

# SEMA Assignments

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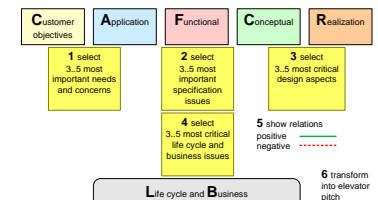
## Abstract

This document described the assignments during the SEMA course. The teachers alternates brief theory lectures with these assignments. The teacher may skip a few assignments, when too little time is available.

## Distribution

This article or presentation is written as part of the Gaudí project. The Gaudí project philosophy is to improve by obtaining frequent feedback. Frequent feedback is pursued by an open creation process. This document is published as intermediate or nearly mature version to get feedback. Further distribution is allowed as long as the document remains complete and unchanged.

August 16, 2025  
status: draft  
version: 0.1



Determine the system of interest

Define your organization

Determine an innovative change to be architected

# Create a Project Overview of the Case

Create a Project Overview for your case

*Project Title*

meta information, e.g. version, date, author, owner

*Project Goals*

- 3 to 5 specific and quantified objectives

*system context*

- sketch the next generation system
- indicate changes compared to the current generation system

*system of interest*

- sketch your next generation subsystem, module, or function
- indicate changes compared to the current generation subsystem

*Key Performance Parameters*

- 5 to 10 specific and quantified requirements

*project master plan with timeline*

- first light, prototype shipment, 1<sup>st</sup> SAT @OEM, 1<sup>st</sup> SAT @OEM's customer, start volume production

*other relevant project information*

# Homework; Discuss and Update Case Overview

Contact the project and team leaders.

Have a dialogue on the case overview.

Adjust the case overview.

Annotate where uncertainties are.

Create a Project Overview for your case

<i>Project Title</i>		meta information, e.g. version, date, author, owner
<i>system context</i> <ul style="list-style-type: none"><li>• sketch the next generation system</li><li>• indicate changes compared to the current generation system</li></ul>	<i>system of interest</i> <ul style="list-style-type: none"><li>• sketch your next generation subsystem, module, or function</li><li>• indicate changes compared to the current generation subsystem</li></ul>	<i>Project Goals</i> <ul style="list-style-type: none"><li>• 3 to 5 specific and quantified objectives</li></ul>
<i>project master plan with timeline</i> <ul style="list-style-type: none"><li>• first light, prototype shipment, 1<sup>st</sup> SAT @OEM, 1<sup>st</sup> SAT @OEM's customer, start volume production</li></ul>		<i>Key Performance Parameters</i> <ul style="list-style-type: none"><li>• 5 to 10 specific and quantified requirements</li></ul>

# Sketch the System-of-Interest

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**Sketch** the **System-of-Interest** in its **context**

- Show some of the internals of the system-of-interest
- Indicate the boundary of the system-of-interest

# Exercise StoryTelling

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Create a story

as text + sketch or as cartoon

Use the criteria

be highly specific!

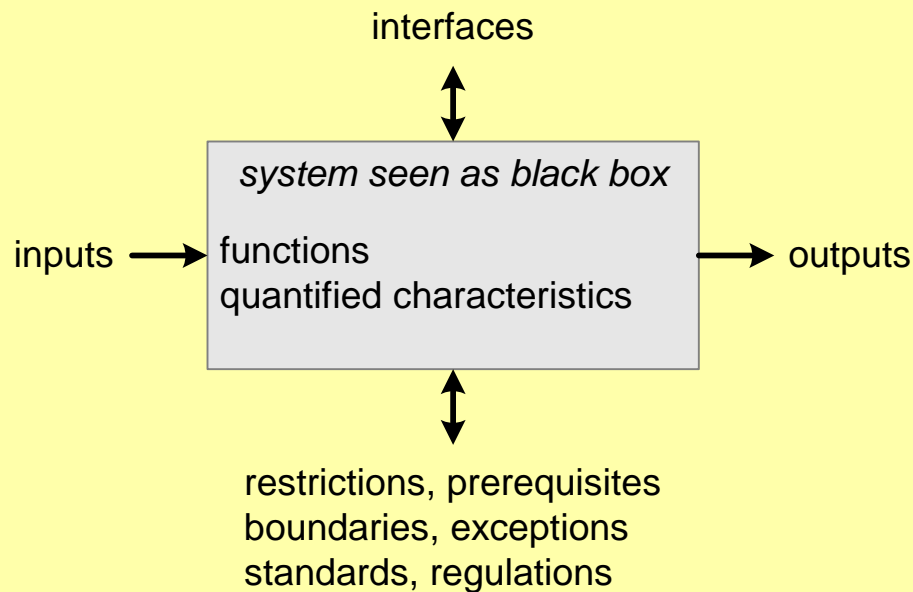
envision the future value proposition

Enjoy!

# Use Case Exercise

Make specification overview with ~10 **SMART** Key Performance Parameters (or functions or interfaces)

determine at least one use case



*use case*  
typical use with relevant  
context data (quantified!)

- **S**pecific *quantified*
- **M**easurable *verifiable*
- **A**chievable (Attainable, Action oriented, Acceptable, Agreed-upon, Accountable)
- **R**ealistic (Relevant, Result-Oriented)
- **T**ime-bounded (Timely, Tangible, Traceable)

# Exercise Dynamic Behavior

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Capture the **dynamic behavior** of the **internals** of your system in **multiple** diagrams.

Diagrams that capture dynamic behavior are among others:

- Functional flow (of control or information, material or goods, or energy)
- Activity or sequence diagrams (e.g. with “swimming lanes”)
- State diagrams

# Exercise Block Diagram

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Make a set of **block diagrams** capturing the **static parts** and **interfaces**.

Ensure coverage of the entire system, e.g. including service, training, production, etc.

Show both **hardware** and **software**

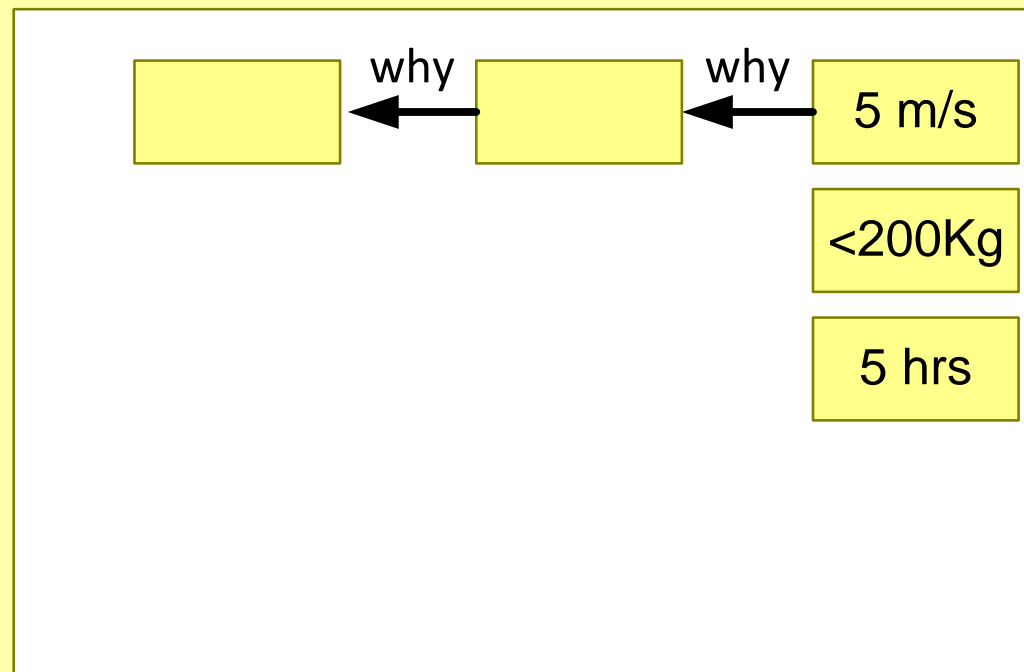
Good block diagrams have in the order of 10 to 20 blocks

# Exercise Customer Key Driver Graph

Make a **customer key driver graph**

Use yellow note stickers

Start at the right hand side






Make a **technical budget** for one of the **key performance parameters**.

- a good budget has 20 to 30 contributing elements
- elements should be balanced (remove or combine insignificant contributions)
- use the previously defined parts and dynamic behavior

# Exercise Concept Selection

Make a **decision matrix** for one of the **concept selections**.

- define at least 3 concepts
- define 7 to 10 criteria for selection
- score the concepts against the criteria, for example using a scale from 1 to 5: 1 = very poor, 5 = very good
- recommend a concept with a rationale

	concept 1 	concept 2 	concept 3 
critterion 1	vulnerable MTTR <span style="background-color: #ffcccc; padding: 2px;">1</span>	robust 30 hours <span style="background-color: #ccffcc; padding: 2px;">3</span>	robust access <span style="background-color: #ccffcc; padding: 2px;">5</span>
critterion n	reusing platform <span style="background-color: #ccffcc; padding: 2px;">4</span>	reusing platform <span style="background-color: #ccffcc; padding: 2px;">4</span>	resource shortage <span style="background-color: #ffcccc; padding: 2px;">2</span>
			best, because ...

Make a **business plan** for the mid to long-term future.

- determine business model
- determine investments, sales volume, sales price, and costs
- estimate the cash flow and accumulated profit
- include at least 3 releases or generations of systems

Analyze the **evolution** during the **lifecycle**.

- identify sources of change in customer context, life cycle context, and technology
- make a list of changes
- determine per change the expected rate of change and the required response time to the change
- optional: determine effort, impact, and risks per change

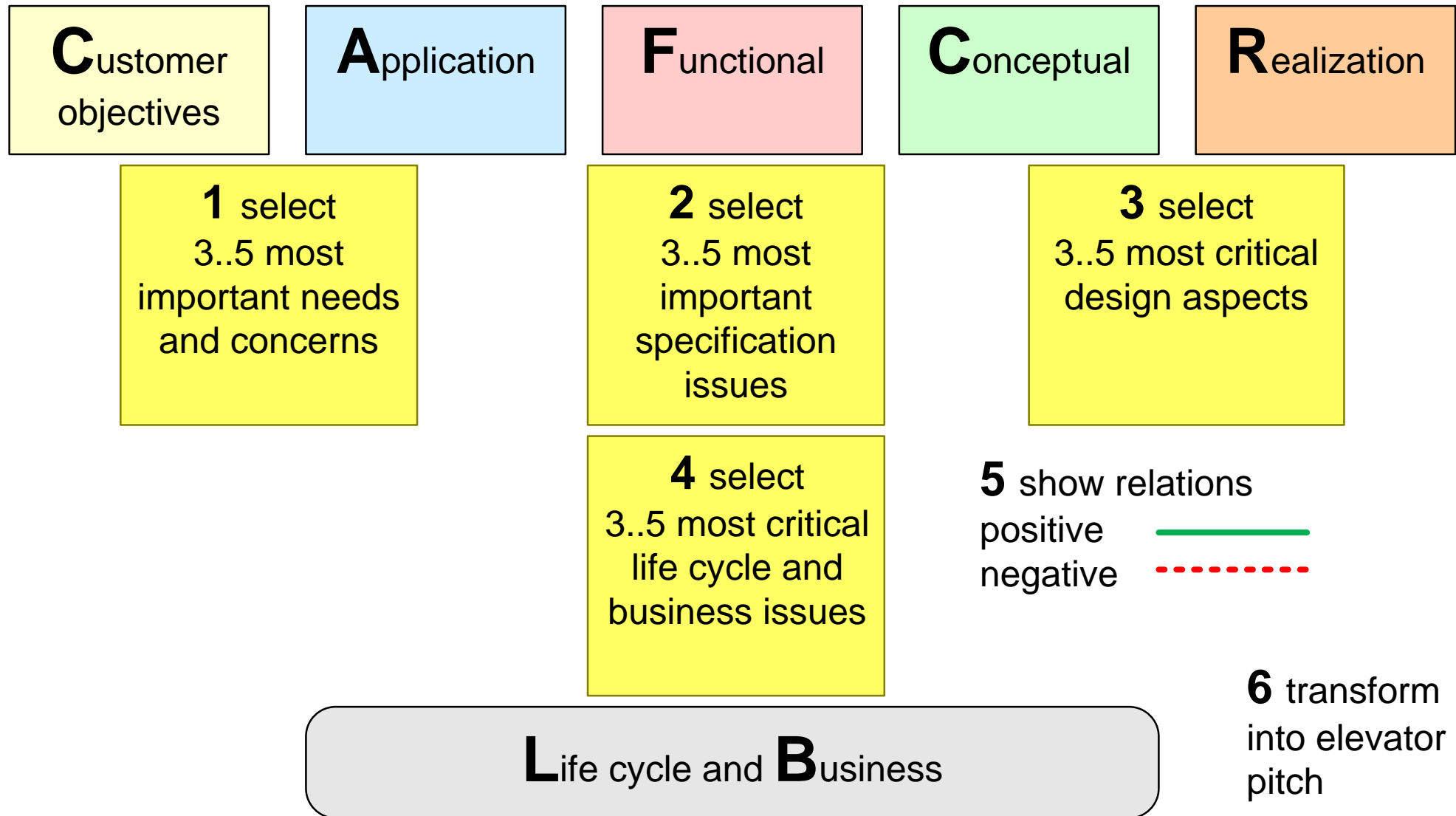
# Exercise Line of Reasoning

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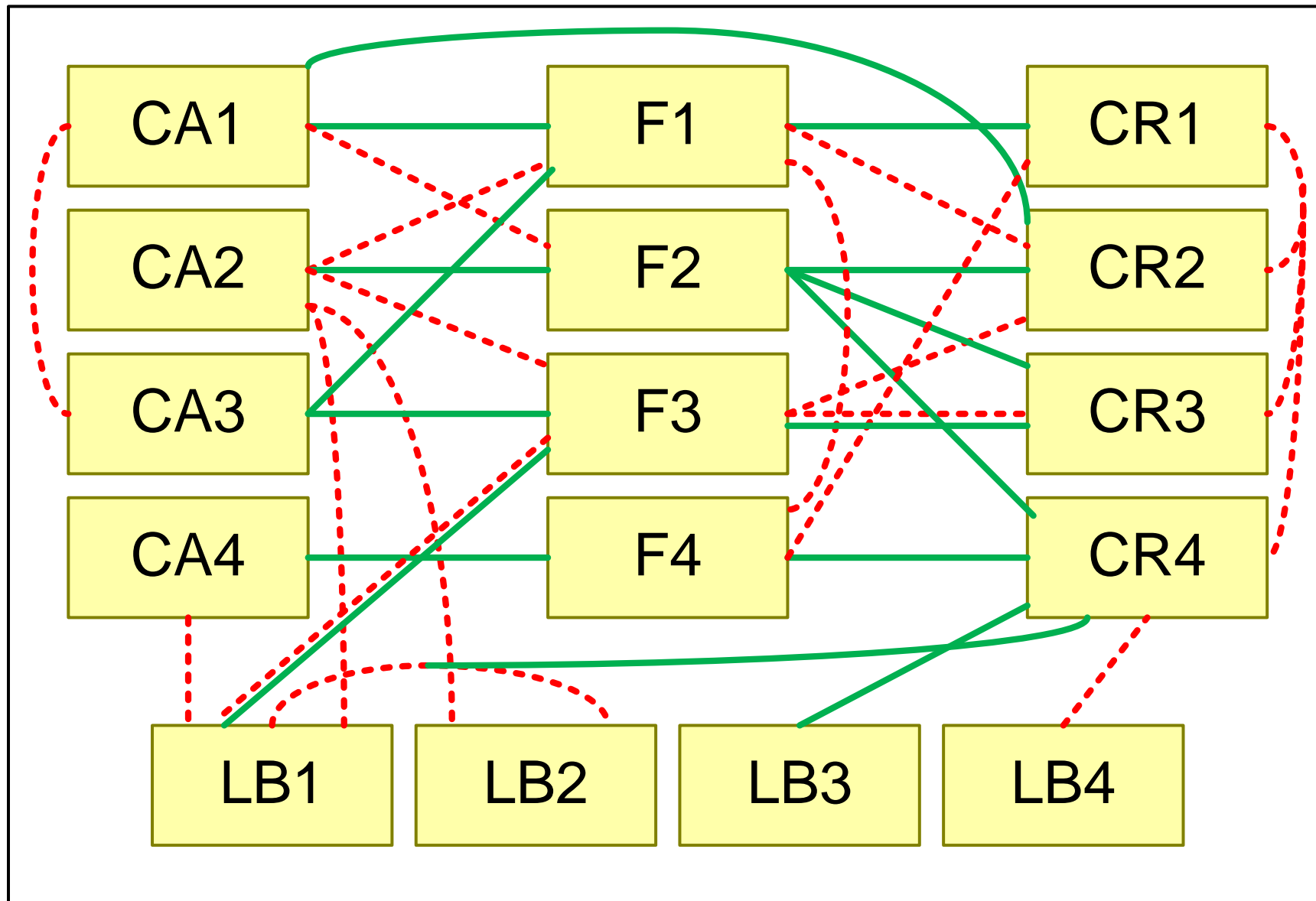
Make a **line of reasoning** for one of the dominant qualities.

- in the CA views; determine what customers do to achieve their goal
- in the F view determine the specification of your system supporting this quality
- in the CR views determine the relevant concepts and technologies
- Take the reverse viewpoints as well: what threatens this quality?

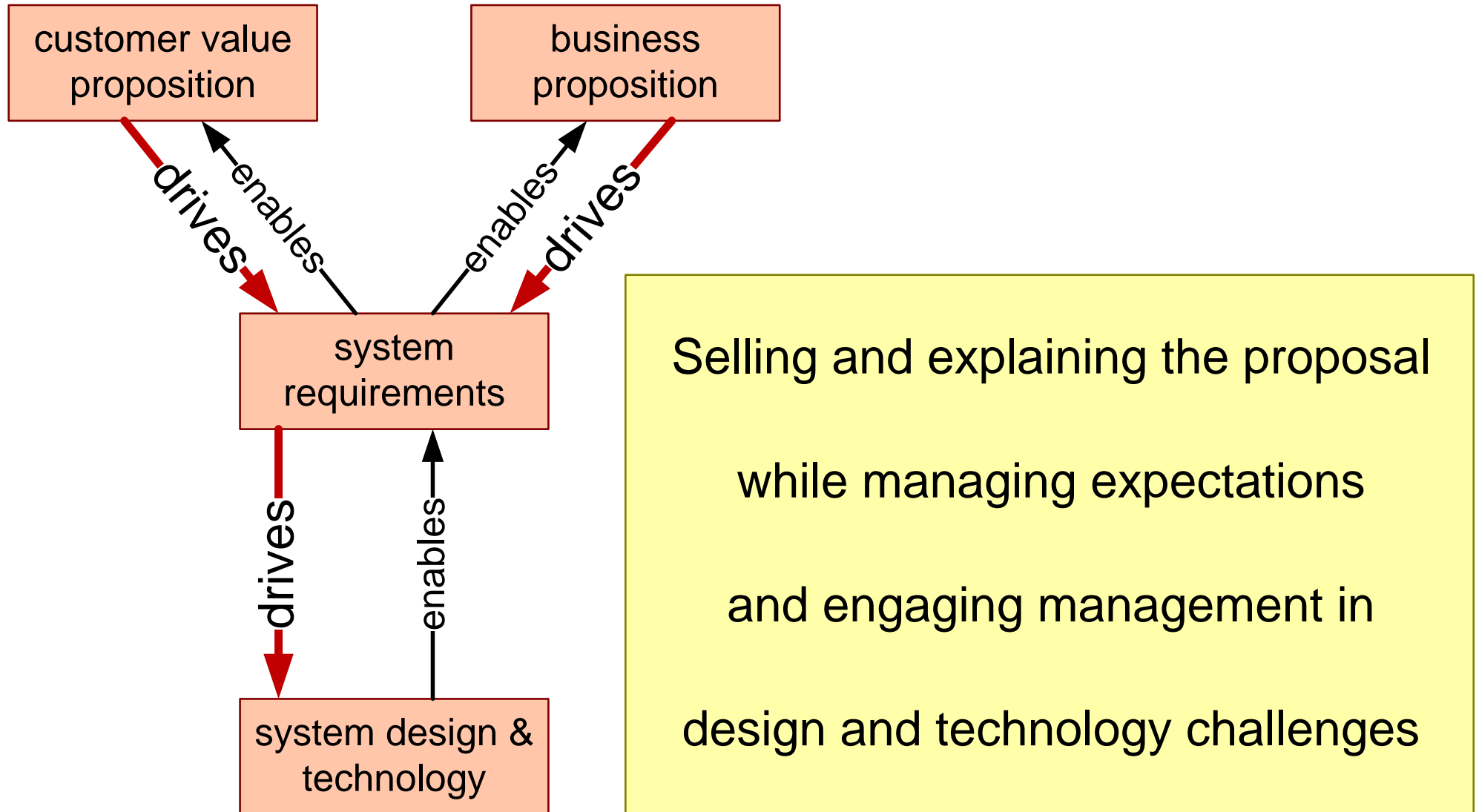
# Exercise Threads of Reasoning



# “Spaghetti” after Step 5



# Elevator Pitch of about 90 seconds



Identify a **chain of models** needed to support architecture development.

- models are related horizontally in the CAFCR model (across views), as well as vertically within a view
- models have various levels of detail; detailed models tend to feed/support less detailed models
- per model
  - formulate its purpose
  - indicate the main quantities that play a role

# Exercise Analysis of Models

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Determine for a few models their **credibility**, **accuracy**, and **working range**.

- Identify top 3 credibility risks
  - identify biggest uncertainties in inputs, abstractions and realization
- Estimate accuracy of results; quantitative, e.g. order 1% or 50%
  - based on most significant inaccuracies of inputs and assumed model propagation behavior
- Identify relevant working range risks
  - identify required (critical) working ranges and compare with model working range

# Exercise Wrap-Up

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**Capture** your work done during the course, e.g. **make photos** of the flip charts.

Make a list of **questions**, **assumptions**, biggest **uncertainties** and **unknowns**

Make a list of **lessons learned**

Make a plan for the **homework**