

Let's talk Machine – The Digital Transformation of Systems Engineering

Let's talk machine!
The Digital Transformation of
Systems Engineering

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INCOSE Symposium 2023

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Consultancy and training company
for Systems and Software Engineering
Headquarter in Hamburg, Germany

Effective Together

- Soft Skills**
 - Team Development
 - Communication
 - Facilitation • Conflict Management
 - Visualization • Lego® Serious Play®
- Software Architecture**
 - Domain Driven Design
 - Documentation • Evaluation
 - ISAQB • CPSA (F+A)
 - Methodology • Machine Learning
 - Patterns • Mobile • Web • Embedded
- Coding**
 - Microservices
 - Spring • Security • Java
 - Craftsmanship • IoT
 - Continuous Delivery • CI/CD
- Testing & Quality Assurance**
 - ISTQB Foundation / Advanced
 - Quality Evangelist • Workshops
 - Hands-on Test Automation • BDD
 - Quality Engineering for IoT
- Security**
 - Threat Analysis
 - Penetration Testing
 - OWASP Top 10
 - Social Engineering
 - Cryptography
- Certifications**
 - CSM • CPSA • DOCS1 • DOCS2 • CPSA • CPRE
 - PMI • PMI-ACP • CSMP • CSMP • CPRE • CTE
- Master**
 - Software Engineering Leadership
 - Systems Engineering Leadership
- Training**
 - Digital Practitioner and Manager Training
 - Visual Engineering Agile Coach Training
 - Certified Systems Engineer Training
- Project Management**
 - Agile Coach
 - Scrum • Kanban
 - Agile Transition • Scaling
 - Agile Product Management
 - CSM • CSPO • PMP • PMI-ACP
- Design Thinking**
 - Agile Experience Design
 - Innovation
 - Service Design • Storytelling
 - DT-Facilitation
 - DT-Teamworking
- Business Processes**
 - BPMN • UML
 - Agile BPO • DMN
 - OCEB2 • EAM
 - Digitalization
 - Model
- Requirements Engineering**
 - Agile RE • Story Maps
 - Product Owner
 - Requirements Management • CPRE
 - Usability and User Experience
 - CPUX • Object Oriented Analysis
- Software Engineering**
 - UML • Methodology
 - Embedded
 - Analysis & Design
 - Real-time • OCLP2 • OCLP3
- Systems Engineering**
 - System Architectures
 - Certified Systems Engineer
 - MBSE • AI • IoT • SysML • SysMOD
 - Safety • Functional Architectures

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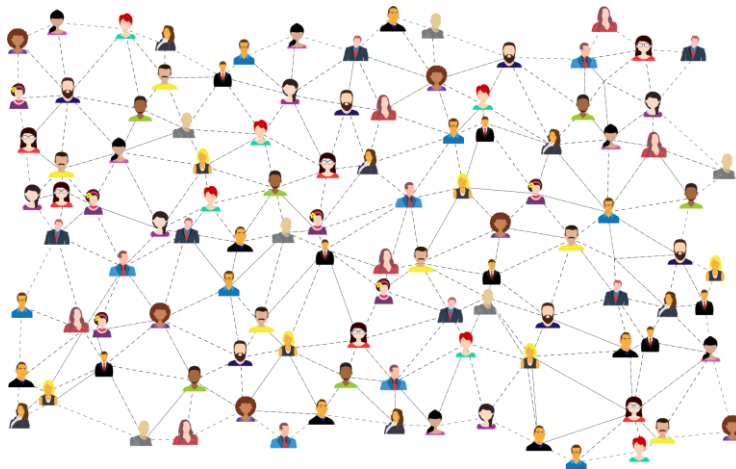
Who am I? Tim.Weilkiens@oose.de

Executive Board Member oose
MBSE Consultant & Trainer
Co-Developer of SysML 1 & 2
Co-Chair of SysML v2 FTF
Book author
Author of SYSMOD & VAMOS
Lecturer of MBSE master courses
Owner of publishing company MBSE4U
Founder X4Planet



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Systems Engineering is a lot about Communication



Communication between team member, suppliers, stakeholders, and so forth.

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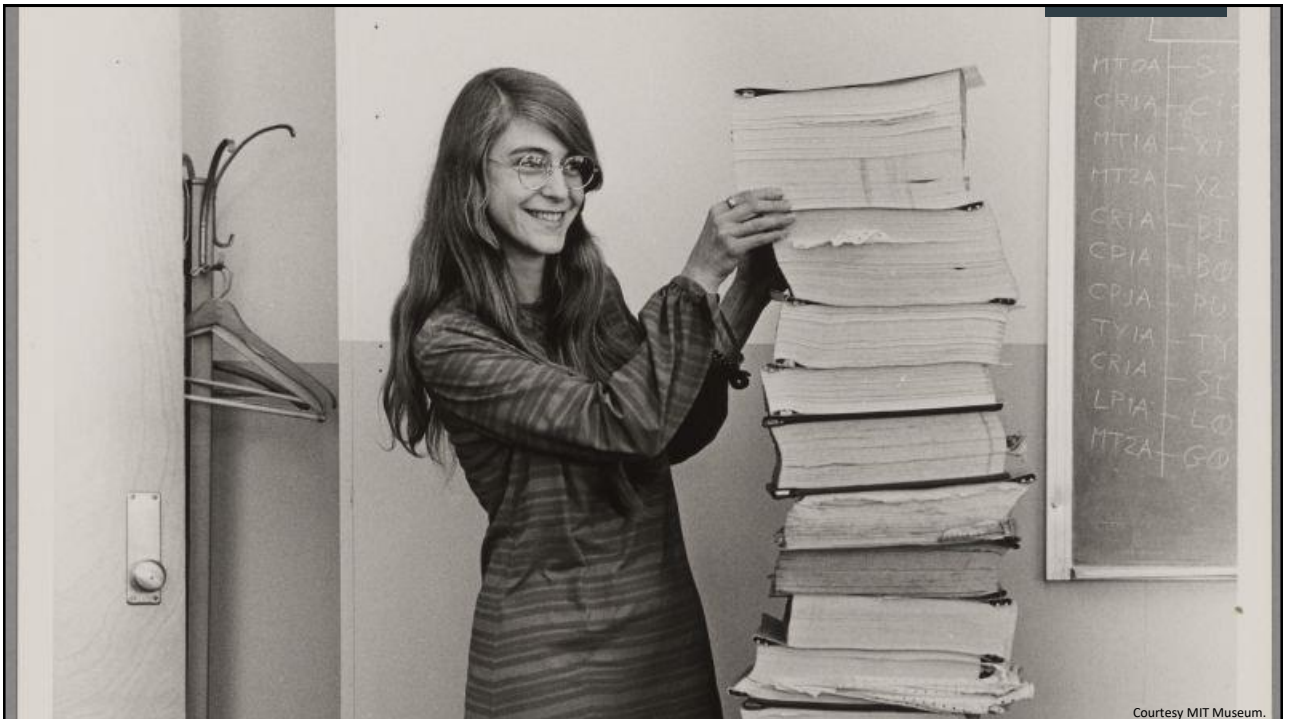


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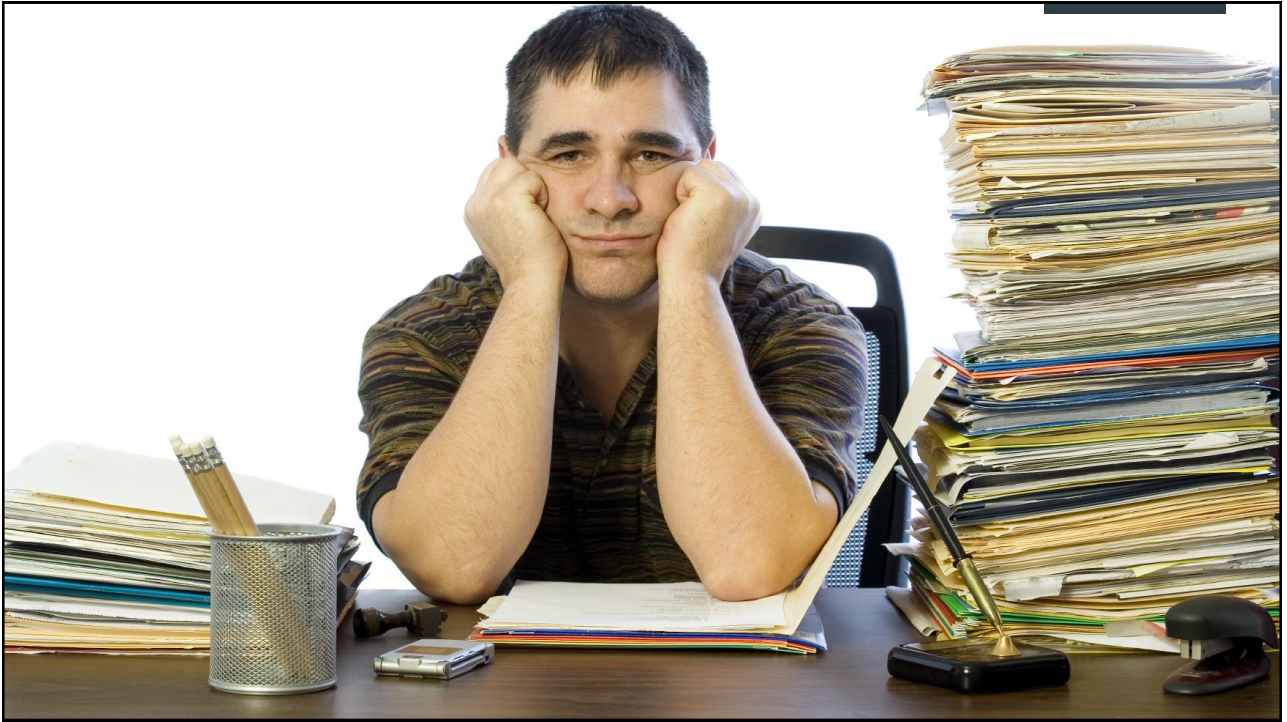


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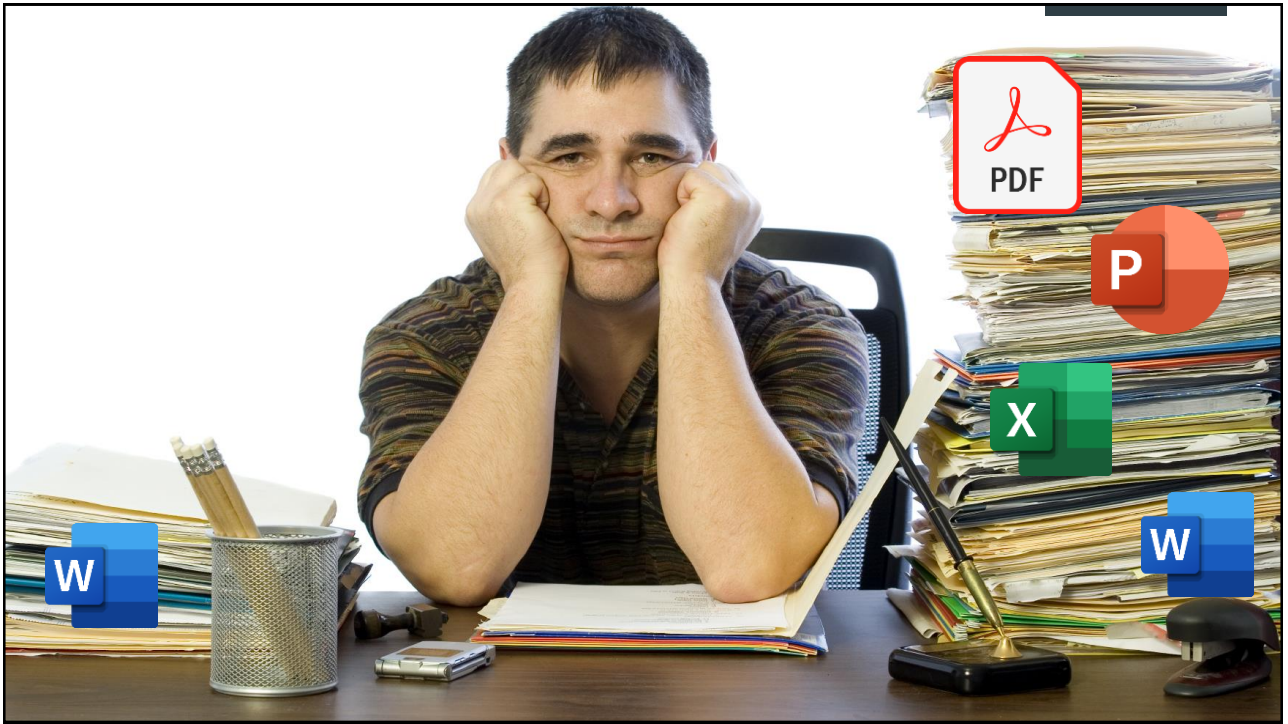


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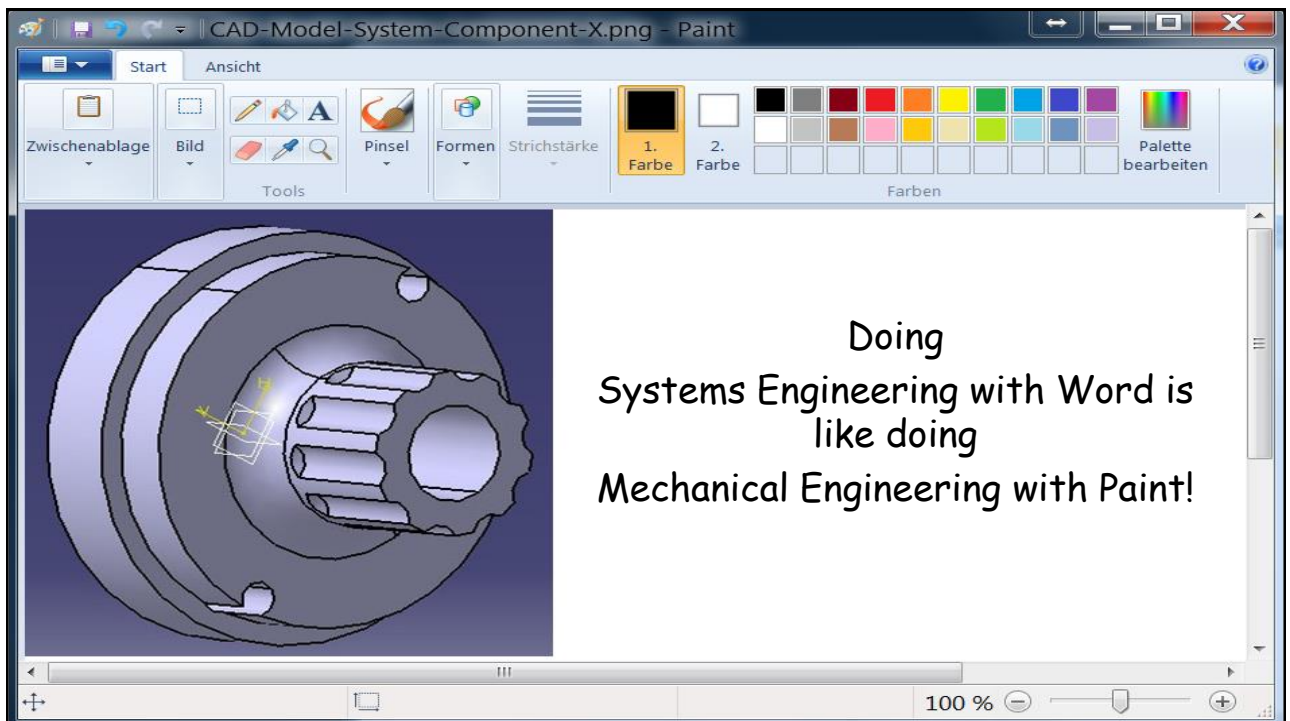


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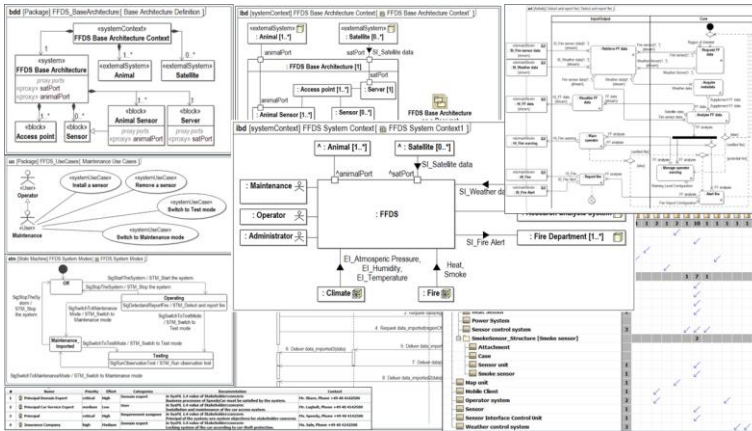


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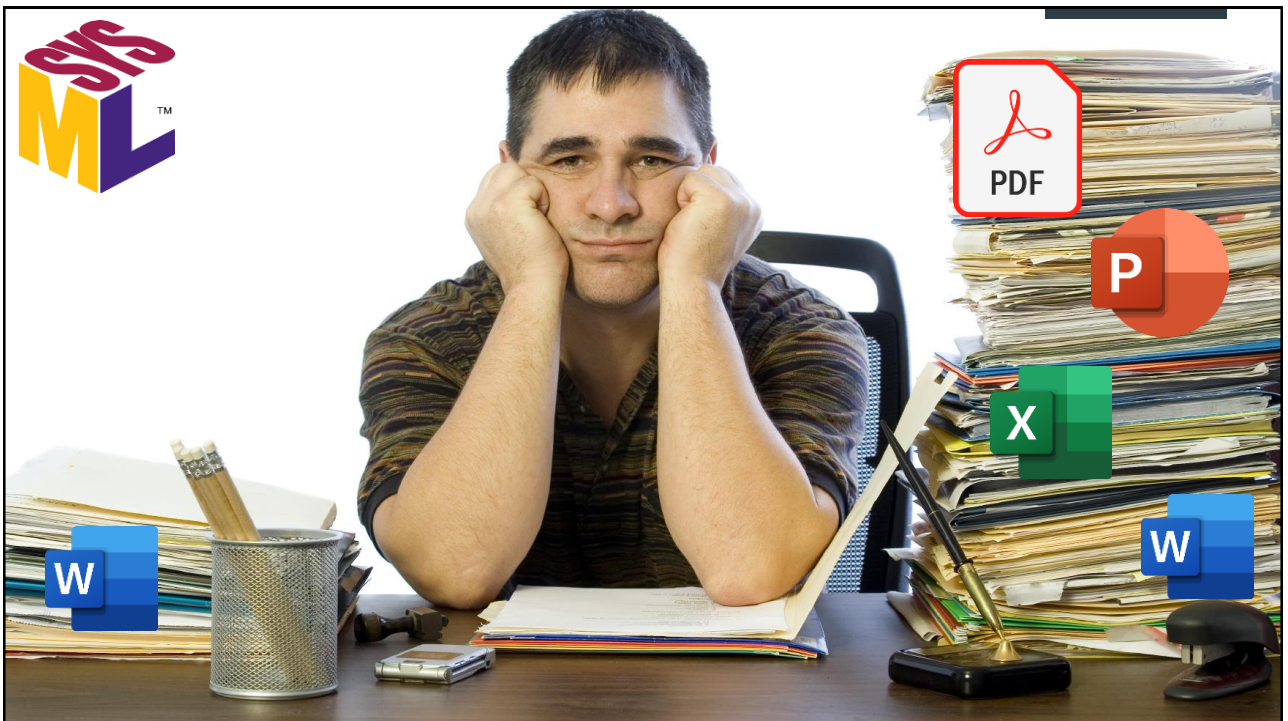
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From DBSE to MBSE – Now it gets much better(?)



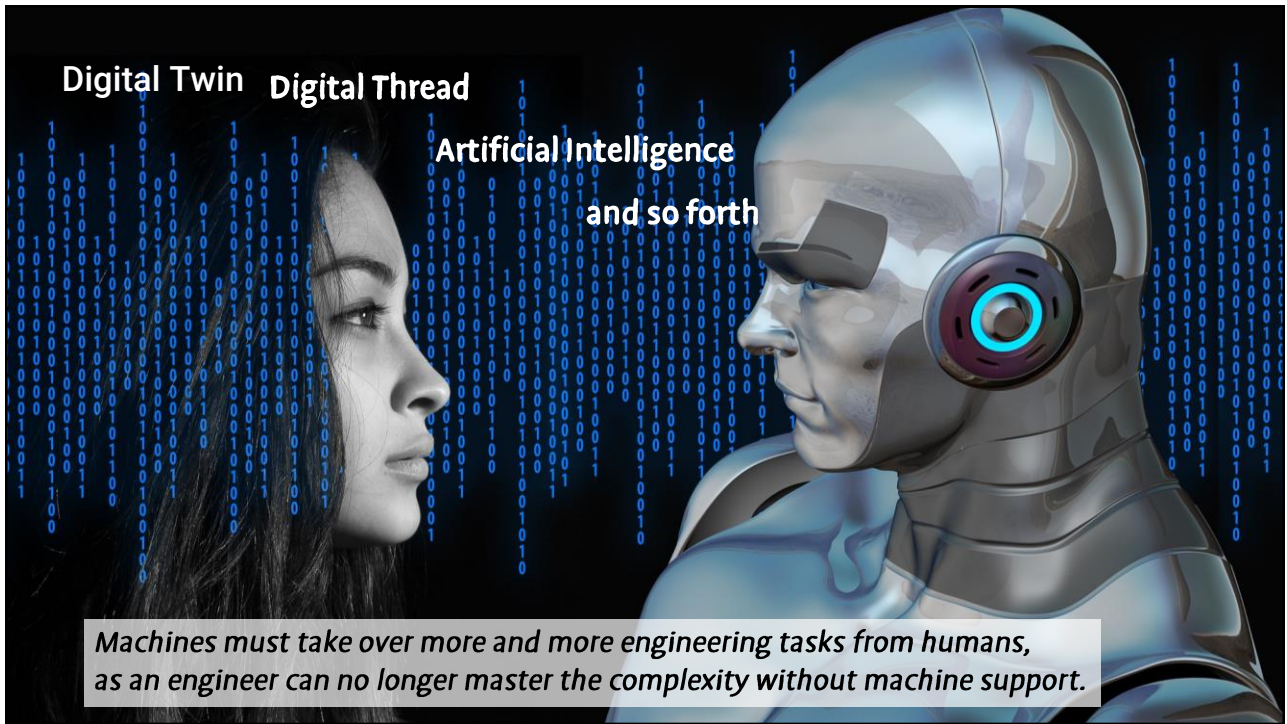
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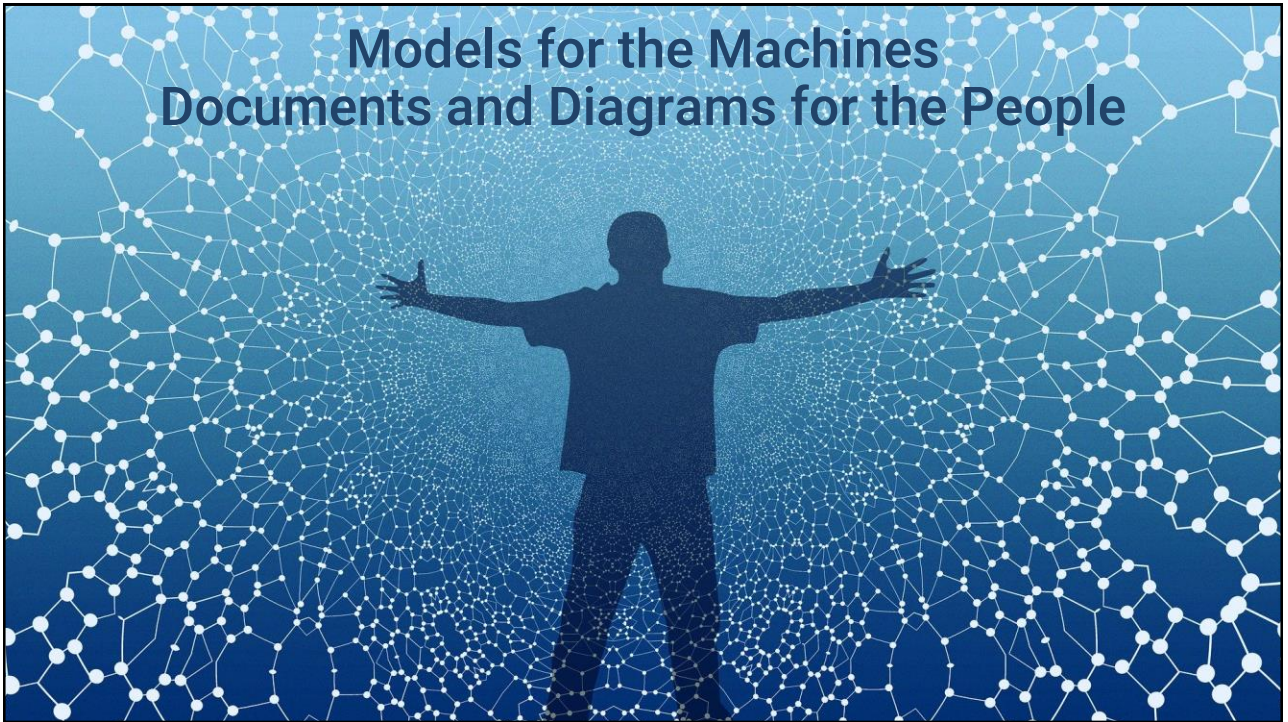
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Without a context this is just a number

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Office tools
provide context
for Humans

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Subsystem	Part	CBE Mass (kg)
SYS1	P1	42,00
SYS1	P2	1,20
SYS1	P3	7,30
Total SYS1		50,50



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For a Machine
42 is a value in the
2nd row, 3rd column

42

Subsystem	Part	CBE Mass (kg)
SYS1	P1	42,00
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SYS1	P3	7,30
Total SYS1		50,50



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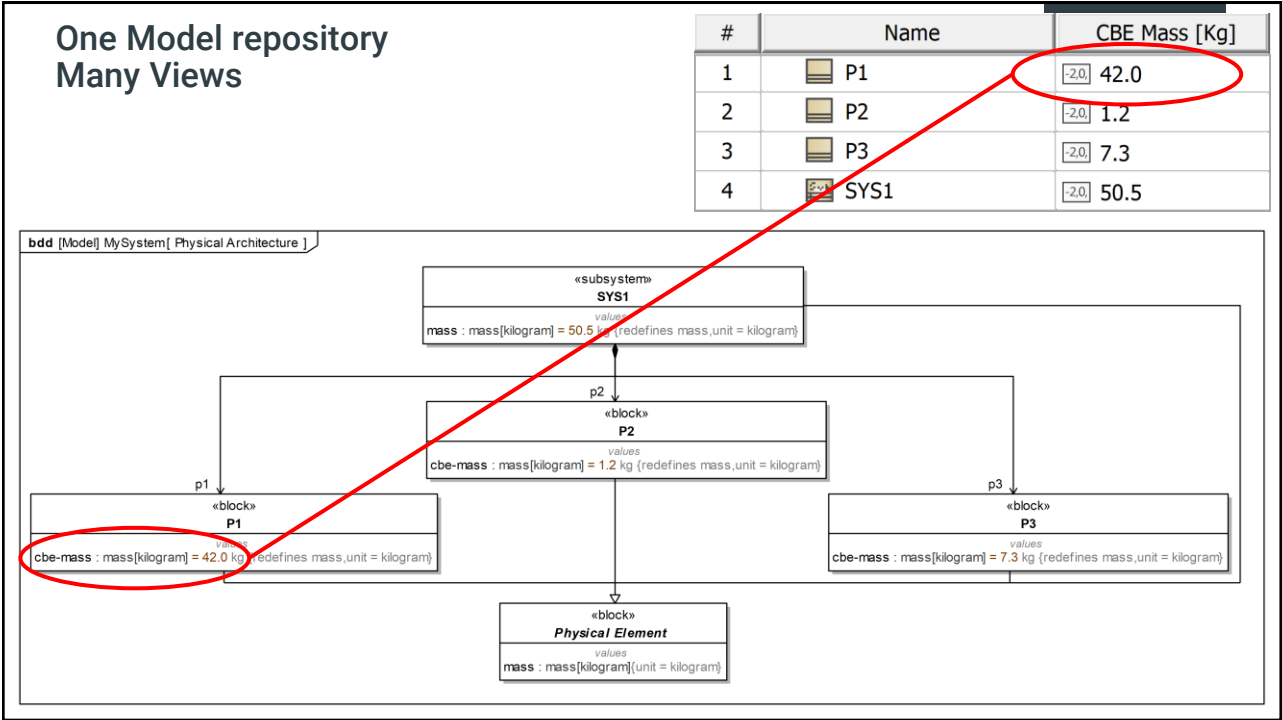
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42 in a SysML model

#	Name	CBE Mass [Kg]
1	P1	42.0
2	P2	1.2
3	P3	7.3
4	SYS1	50.5











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Machine readable Semantics

#	Name	CBE Mass [Kg]
1	 P1	 42.0
2	 P2	 1.2
3	 P3	 7.3
4	 SYS1	 50.5

«block»
P1
values
cbe-mass : mass[kilogram] = 42.0 kg {redefines mass,unit = kilogram}

- Value property cbe-mass
- Owner block P1
- Value type mass[kilogram]
- Unit kilogram
- Quantity kind mass
- ...



SysML makes common systems engineering concepts accessible for machines.









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The Model makes the Difference



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#	Name	CBE Mass [Kg]
1	 P1	 42.0
2	 P2	 1.2
3	 P3	 7.3
4	 SYS1	 50.5

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The Model makes the Difference











No Model?

Model



Subsystem	Part	CBE Mass (kg)
SYS1	P1	42,00
SYS1	P2	1,20
SYS1	P3	7,30
Total SYS1		50,50

#	Name	CBE Mass [Kg]
1	 P1	 42.0
2	 P2	 1.2
3	 P3	 7.3
4	 SYS1	 50.5

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DEFINITION

An MBSE Model is a model that represents Information about systems and their environments and is based on a modeling language that covers concepts of the systems engineering domain.

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The Kind of Model is Crucial

„Worksheet Modeling Language“

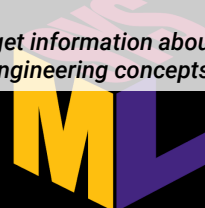
Machines get information about cells, data formats, etc.











Subsystem	Part	CBE Mass (kg)
SYS1	P1	42,00
SYS1	P2	1,20
SYS1	P3	7,30
Total SYS1		50,50

Systems Modeling Language

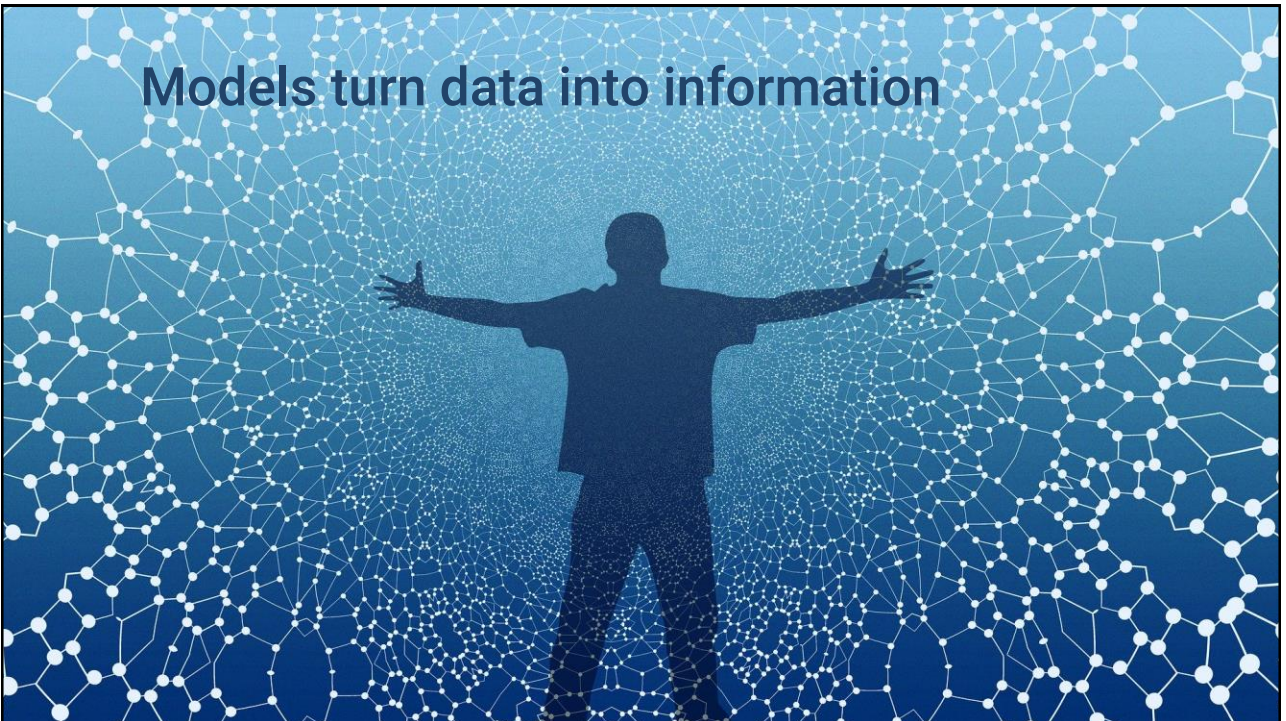
Machines get information about systems engineering concepts



#	Name	CBE Mass [Kg]
1	 P1	 42.0
2	 P2	 1.2
3	 P3	 7.3
4	 SYS1	 50.5

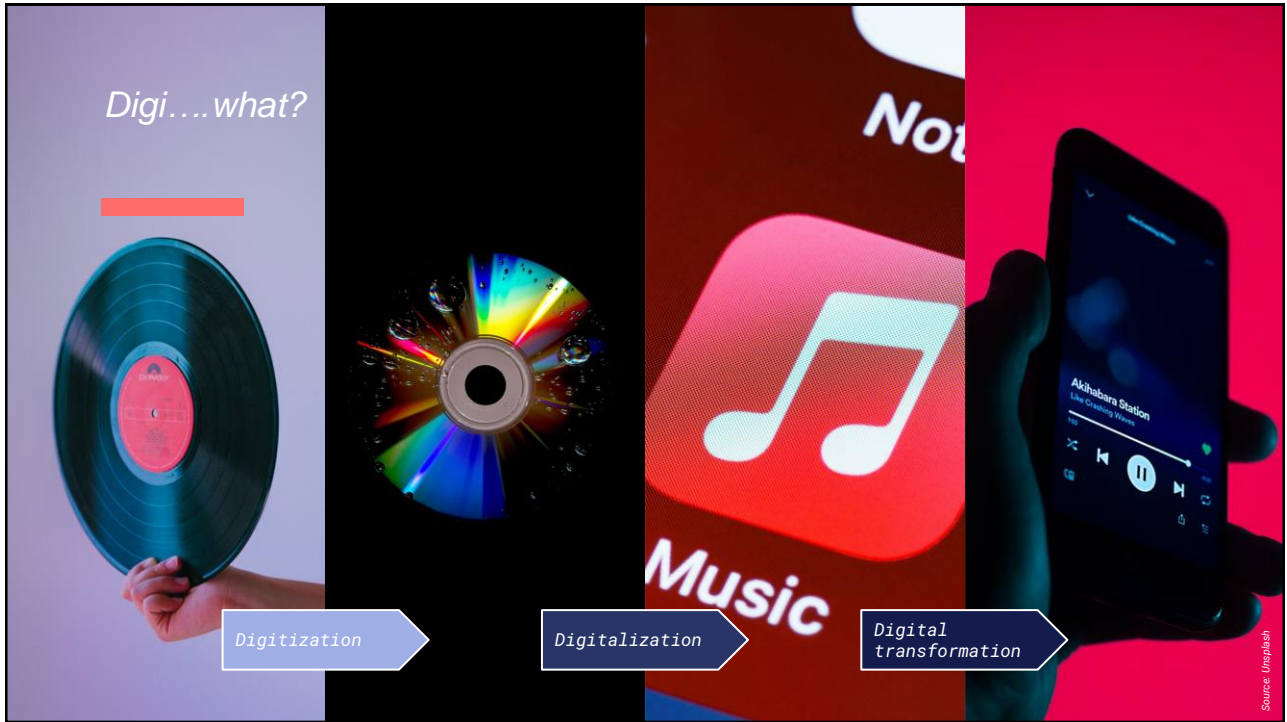
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Models turn data into information

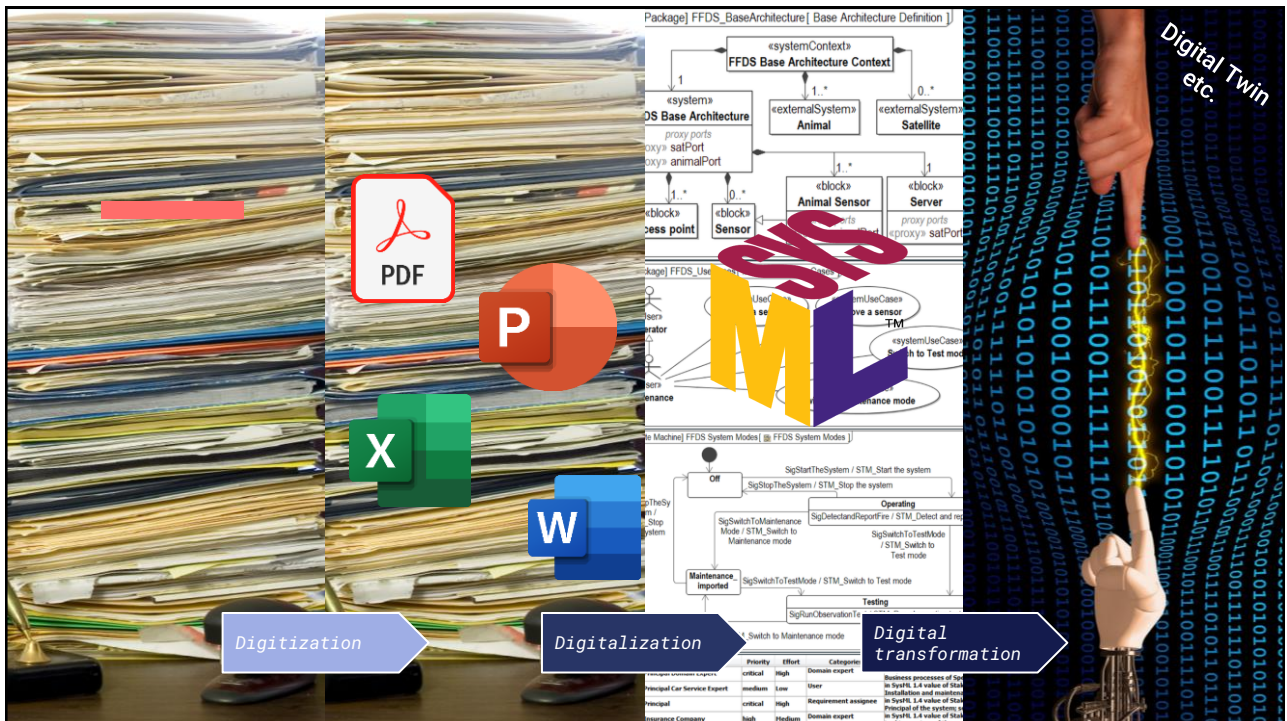


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Modeling is not Drawing

„A picture is worth a thousand words...

...and a model is worth a thousand pictures.“

(Andreas Willert)

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