A Holistic Approach for Realizing Model Based Enterprises

Brian Christensen
Dassault Systèmes
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Agenda

Business Drivers

Historical Perspective

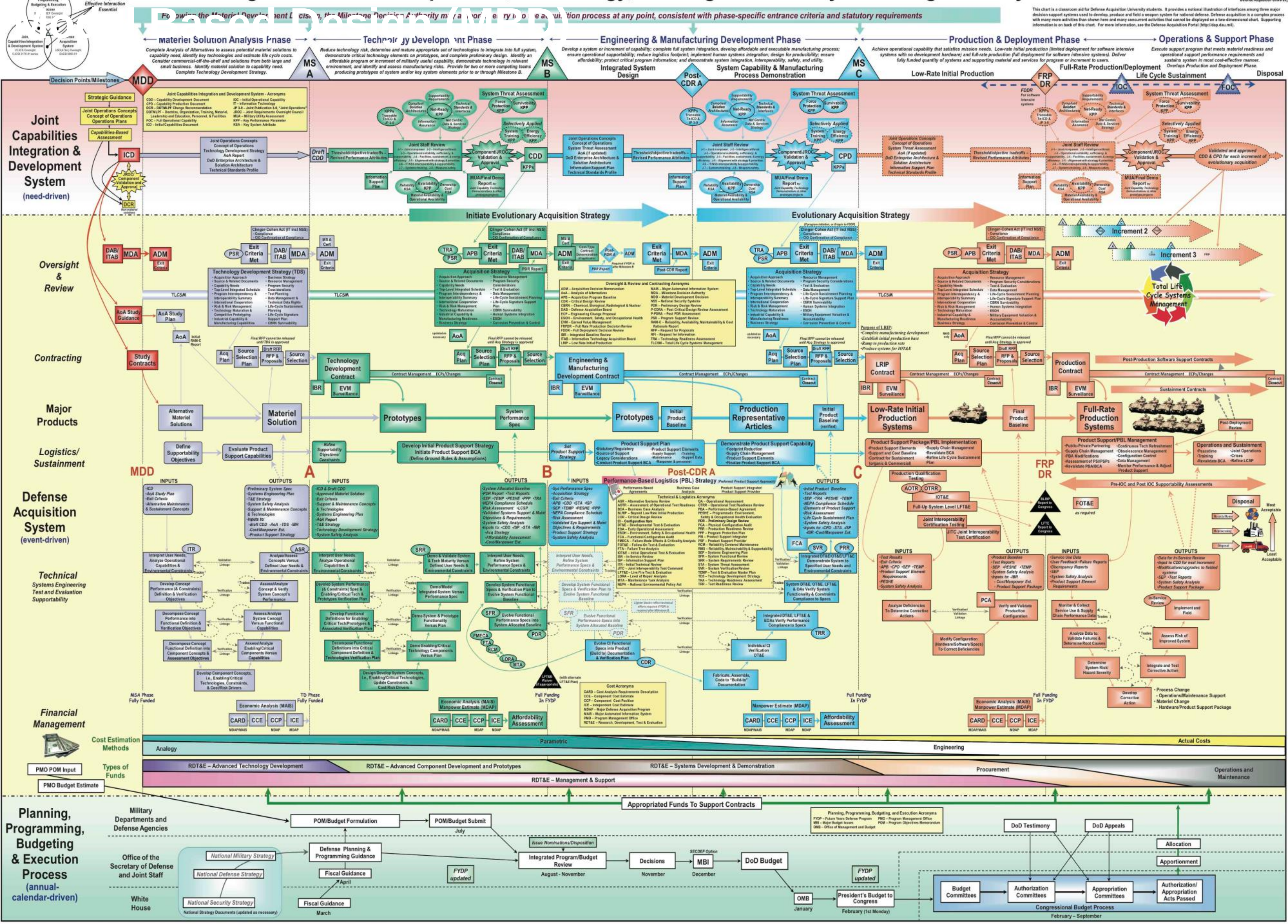
The Way Forward with MBE

Business Drivers for Model Based Enterprise

- **Understandings NEEDS**
  - Improved customer satisfaction through enhanced ability to meet customer commitments
- **Delivering Commitments**
  - Enable the successful execution of a larger number of increasingly complex product development projects while managing
    - Cost, Schedule, Head-count
  - Build a culture of commonality and variability to leverage common methods and infrastructure and enable improved execution

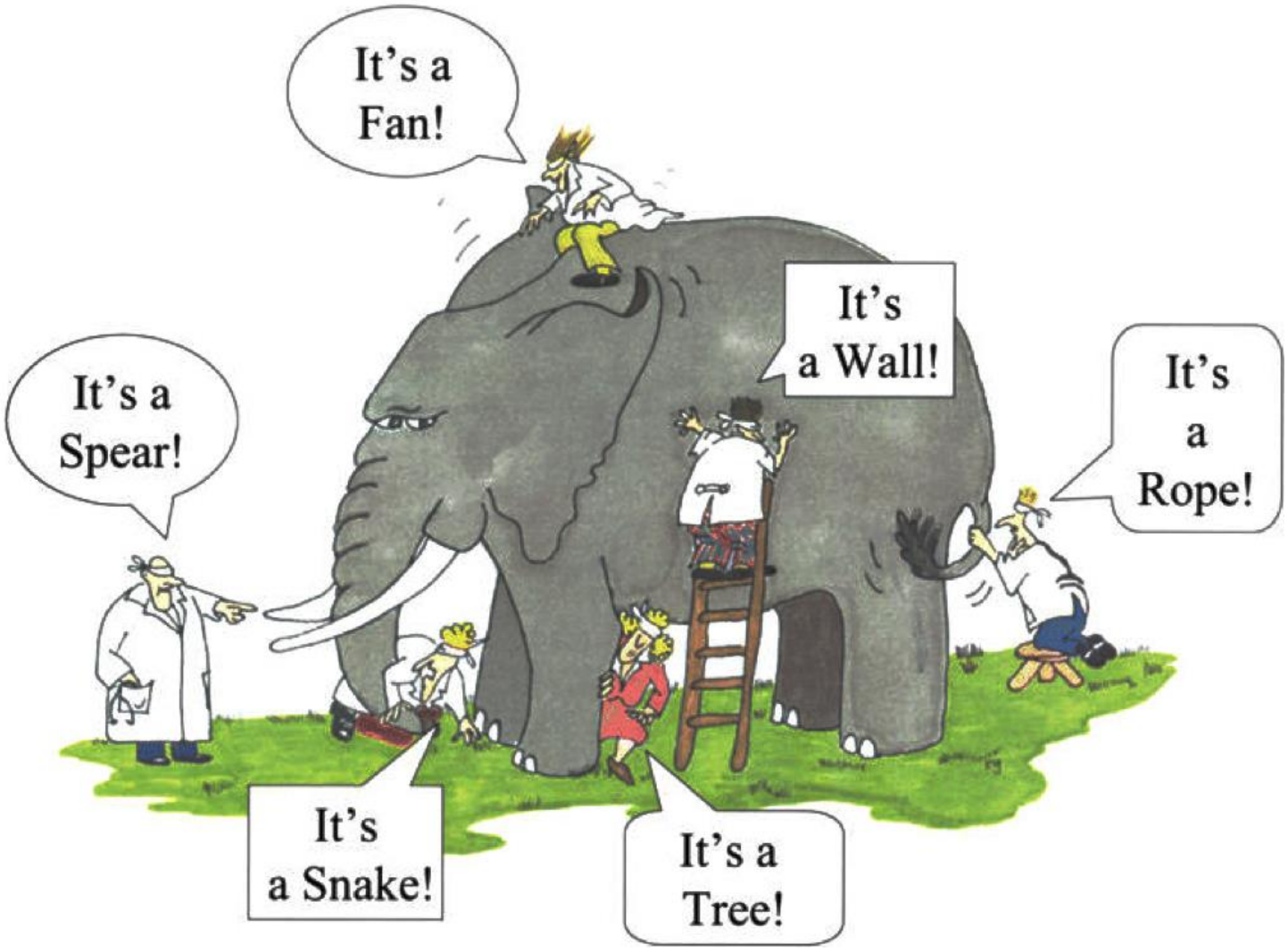
Version 5.4 15 June 2010

Integrated Defense Acquisition, Technology, and Logistics Life Cycle Management System

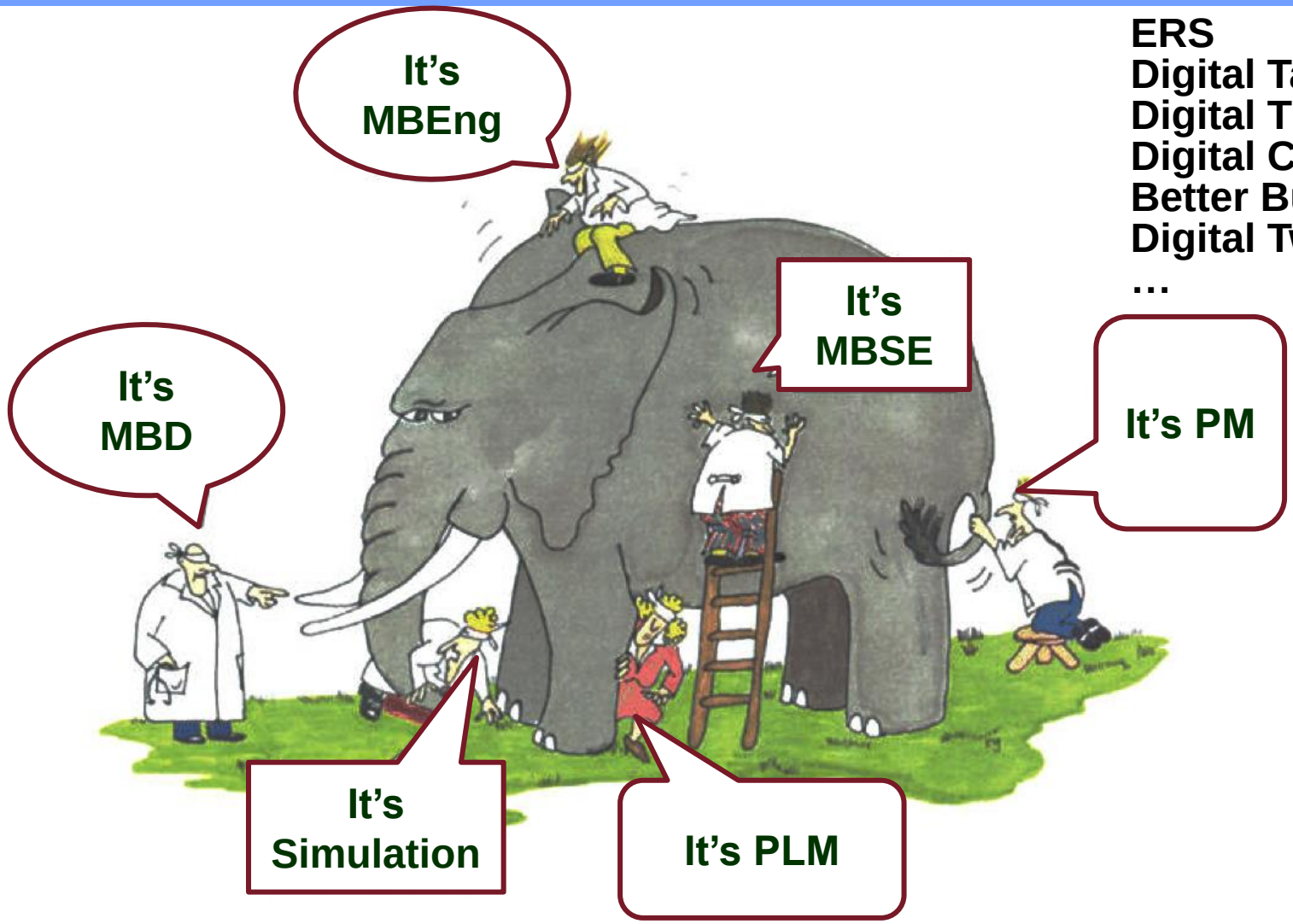


Authors Chuck Cochrane and Brad Brown   For a single copy of this chart, send a request to daupubs@dau.mil   Send recommendations to improve the content of this chart to wallchart@dau.mil

It Is Like . . .



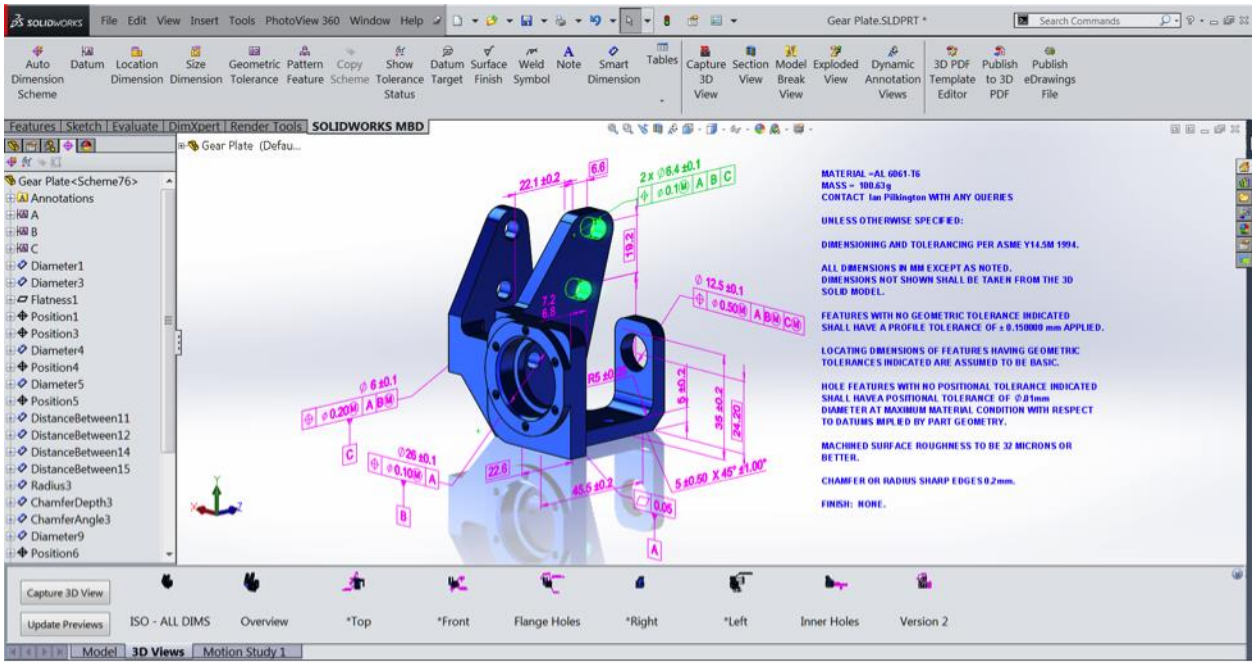
What is MBE?



ERS
Digital Tapestry
Digital Thread
Digital Continuity
Better Buying Power
Digital Twin
…

Model Based Design (MBD)

- **Is the authoritative source of the product definition**
- **Fully replaces a traditional drawing**
- **Includes full Product Manufacturing Information (PMI)**

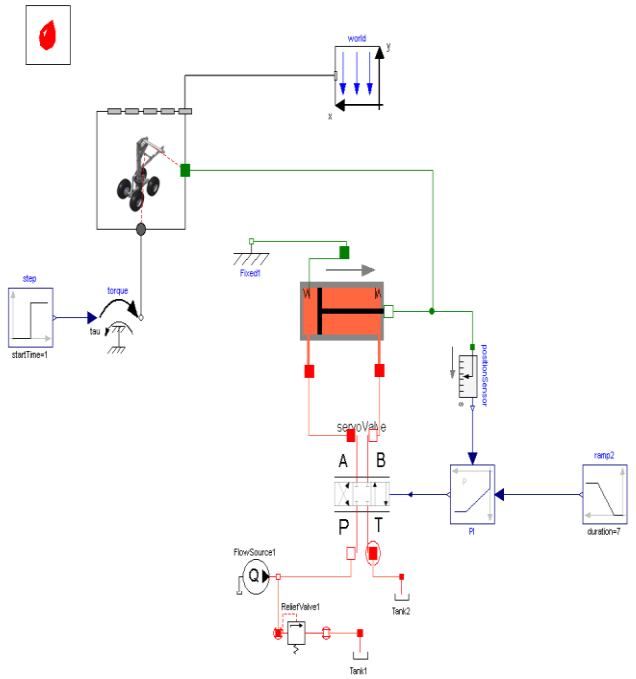


http://model-based-enterprise.org/model-based-definition.html

Model Based Engineering (MBE)

MBE Definition

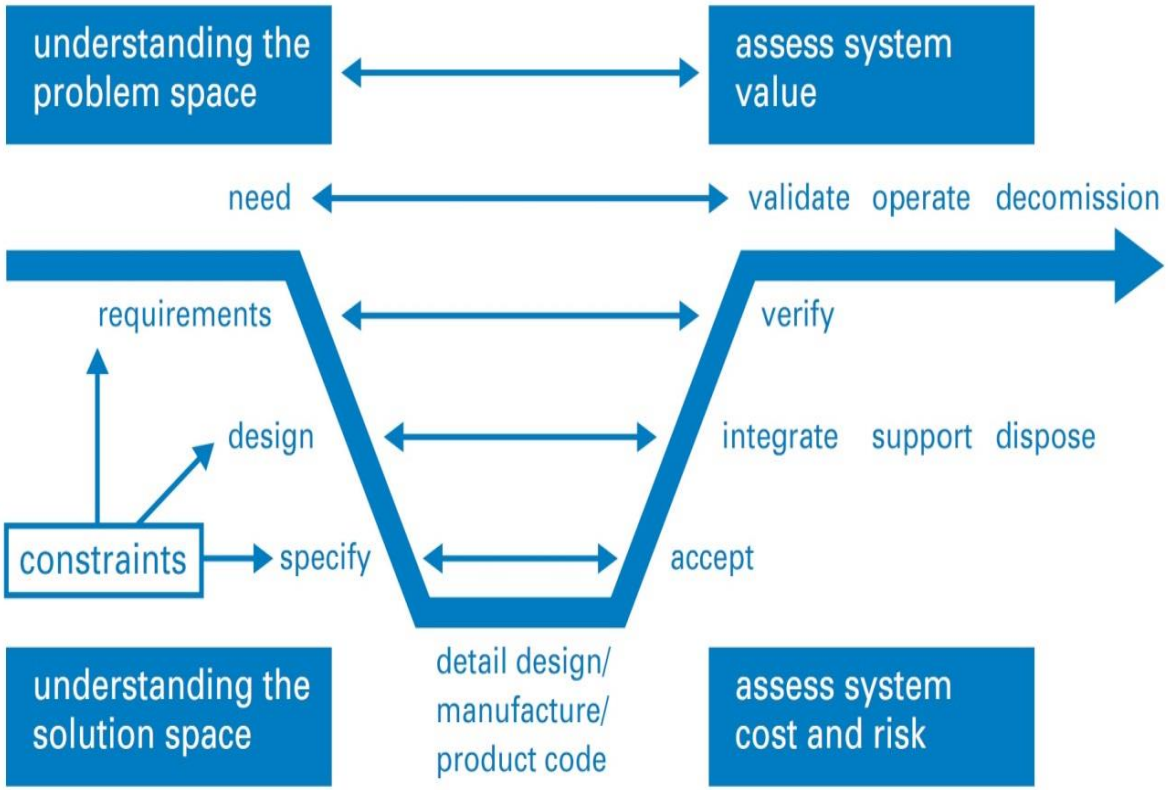
- **Model-Based Engineering (MBE): An approach to engineering that uses models as an integral part of the technical baseline that includes the requirements, analysis, design, implementation, and verification of a capability, system, and/or product throughout the acquisition life cycle**
- **Model: A physical, mathematical, or otherwise logical representation of a system, entity, phenomenon, or process. (DoD 5000.59 -M 1998)**
- **Preferred MBE Practices:**
  - **Models are scoped to purpose/objectives**
  - **Models are appropriate to the context (e.g., application domain, life cycle phase)**
  - **The models represent the technical baseline that is delivered to customers, suppliers, and partners**
  - **Models are integrated or interoperable across domains and across the lifecycle**
- **Core to MBE is the integration of descriptive/design models with the computational models**




```
equation
  w = der(phi);
  a = der(w);
  J*a = flange_a.tau + flange_b.tau;
```

Model Based System Engineering (MBSE)

- **The formalized application of modelling to support:**
- **System requirements**
- **Analysis**
- **Design**
- **Validation & Verification**
- **Beginning in the conceptual design phase and continuing throughout development and later lifecycle phases**

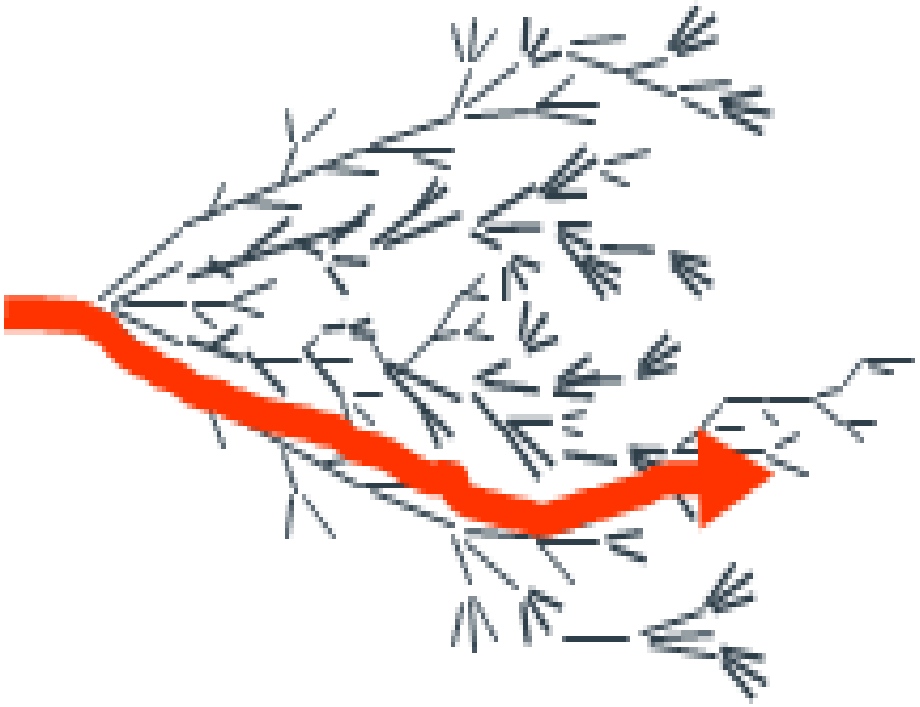


https://incoseonline.org.uk/Documents/zGuides/Z9_model_based_WEB.pdf

Integrations for a Model Based Enterprise

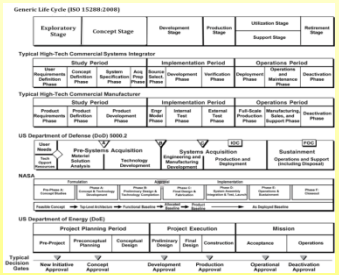
The Next Step Forward

- **Integrates the approaches of**
  - **Model Based Design,**
  - **Model Based Engineering**
  - **Model Based System Engineering**
  - **Product Lifecycle Management**
  - **Program Management**
  - **Product Line Engineering**
  - **…**

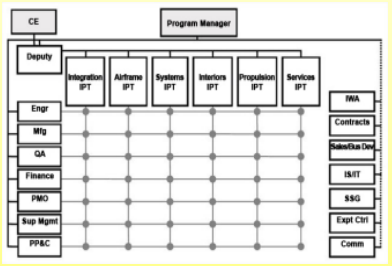


Elements of a Model Based Enterprise

Program Lifecycle



Organization Breakdown Structure

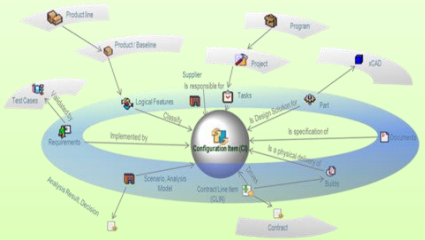


Work Breakdown Structure

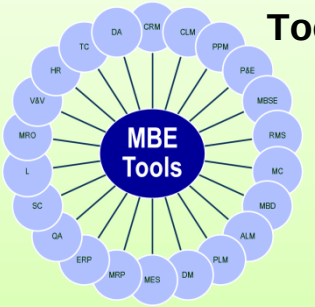
Industry Business Processes

Business Processes

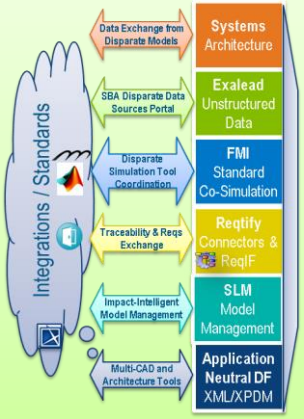
Data Model



Tools



Standards/Integrations



Infrastructure

Platform

Single Authoritative Source System of Record (SASSR)

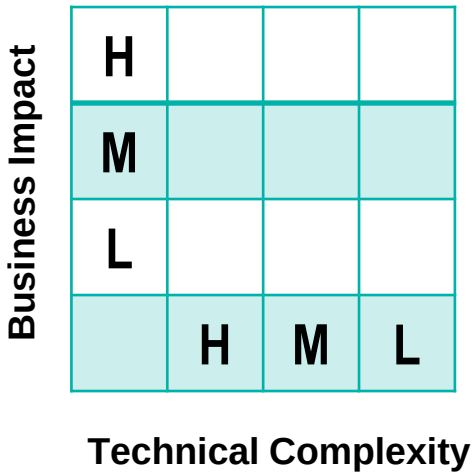
Trust in Data, Trust In Actions → Execution Excellence

- Model Based Enterprise is built upon the ability to preserve investment across domains, lifecycles, and acquisition.
- It involves the ability to improve client interaction by early validation.
- It involve the transformation, translation, maturity of any structured data-model involved in the specification and execution of the product development effort.

- ***Information consistency*** – is consistent with the architecture, metadata structure, or schema and that information in one architecture element is consistent with the information in another architecture element.
- ***Data completeness*** – all required data attributes elements are specified.
- ***Transformation*** – allows the intellectual capital invested in the architectural description to reach beyond the set of tools used in creating it. It is gaining access to data created and managed completely outside of the Dassault Systèmes' context. A good example is data validated in analytic models are captured in requirements and can be transformed to be readily accepted by code generators and verification elements alike.
- ***Iteration*** –allows the architecture refinement and decision process to produce reliable, trusted results.
- ***Lack of Ambiguity*** – the meaning of each element must be clear (semantic specificity).

Evaluating Organizational Change

Aspects to be Evaluated



- **Business Impact**
  - **Rethink How to Perform Business Processes**
  - **KPI's to Business Measure Value of Change**
- **Technical Complexity**
  - **Plan, Install, Configure, Change**

http://ezinearticles.com/?Organizational-Change-Management---Four-Truths-Leaders-Should-Know-About-Organizational-Change&id=3712808, Robert Tanner

Evaluating Organizational Change

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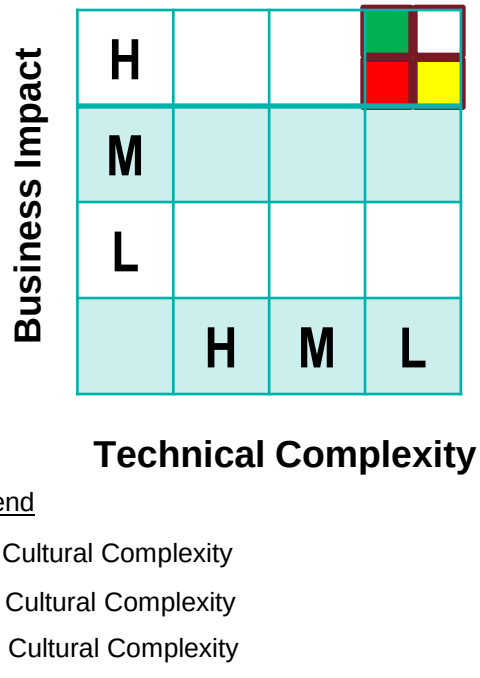


- **Business Impact**
  - **Rethink How to Perform Business Processes**
  - **KPI's to Business Measure Value of Change**
- **Technical Complexity**
  - **Plan, Install, Configure, Change**
- **Cultural Complexity**
  - **Communication**
  - **Willingness to Change**

http://ezinearticles.com/?Organizational-Change-Management---Four-Truths-Leaders-Should-Know-About-Organizational-Change&id=3712808, Robert Tanner

Evaluating Organizational Change

Aspects to be Evaluated

- Business Impact

People do not resist changes which they believe is their best interests

re

A change vision is a critical component of an effective change management effort.

Business Impact

Robert Tanner

- Willingness to Change

Legend

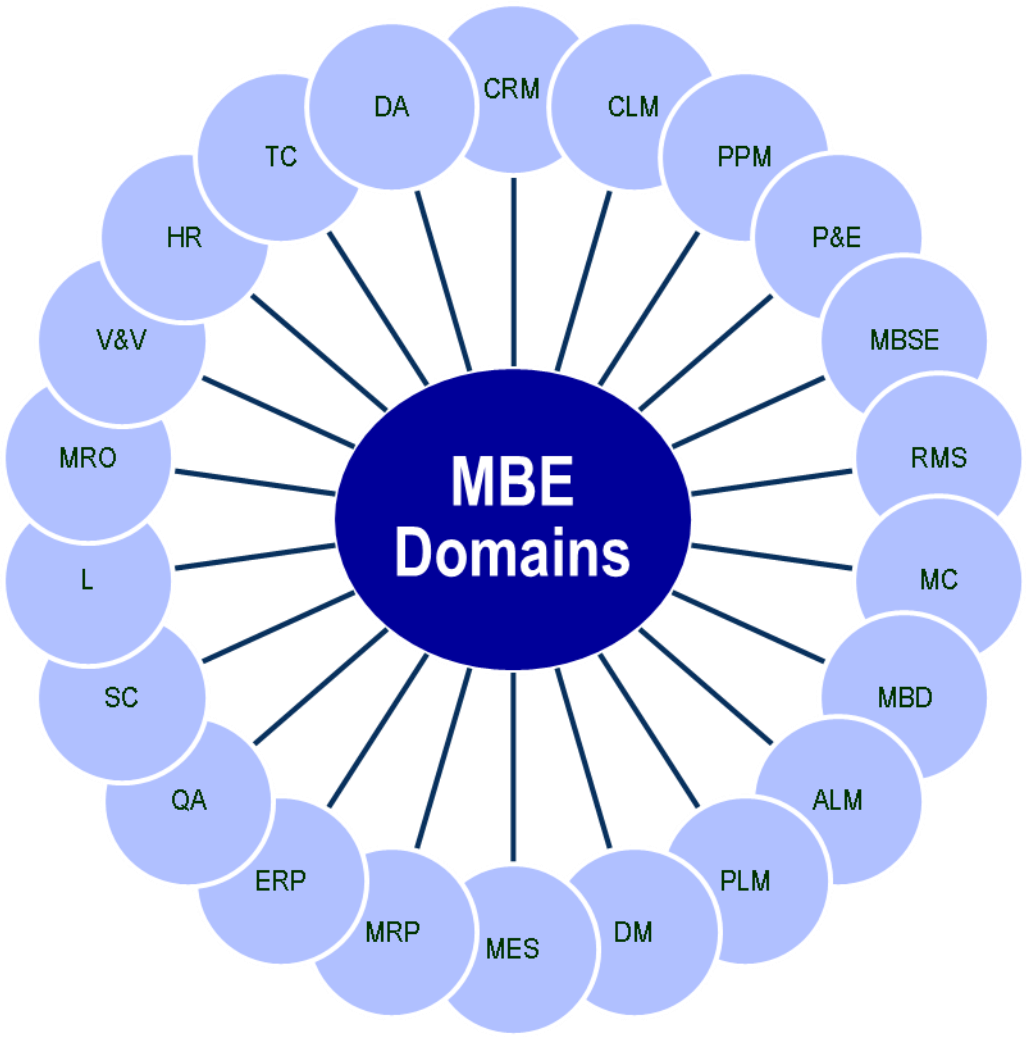
Low Cultura

Med Cultur

High Cultural Complexity

http://ezinearticles.com/?Organizational-Change-Management---Four-Truths-Leaders-Should-Know-About-Organizational-Change&id=3712808, Robert Tanner

MBE Domains

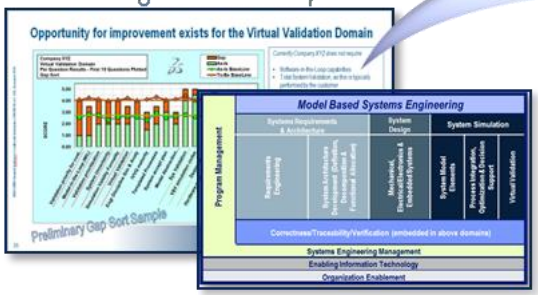


1) CRM (Customer Relationship Managements)
2) CLM (Contract Lifecycle Management)
3) PPM (Product & Portfolio Management)
4) P&E (Pricing and Estimating)
5) MBSE (Model Based System Engineering)
6) RMS (Reliability, Maintainability, Supportability)
7) MC (Material Compliance)
8) MBD (Model based Design)
9) ALM (Application Lifecycle Management)
10) PLM (Product Lifecycle Management)
11) DM (Digital Manufacturing)
12) MES (Manufacturing Execution System)
13) MRP (Manufacturing Resource Planning)
14) ERP (Enterprise Resource Planning)
15) QA (Quality Assurance)
16) S (Supply Chain)
17) L (Logistics)
18) MRO (Maintenance Repair Operations)
19) V&V (Validation & Verification)
20) HR (Human Resources)
21) TC (Trade Compliance)
22) DA (Data Analytics / Dashboarding)

MBE Business Case Process

1

Executive Interviews & Strategic Workshops



Gaps

2

Capability / Maturity Analysis Results

3

Solution Roadmap

Initiatives

Platform

Actionable Projects

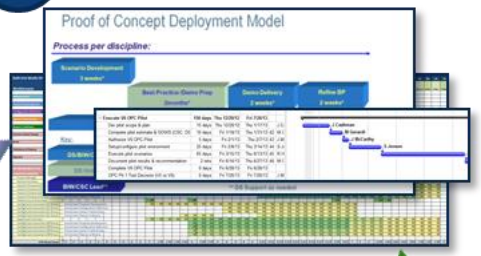
4

Business Case Analysis

Prioritization Justification

5

Pilot Project/Deployment Roadmap to Demonstrate & Realize Value



MBE Business Case Process

5 *Pilot Project/Deployment Roadmap to Demonstrate & Realize Value*

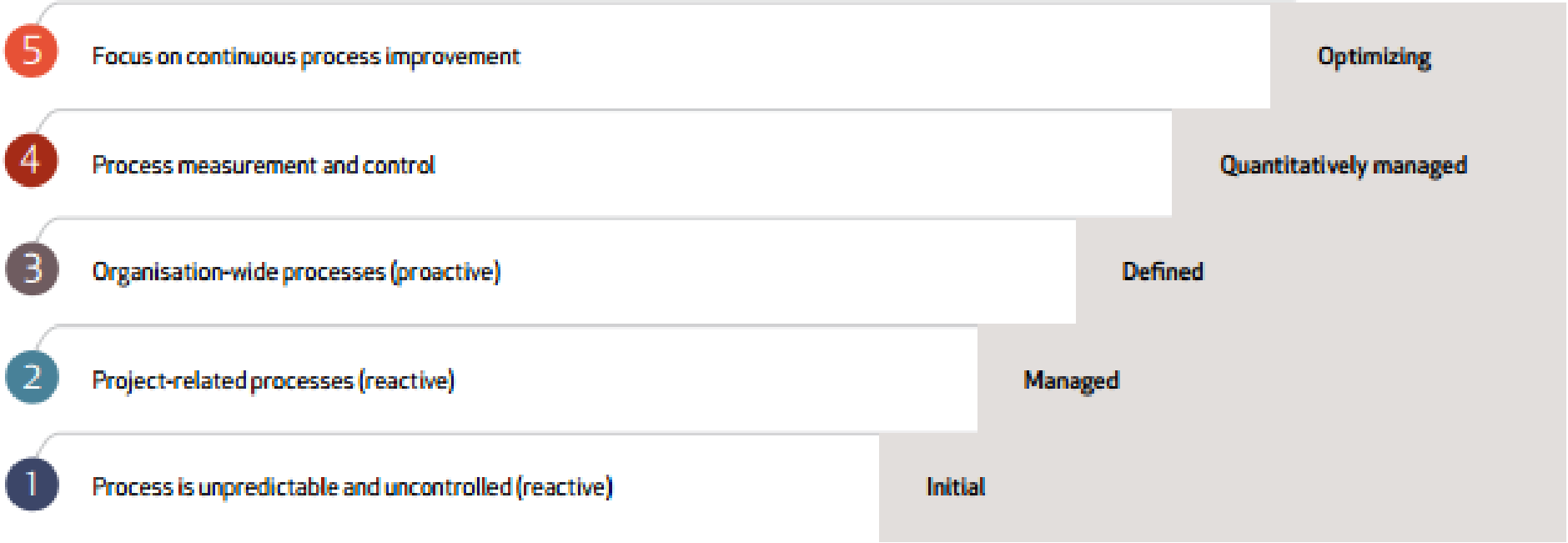
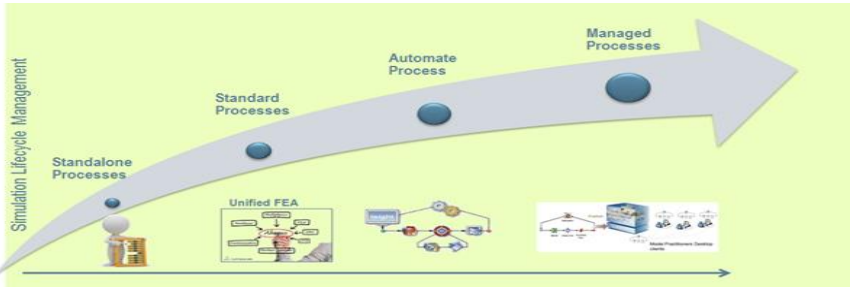
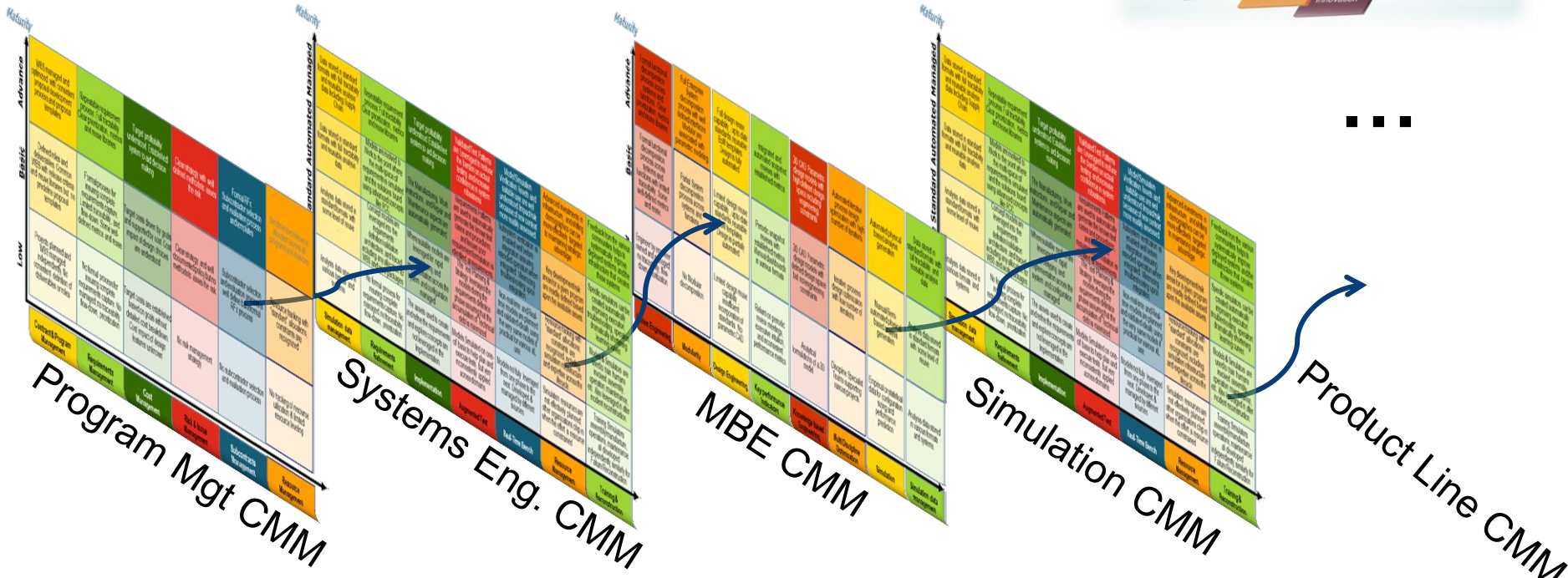


Figure 2 - Steps in CMMI maturity levels of an organisation

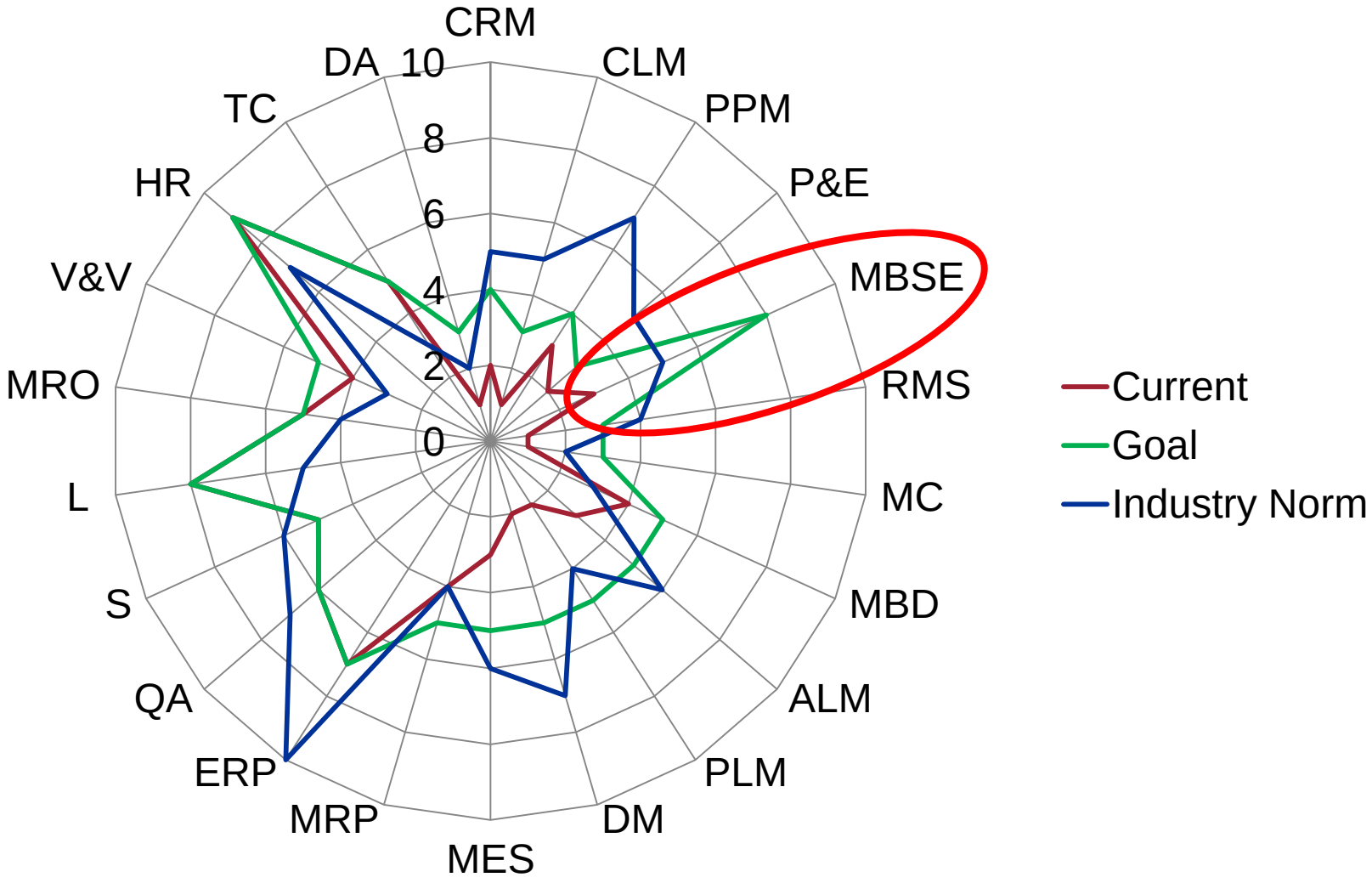
Capability Maturity Models

Global Product Data Interoperability Summit | **2015**

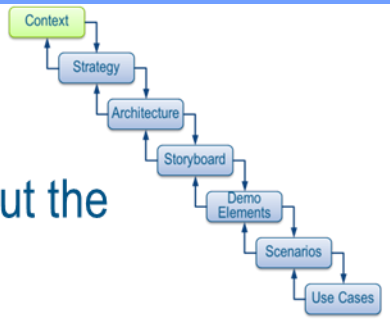




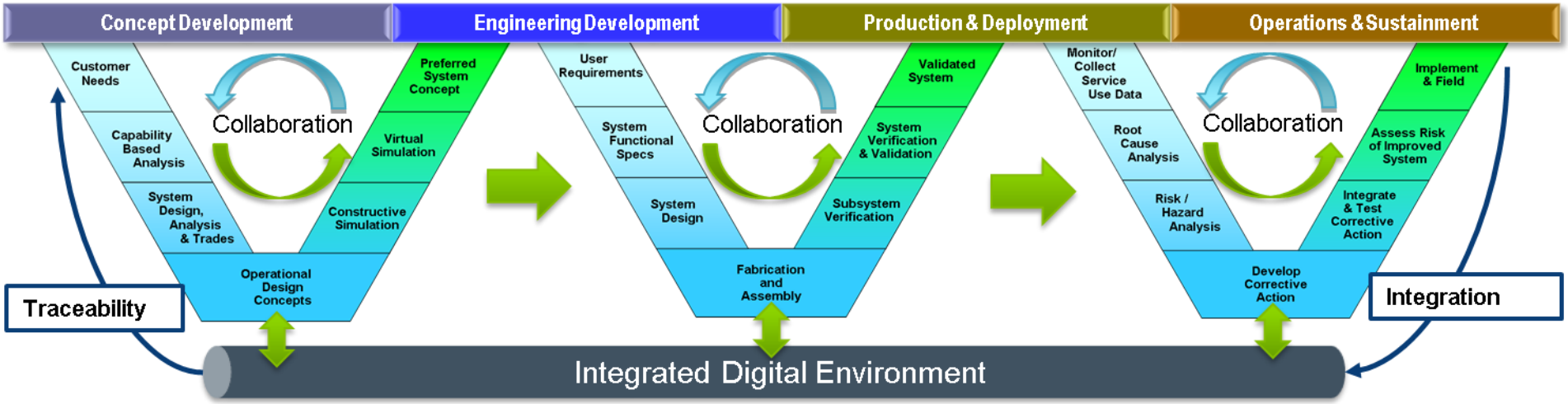
MBE Domains Assessment (Notional)



PLM Enabled MBSE



An integrated database approach to MBSE maintains information throughout the product lifecycle – ConOps to Requirements to design to production…



…This provides the ability for more effective downstream performance, logistics, and cost analyses

Christi A. Gau Pagnanelli, Barbara J. Sheeley, Ronald S. Carson, PhD, INCOSE Fellow **The Boeing Company**
22nd Annual INCOSE International Symposium - Rome, Italy - July 9-12, 2012

A Holistic Approach

- **Measured and Thoughtful Change**
- **Analyze Current Maturity, Industry Maturity and Objective Maturity**
- **Measure Business Impact**
- **Measure Deployment Effort**
- **Measure Technical Complexity**