

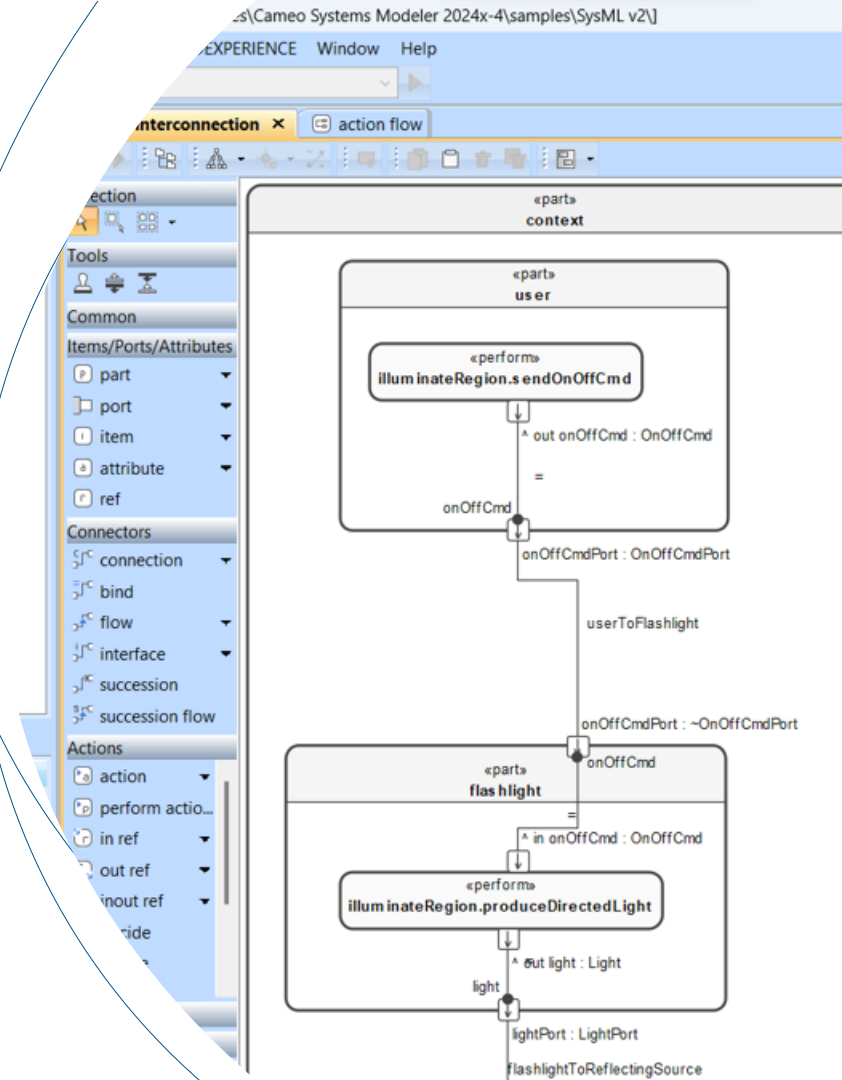


# HOLISTIC VIEW INTO MBSE AND SOME SYSML V2

This is the sub-title of the presentation

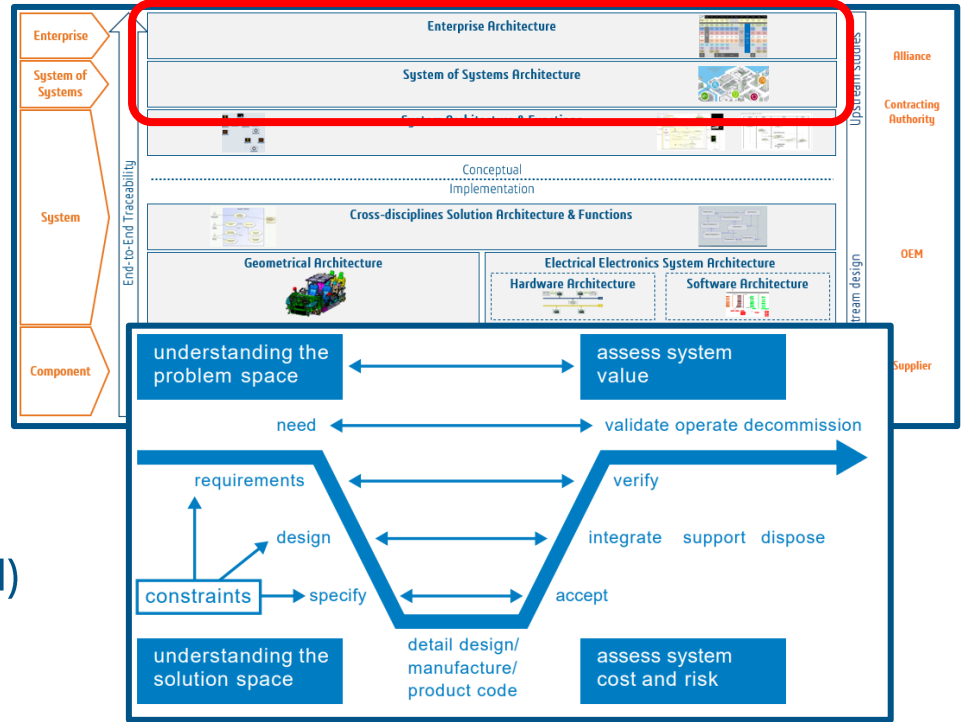



3DEXPERIENCE



# SYSTEMS ENGINEERING ON MULTIPLE LEVELS

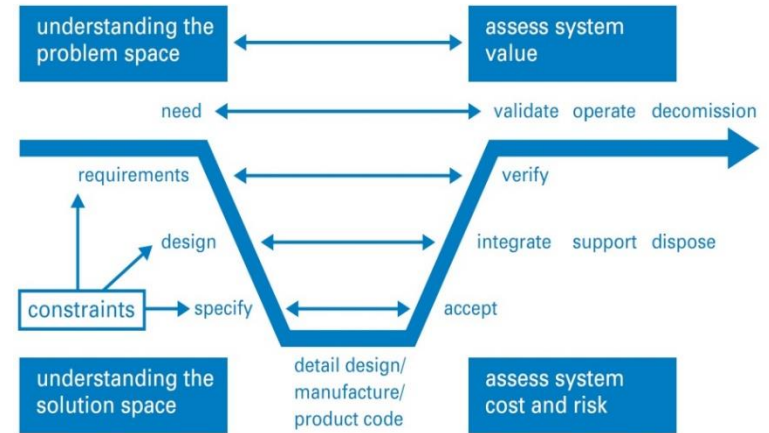
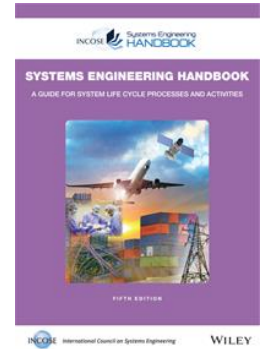
- Enterprise Architecture
  - Strategic Layer
    - Drivers
    - Challenges
    - Opportunities
- System of Systems
  - Investigating
    - Portfolio
    - Design Options
    - Constraints
- System of Interest (system -/product level)
  - Techniques
    - Trade Analysis
    - Requirements Validation



 UAF UNIVERSITY OF AIR FORCE	Motivation Mv	Taxonomy Tx	Structure Sr	Connectivity Cn	Processes Pr	States St	Sequences Sq	Information If	Parameters Pm	Constraints Ct	Roadmap Rm	Traceability Tr
<b>Architecture Management Am</b>	Architecture Principles Am-Mv	Architecture Extensions Am-Tx	Architecture Views Am-Sr	Architectural Am-Cn	Architecture Am-Pr	Architecture Am-St	Architecture Am-Sq	Architecture Am-If	Architecture Am-Pm	Architecture Constraints Am-Ct	Architecture Roadmap Am-Rm	Architecture Traceability Am-Tr
<b>Information for the Entire Architecture (Dictionary, Viewpoints)</b>												
<b>Summary &amp; Overview Sm-Ov</b>												
<b>Strategic St</b>	Strategic Motivation St-Mv	Strategic Taxonomy St-Tx	Strategic Structure St-Sr	Strategic Connectivity St-Cn	Strategic Processes St-Pr	Strategic States St-St	Strategic Sequences St-Sq	Strategic Information St-If	Strategic Parameters St-Pm	Strategic Constraints St-Ct	Strategic Roadmaps: Deployment, Phasing St-Rm-D, -P	Strategic Traceability St-Tr
<b>Captures Goals, Objectives and Capabilities</b>												
<b>Operational Op</b>		Operational Taxonomy Op-Tx	Operational Structure Op-Sr	Operational Connectivity Op-Cn	Operational Processes Op-Pr	Operational States Op-St	Operational Sequences Op-Sq	Operational Information Op-If	Operational Parameters Op-Pm	Operational Constraints Op-Ct	-	Operational Traceability Op-Tr
<b>Understand the SoS from Operational / Logical Perspective</b>												
<b>Services Sv</b>	Requirements Rq-Mv	Services Taxonomy Sv-Tx	Services Structure Sv-Sr	Services Connectivity Sv-Cn	Services Processes Sv-Pr	Services States Sv-St	Services Sequences Sv-Sq	Services Information Sv-If	Services Parameters Sv-Pm	Services Constraints Sv-Ct	Services Roadmap Sv-Rm	Services Traceability Sv-Tr
<b>Identify Services to Abstract Behavior and Capabilities</b>												
<b>Personnel Ps</b>		Personnel Taxonomy Ps-Tx	Personnel Structure Ps-Sr	Personnel Connectivity Ps-Cn	Personnel Processes Ps-Pr	Personnel States Ps-St	Personnel Sequences Ps-Sq	Personnel Information Ps-If	Personnel Parameters Ps-Pm	Personnel Constraints Ps-Ct	Personnel Roadmaps: Evolution, Forecast Ps-Rm-A, -E, -F	Personnel Traceability Ps-Tr
<b>Understand Constituent Systems of Systems and Relationships to Personnel / Organizations</b>												
<b>Resources Rs</b>		Resources Taxonomy Rs-Tx	Resources Structure Rs-Sr	Resources Connectivity Rs-Cn	Resources Processes Rs-Pr	Resources States Rs-St	Resources Sequences Rs-Sq	Resources Information Rs-If	Resources Parameters Rs-Pm	Resources Constraints Rs-Ct	Resources Roadmaps: Evolution, Forecast Rs-Rm-E, -F	Resources Traceability Rs-Tr
<b>Perform Security Analysis – Cyber, Physical</b>												
<b>Security Sc</b>	Security Controls Sc-Mv	Security Taxonomy Sc-Tx	Security Structure Sc-Sr	Security Connectivity Sc-Cn	Security Processes Sc-Pr	Security States Sc-St	Security Sequences Sc-Sq	Security Information Sc-If	Security Parameters Sc-Pm	Security Constraints Sc-Ct	-	Security Traceability Sc-Tr
<b>Understand Development Milestones</b>												
<b>Projects Pj</b>	-	Projects Taxonomy Pj-Tx	Projects Structure Pj-Sr	Projects Connectivity Pj-Cn	Projects Processes Pj-Pr	Projects States Pj-St	Projects Sequences Pj-Sq	Projects Information Pj-If	Projects Parameters Pj-Pm	Projects Constraints Pj-Ct	Projects Roadmap Pj-Rm	Projects Traceability Pj-Tr
<b>Capture Government Standards &amp; Compliance</b>												
<b>Standards Sd</b>	-	Standards Taxonomy Sd-Tx	Standards Structure Sd-Sr	Standards Connectivity Sd-Cn	Standards Processes Sd-Pr	Standards States Sd-St	Standards Sequences Sd-Sq	Standards Information Sd-If	Standards Parameters Sd-Pm	Standards Constraints Sd-Ct	Standards Roadmap Sd-Rm	Standards Traceability Sd-Tr
<b>Execution - Actual Instances of Resources Deployed or Allocated</b>												
<b>Actual Resources Ar</b>	-	-	Actual Resources Structure Ar-Sr	Actual Resources Connectivity Ar-Cn	Actual Resources Processes Ar-Pr	Actual Resources States Ar-St	Actual Resources Sequences Ar-Sq	Actual Resources Information Ar-If	Actual Resources Parameters Ar-Pm	Actual Resources Constraints Ar-Ct	Actual Resources Roadmap Ar-Rm	Actual Resources Traceability Ar-Tr

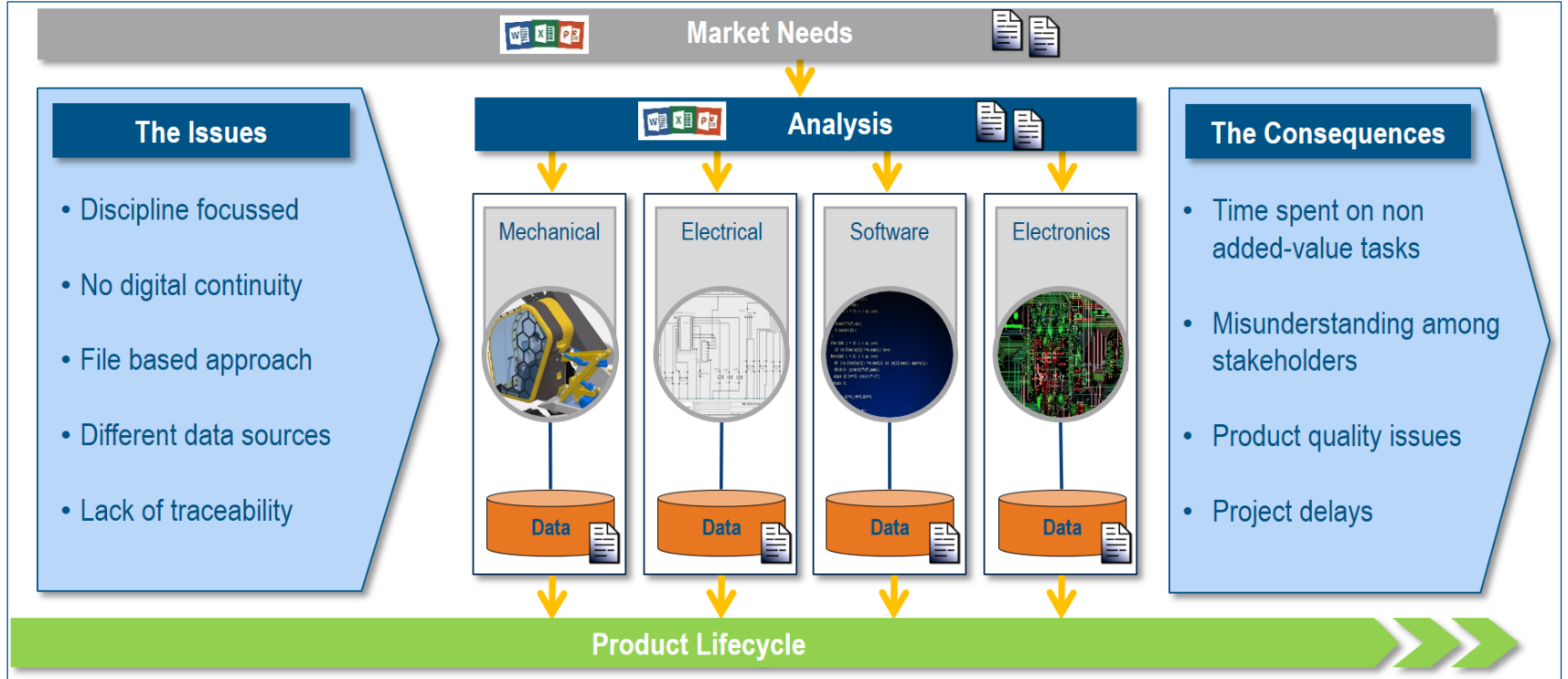
# SYSTEMS ENGINEERING

- Understanding the problem before jumping into the solution (stakeholder needs, context, use cases, behavior)
- Strong focus on customer needs and required functionality for all product lifecycle phases
- Considering the complete problem incl. operations, performance, test, manufacturing, cost & schedule, training & support, maintenance, disposal
- Reducing complexity by decomposing the system of interests into subsystems with clearly defined functions, interactions, responsibilities,...



Source: INCOSE

# SILO WORKING



# SYSTEMS ENGINEERING AND SILO WORKING

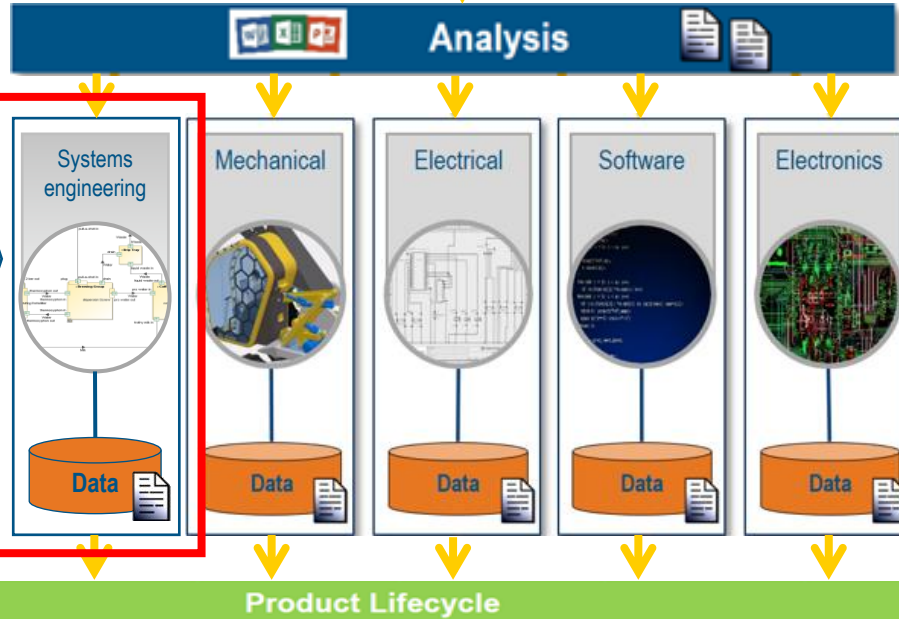


Market Needs



## The Issue

- Discipline focused
- No digital continuity
- File based approach
- Different data sources
- Lack true of traceability



## The Consequences

- Time spent on non added value tasks
- Misunderstanding among stakeholders
- Still Product quality issues
- Still Project delays

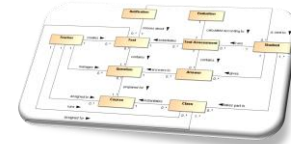
Product Lifecycle

# MBSE

PICTURE

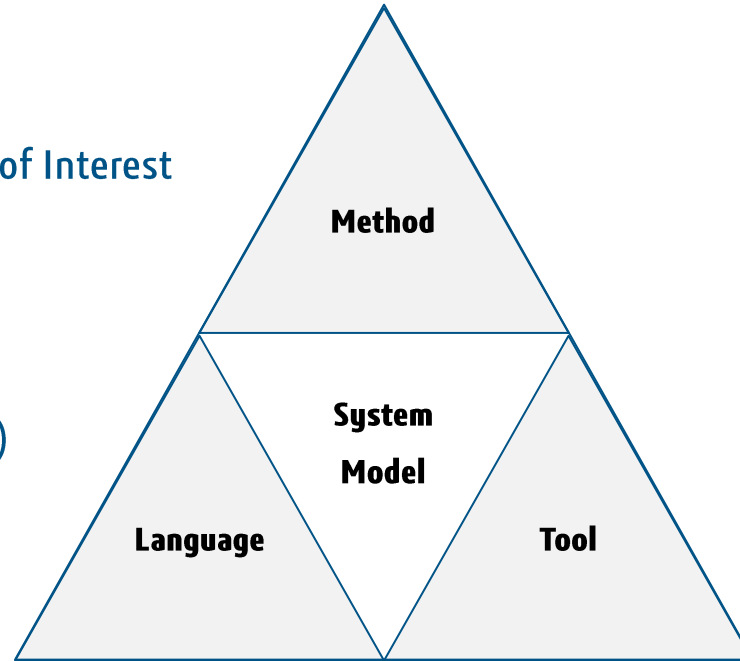
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MODEL



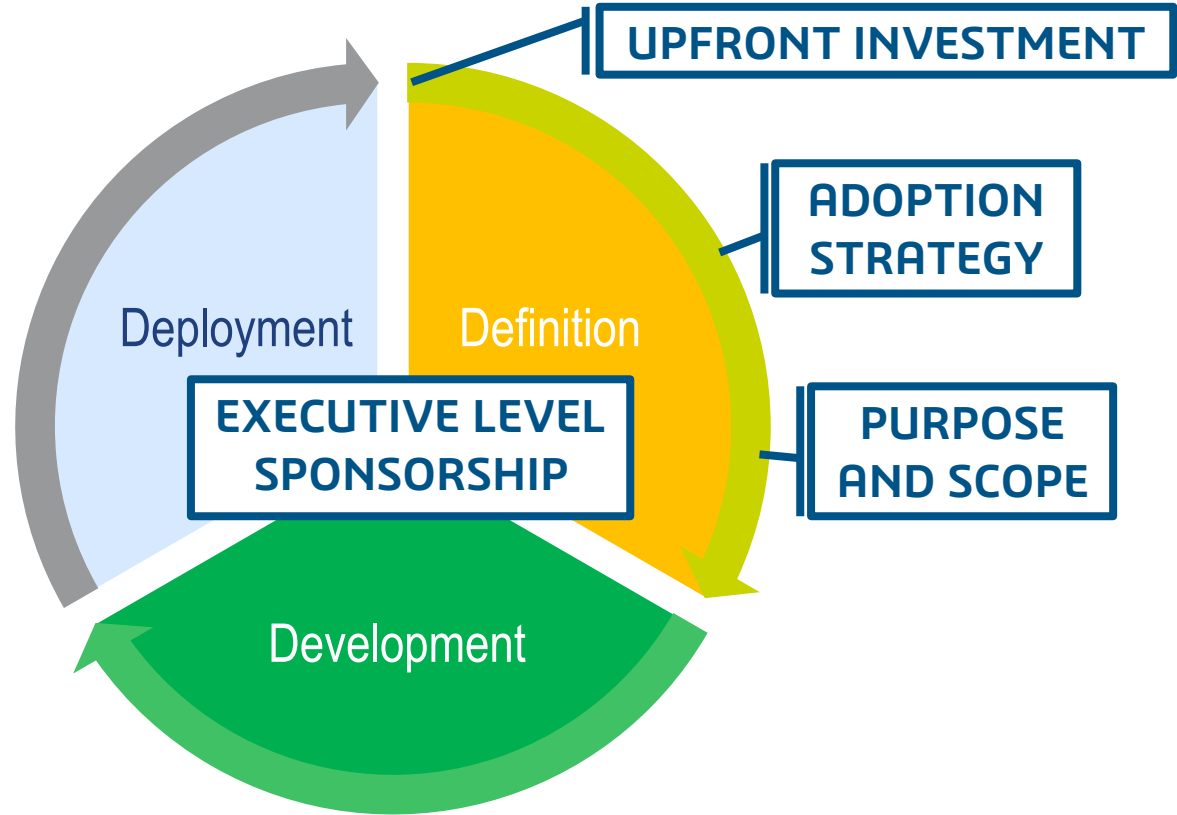
MBSE needs:

- A holistic modeling approach
- A central model for the whole System of Interest (System model)
- A unified modeling language (SysML)
- A modeling framework (method, rules)
- A modeling tool
- Qualified and motivated employees



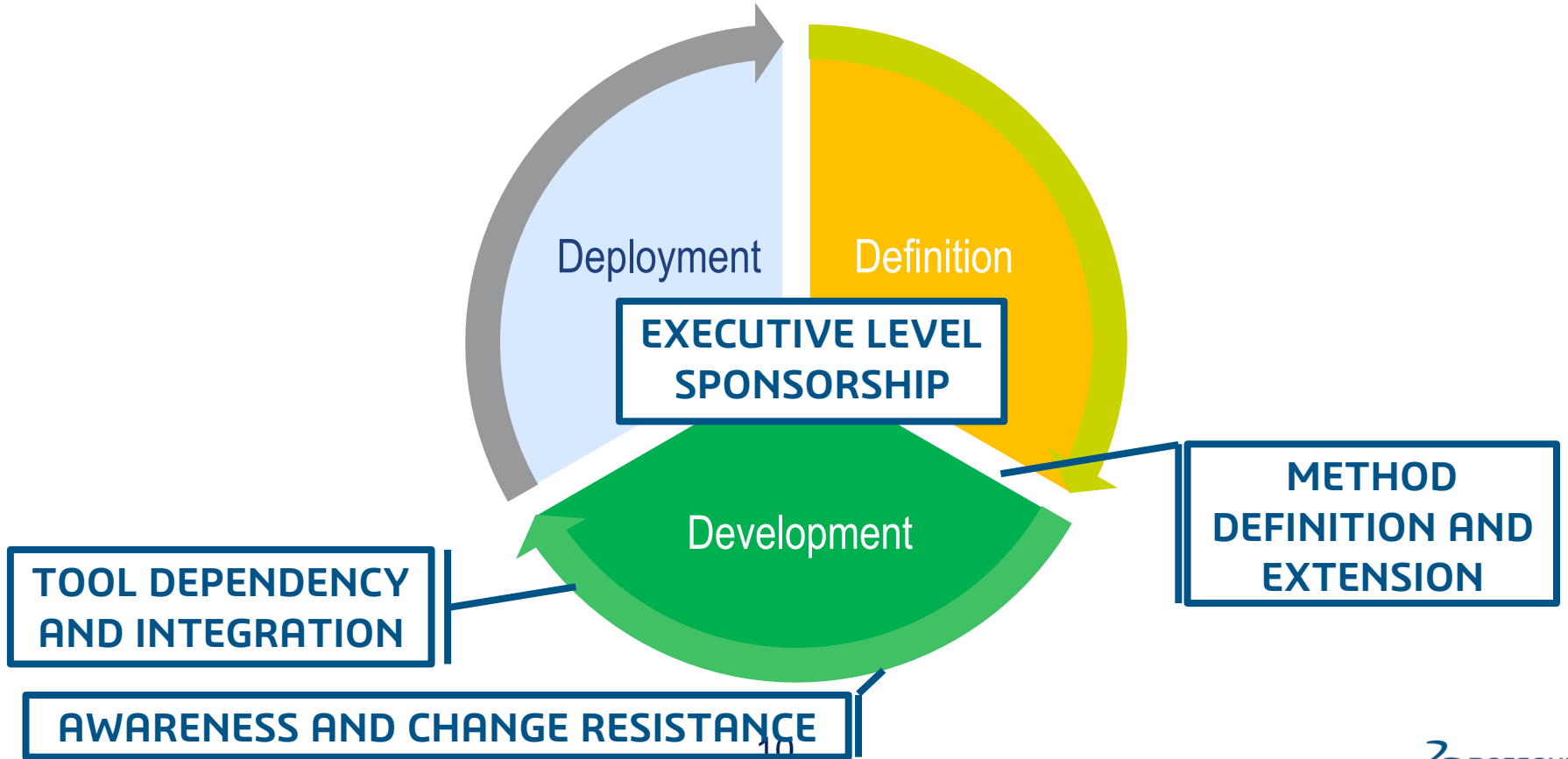
**ORGANIZATION HAS TO ADOPT TO THE NEW METHODOLOGY**

# MBSE CHALLENGES – DEFINITION

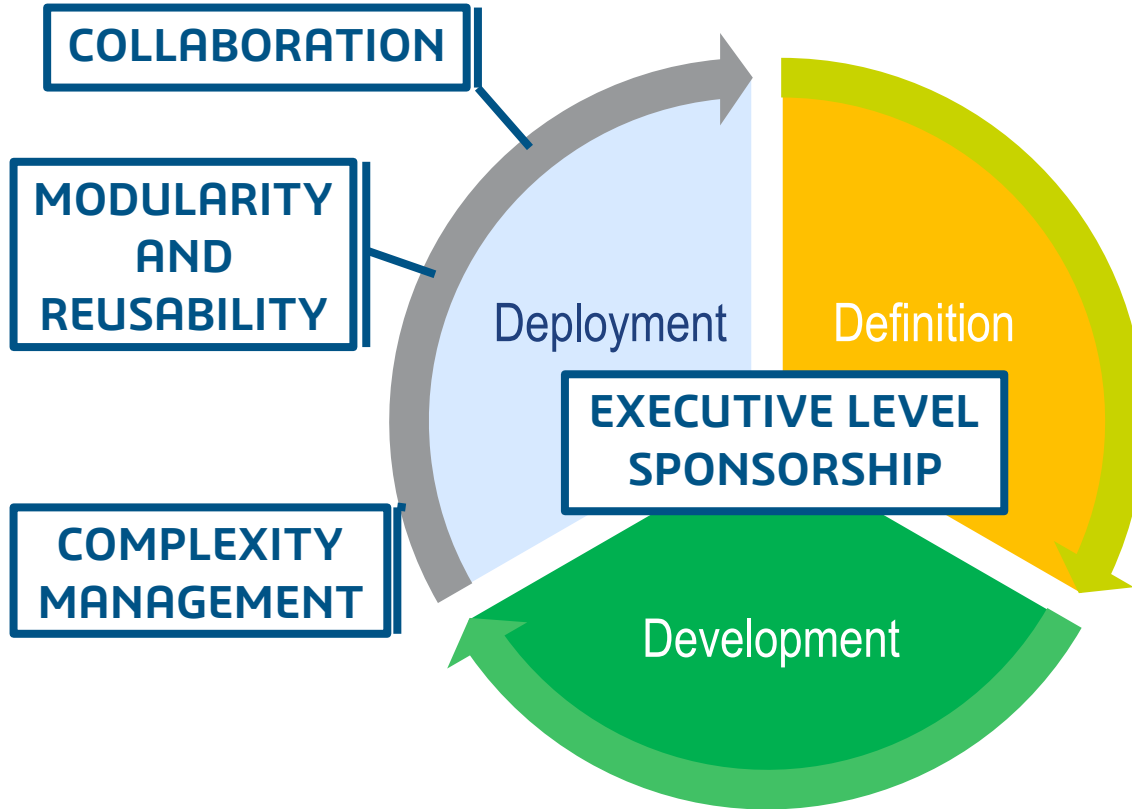




# MBSE CHALLENGES – DEVELOPMENT

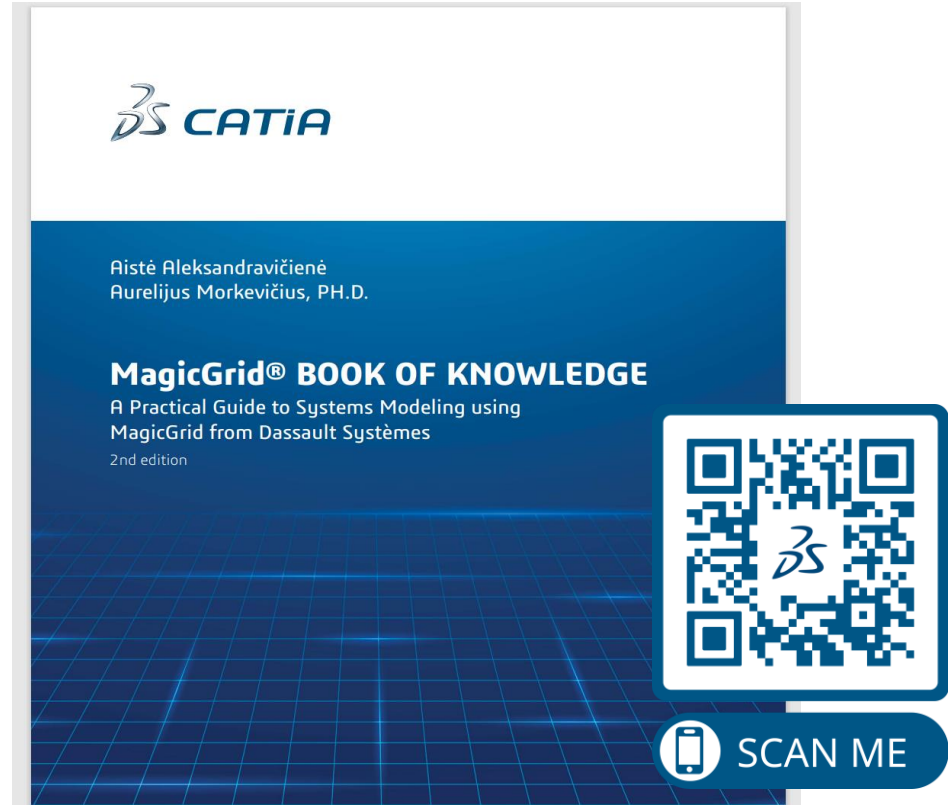


# MBSE CHALLENGES – DEPLOYMENT



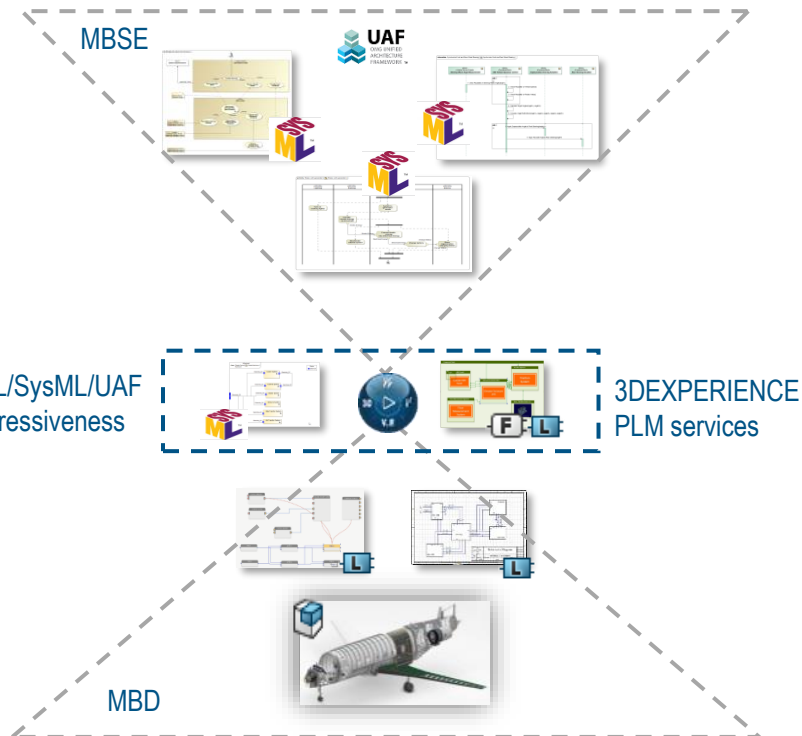
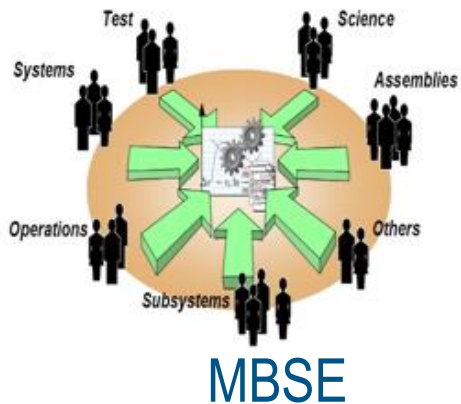
# MAGIC GRID

- MagicGrid is the bridge between the theory and practice, bringing three major MBSE components – method, language, and modeling tool – together.
- Companies needed an unambiguous approach for developing system models using SysML, the critical enabler for MBSE, as defined by the International Council on Systems Engineering (INCOSE).
- The MagicGrid framework has evolved by summarizing the experience of numerous MBSE adoption projects, as a foundation and collection of best practices that can be modified or extended to support specific customer needs. The framework is completely applicable in practice for the following reasons:
  - It is fully compatible with “vanilla” SysML, which means, no extensions for the standard SysML are required.
  - It clearly defines the modeling process, which is based on the best practices of the systems engineering process. It is tool-independent, as long as that tool supports SysML



# MBSE AND MBD AS ONE PROCESS

- MBSE – Model Based Systems Engineering
- MBD – Model Based Definition



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SCAN ME



**Matti Koskipää**  
MBSE and product development  
process evangelist



MAYKE.SMITS@3DS.COM  
06 18 90 73 04





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