work breakdown and requirements creation, there is a full set of activities.

Design Specification

↳ The list of all requirements to fulfill, this needs to be clarified in a non-subjective manner, this means they are objectively assessable relative to quantitative and qualitative designs.

- ↳ Proper technical specifications also outline proper tests and testing methods
- ↳ There are many things that are usually in technical specifications

We also need to define the stakeholders, to clarify the scope we can use 4 main categories:

- buyer
- user → can be not clear in many cases.
- beneficiary
- outsider

There are different kinds of techniques that aid us during different parts of the design process.

Life-cycle Analysis → Analysis of different parameters and their effect through the life-cycle of a product, e.g. the life-cycle carbon emissions through the life-cycle.

There are some checklists one are supposed to trigger the recognition of some requirements that may have escaped us.

- ↳ Pugh Checklists
- ↳ Pahl-Betz Checklist

They are usually divided in categories.

Use these for the start of the prae finale