

# Digitalization, Model-based x, PLM and the Product Innovation Platform: Where do we go from here?



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# Digitalization: Transforming Enterprises

*Digitalization requires rethinking the business, product, and data (1 of 2)*

- Radical advances in digitalization are underway all around us
  - An obvious example is the intelligent, connected thermostats that mind our homes when we're away
- Digitalization itself as been defined in many ways, but the most succinct is the business strategy best geared to extract real-world value from digital data (e.g., Airbnb, Amazon, etc.)
- The Internet of Things (IoT) with its billions of connected devices is and will play a major role
  - A source of “big data” and enabling closed loop lifecycle management
  - Making the digital thread and digital twin more achievable



# Digitalization: Transforming Enterprises

*One cannot escape the on coming data tsunami (2 of 2)*

- Driven by the phenomenon of Big Data, information management as we know it is being re-engineered top to bottom
- Big Data threatens to overwhelm long-established workflows and processes and make them obsolete
  - This is especially true in the less computerized segments of the lifecycle such as marketing, regulatory compliance, and field service



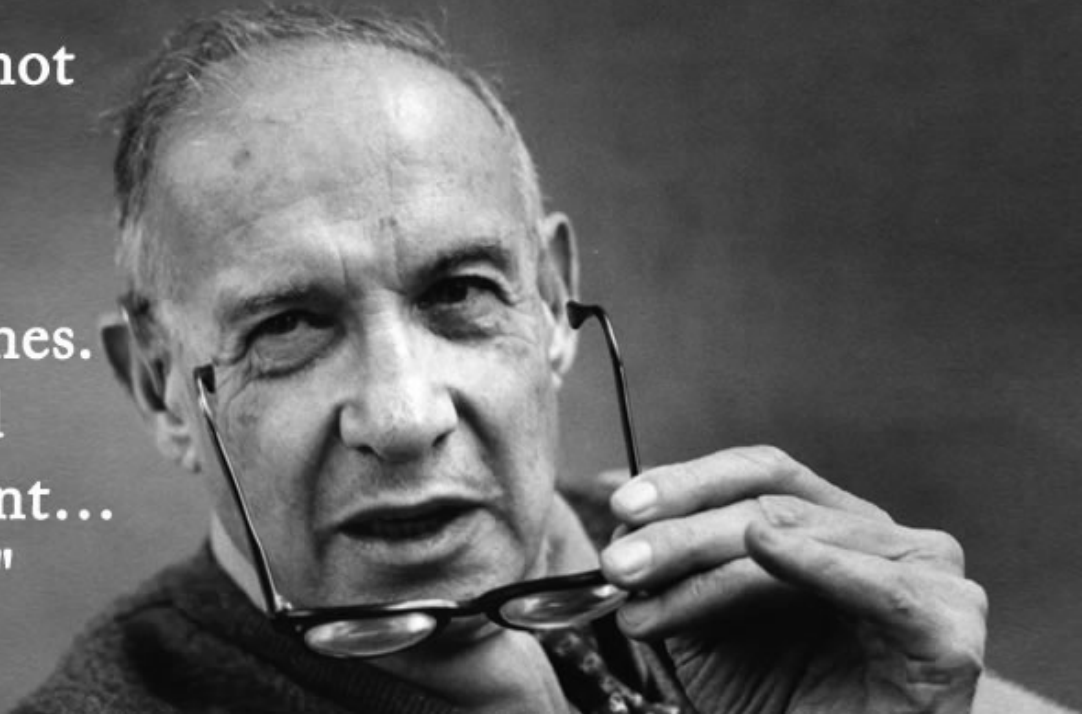
# “Digitalization” accelerates change & innovation

"The enterprise that does not

**innovate**

inevitably ages and declines.  
And in a period of rapid  
change such as the present...  
the decline will be fast."

-Peter F. Drucker





*“Digitalization is the main reason just over half of the companies in the Fortune 500 have disappeared from the list since 2000.”*

Pierre Nanterme, CEO Accenture, World Economic Forum



# New Products Bring More Complexity & Risk

*Innovation will require a Simulation-Driven Systems Engineering approach*

- Significant electronics & software content 
- New processes & materials- lighter, stronger, green
- Consumers demand “mass customized” products with all the latest technological features... **Now!**
- Shorter lifecycles = continuous product innovation
- “IoT” environment = constant market feedback 

***Complex market requirements demand more upfront cross-domain engineering***



# Defense Systems Have Unique Requirements

*Reliability & Sustainability require a Model-Based Systems Engineering approach*

- Must design, build and operate “systems of systems”
- Shrinking DoD R&D & procurement budgets
- Rapidly changing threats & operational requirements
- Rapidly changing electronics & S/W technologies
- Extremely long lifecycles requiring continuous system & subsystem upgrades (LOTAR)
- Cyber security threats to sensitive IP

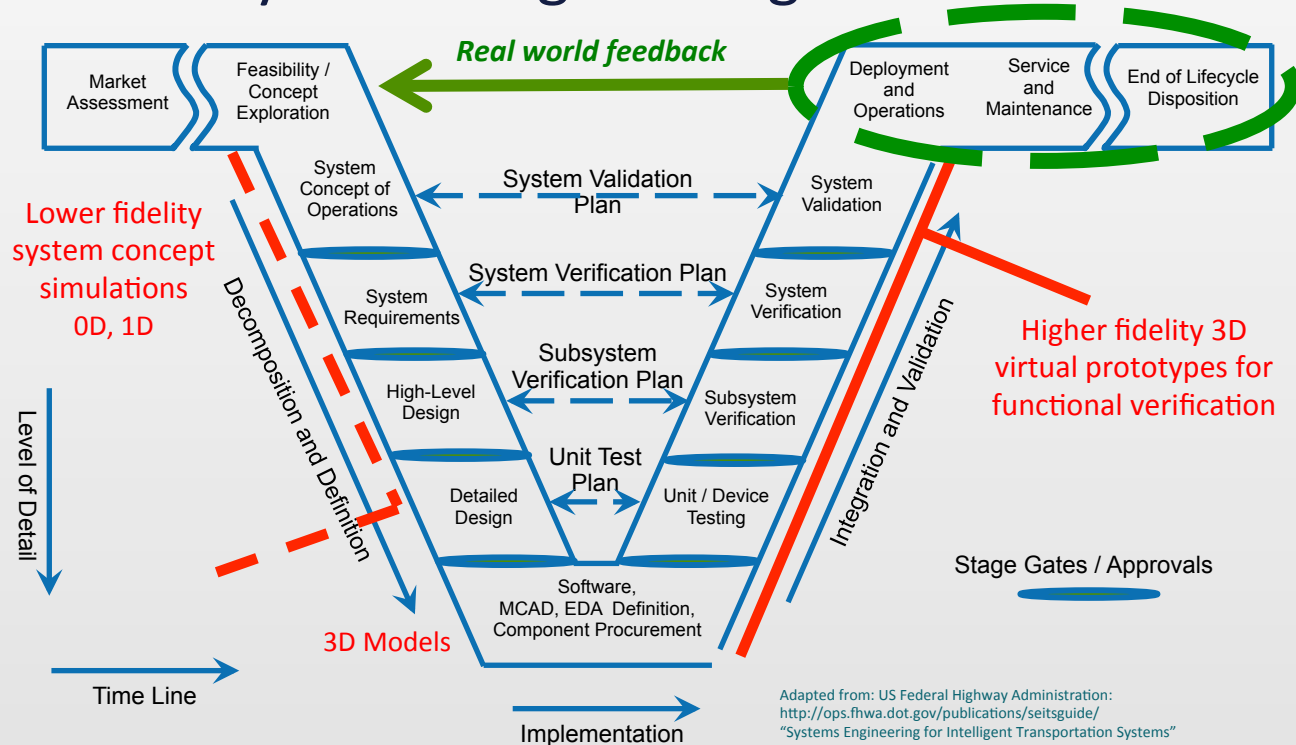
***Digital thread is enabled and supported by a robust systems model and MBE processes***

# MBE enables Systems Engineering

*MBE provides high-value knowledge continuity across lifecycle processes*

- Model-Based Engineering is a systems development paradigm
- MBE supports the application of modeling principles and best practices that enable true systems engineering

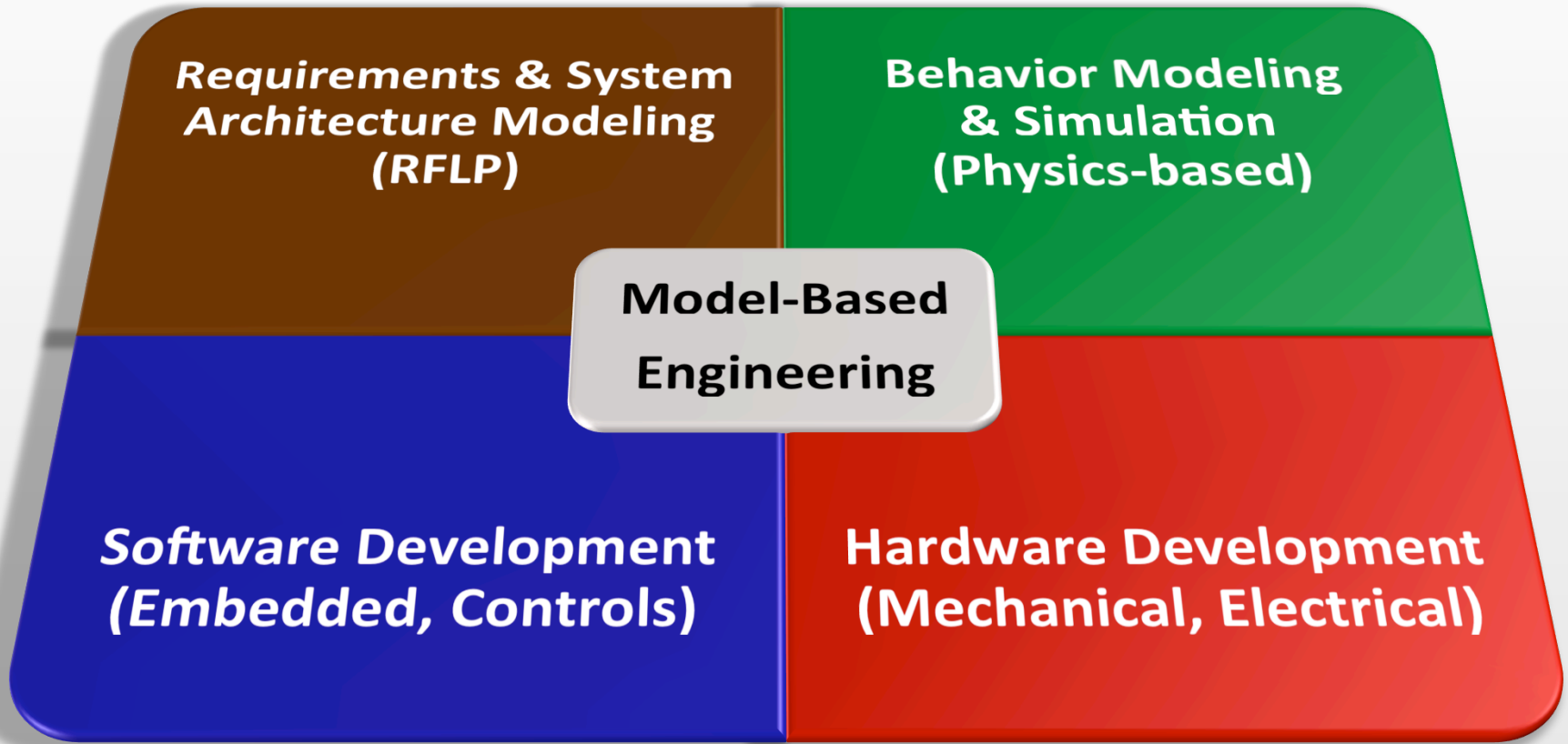
- The digital model is key to enable collaboration across domains and data re-use through the system's life





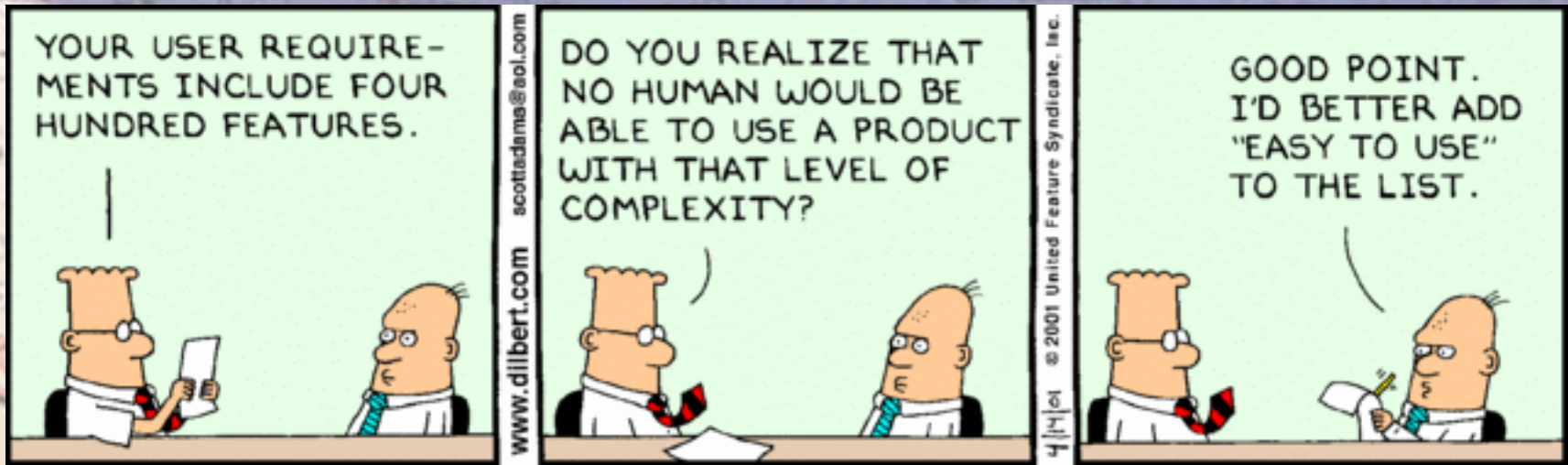
# MBE- What is the Business Challenge?

*Disciplines are approaching product design from different perspectives*



*All areas are supported by a number of overlapping solutions*

# So, Which Model is Correct?



*Some...  
and  
none...all...*

# The Emergence of the Digital Platform

*Platformization, the next evolution of PLM, required to support digitalization*

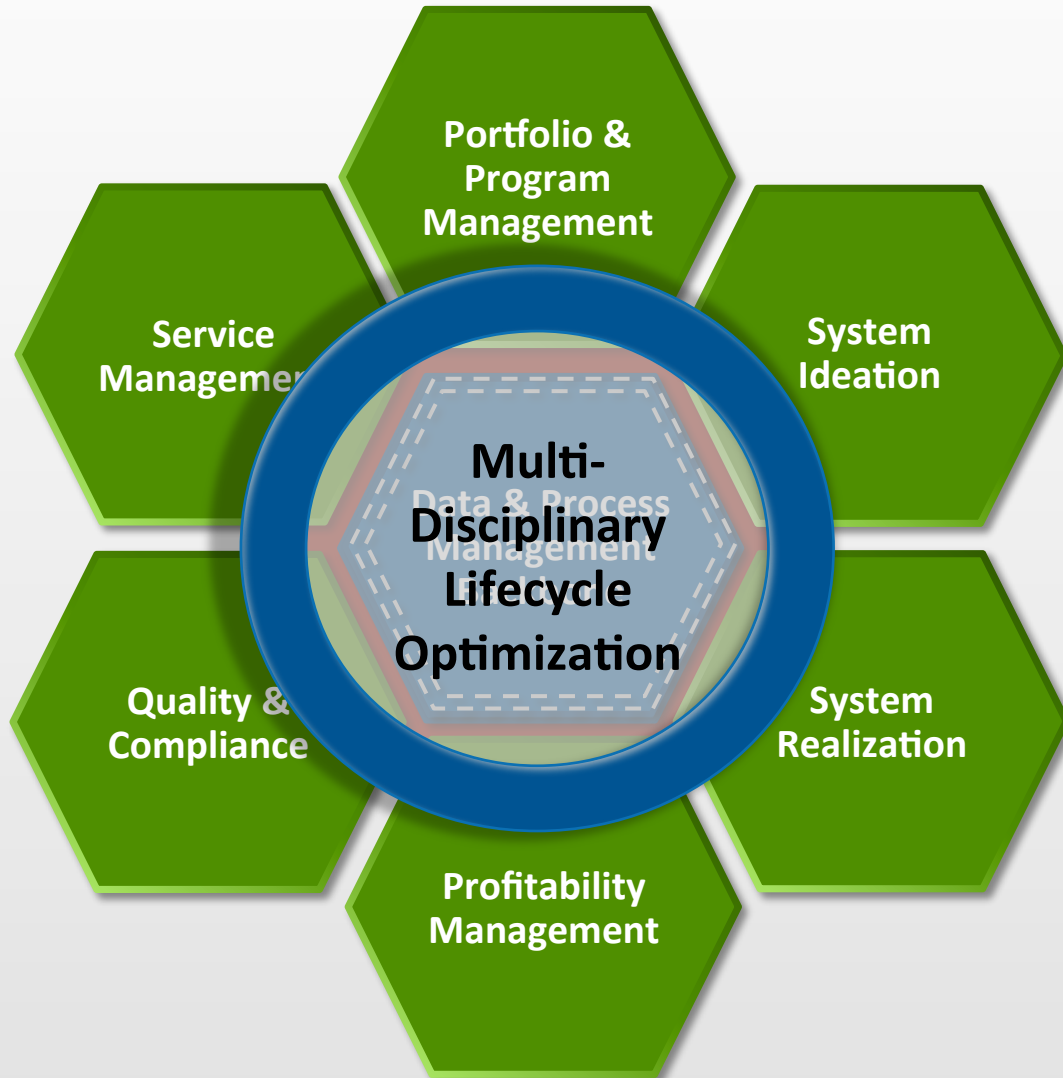
*Proliferating digital platforms  
will be at the heart of  
tomorrow's economy,  
and even government...*



*The Economist, January 18th, 2014*

# CIMdata's Product Innovation Platform Model

*A key element of the Digital Enterprise Innovation Model*



*A set of evolving  
Functional Domains  
orchestrated by an  
enterprise level “systems  
of systems” approach*

# PLM: The Required End-to-End Connectivity

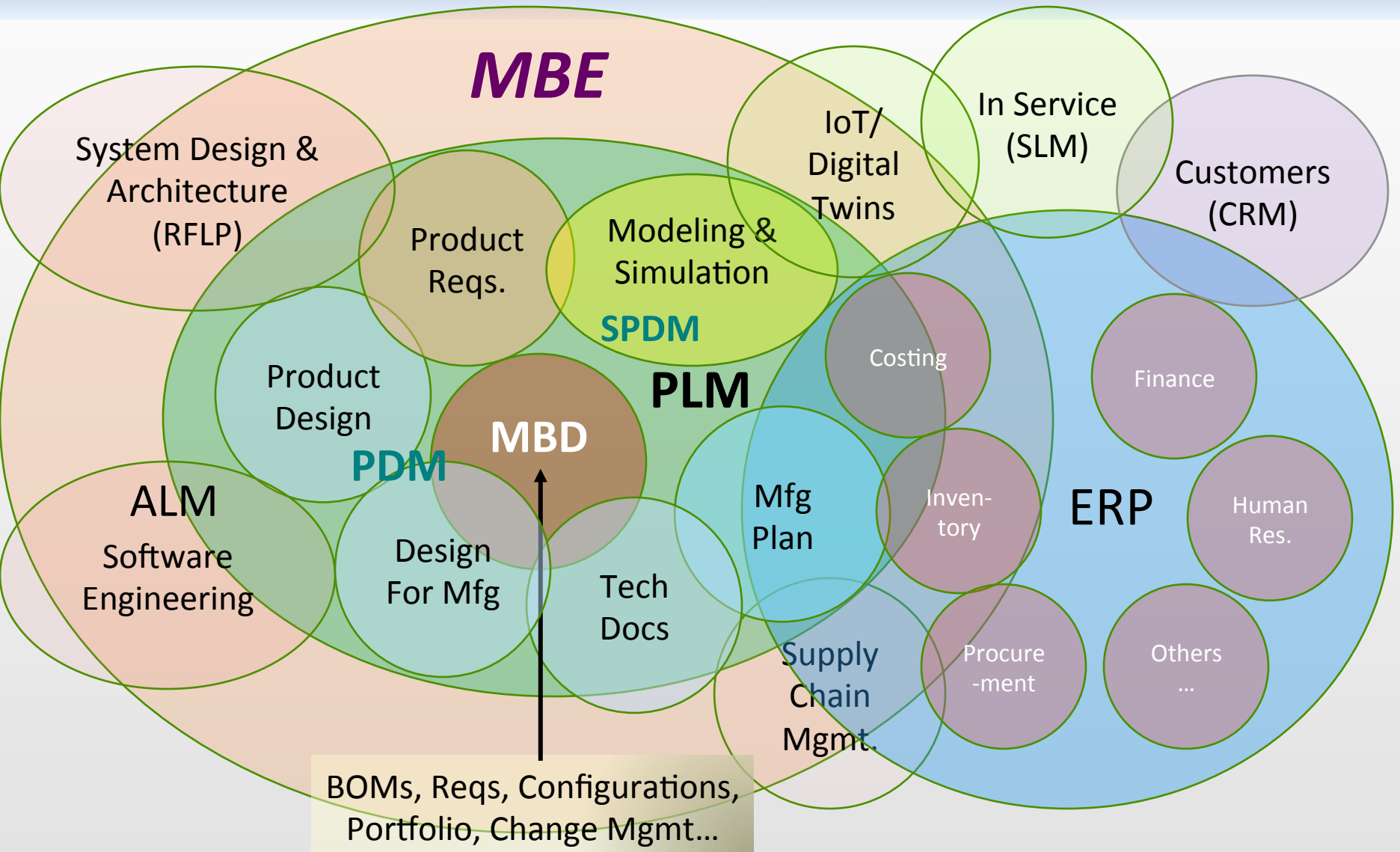
*PLM touches all phases of a product's life—digitalization demands it*



PLM Solutions—Information Management across Media, Process, Time, Geography, & Enterprise

# Relationship of Model-Based Initiatives to PLM

*MBSE, MBD & PLM support all domains involved in Model-Based Engineering (MBE)*



# MBE Implementation Issues

## *Missing strategies & capabilities*

- MBE focus today is often limited to developing & managing 3D designs and electronic work packages (3D viewable data + some PMI) for downstream manufacturing and in-service use
- MBE too often is not supported by an enterprise product innovation platform strategy and related IT environment
  - Lack of a single (logical), consistent product data repository across the lifecycle and across domains (i.e., hw/sw/electrical multi-BOM in PLM speak)
    - Typically see huge number of disconnected and inconsistent data repositories
    - Inefficient and costly data duplication, master model difficult to find (if it can be identified at all); Systems models disconnected from design BOMs
  - Strategies for long term data support are not in place (i.,e., LOTAR)
- Organizations and people are not well prepared (educated, trained) to adopt a systems-driven MBE approach

# MBSE Implementation Issues with PLM

## *Barriers to more widespread adoption*

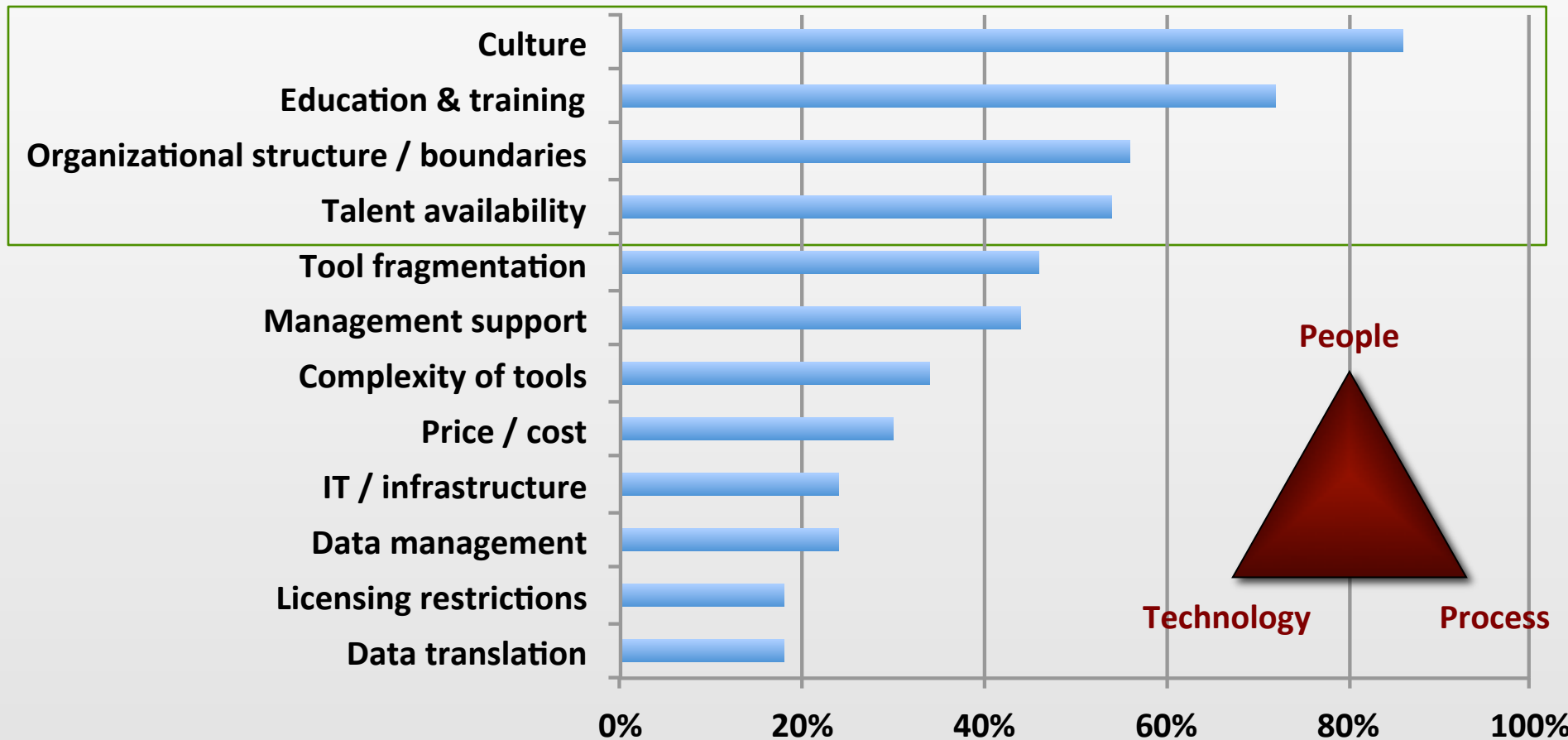
- In practice, the ‘system models’ used in model-based SE today do not readily support **knowledge sharing and collaboration across domains**, especially for globally distributed product/project teams
- **System requirements definition and functional flow-down** to key sub-systems & components providing design traceability to performance verification and validation is extremely lacking or sometimes even non-existent today
- **Data management with version and configuration control** is a major issue—virtually non-existent today at the conceptual stage
- **Data exchange & interoperability** across engineering functional domains, tools & applications is very difficult—but promising standards are emerging (FMI, OSLC, AP2xx , SysML2, MoSSEC, etc.)



# Barriers To Industry Implementation

*What people cited as problems to overcome in adopting & using MBE/MBSE*

- It is about people & process—not just technology



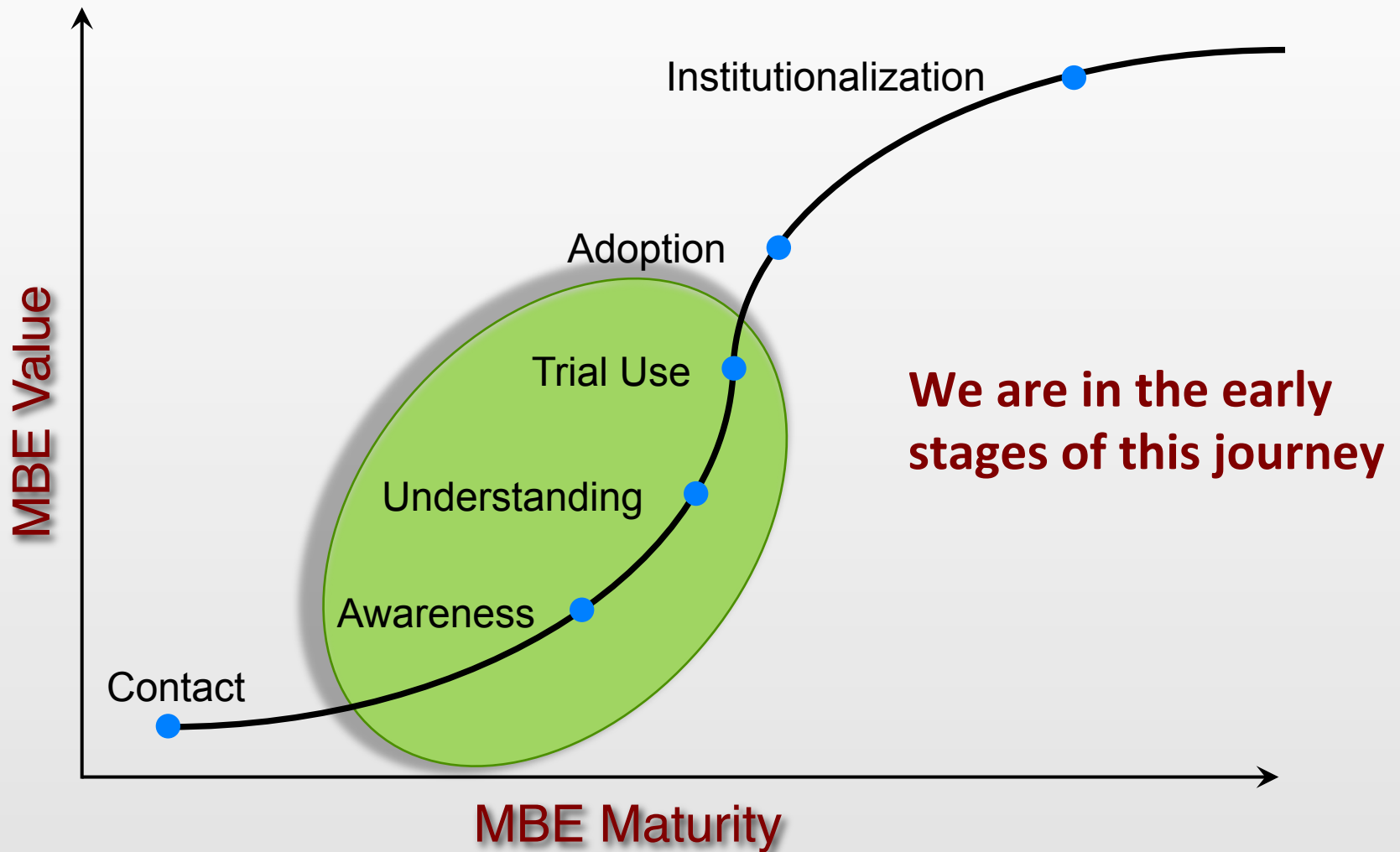
# Lessons Learned- Key Factors for MBE Success

*Driving the strategy to realization*

- MBE needs to be developed and supported in the context of an enterprise “platform of platforms” solution but.....
- *Implemented and promoted based on specific MBE business use case success and measurable ROI* **Crawl....Walk.....Run!**
  - Define and pilot well-defined MBE processes in specific business focus areas—  
Must account for cultural change and the people buy-in/training required
- OEMs need to understand what they are asking suppliers to do—the paradigm shift, benefits, and issues of MBE
- Industry & DoD need to support new contractual concepts  
*AND* accept electronic project deliverables/signoffs/TDPs

# MBE Value Comes Over Time

*It takes time, commitment, and change*



# Final Thoughts

*Digitalization, MBE, PLM and Product Innovation Platform: What does it all mean?*

- The emergence of the product innovation platform concept has the potential to not only enable the end-to-end digitalization required to be successful, but to *thrive*
- Need to continually rethink PLM/MBE/MBSE to enable our ability to design and deliver innovative products and services
  - Business models (e.g., the digital enterprise, IoT, etc.), platform strategies, solution/services offerings, delivery & pricing models... all may have to change
- The march of technology, digitalization included, is widely recognized as both unstoppable and incomprehensible
- ***It's not about what we call it; It's about delivering value to customers and all other stakeholders of the enterprise***



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