Methodological Design V-model coffeemaker

Jan Bollen

Saxion University of Applied Sciences

Agenda

- Projects
- Methodological design
- Stakeholders
- V model
- Project Setup
- System Requirements
- Functional Design
- Technical Design
- Testing
- Deliverables

SAXION

Projects, examples

- Building a bridge
- Developing a new product
- Developing a marketing plan
- Reducing waiting lists at hospitals
- Doing a theater production
- Conducting research for a thesis
- Organizing a pop festival
- Implementing software at a company
- Setting up a website
- ……..

Managing a Project

Project Life Cycle

- Initiation
- Planning
- Execution
- Closure

Activities / Coffeemaker

Execution of the project

- Research

/ know all the details of the original coffee maker machine

- Designing

/ How will the new machine work and look like

- Realising

/ Producing the new machine

- Testing

/ Does it work yes or no?

/ Is the Client and User satisfied?

Principles of methodological design

- **Think first, then act!**
- Think through project in detail
  - from start to finish **AND**
  - from finish to start.
- Work from global to detail
  - Top-down working
  - First the big picture
  - Then the details!

Methodological Design

Objectives

- Minimization of Project **Risks**
- Improvement and Guarantee of **Quality**
- Reduction of **Total Cost** over the entire project
- Improvement of communication between all Stakeholders

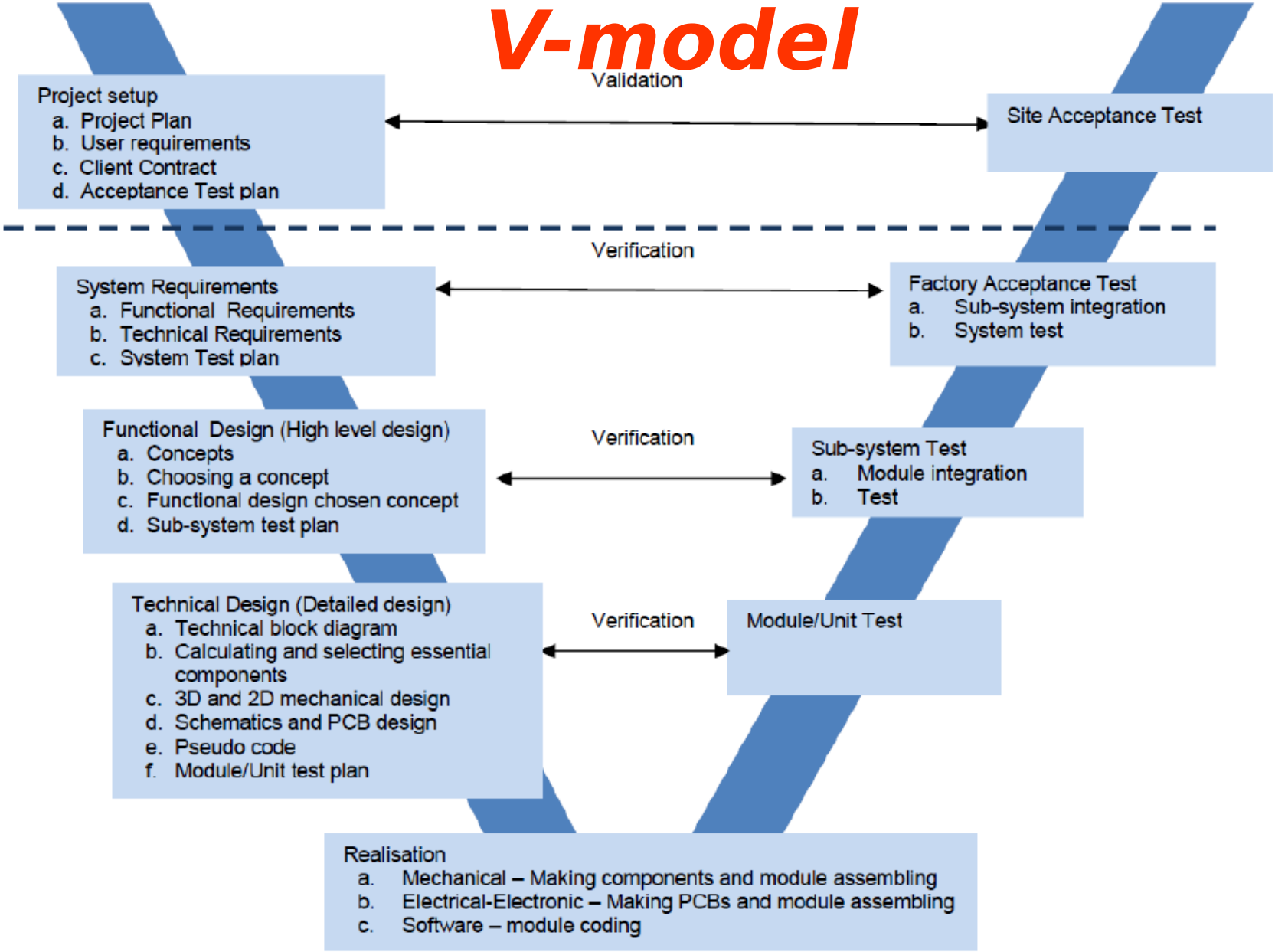
Stakeholders

- Operator
- Manufacturer
- Seller
- Transporter
- Maintainer
- Dismantler

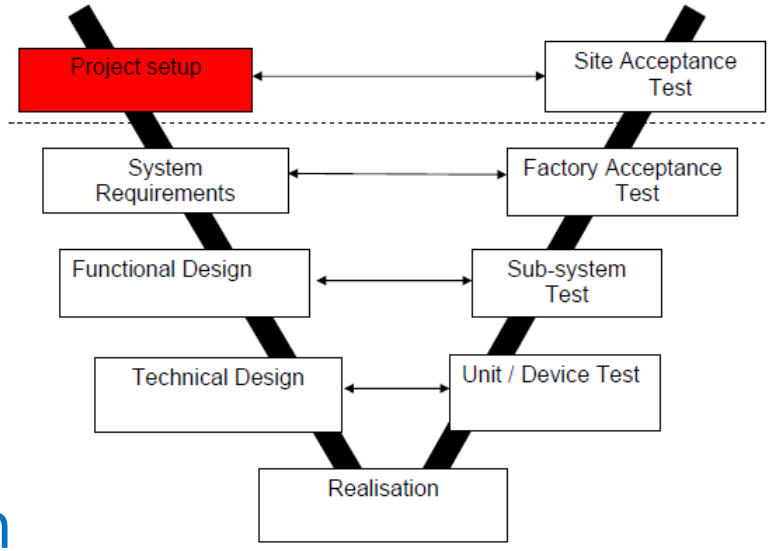
Costs

- Chairman € 90 per hour
- Secretary € 40 per hour
- Designer € 60 per hour

V-model


Project setup
a. Project Plan
b. User requirements
c. Client Contract
d. Acceptance Test plan
Validation
Site Acceptance Test
Verification
System Requirements
a. Functional Requirements
b. Technical Requirements
c. System Test plan
Factory Acceptance Test
a. Sub-system integration
b. System test
Functional Design (High level design)
a. Concepts
b. Choosing a concept
c. Functional design chosen concept
d. Sub-system test plan
Verification
Sub-system Test
a. Module integration
b. Test
Technical Design (Detailed design)
a. Technical block diagram
b. Calculating and selecting essential components
c. 3D and 2D mechanical design
d. Schematics and PCB design
e. Pseudo code
f. Module/Unit test plan
Verification
Module/Unit Test
Realisation
a. Mechanical – Making components and module assembling
b. Electrical-Electronic – Making PCBs and module assembling
c. Software – module coding

Project setup



- User Requirements
  - Description of the system as expected by the client Saxion
- Project Plan
  - Document for managing the project
  - **Use the format of Roel Gritt !!!**
- Site Acceptance Test (SAT)
  - Demonstration of working model of the modified coffeemaker machine.

Project setup

Project Plan

Background info	Where (in what environment) will the project be carried out?
Project results	Why carry out this project and what is the desired final result?
Project activities	What do we need to do to achieve the project goal?
Project limits	What are the boundaries of the project?
The products	What are the intermediate products?
Quality control	How can we ensure the sufficient quality of all products?
Project organization	Who is participating and how do we plan to collaborate?
Schedule	Who is doing what / when?
Costs and benefits	What will the project cost and what will it yield?
Risks	What could cause the project to fail?

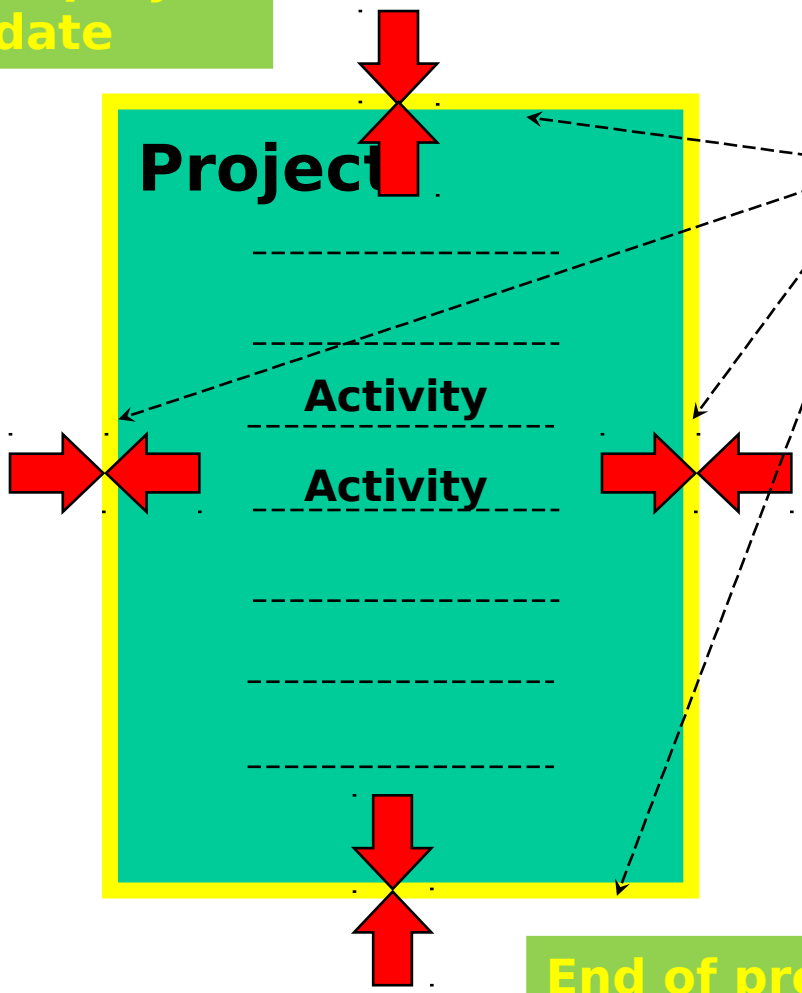
Project setup, SMART results

- S – Specific
- M – Measurable
- A – Acceptable
- R – Realistic
- T – Time bound

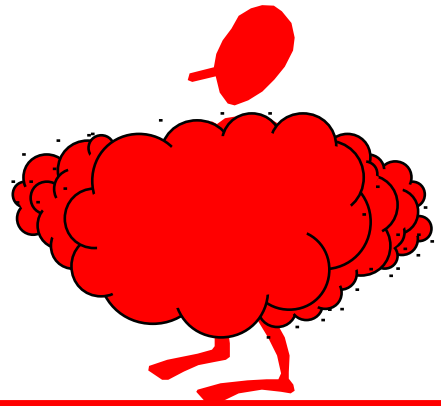
Example of a SMART Goal		
S	Specific	I want to lose 5kg
M	Measurable	Use weighing scale
A	Achievable	Yes, with combination of diet and exercise
R	Relevant	You bet! Health: I am overweight and have high risk factors for heart disease Looks: I want to improve my social life Life: I want to try wakeboarding in 6mths
T	Timeline	12 weeks ≈ 3months

Project limits

Start of project
Start date



Boundaries



Project boundaries must be specific!

End of project
End date

Project Organization

Main functions in a project organization:

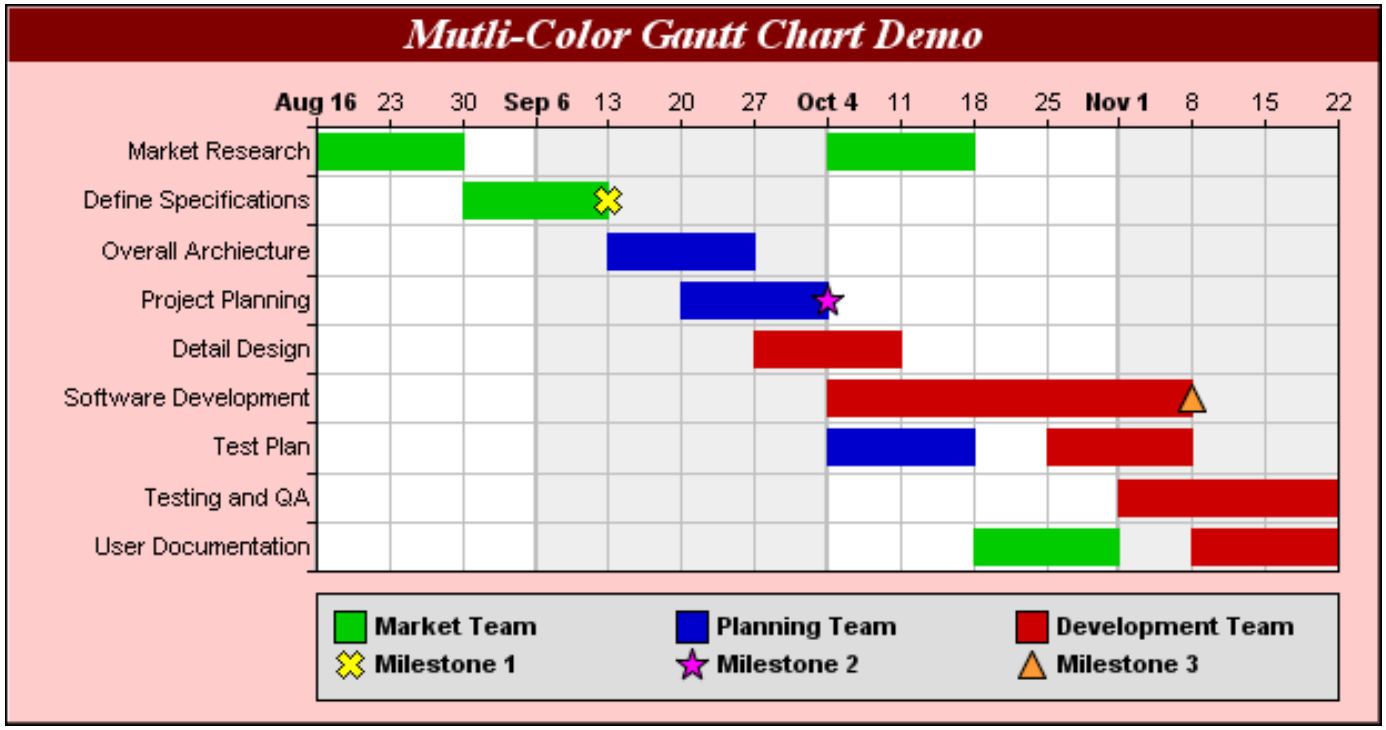
- Project leader
- Secretary / documentation
- Technical designer 1
- Technical designer 2

Each function should be described:

- Tasks
- Responsibilities

Schedule, Gantt Chart

Software: Microsoft Projects GanttProject



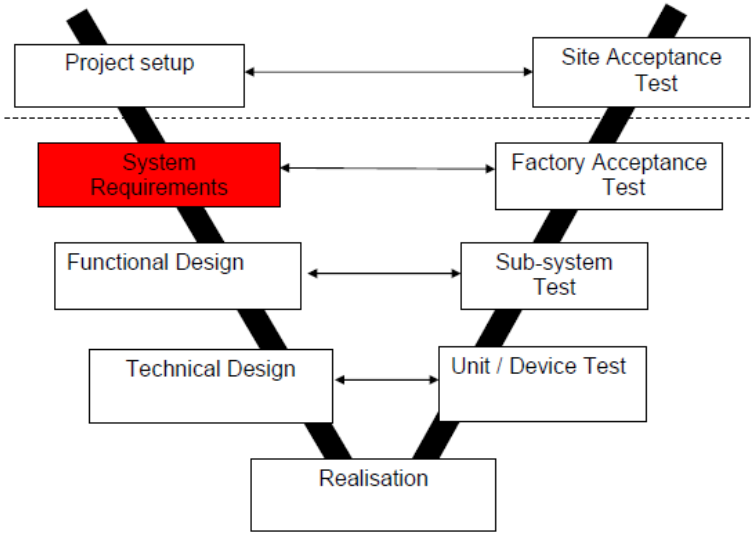
Activities

Tasks

Milestones

Legenda per person

System requirements



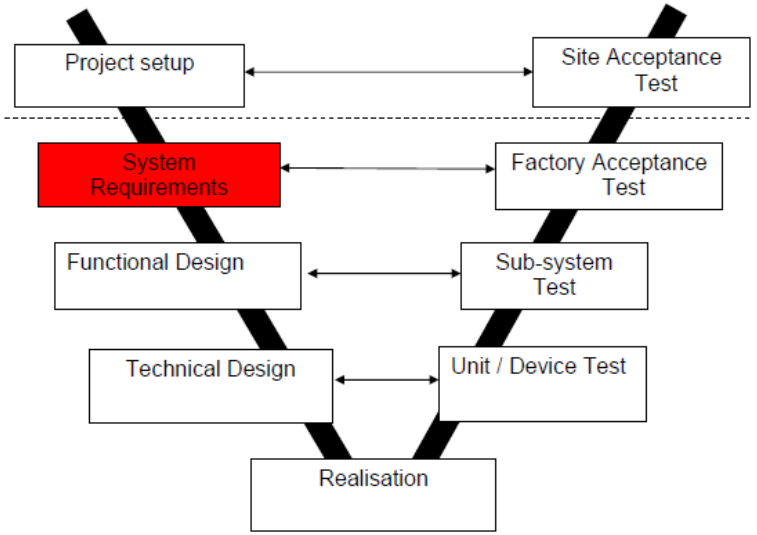
First some questions should be answered:

- Investigate coffee making
- Research original machine
- Temperature measurements original machine
- *Conclusions of temperature control original machine*

System requirements:

- *Specifications temperature range new machine*

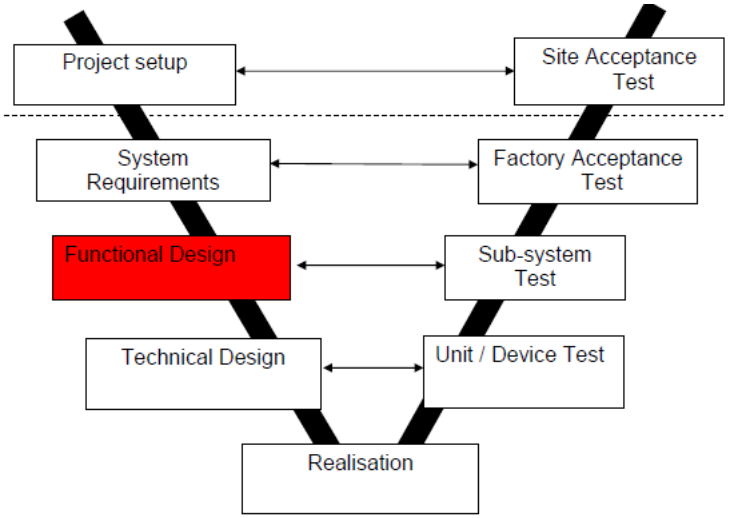
System requirements



Some other questions:

- Who is the target group of clients?
- What will the clients pay for the machine?
- Is the speed of coffee making important?
- What is a normal drinking coffee temperature?
- What is the maximum coffee temperature?
- For how many cups is the coffee machine?

Functional Design

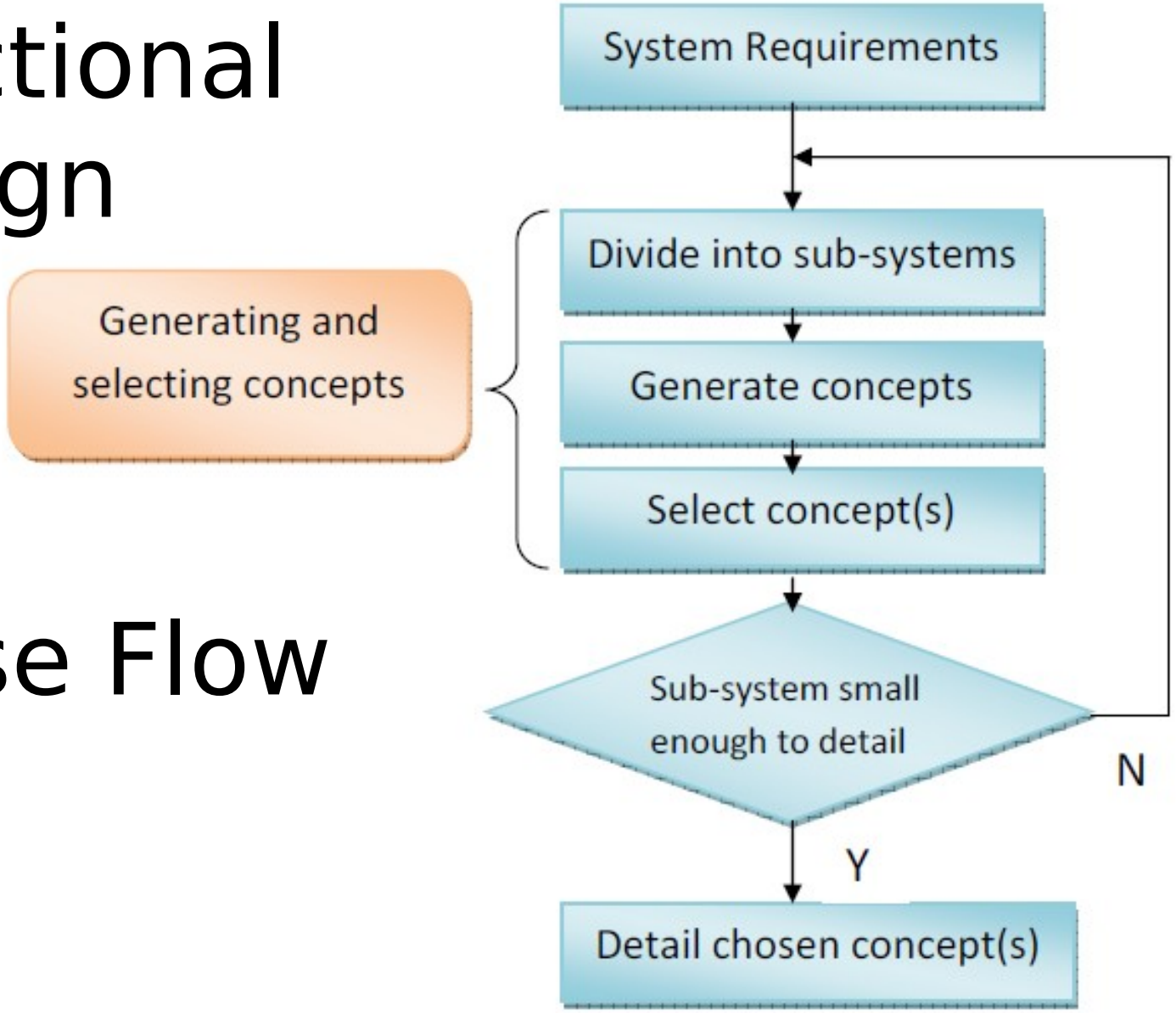


- What does the client get? How can the user operate the new machine?

- Concept principles (morphological)
  - *Electrical block diagram:* What temperature sensor? / How to do signal process? / What control concept? / Which power stage?
  - *Mechanical:* New construction of chassis / Which material? / How to assemble?

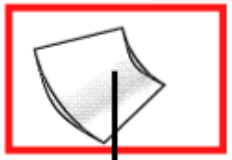
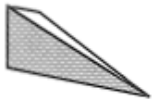
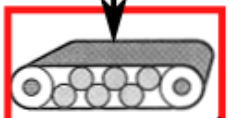
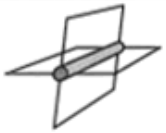
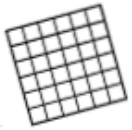
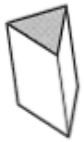
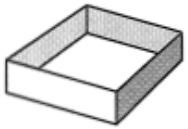
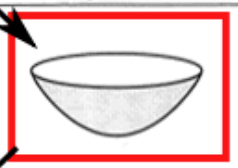
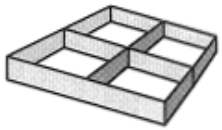
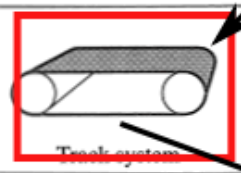
Functional design go / no go

Functional Design



Phase Flow

Morphological example

	Option 1	Option 2	Option 3	Option 4
Vegetable picking device		 Triangular plow	 Tubular grabber	 Mechanical picker
Vegetable placing device	 Conveyor belt	 Rake	 Rotating mover	 Force from vegetable accumulation
Dirt sifting device	 Square mesh	 Water from well	 Slits in plow or carrier	
Packaging device				
Method of transportation		 Track system	 Sled	
Power source	Hand pushed	Horse drawn	Wind blown	Pedal driven

Concept 1

Horizontal:

Options

Vertical:

Items / functions / key parameters

Morphological coffee maker

Horizontal:

Options

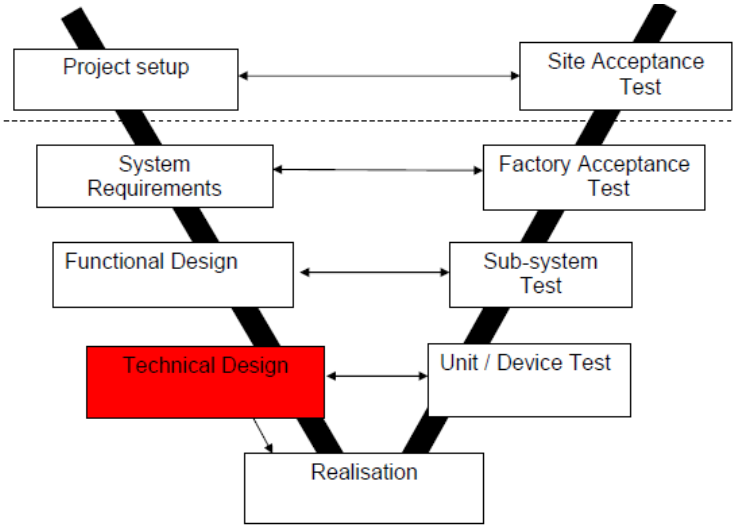
Vertical:

Items / functions / key parameters

	option 1	option 2	option3
thermistor			
temperature sensor circuit			
controller ciruit			
power stage			

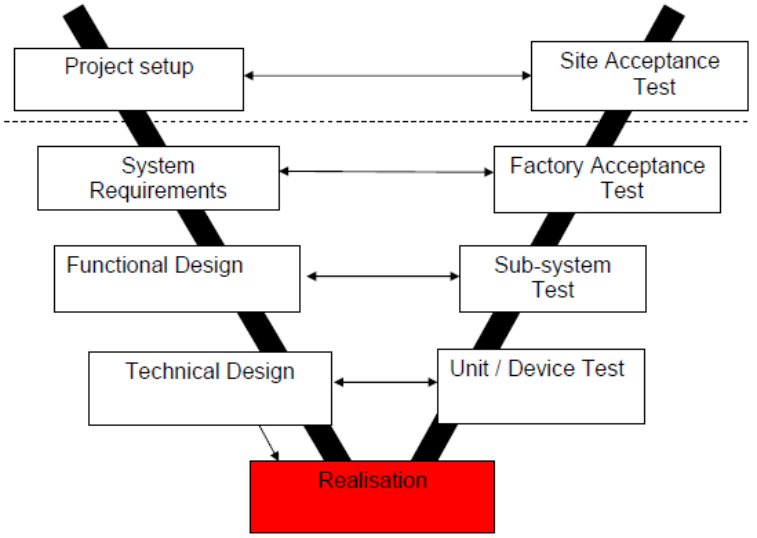
Make choices clear

Technical Design



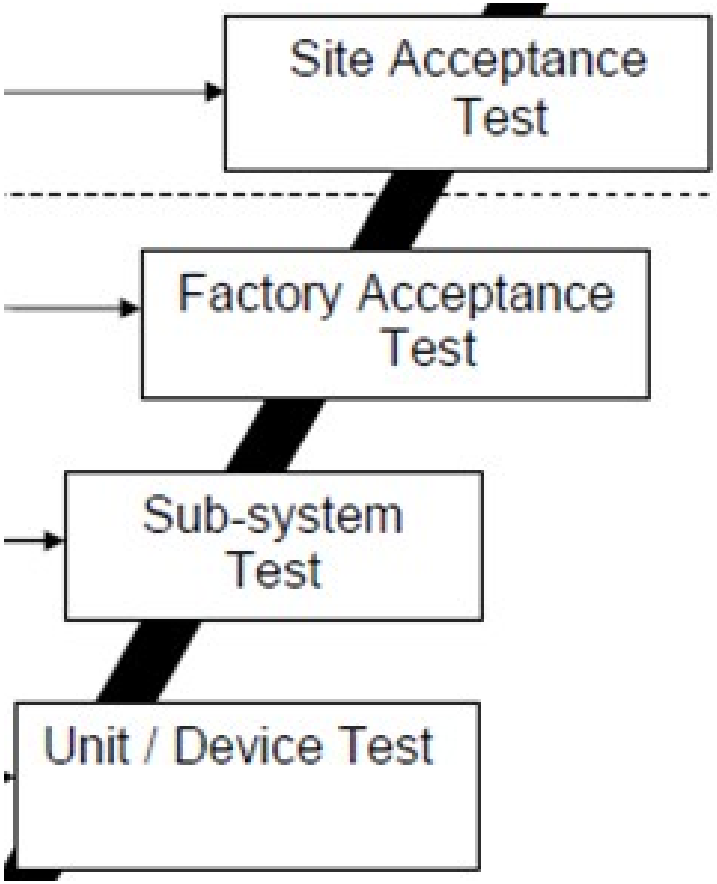
- Detailed Electrical design
  - Calculation / Simulation
  - Temperature sensor
  - Wheatstone
  - Controller (Software block definition / flow chart)
  - Power stage
- Detailed Mechanical design
  - Drawings of chassis is known
  - Material is known

Realisation



- Electrical-Electronic
  - Making PCBs and unit assembling
- Mechanical
  - Making components and unit assembling
- Software
  - Unit coding

Testing



- SAT: demonstration for SAXION (client)
- FAT: totally circuit test inside the machine
- SST: totally circuit test outside the machine
- UDT: circuit test by block

Deliverables

- Project plan
- Logbook
- Agenda’s and minutes
- Go/NoGo presentation
- Final Report
- Poster
- Final presentation