

Laying the Foundations: The Initial Stages of Implementing

SYSTEMS ENGINEERING IN CARGO SOUS TERRAIN

Summary

- Project Introduction
- Systems Engineering in CST: The Beginning
- Relevance of Systems Engineering in complex infrastructure Projects
- Early Challenges in Integration
- Strategic Approaches and Methodologies
- Early Successes and Learning Experiences
- The Role and Impact of Systems Engineering in CST
- Conclusion and Next Steps
- Q&A

About us



LAURENT MAGNIN

Head of Mechatronics
Cargo Sous Terrain (CST)

Project Leadership, Solution
Engineering, Mechanical
Engineering, Mechatronics, Fire
Protection, Infrastructure



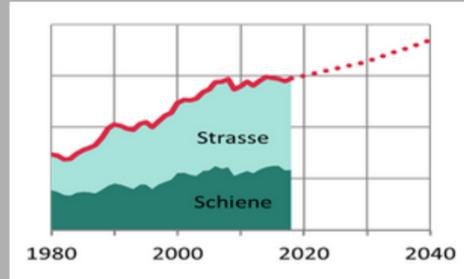
PIERO CIANCIA

Systems Engineering Expert
Ciancia Consulting Partner

Requirements Engineering,
Systems Architecture, System of
Systems, Model-based Systems
Engineering (MBSE)

Project Introduction

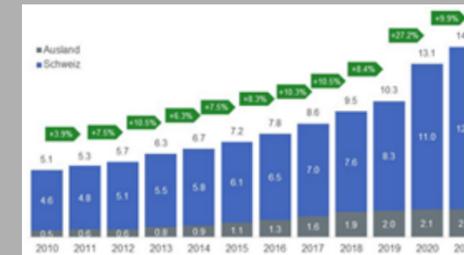
Challenges in logistics in Switzerland



25% increase in freight traffic by 2040



Load on the main traffic axes at the capacity limit



Strong trend towards online retail and small-scale units

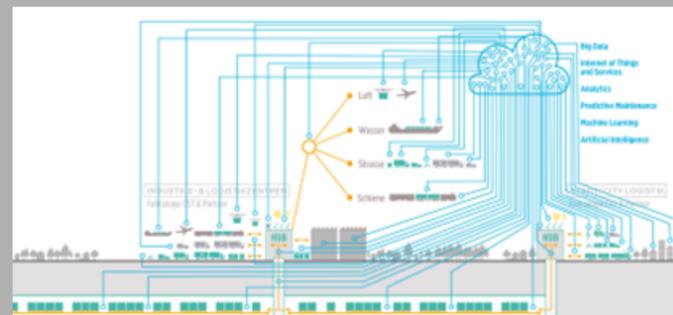


Burden on city centers due to delivery traffic

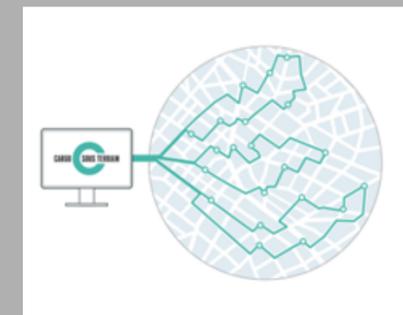
Proposed solution



Alternative logistics infrastructure underground

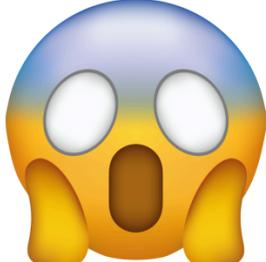


Full automation of the flow of goods and a complete integration with the suppliers and the customers



Efficient distribution through coordinated delivery to points of sale and end customers

Systems Engineering in CST: The Beginning



Phase I
The shock



Phase II
The research for a
Methology



Phase II
Calling up Piero



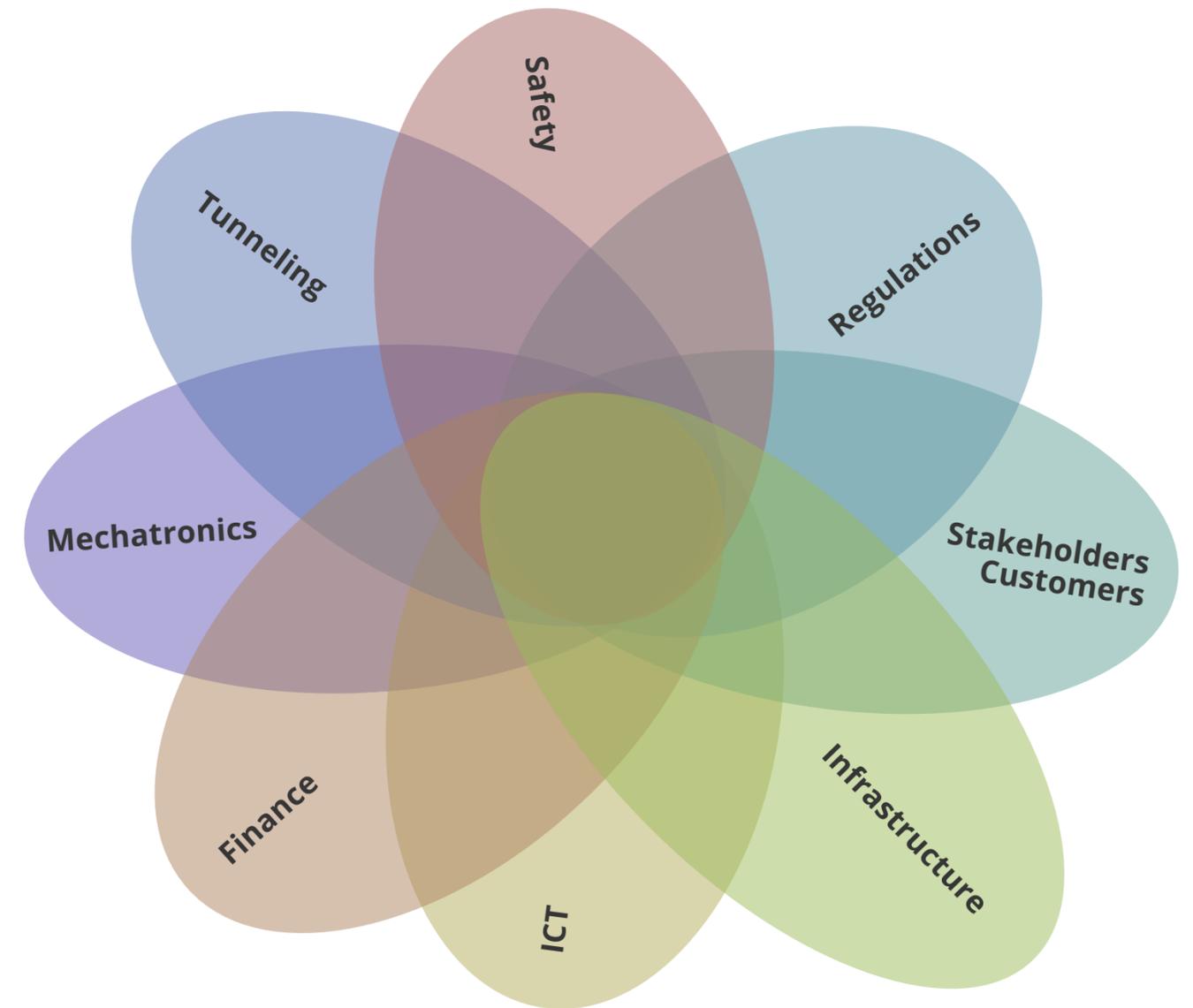
Phase IV
The analysis



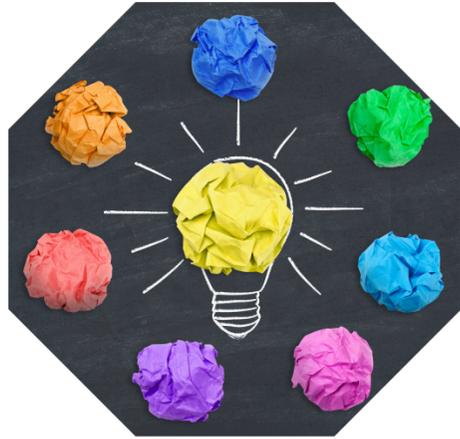
Phase V
The pilot

Relevance of Systems Engineering in complex infrastructure Projects

**SYSTEMS ENGINEERING
CREATES A COMMON
LANGUAGE FOR ALL PROJECT
PARTICIPANTS**



Early Challenges in Integration



Clarity and scope of Business Requirements

Different disciplines speak **different languages**



Motivating stakeholders to **see the big picture**

Strategic Approaches and Methodologies



Internal Stakeholder Analysis

- Interviews
- Documentation review
- (A lot of) Coffee corner talks

External Stakeholder Analysis

- Internet research
- Interviews with representatives



Informal collection of needs.

“Officially” MBSE but actually MBSE (BA+RE).

Middle-Out Approach.

Development of a Systems Engineering Vision.

Creation of a Systems Engineering Plan.

Early Successes and Learning Experiences



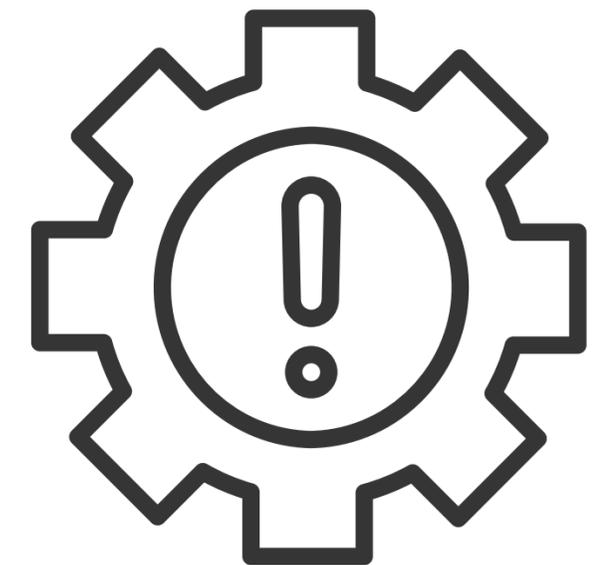
1. **Initial study** on application of MBSE at CST.
2. Approval of a **Systems Engineering Vision**.
3. Approval of first draft of a **Systems Engineering Plan (SEP)**.
4. **Recruiting** of a Technology Manager.
5. **Pilot Project** on the adoption of Systems Engineering.
6. Recruiting of a ~~Technology Manager~~ **Solution Engineer**.

Changing an organisation requires **more soft skills than hard skills**.

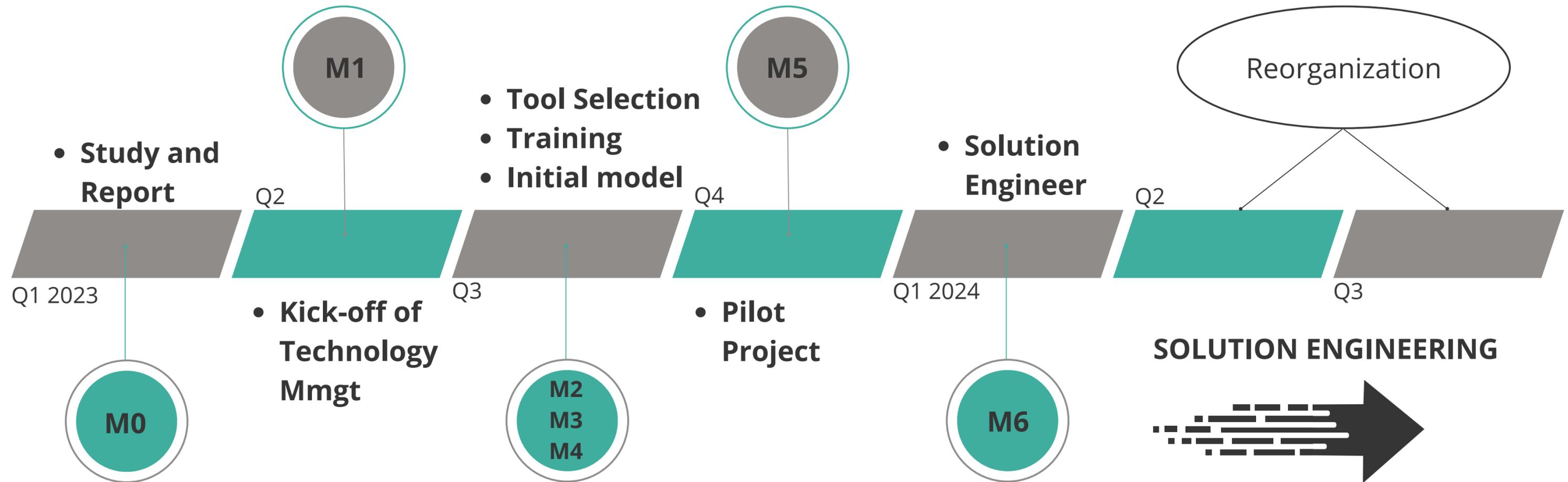
SE had to **“get on the CST”**, a running vehicle (in a tunnel!).

An initial attempt to adopt **use case analysis failed**.

Partial outcome from the pilot project was **rejected by the management**.



The Role and Impact of Systems Engineering in CST



Conclusion and Next Steps

SE is established in the Company



Reevaluation of the project and company structure



Refining Project Goals and Requirements Engineering



Development of System Architecture



Q&A Session

