28th Annual INCOSE international symposium

Washington, DC, USA

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Towards Solving MBSE Adoption Challenges

The D3 MBSE Adoption Toolbox

www.incose.org/symp2018

Motivation

- MBSE promise
- MBSE adoption relies on human, financial, organizational and technological factors
- Few reports talk about the problems and failure stories
- Discussion focuses on MBSE technical details (e.g., SysML language, modeling tool) rather than identifying and understanding other factors
- MBSE is a matter of necessity, rather than cost saving?

Jungle of Buzzwords

INCOSE definition is very vague "formal application of models…"

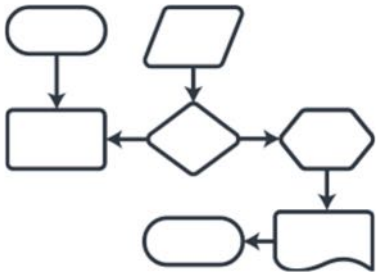
What is the difference between MBSE and MBD?

What is the difference between System Architecture and System Design?

INCOSE says "SysML is critical enabler for MBSE"

MBSE Adoption components

Personnel



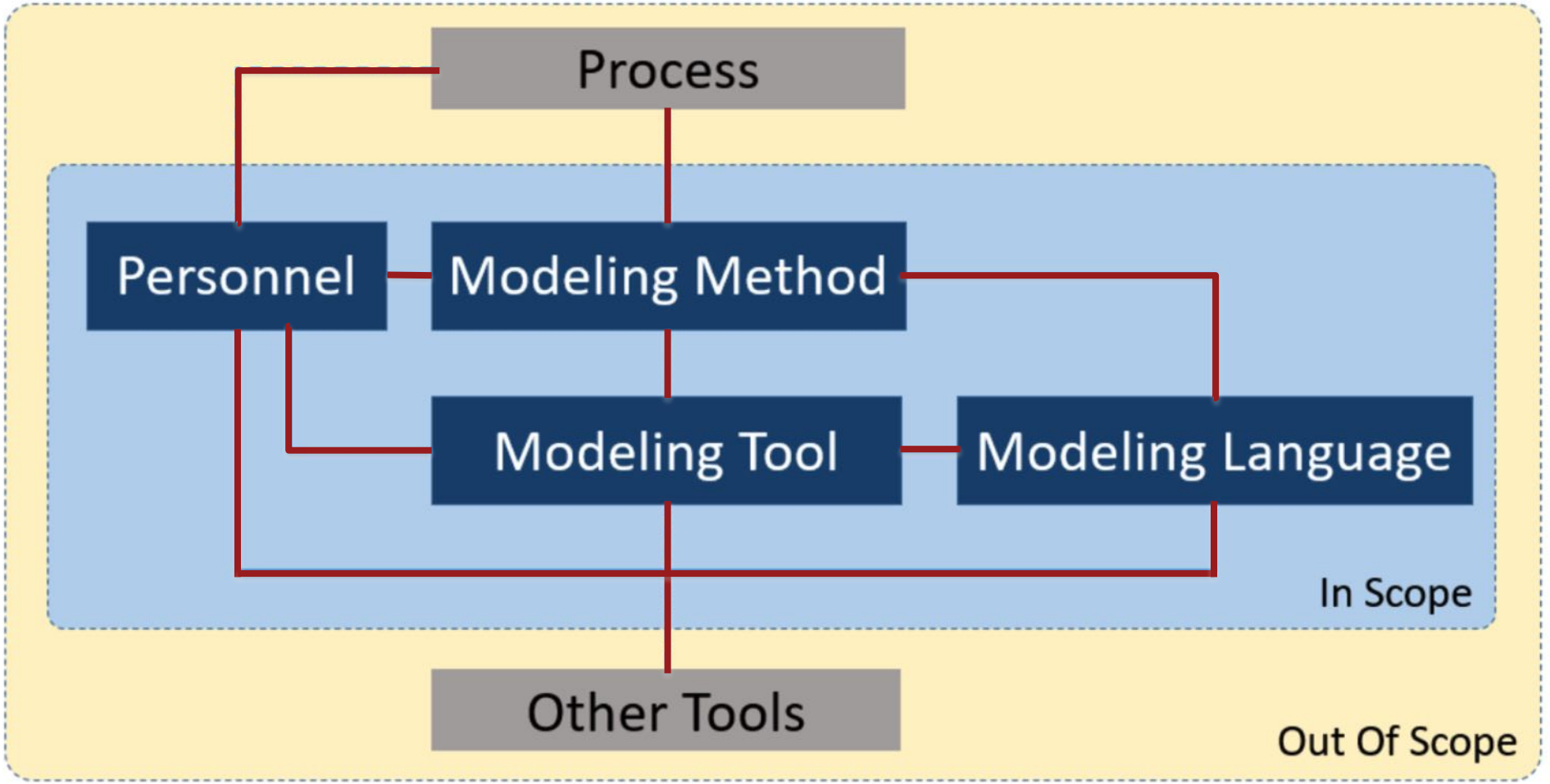
Process

Modeling Language

Modeling Method

Modeling Tool

MBSE Adoption components



Executive Level Sponsorship

Collaboration

Adoption Strategy

Awareness and Change Resistance

Upfront Investment

Complexity Management

Purpose and Scope

Method Definition and Extension

Tool Dependency and Integration

Modularity and Reusability

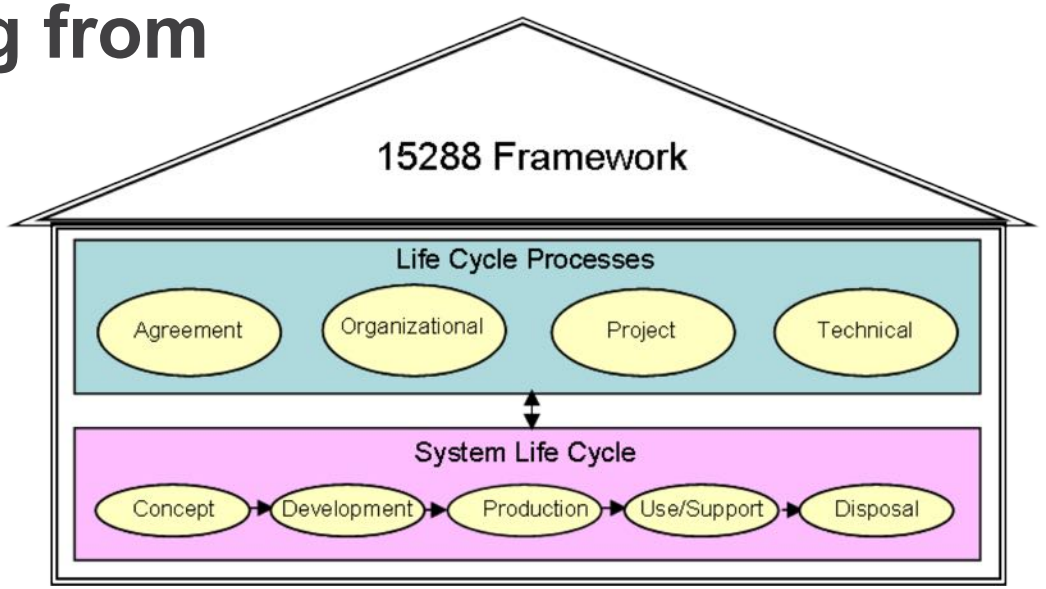
ISO 15288

Perfectly addresses the main processes of SE!

But

Does it fit for MBSE?

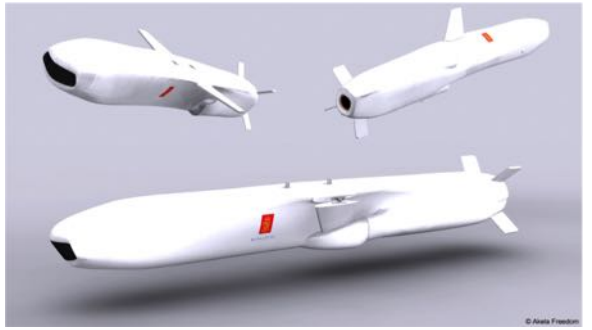
Where is the process of transitioning from document-based SE to MBSE?



Kongsberg Defense and Airspace

- A number of different technologies to be integrated
- A lot of software (60% of the system requirements affects software)
- 30-years lifecycle

- A new methodology had to be developed and learned
- It took several years and 10 training sessions to mature AF
- The majority claim that SysML is too complex
- Clear terminology is essential in communicating the model
- it is a challenge to develop methodology and guidelines in parallel with product development
- The project is considered a success!
- There is commitment from management to move forward



Bombardier Transportation

Operational Analysis

OA - main deliverables
1. Context & scope
2. Interactions between SOI[1] and actors
3. SOI use cases including their detailed behavior

Functional Analysis

FA - main deliverables
1. Functional architecture
2. System of interest decomposition
3. Allocation of Functional Blocks to the SOI's parts

Technical Analysis

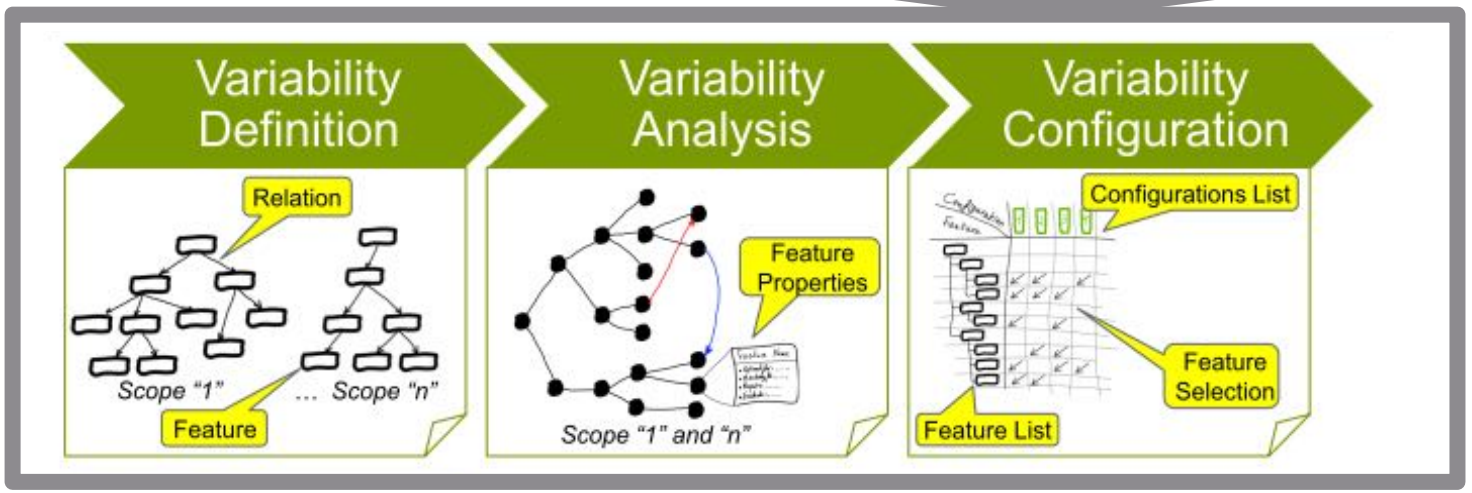
TA - main deliverables
1. Technical breakdown structure
2. Technical architecture
3. Allocation of functional blocks to technical blocks

MBSE + Variability Management:
- Enable re-use
- Modular development
- Engage sales, management, and other non-SE stakeholders
- Other…

➢ Being a frontrunner for other MBSE applications (e.g., MBPLE) is challenging

A need to customize a method for:
Optimized requirements traceability with system design and safety, automatic document generation for homologation, and other…

➢ It takes time to make MBSE adoption beneficial



Influencers

Standards, Handbooks, Books, Wikis, MBSE courses…

Experience, lessons learned, practices…

Consider project management and ROI concerns

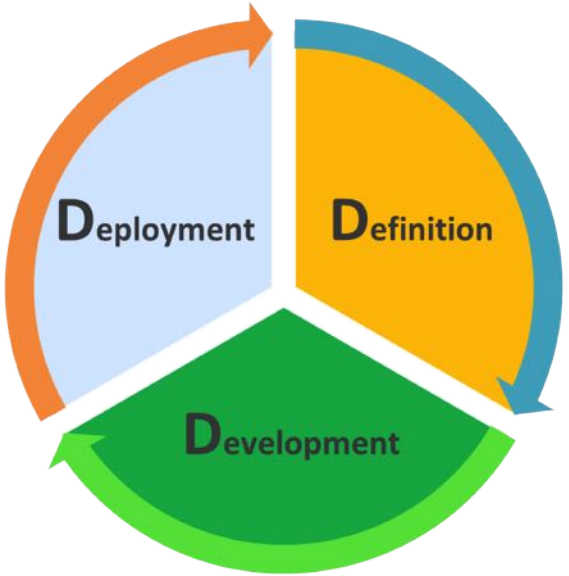
Experts' feedback from different industries

Adoption challenges survey results

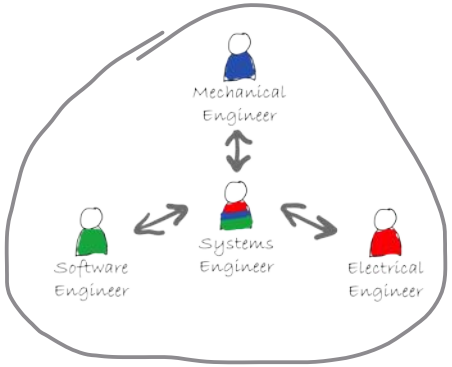
Partner and collaborate to define an efficient foundation

Clear target towards optimized MBSE adoption

D3 MBSE Adoption Toolbox

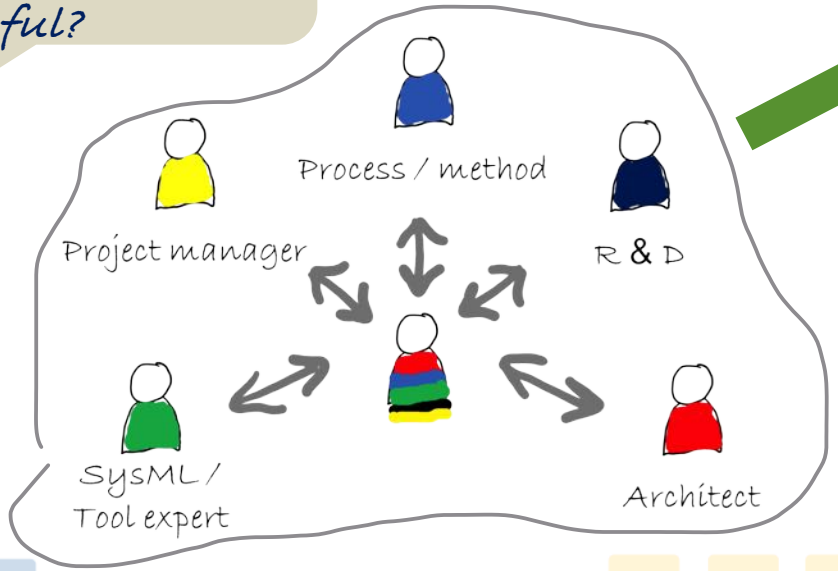


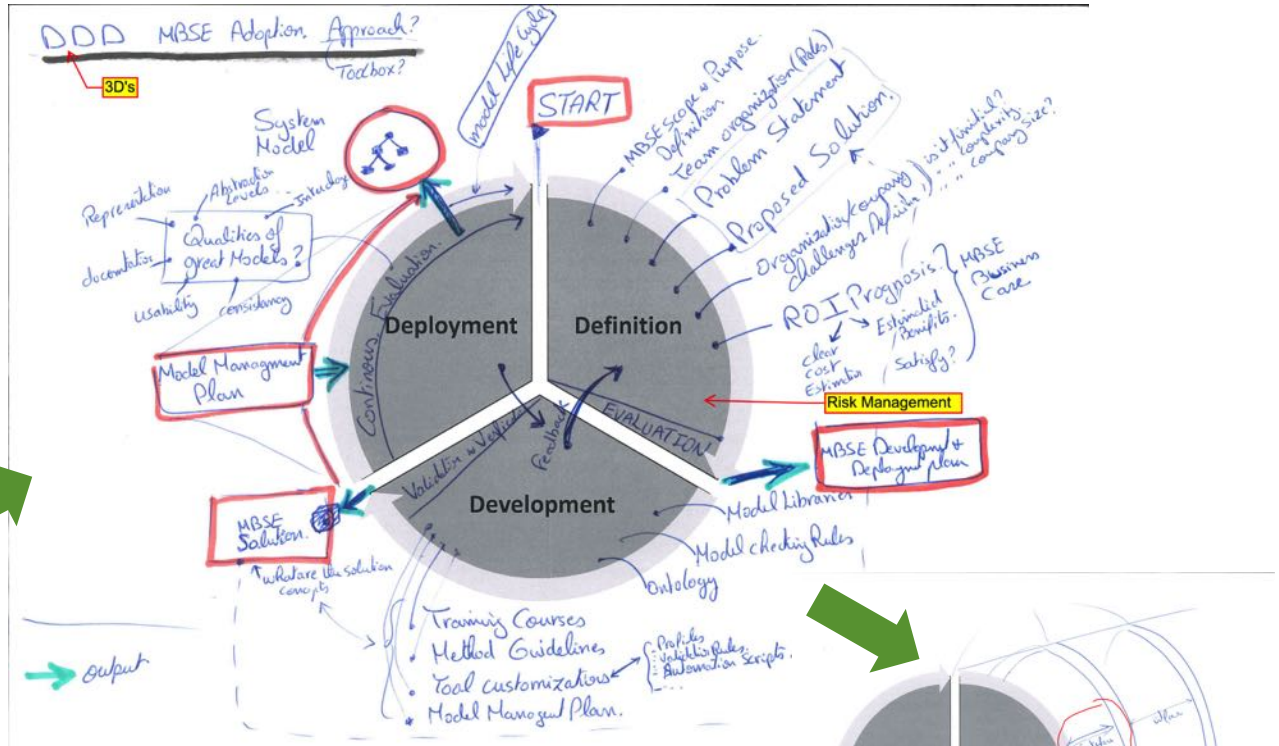
Why D3 and not DDD, 3D‘s or D^3...?

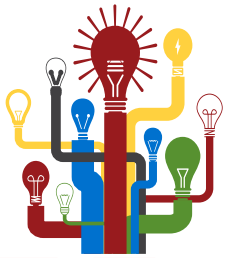


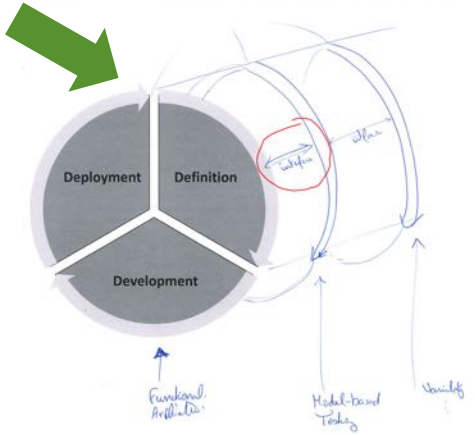
Who is responsible that MBSE adoption is succesful?

Another level of abstraction

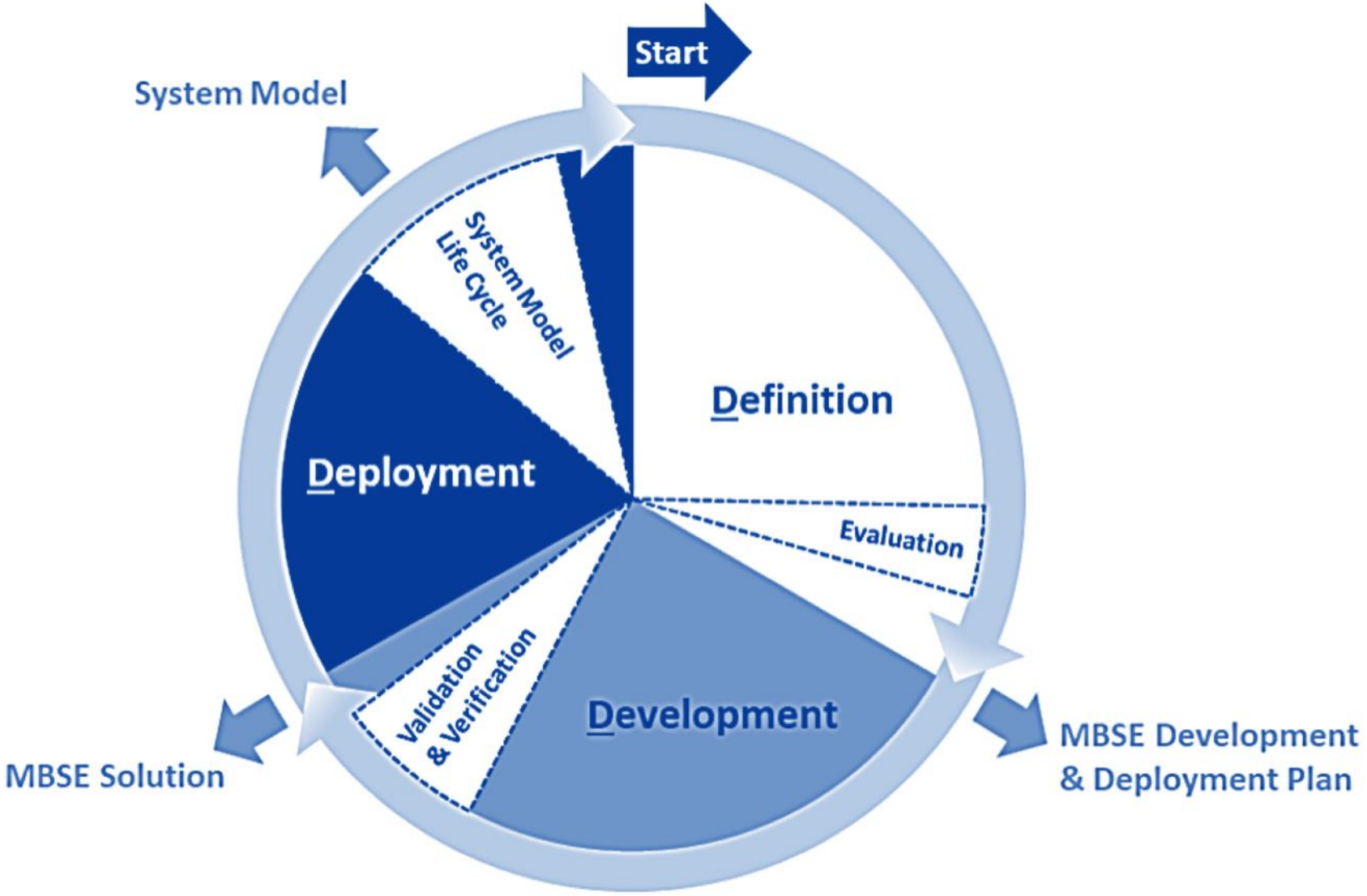








D3 MBSE Adoption Toolbox



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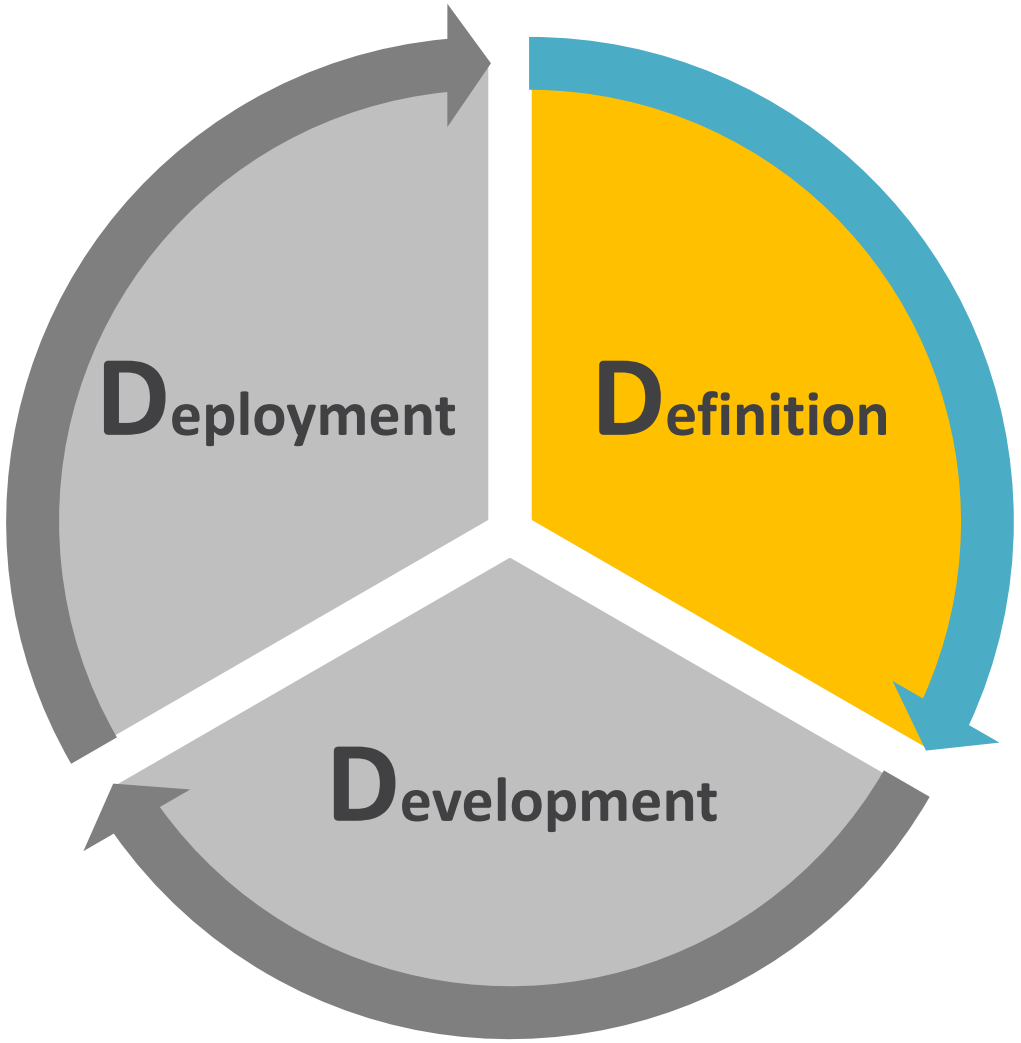
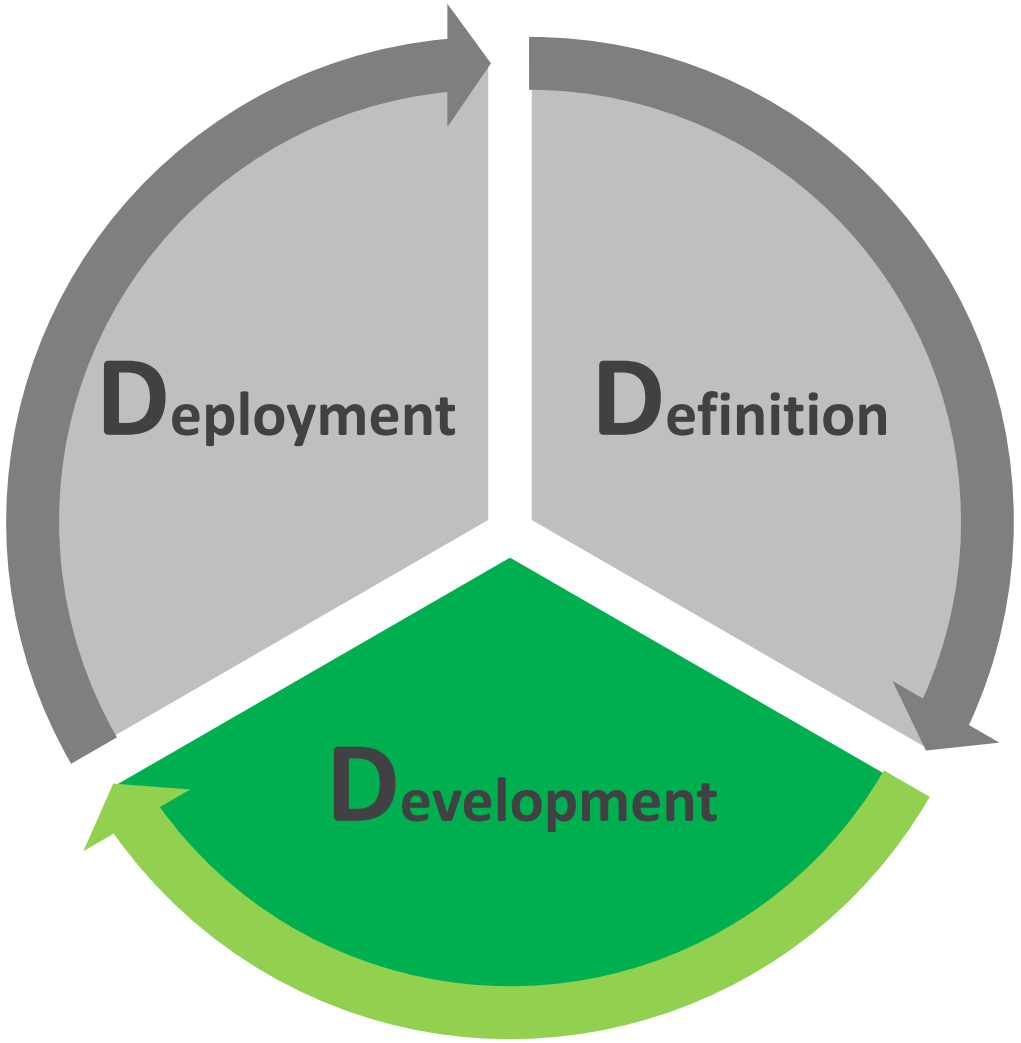


Definition Phase

- ❑ MBSE adoption **scope**
- ❑ MBSE adoption **purpose**
- ❑ **Team** establishment
- ❑ **Problem** statement
- ❑ **Awareness** courses
- ❑ **ROI** prognoses
- ❑ **Quality** assurance
- ❑ **Risk** management

➢ **Delivery of Development & Deployment plan**

D3 MBSE Adoption Toolbox

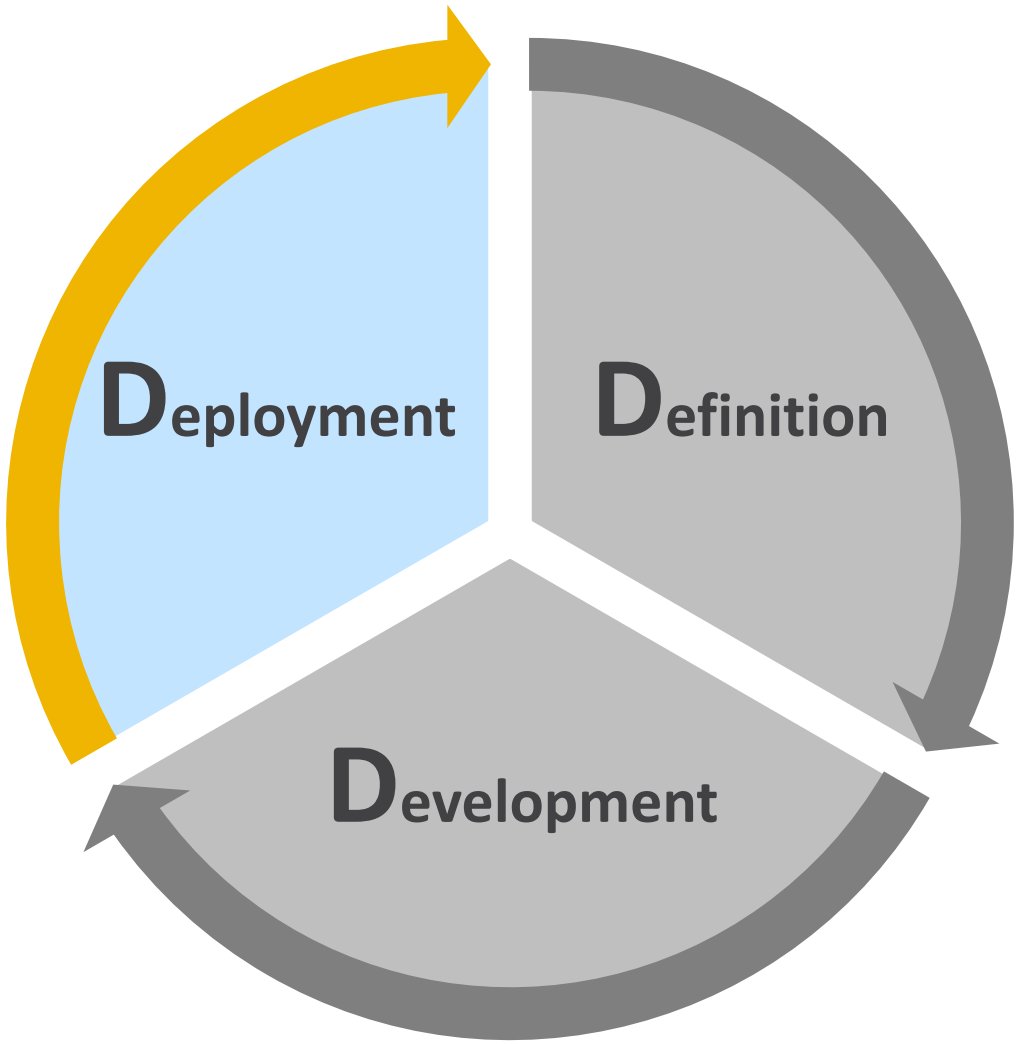


Development Phase

- ❑ Model **libraries**
- ❑ **Ontology** and glossary
- ❑ **Domain** models
- ❑ **Guidelines**
- ❑ Customized **training** courses
- ❑ Model **checking** rules
- ❑ Tool **customizations**

➢ **MBSE solution delivery**

D3 MBSE Adoption Toolbox



Deployment Phase

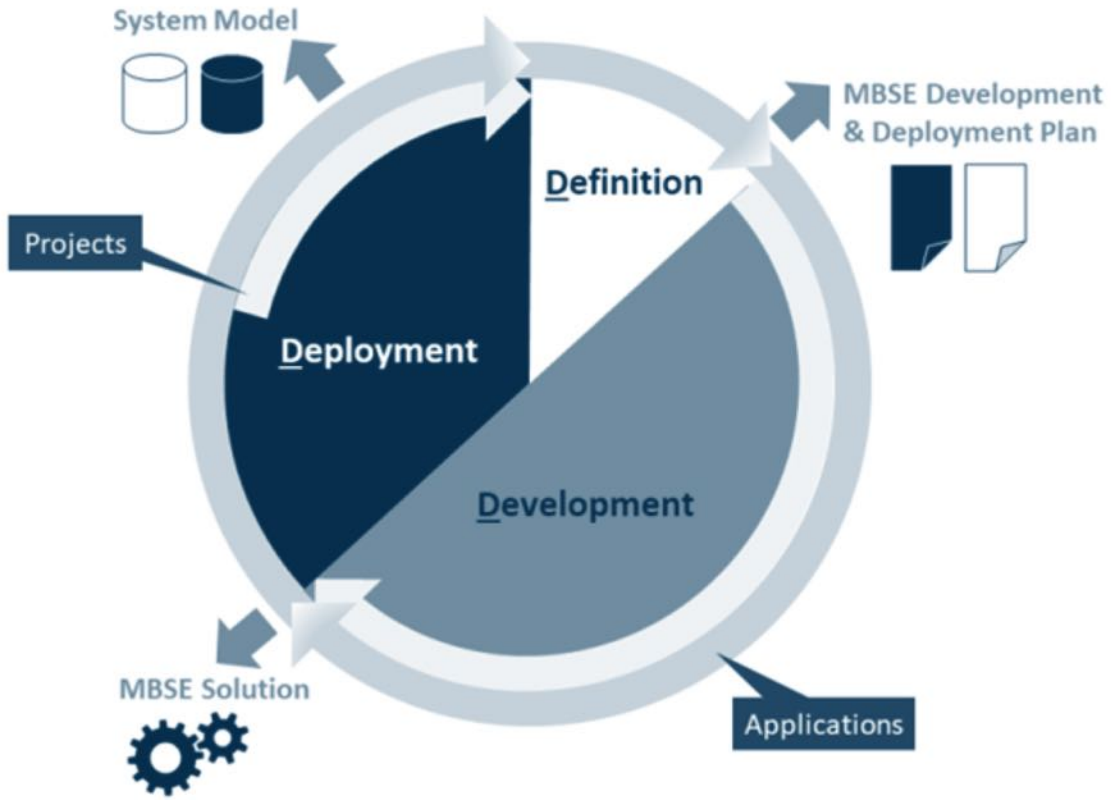
- ❑ Modeling **governance**
- ❑ Monitoring, coaching & Reporting
- ❑ Model **integration**
- ❑ Model **execution**
- ❑ Model **verification** and **validation**
- ❑ Quality of **valuable models**
- ❑ Systems model life cycle management

➢ **System model delivery**

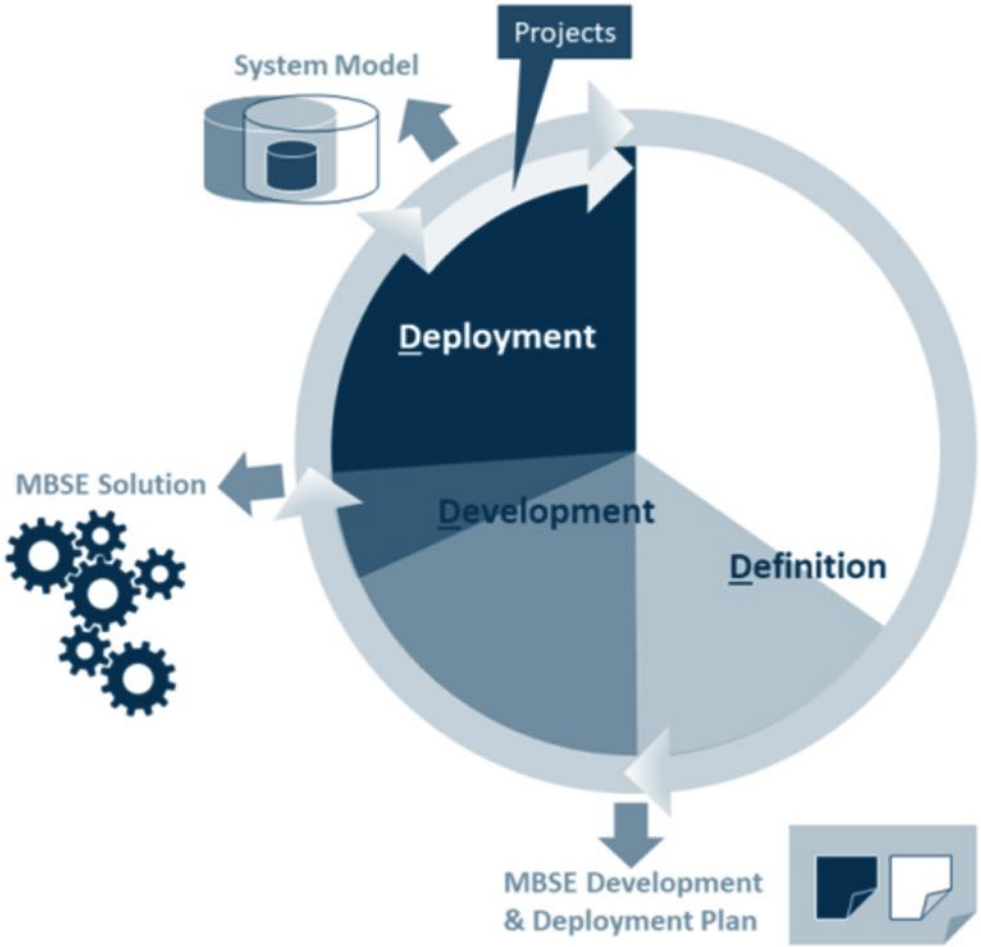
D3 MBSE Adoption Toolbox

Two Application Cases

Application Case 1



Application Case 2



Looking Forward

- Focus also on non-technical factors
- Enhance and work further on the draft version of the D3 MBSE Adoption Toolbox
  - ➢ Do it with you and not alone

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