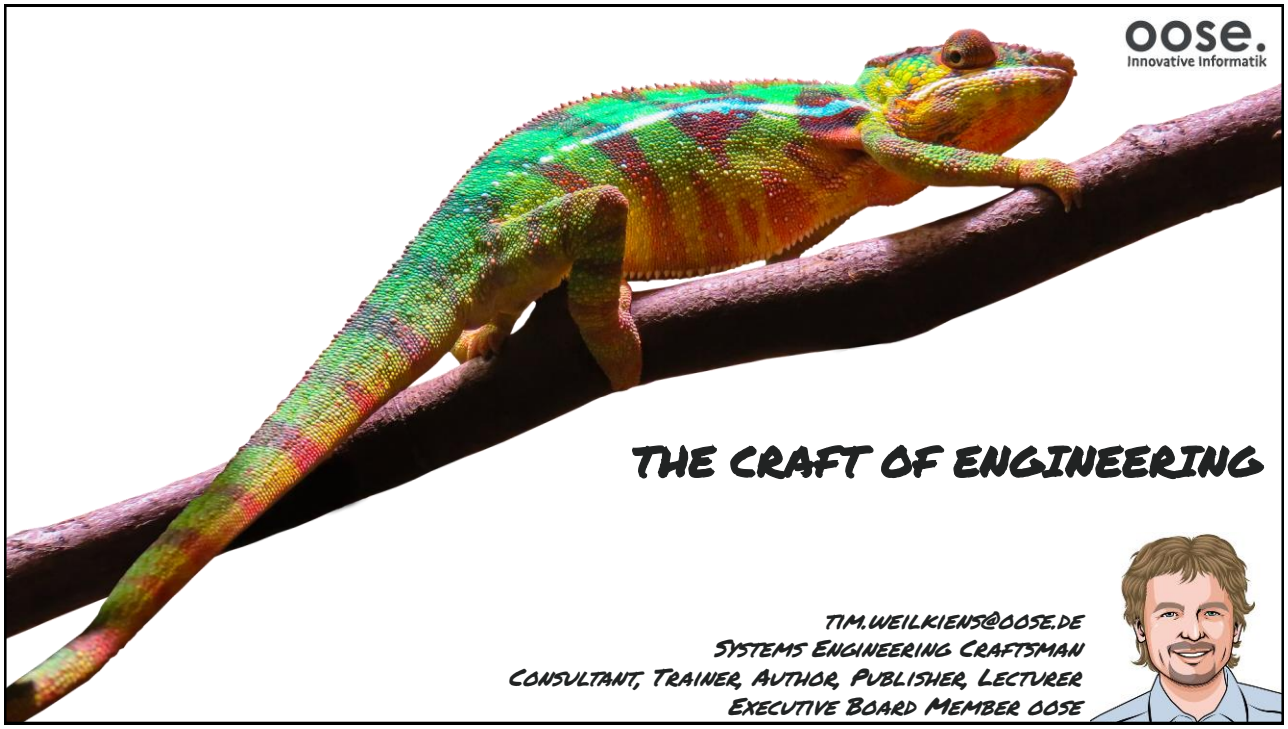
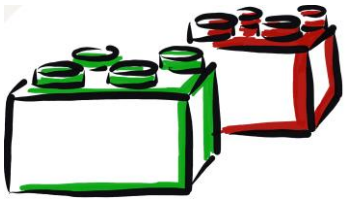

oose.
Innovative Informatik
THE CRAFT OF ENGINEERING
tim.weilkiens@oose.de
Systems Engineering Craftsman
Consultant, Trainer, Author, Publisher, Lecturer
Executive Board Member oose

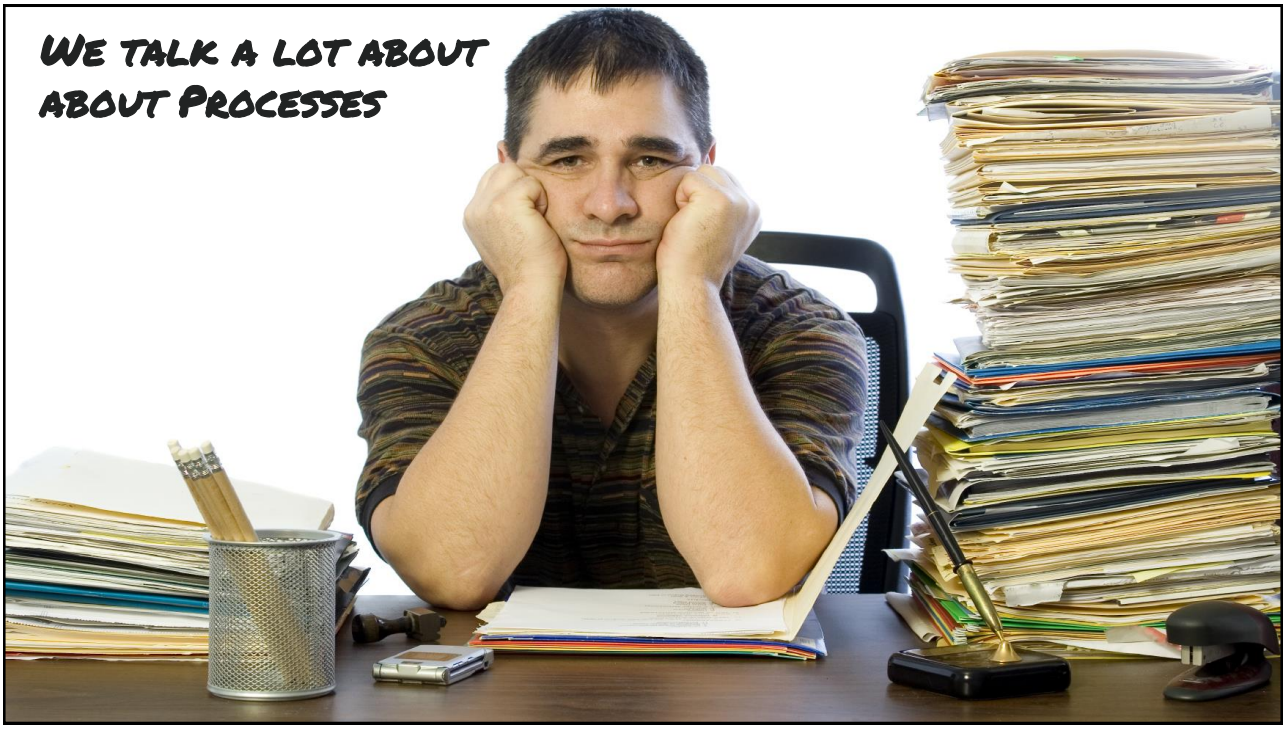

Requirements Engineering is dead...
RETHINK
4.0

Agile Systems Engineering

oose.
Innovative Informatik



We talk a lot about about Processes



We also talk a lot about SysML

oose.
Innovative Informatik

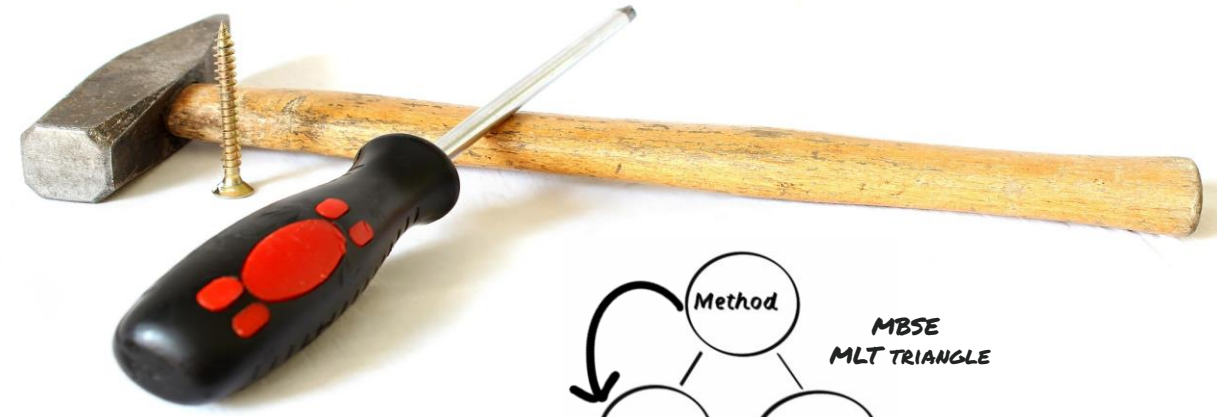
OMG
SYSTEMS
MODELING
LANGUAGE

SysML™


We Talk a lot about tools
SPACEX


We have a strong focus on Tools
oose.
Innovative Informatik
TOOLS FIRST!

Is it Really a Good Practice to buy the Hammer before you have Checked if you have nails or screws?

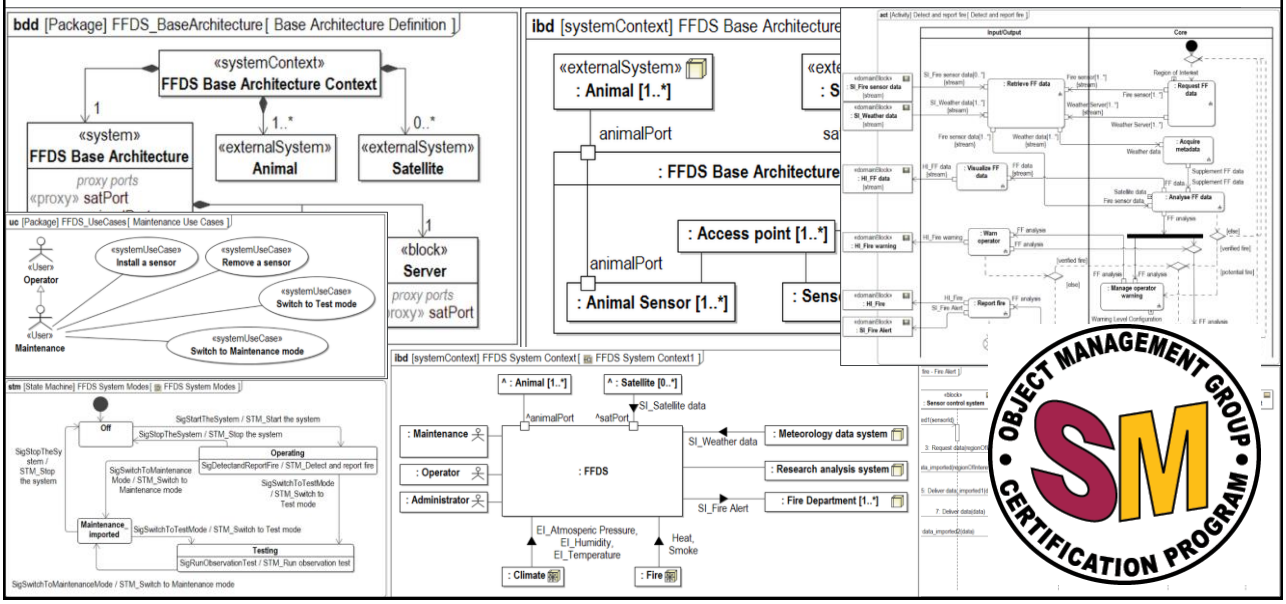


MBSE
MLT TRIANGLE

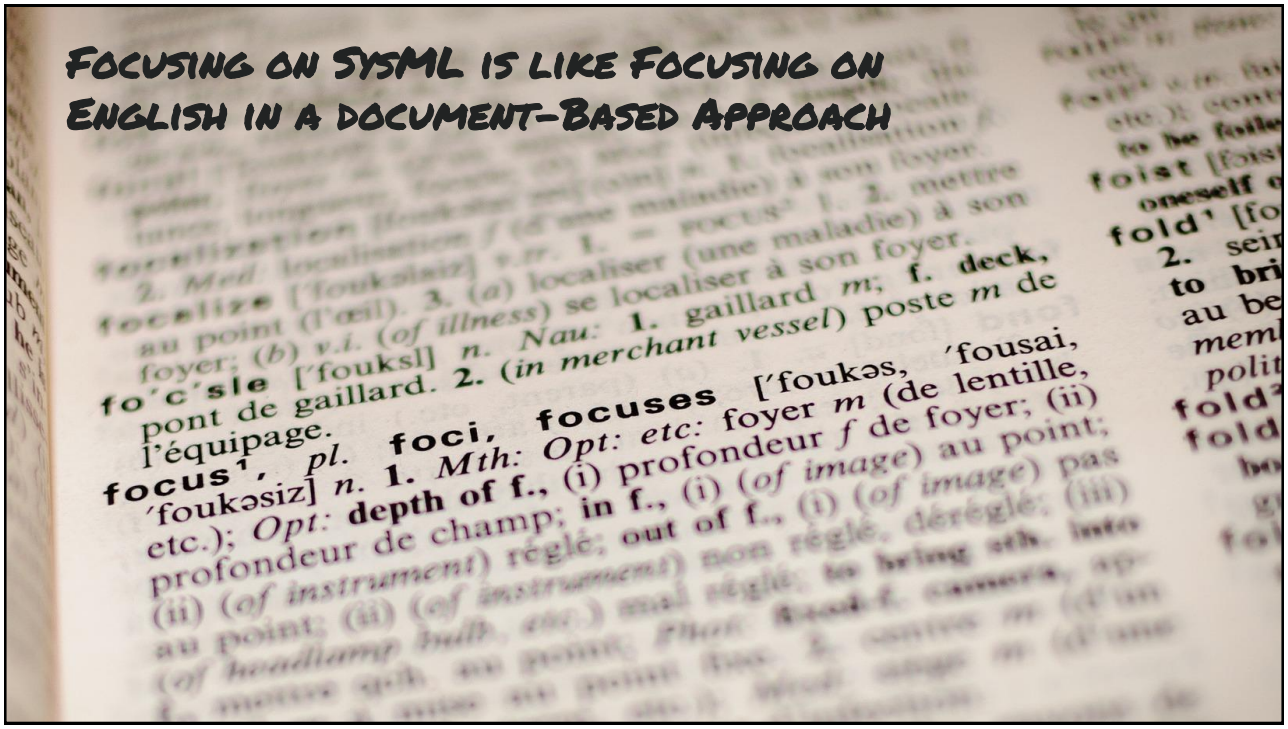
We have a strong Focus on

OMG SYSTEMS MODELING LANGUAGE SysML™

oose. Innovative Informatik

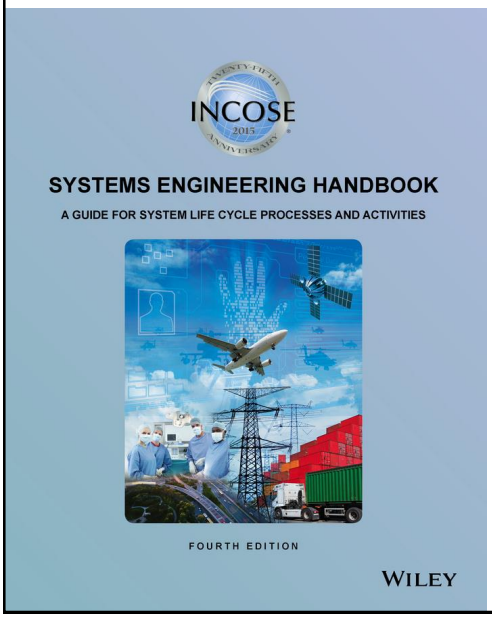


Focusing on SysML is like Focusing on English in a document-Based Approach



We have a strong focus on Processes

oose. Innovative Informatik



Systems engineering is a lot about processes.

We even award systems engineers who knows the processes very well:

CERTIFIED INCOSE CSEP SYSTEMS ENGINEERING PROFESSIONAL ™

Certified Systems GfSE Engineer
Gesellschaft für Systems Engineering e.V.
German Chapter of INCOSE

Processes cover mainly Known Things

There are known knowns. These are things we know that we know. There are known unknowns. That is to say, there are things that we know we don't know. But there are also unknown unknowns. There are things we don't know we don't know.

Donald Rumsfeld, 2002

The Black Swan: The Impact of the Highly Improbable by Nassim Nicholas Taleb

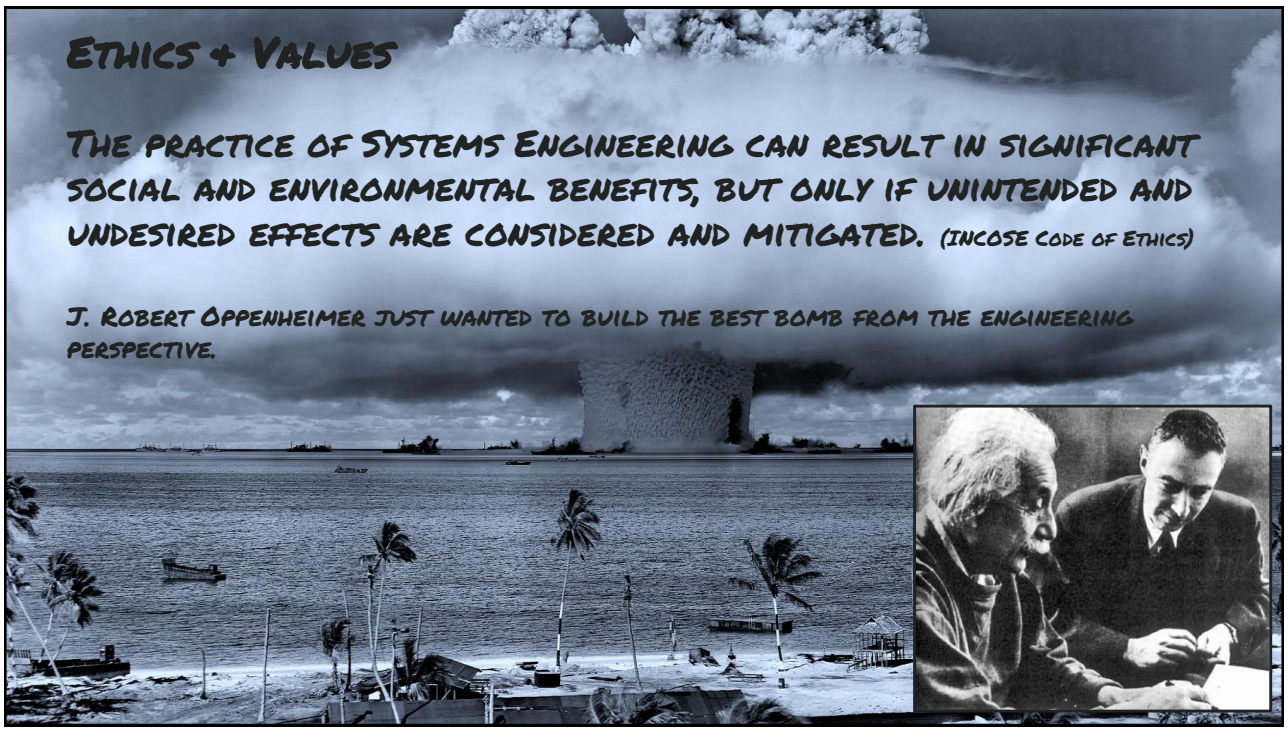
There is a Missing Piece...

We often neglect communication

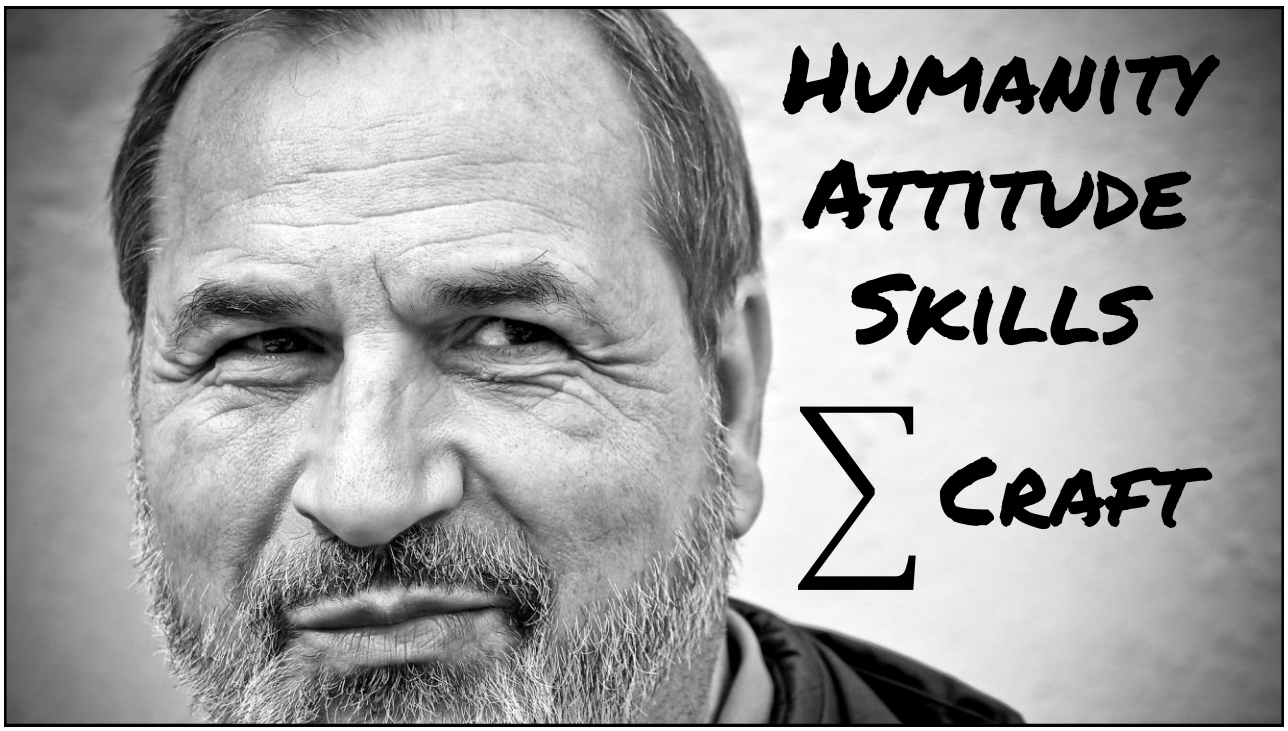
Ethics + Values

The practice of Systems Engineering can result in significant social and environmental benefits, but only if unintended and undesired effects are considered and mitigated. (INCOSE Code of Ethics)

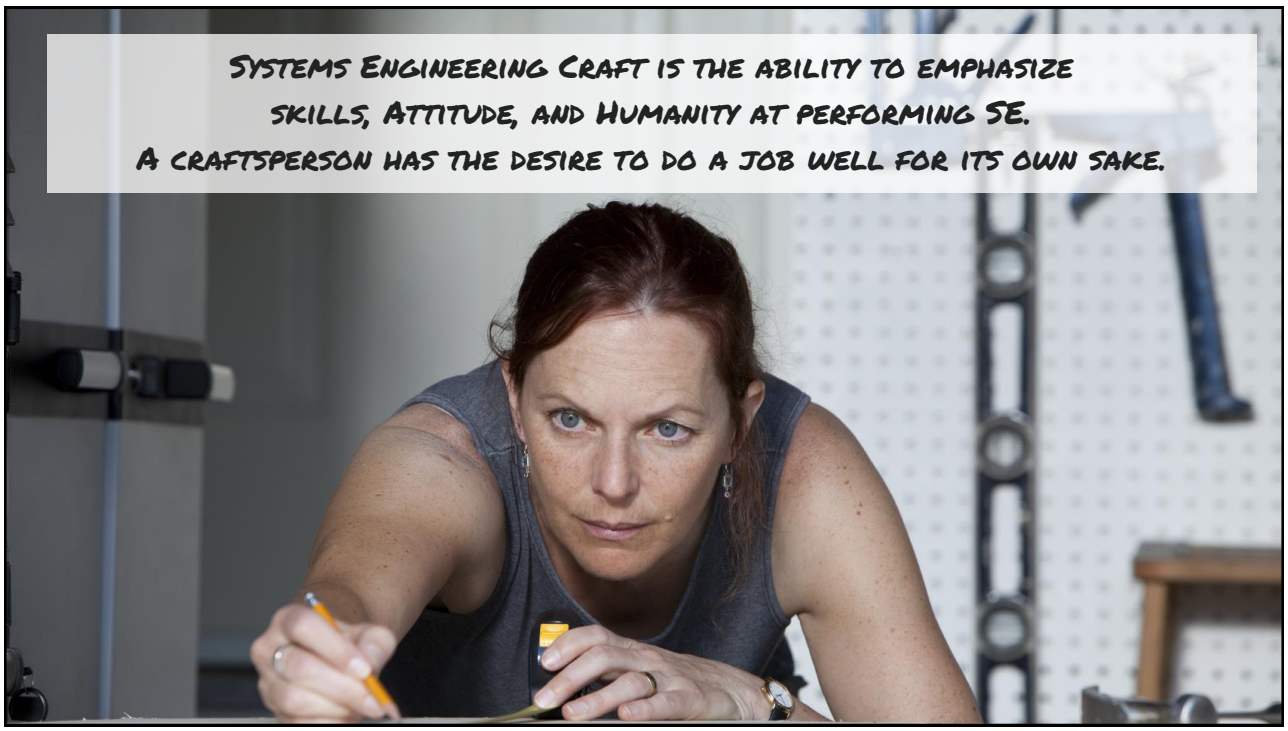
J. Robert Oppenheimer just wanted to build the best bomb from the engineering perspective.

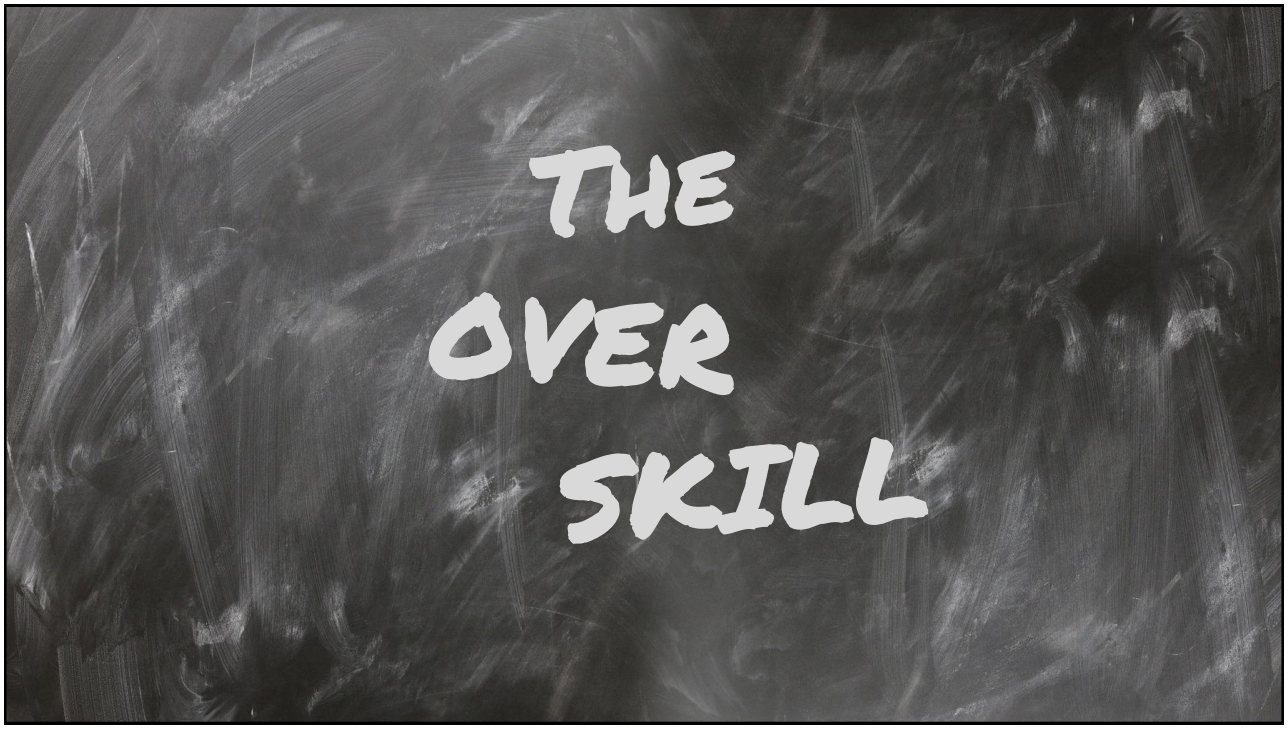



...And do not forget your Attitude?
I am proud to be an engineer!


Humanity
Attitude
Skills
∑ Craft


CRAFT
Tim Weilkiens, Michael Vinarcik
MBSE Craftsmanship
- MBSE4U Booklet Series -
MBSE4U


Systems Engineering Craft is the ability to emphasize
skills, Attitude, and Humanity at performing SE.
A craftsperson has the desire to do a job well for its own sake.



THE OVER INABILITY IS...

...IF SOMEONE READS „OVER"...

INDIVIDUALS AND INTERACTIONS	OVER PROCESSES AND TOOLS
WORKING SOFTWARE	OVER COMPREHENSIVE DOCUMENTATION
CUSTOMER COLLABORATION	OVER CONTRACT NEGOTIATION
RESPONDING TO CHANGE	OVER FOLLOWING A PLAN

Source: www.agilemanifesto.org

...AND UNDERSTANDS „INSTEAD"!

That is, while there is value in the items on
the right, we value the items on the left more.

Foundation for Complex Systems Engineering

To provide a platform for continuous improvement of the development approach for complex systems we value...

Multifunctional teams	over	Engineering silos
Focus on purpose	over	Focus on requirements
Empowered teams	over	Tasked individuals
Early learning	over	Late failures

Source: Arie van Bennekum, Josef Oehmen, Tim Weilkiens, Alexander Stein, Johann Oelen

Fifty shades of a Practice Skill

oose. Innovative Informatik

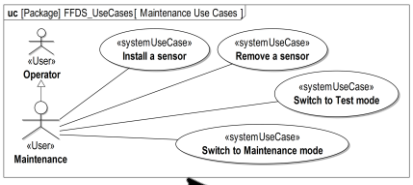
Practices can be contradictory.

There is no Right or Wrong!

It depends on the context which approach is the best!

7+/-2 Rule versus Poster

oose. Innovative Informatik



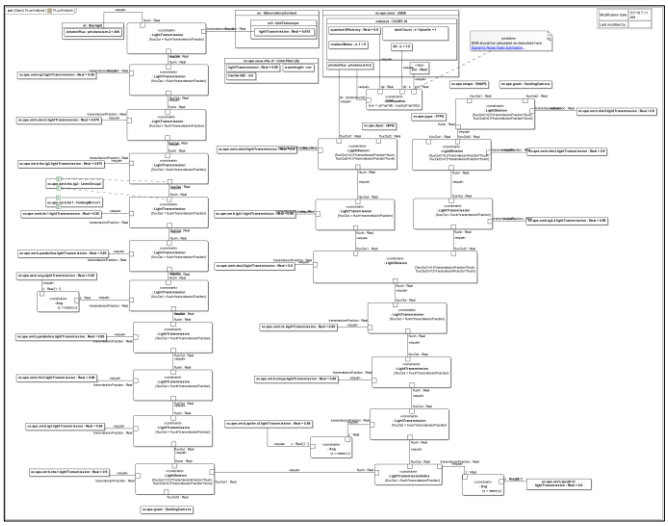
7+-2 Rule

A diagram should not show more than 7+-2 Elements!

Better: Max. A4/Letter.

Poster Tool

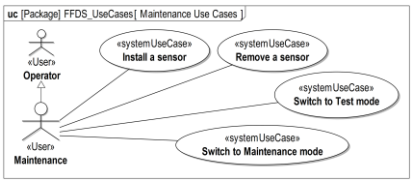
A Poster gives a broad Overview of an Aspect!



Sometimes Office-Views are the better choice...

oose. Innovative Informatik

Many Diagrams are only graphical lists. Do not spend effort on maintaining layouts in your daily business.



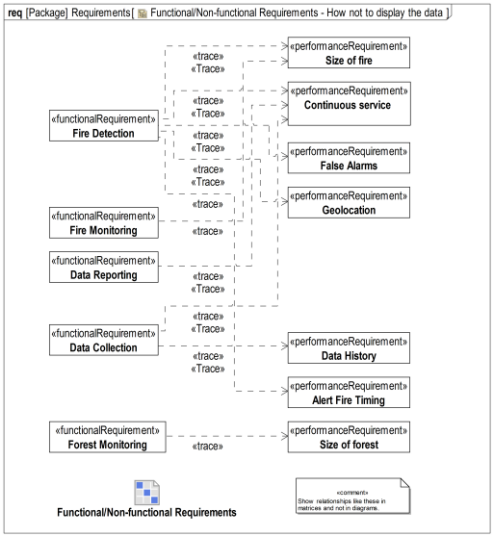
Create Diagrams on Demand for Workshops or special views; Often throwaway diagrams

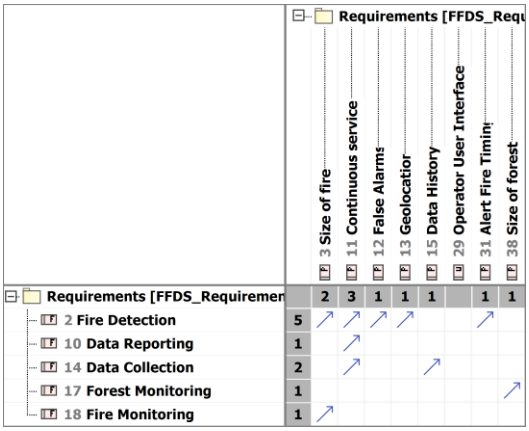
Use tables to manage the data in your daily business. And they show all the data (Queries!)

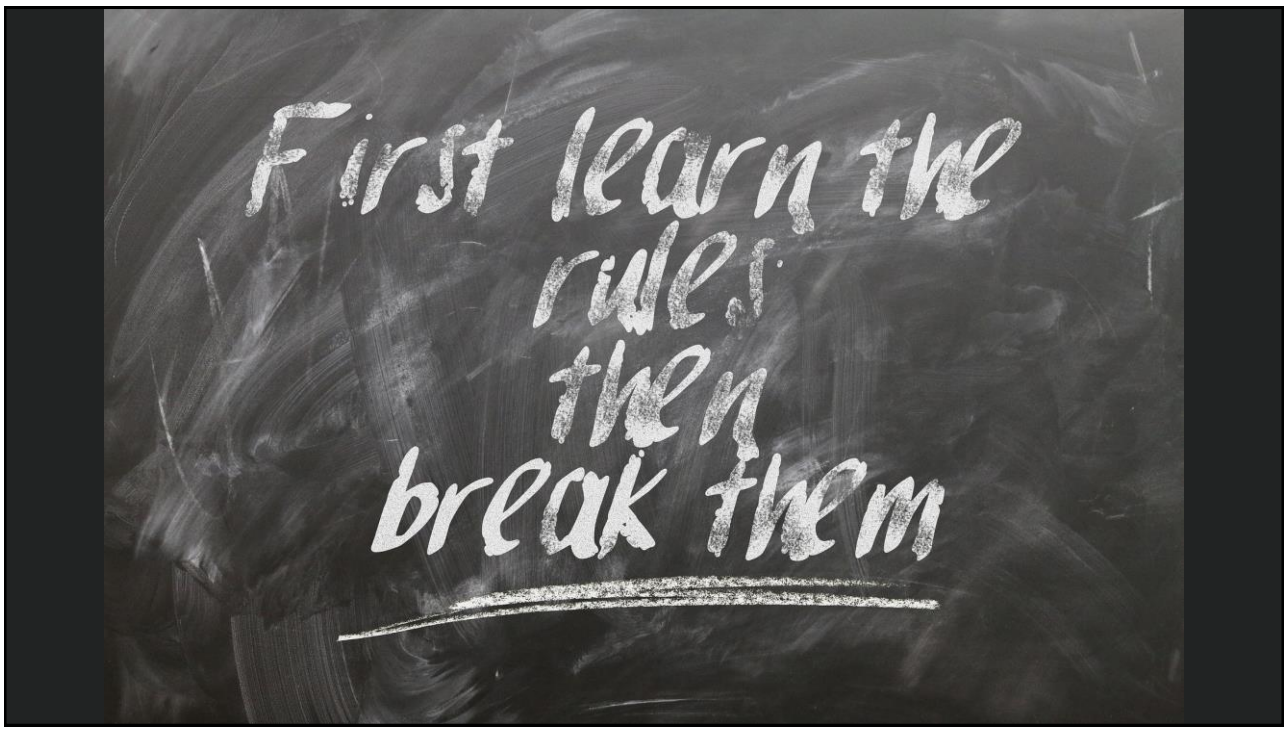
#	Name	Documentation	Actor
1	Detect and report fire	Run the observation loop and report any potential occurences of fire to the operator and fire department.	Fire Meteorology data system Research analysis system Operator Fire Department
2	Install a sensor	Install a new fire detection sensor.	Maintenance
3	Ping a sensor	Select and contact a sensor to check if it is alive.	Operator
4	Remove a sensor	Remove a fire detection sensor from the system.	Maintenance
5	Run observation test	Run a test of the observation loop. Test components simulate forest fires.	Meteorology data system Operator
6	Start the system	Start the system from off to the state ready.	Operator
7	Stop the system	Switch off the system.	Operator
8	Switch to Maintenance mode	Switch the system to the maintenance mode.	Maintenance
9	Switch to Test mode	Switch the system to the test mode. Fire alerts are not sent to the fire	Maintenance

A Matrix is the perfect Relationship Viewer/Editor

oose. Innovative Informatik





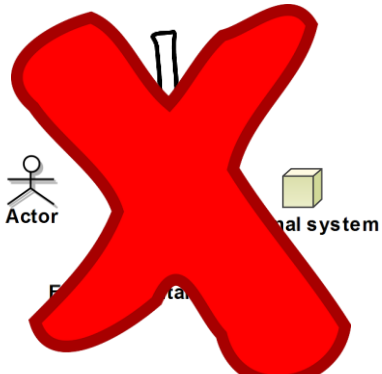


The Death of the Actor

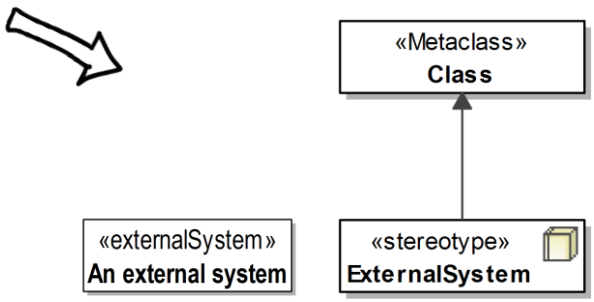
The Death of the Actor – Explanation

oose. Innovative Informatik

Concept Actor:
Entity outside of the system
That interacts with the system.



Model Element Actor with Stereotypes

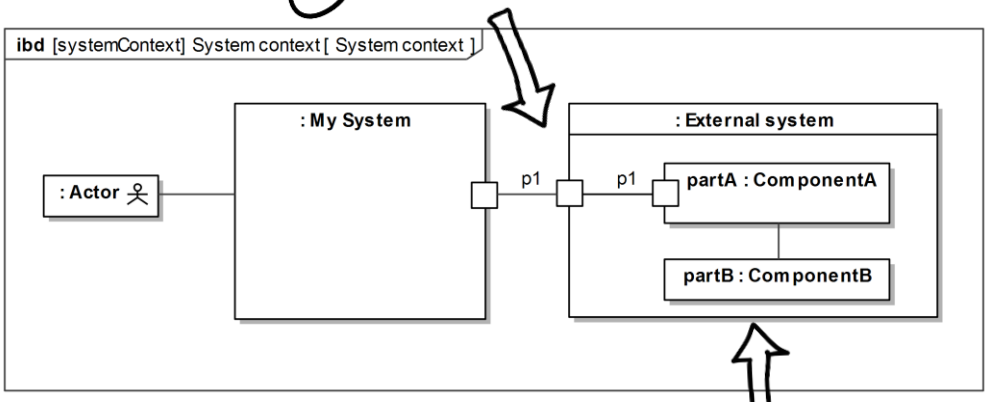


Model Element Class/Block with Stereotypes

Blocks to model the Actor concept

oose. Innovative Informatik

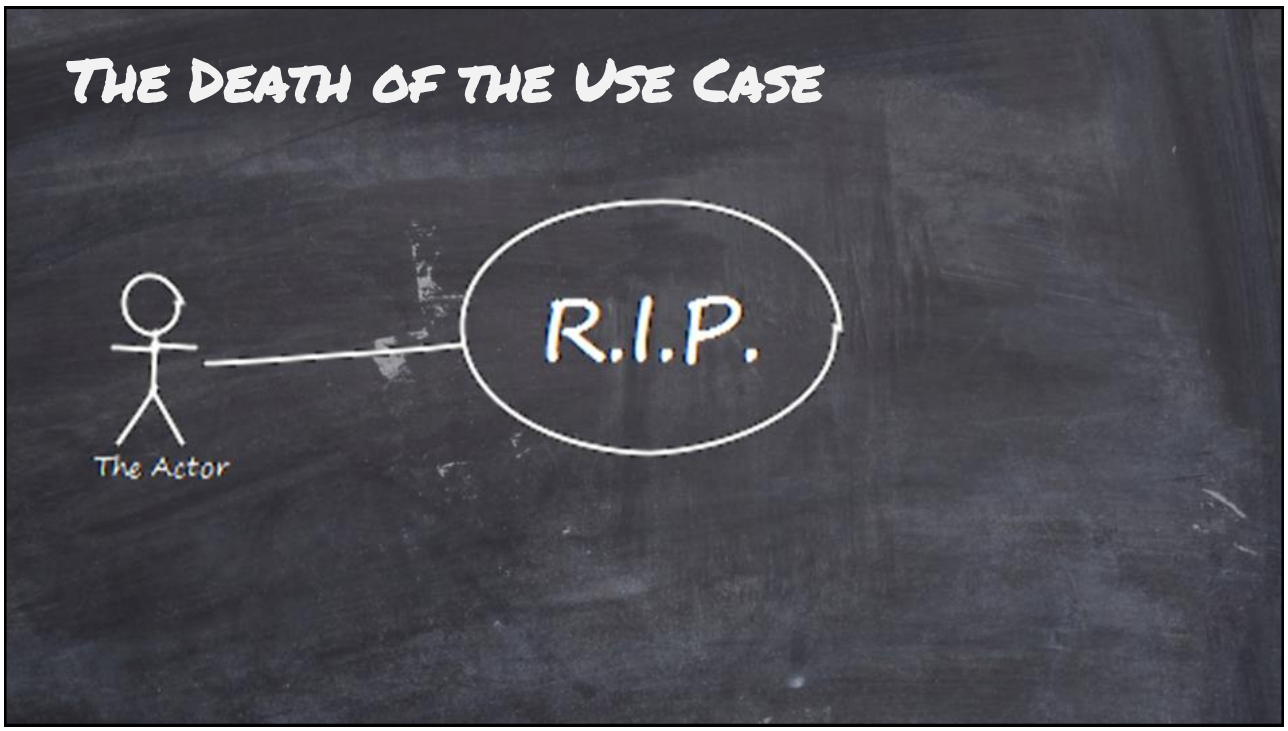
1 Actor Interfaces/Ports



3 External system can be a system or block in another context.

2 Internal parts

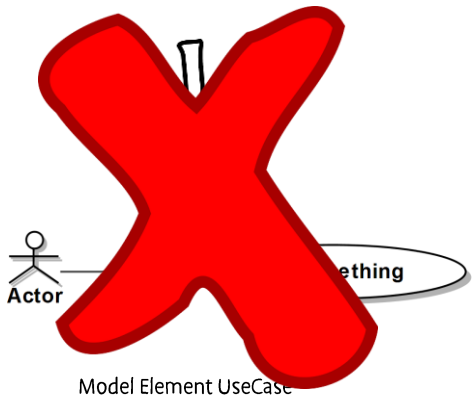
The Death of the Use Case



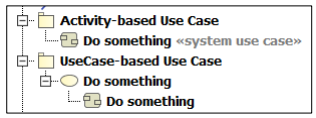
The Death of the Use Case – Explanation

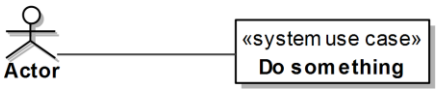
oose. Innovative Informatik

Concept Use Case:
Actions performed by a System to yield an observable result of value to a user or Stakeholder.



Model Element UseCase

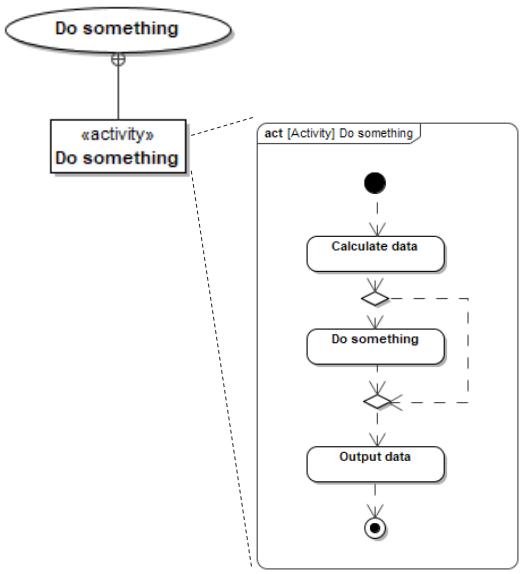




Model Element Activity with Stereotype

Usage-Oriented Language Design

oose. Innovative Informatik

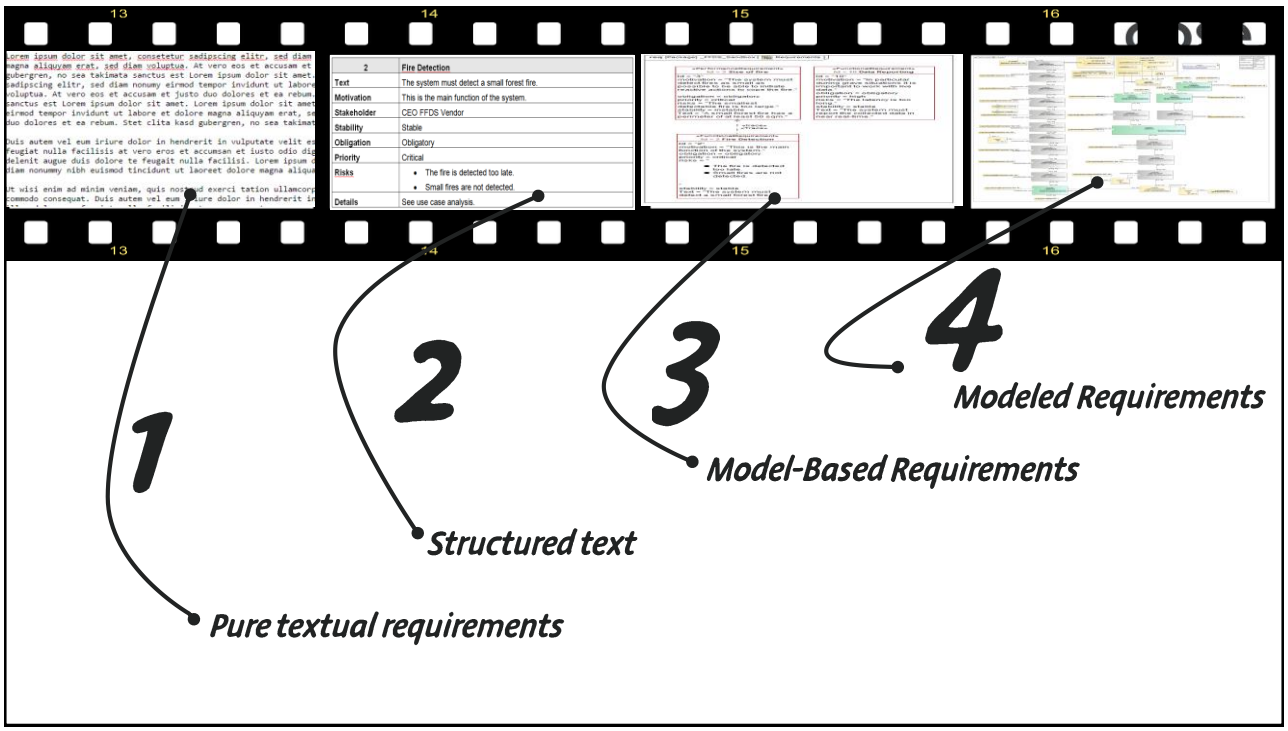


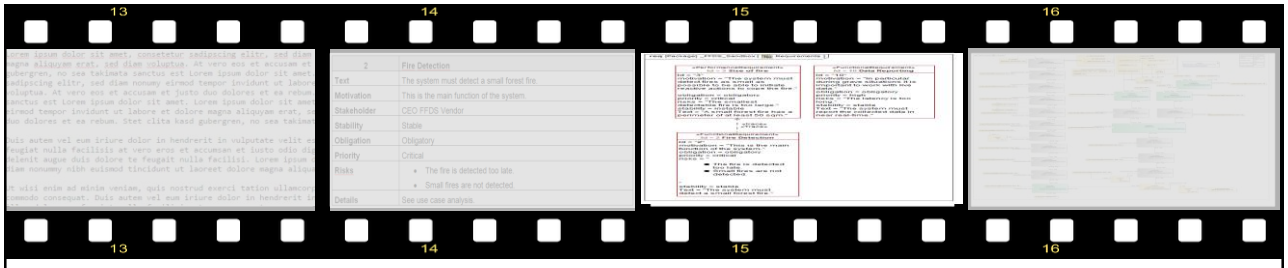
Use Cases, Activities, Actions, ...?

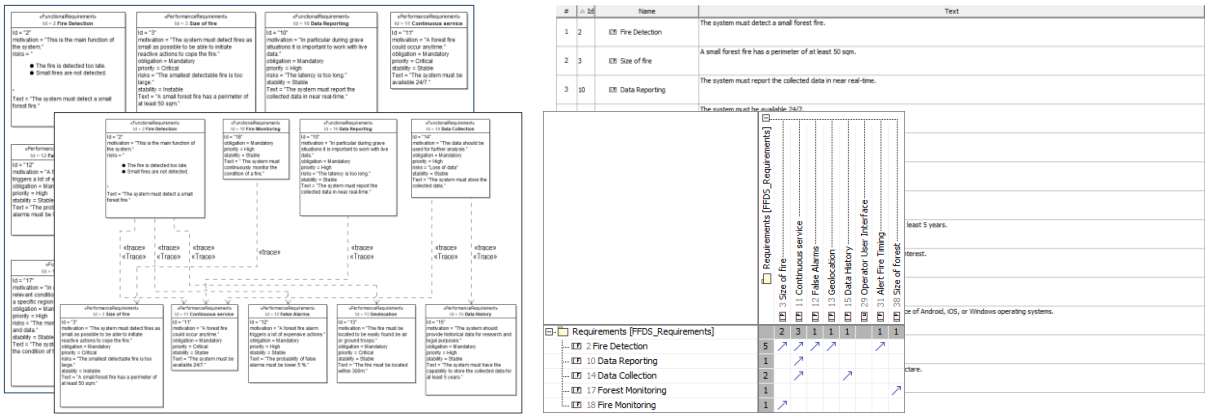
Most User do not really care. It is just a set of functions.

We follow a usage-oriented approach to design SysML v2.


Requirements Engineering is dead...
RETHINK
4.0

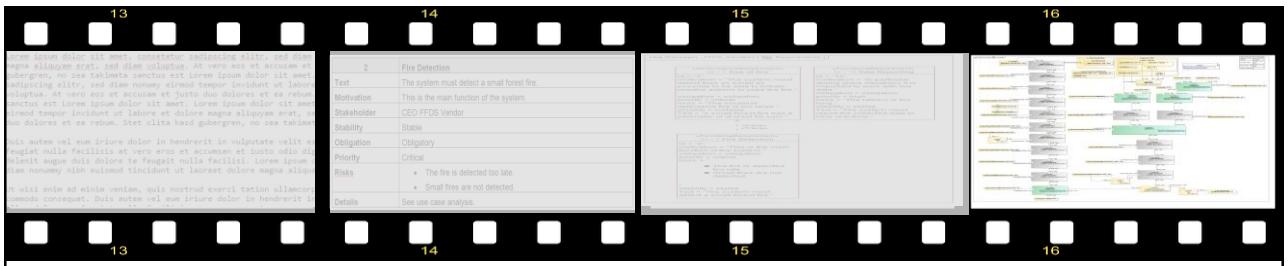

13
14
15
16
2
Fire Detection
Text
The system must detect a small forest fire.
Motivation
This is the main function of the system.
Stakeholder
CEO FFDS Vendor
Stability
Stable
Obligation
Obligatory
Priority
Critical
Risks
The fire is detected too late.
Small fires are not detected.
Details
See use case analysis.
1
2
3
4
Pure textual requirements
Structured text
Model-Based Requirements
Modeled Requirements





#	Id	Name	Text
1	2	Fire Detection	The system must detect a small forest fire.
2	3	Size of fire	A small forest fire has a perimeter of at least 50 sqm.
3	10	Data Reporting	The system must report the collected data in near real-time.
			The system must be available 24/7.

Requirements [FFDS_Requirements]	3 Size of fire	11 Continuous service	12 False Alarms	13 Geolocation	15 Data History	29 Operator User Interface	31 Alert Fire Timing	38 Size of forest
Requirements [FFDS_Requirements]	2	3	1	1	1		1	1
2 Fire Detection	5	↗	↗	↗		↗		
10 Data Reporting	1		↗					
14 Data Collection	2		↗		↗			
17 Forest Monitoring	1							↗
18 Fire Monitoring	1	↗						



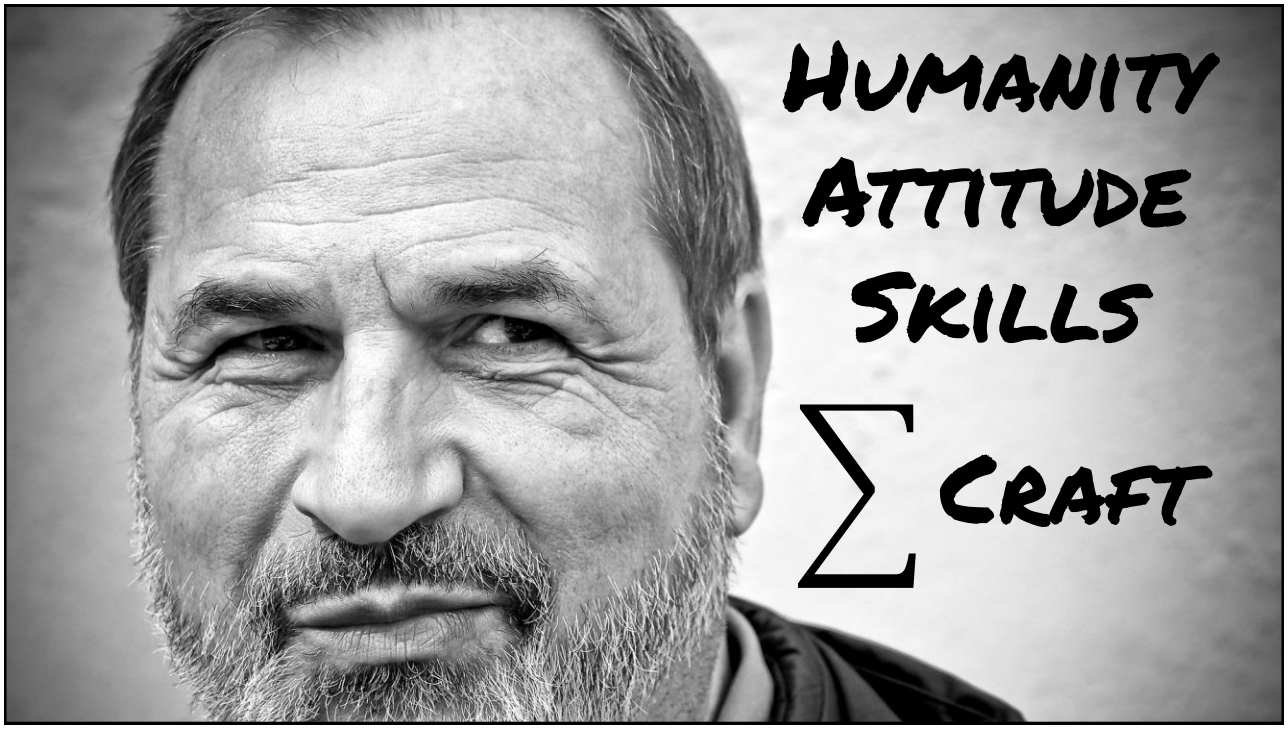
«block» Control Unit
values
«PerformanceRequirement» **maxWeight** : kg = 1.5{readOnly,redefines maxWeight,DerivedFrom = Weight Requirement, Id = "REQ42", obligation = Mandatory, priority = High, stability = Instable}

- SysML 1.5 enables non-textual requirements
- SysML v2 will support formal requirement statements
- „The model itself is the requirement" – Sandrina Köstler, Airbus, ReConf 2018

How to become a Systems Engineering Craftsperson

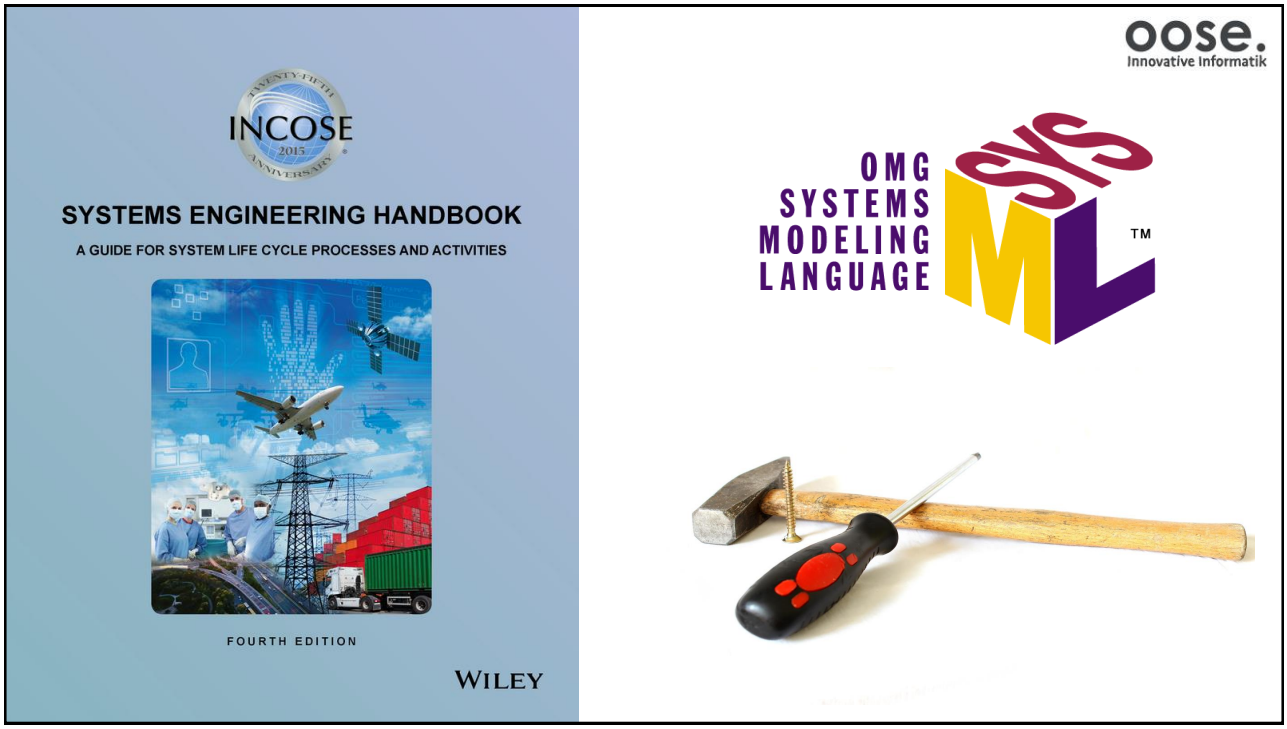
"A craftsperson has the desire to do a job well for its own sake."

- There is no process – No Certification....it is a Mindset!
- Long-life Learning
- For example, Join Communities and be Actively Involved
  - SWISSED, TDSE, EMEASEC, ...
  - Working Groups MKS, FAS, PLM4MBSE, ...
  - Standardization Groups SysML v2, ...



oose.
Innovative Informatik

OVER


INCOSE
2015
SYSTEMS ENGINEERING HANDBOOK
A GUIDE FOR SYSTEM LIFE CYCLE PROCESSES AND ACTIVITIES
FOURTH EDITION
WILEY
oose.
Innovative Informatik
OMG
SYSTEMS
MODELING
LANGUAGE
SYSML
TM


I am proud to be an engineer!
Contact me
tim.weilkiens@oose.de
THE CRAFT OF ENGINEERING
MASTERY OVER KNOWLEDGE