Transdisciplinary Approach to Enhance Customer Engagement in the Design of Complex Defence Systems

Giulio Telleschi, Andrea Caroni
MBDA Italy

WiSEB special track – ICONS 2020
February 27, 2020 - Lisbon
Contents

- MBDA – the Company
- Managing complexity in systems design
- Customer engagement: the added value
- Transdisciplinary approach
- Conclusions
- References
MBDA – The Company
MBDA is the first truly integrated defence company in Europe and the only European one able to provide missiles and missile systems for each branch of the armed forces, whether in the air, at sea or on land.
Transdisciplinary Approach to Enhance Customer Engagement in the Design of Complex Defence Systems - WISEB ICONS2020

MBDA's heritage mirrors the history of tactical missiles in Europe

Ce document est la propriété de MBDA. Il ne peut être communiqué à des tiers et reproduit sans l’autorisation préalable écrite de MBDA et son contenu ne peut être divulgué. © MBDA 2020.

This document and the information contained herein is proprietary information of MBDA and shall not be disclosed or reproduced without the prior authorisation of MBDA. © MBDA 2020.
MBDA and European cooperative programmes

Promoting and delivering cooperative programmes is deeply rooted in MBDA’s DNA

STORM SHADOW / SCALP  METEOR  ASTER Family  CAMM, CAMM-ER

TAURUS KEPD 350  SEA VENOM / ANL  FC/ASW
Managing complexity in systems design
Missile….1 single word for many technical aspects

When you read “Missile”, what do you think of?
The enhancement in missile design processes has to encompass current and future missile developments in all fields that are part of MBDA portfolio, including access to platforms and customer engagement:

**How many missile-platform-customer combinations can you imagine?**

![Diagram showing various missile platforms and customer combinations](image)
Facing the change

• The Defense world is facing a big change
• Cooperative multinational programs
• MBDA wide portfolio and number of customers
• Need to manage increasing complexity in missile design
• Missile interoperability is leading to a wider-ranging requirement set, Concepts of Operations (ConOps) and Concepts of Use (ConUse)
• Limited budget constraints

→ Processes to facilitate the transition
→ Protect information, enable sharing
→ Many variants to be managed
→ Systems engineering is more and more relevant. Risk reduction is a must
→ Move from a document-based approach to a model-based approach (broad meaning)
→ Provide modular, interoperable and cost-efficient solutions
Customer engagement: the added value
Engaging the Customer since the early stages of design and keeping the engagement for the entire life-cycle [ref. 1] is the winning factor in order to have:

- Effective needs elicitation and requirements refinement
- Reduce rework
- "building the right thing" and "building it right" [ref. 2]
Transdisciplinary approach
MBDA fosters wide adoption of Model-Based Systems Engineering:

- MBSE in MBDA empowers the advantages provided by cross-sharing and model consistency;
- MBDAAF, a legacy MBDA DAF (i.e. Defense Architectural Framework);
- International working groups;
- National Capability Teams to foster MBSE within each National Company (NatCo);
- Legacy guidelines and procedures.
- Limited sharing across NatCos due to restricted or classified information, therefore MBSE is tailored for each project-specific solution.
Why is it intrinsically transdisciplinary?

The system architecture design has to face many challenges:

- Multi-viewpoint engineering activity;
- Functions are cross-viewpoints;
- 1 source of truth;
- Early and robust validation of the solution architecture.

[ref. 3]
Missile design and customer engagement are linked together with the definition of Functional Chains [ref. 4, ref. 5]:

- Group missile Functions with a goal-driven approach;
- Easier elicitation of the needs at the right level, generating clear expectations and delivering a fit-for-purpose solution;
- High-level requirements are captured in a compact model that is easy to read, especially if compared to traditional document-based approach;
- Providing the Customer with a benchmark within the project and across projects;
- Requirements are therefore analyzed with all the cross-dependencies.
Conclusions
We’re challenging the approach with the Customer in order to increase the effectiveness of Customer engagement.

The traditional approach is evolving:

1. Document-based sharing (verbose)
2. Model-based Systems Engineering (models are requirements in context)
3. Engagement throughout the entire life-cycle (fully transdisciplinary approach)
   + Funcional Chains (requirements and all cross-dependencies)
Benefits for the Customer:

• Easier elicitation of the needs at the right level, generating clear expectations and a fit-for-purpose solution;

• High-level requirements are captured in a compact model that is easy to read, especially if compared to traditional document-based approach;

• Functional Chains allow to see the cross-dependencies between requirements, with clear rationale for design choices.
References
References


Questions and requests of further information may be addressed to:

Giulio Telleschi  
giulio.telleschi@mbda.it  
Chief Systems Engineer for Marte ER missile  
Missile Design – MBDA Italy

Andrea Caroni  
andrea.caroni@mbda.it  
Chief Systems Engineer for NASM missile  
Head of Functional Design  
Missile Design – MBDA Italy