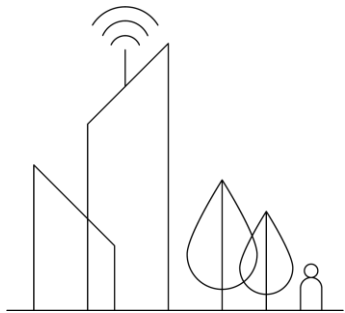


A man with glasses and a goatee, wearing a dark suit, is smiling and looking upwards. A woman with long dark hair, wearing a dark coat, is laughing joyfully. They are standing outdoors in front of a modern, light-colored building with large windows. The sky is clear and blue.

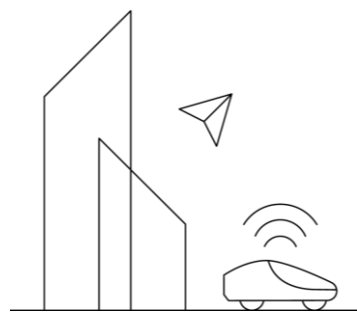
AFRY – Archimedes Initiative

ESKIL BENDZ, CSEP

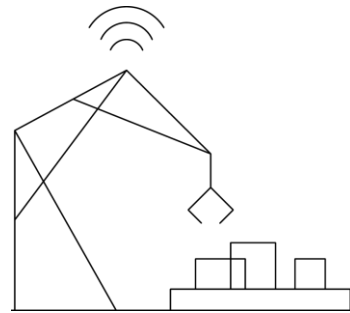
New Types of Systems – with Increasing Complexity



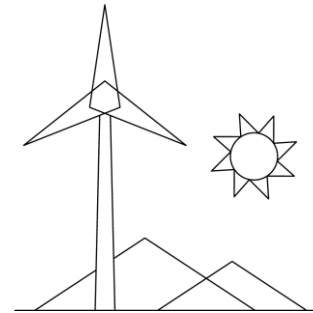
SMART CITIES AND
INFRASTRUCTURE



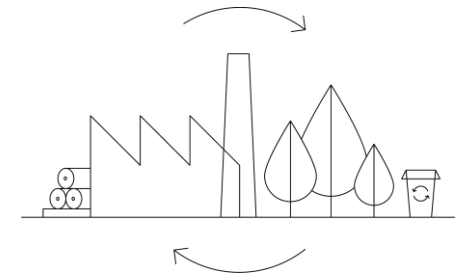
FUTURE
MOBILITY



INDUSTRIAL
DIGITALISATION



CHANGING ENERGY
MARKETS



TRANSITION TO
BIOECONOMY

BACKGROUND

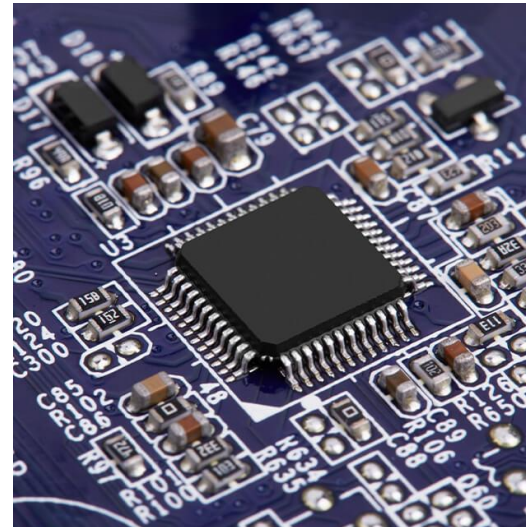
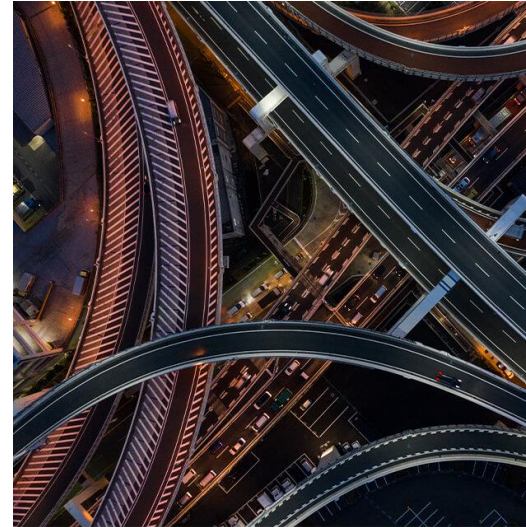
Shift in Development of Products and Systems

Yesterday

Development of new products dominated by **hardware**

Today

A majority of development efforts is in **software**



Hardware vs Software Projects

Hardware

- Typically developed in one project
- Updated/Refined/Cost-reduced in another project

Software

- Released before all wanted functionality is there
- Updated continuously in DevOps teams



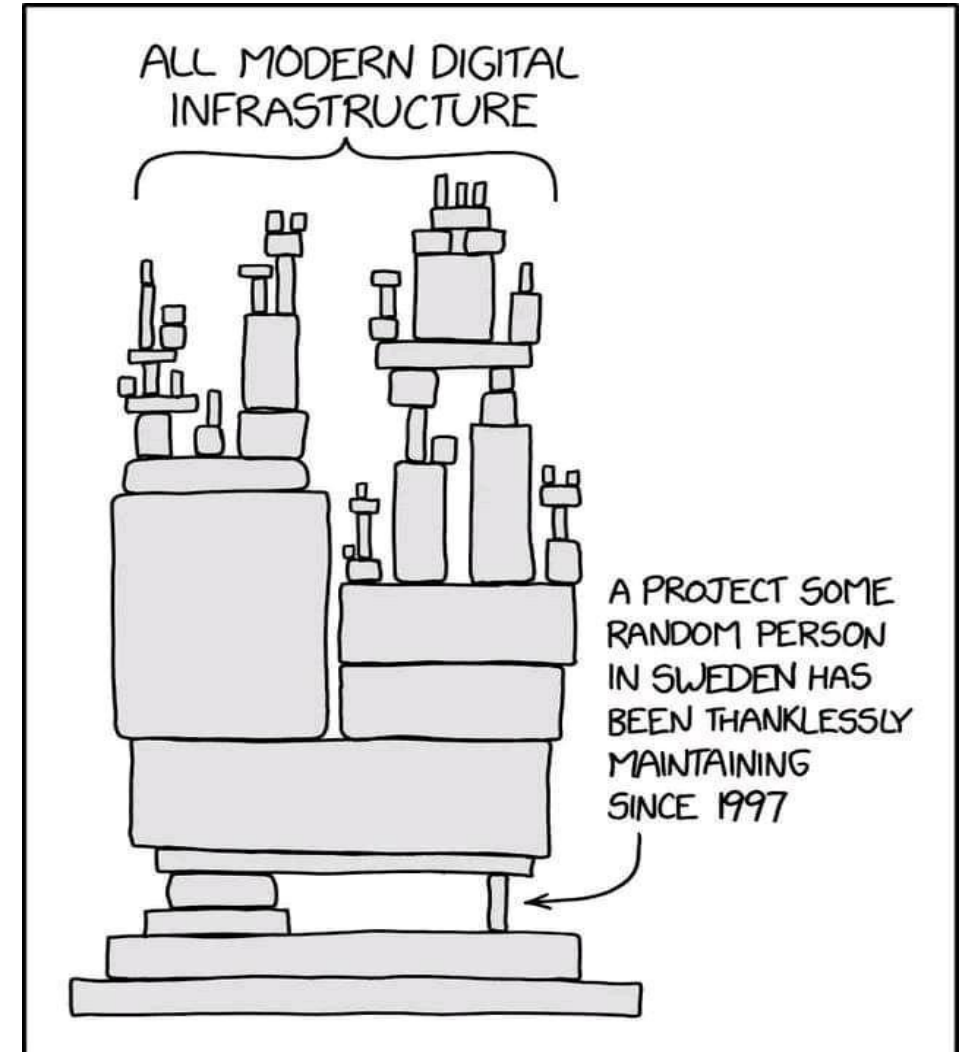
Industry Key Challenges

Technical challenges:

- Requirements handling
 - The struggle between V-model approach and Agile
- Dependencies & functionality over time (legacy)
- Code development by others (>90%) & everchanging software interfaces

People challenges:

- **Shortage of Systems Engineers**



Views on Systems Engineering Frameworks

- Systems Engineering \neq INCOSE!?
- INCOSE is still one of the best frameworks out there
- There are more ideas and frameworks used around the world
 - Especially within Software and Design thinking
- **Need for a common engineering language among developers and stakeholders**



Systems Engineering Training at AFRY

AFRY Academy BAS 4: Introduction to Systems Engineering

- Mandatory
- Basic understanding SE
- Concept, history, usage
- Two hours

AFRY Academy SE: Application of SE

- For all working with SE
- How to implement SE in assignments?
- Practical use of the SE framework
- Focus on craftsmanship
- 2-3 days

AFRY Academy SE: Study circle in Systems Engineering since 2017

- For those who want to work with and immerse themselves within SE
- For those who aims at certification (ASEP/CSEP)
- Focus on ISO/IEC/IEEE 15288 and INCOSE SE Handbook
- Runs at least annually
- Once a week for seven weeks
- > 50 participants
- Has led to:
 - 9 CSEP
 - 7 ASEP

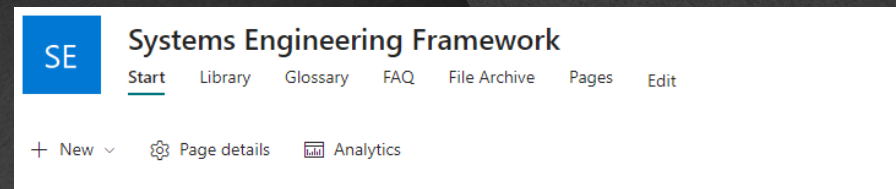
External courses: Systems Engineering SE Management

- For those who want to go deeper and work with SE and SE Management
- Take roles as SE Manager or Lead Systems Engineer in projects



Systems Engineering Framework at AFRY

- Framework based on
 - ISO/IEC/IEEE 15288:2015
 - INCOSE Systems Engineering Handbook
- Purpose
 - Supports systems engineers
 - Supports education
 - Promotes best practices
 - Capture knowledge
 - Spread knowledge



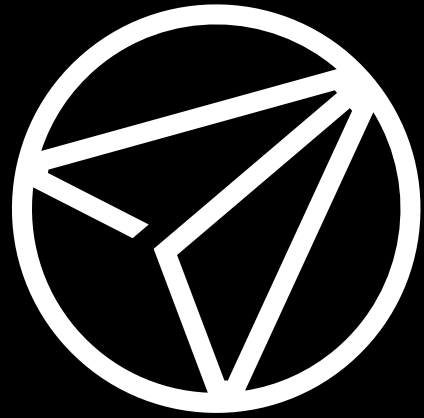
Partnership to Support Swedish Industry

- Complex systems drive the need for more Systems Engineers to Swedish industry
- Swedish industry has a tradition of being good at handling complex systems
- Academia has a tradition of being very good in specialized topics

We welcome the introduction of Systems Engineering into university education and research



Making Future



AFRY

ÅF PÖYRY