# Engineering Belief: From SE 6.0 to Generation 7

GLOBAL PRODUCT DATA

INTEROPERABILITY

SUMMIT 2025

BOEING ELYSIUM LOCKHEED MARTIN NORTHROP GRUMMAN Parker PDES, Inc.® Connecting the Digital Enterprise

Brian Haan
Dassault Systèmes'
Director, MBSE & SPDM Process Consulting and Services

# Author’s Bio – Garrett Thurston



Garrett Thurston is a Principal Technical Fellow at Dassault Systèmes with over four decades of experience driving digital and model-based transformation in complex acquisition environments, particularly within the aerospace and defense sectors. A recognized leader in systems thinking, Garrett is widely known for shaping the adoption of Model-Based Systems Engineering (MBSE) and digital engineering practices across both government and industry.

Since 2013, he has led Dassault Systèmes’ **Model-Based Acquisition (MBA)** strategy, influencing internal and external policy, shaping customer engagements, and championing capability-driven transformation across the U.S. Department of Defense (DoD). He was the originating voice behind the strategic acquisition of **No Magic**, a pivotal move that reshaped the digital engineering landscape and secured 3DEXPERIENCE’s position as a leader in integrated MBSE.

Garrett is a trusted advisor and technical voice within multiple **DoD communities of practice**, serving as a thought leader on topics such as AI-augmented roadmapping, mission engineering, capability portfolio management, and acquisition maturity models. He regularly engages in cross-agency and cross-service collaboration to advance policy, architecture practices, and organizational design for digital transformation.
He holds a bachelor’s degree in science with a minor in liberal arts and advanced degrees in both engineering and business. His graduate research, sponsored by the U.S. Air Force and DARPA, included specialized studies in intelligence, policy, secrecy, and terrorism—a foundation that informs his holistic approach to defense transformation and decision-making architectures.

Garrett has also guest lectured for the Defense Acquisition University (DAU) on the Modular Open Systems Approach (MOSA), and a frequent speaker on the role of AI, human-centered design, and digital governance in accelerating decision dominance. His current focus is on enabling AI-Augmented Roadmapping—a capability that empowers teams to prototype the future with greater clarity, velocity, and strategic foresight.

# Presenter’s Bio – Brian Haan



Brian HAAN has 30 years of experience in Systems Engineering and Systems Engineering Management across a range of technical domains and industries.

His technical expertise lies in modeling and simulating adversarial resilience to identify and develop requirements to help missions, systems, and organizations withstand, adapt to, and recover from adversarial disruptions or attacks. This work informs the design of safeguards and adaptive response strategies against intelligent, evolving threats.

Currently, Brian serves as Director of Model-Based Systems Engineering (MBSE) and Simulation Process Data Management (SPDM) Process Consulting and Services at Dassault Systèmes. In this role, he helps clients realize the value of MBSE, SPDM, and their integration in the development of complex systems in competitive environments.

# ABSTRACT: Engineering Belief – From SE 6.0 to Generation 7



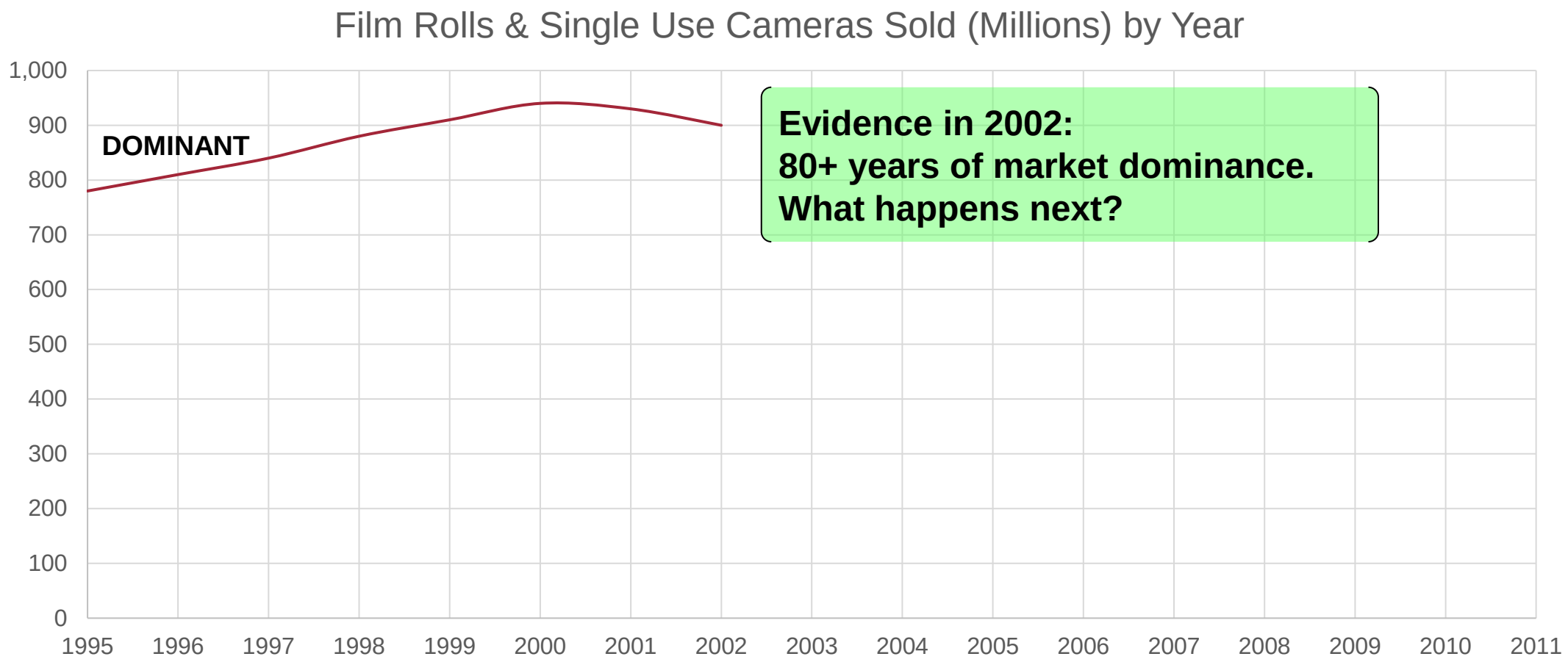
As digital transformation accelerates across defense, aerospace, and complex systems enterprises, engineering must evolve. It's no longer enough to model behavior or integrate toolchains—we must engineer for **belief**, consequence, adaptability, agility, assurance, and accountability.

This session introduces **Systems Engineering 6.0** (SE 6.0) as a new innovation epoch—a future-facing framework that reshapes how we anticipate change. It empowers organizations to align belief systems, behaviors, and design logic with mission outcomes. SE 6.0 integrates ethical reflexivity, AI augmentation, interoperability, and real-time decision stewardship to redefine engineering for a volatile, multi-domain world.

We'll examine how **Generation 7** activates SE 6.0 through the 3DEXPERIENCE platform, turning philosophy into execution. At the core is Genuine Digital—Dassault Systèmes' proven operating model for digitally resilient, interoperable, and trusted systems. By embedding semantic intelligence, adaptive traceability, and value-conscious automation across the lifecycle, Genuine Digital ensures engineering integrity at scale.

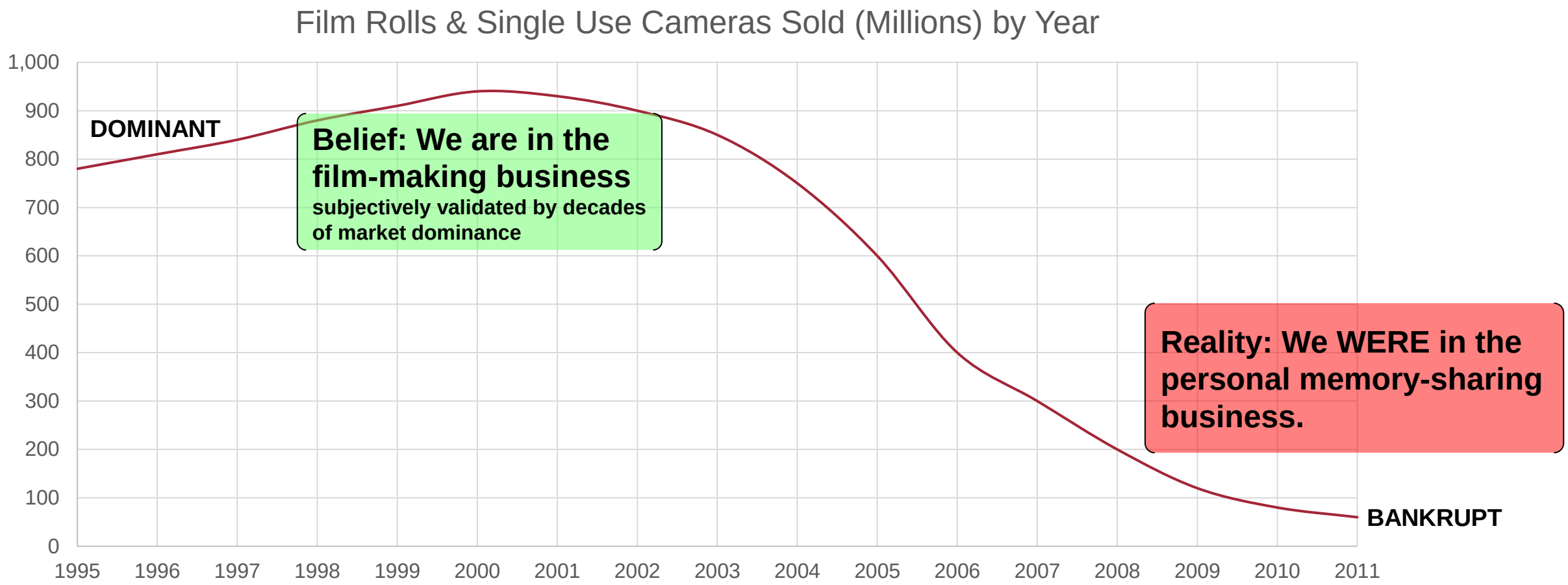
# Belief frames action.





# Failure to adapt mindset (belief) in a changing world is… failure.



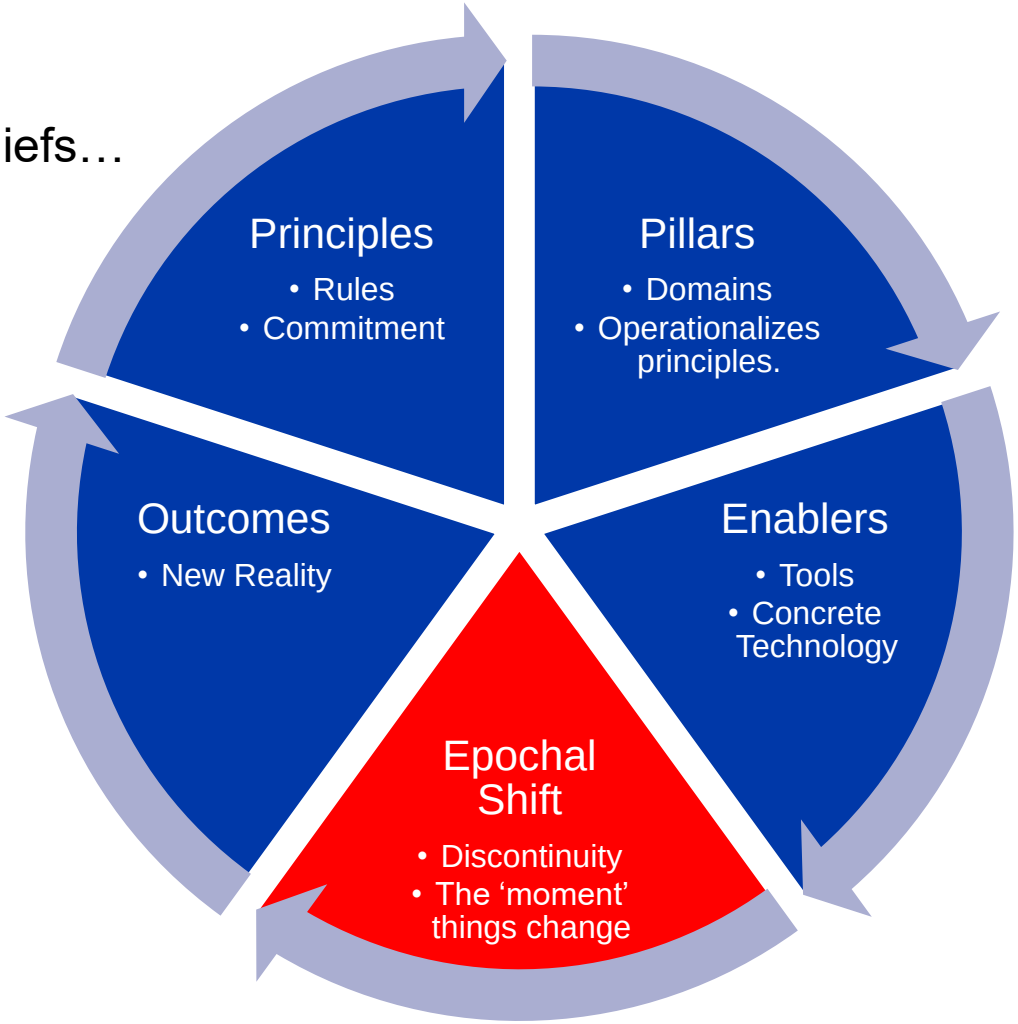


# The Generalized Pattern Around an Epochal Shift



An organization unable or unwilling to challenge its own beliefs…

…will at some point fall behind to a changes reality.



# Dassault Systemes – Legacy of Elevating Engineering Representation and Human Know-How



MAKE PRET

Elevated Representation

Gen 7

Gen 6

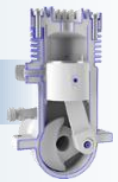
Gen 5

Gen 4

Gen 3

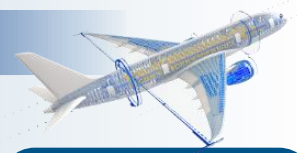
Gen 2

Gen 1



3D

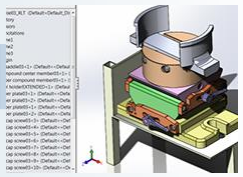
Digital Pre Assembly



DMU

Digital Mock-up

Collaborative Design in context



PDM

Product Data Management

Program | Project Management

PLM

Product Lifecycle Management

Lifecycle

Virtual Twin

Systems Thinking

Product x Business Experience

Virtual Twin of Human

Cycle of life

UNIV+RSE

Integration of multiple virtual twins within a secure environment enabling velocity, efficiency, and sustainability through modeling, simulation, data science, and AI

Elevated Human Know-How

# Convergence of Legacy with Systems Engineering Domain



Elevated Representation

Gen 7

Gen 6

Gen 5

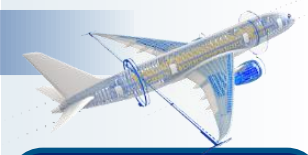
Gen 4

Gen 3

Gen 2

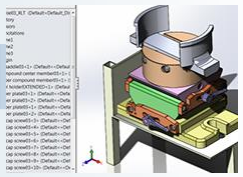
Gen 1

3D



DMU

Digital Mock-up



PDM

Product Data Management

PLM

Product Lifecycle Management

Virtual Twin

Systems Thinking

Virtual Twin of Human

UNIV+RSE

**Convergence With Systems Engineering**

Elevated Human Know-How

Digital Pre Assembly

Collaborative Design in context

Program | Project Management

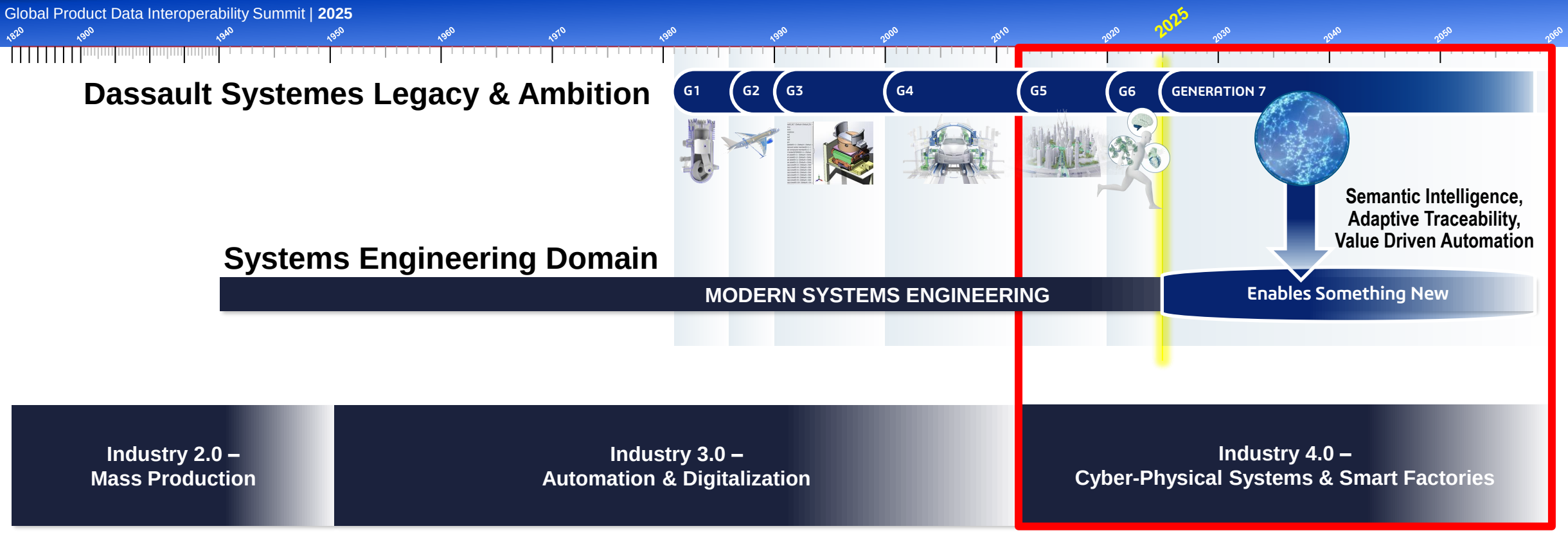
Lifecycle

Product x Business Experience

Cycle of life

# DS Legacy & Ambition leaning into a new SE Epoch and Industry 4.0





# Systems Engineering Innovation Epochs and Benchmarks

Global Product Data Interoperability Summit | **2025**

1820 1900 1940 1950 1960 1970 1980 1990 2000 2010 2020 **2025** 2030 2040 2050 2060

## SE 1.0

CHARACTERISTICS
- Water Fall
- Structured Requirements

STANDARDS

| | |
|---|---|
| 1969 | MIL-STD-499 |

- Panama Canal
- Lowell Mill System
- Golden Gate Bridge
- Manhattan Project
- Hoover Dam
- B-52 Stratofortress
- U-2
- SR-71
- F-15 Eagle
- AWACS
- ※ *Arthur Hall* — *First MIT SE Course*
- ※ *Goode & Machol* — *First SE*
- ※ *Mervin J. Kelly* — *First Usage of SE*
- ※ *Simon Ramo* — *The Systems Approach*

## SE 2.0

CHARACTERISTICS
- RFLP
- StageGate
- Increased Complexity

STANDARDS

| | |
|---|---|
| 1974 | MIL-STD-499A |
| 1976 | MIL-STD-1521A |

- Space Shuttle
- Apollo Program

## SE 3.0

CHARACTERISTICS
- Modeling Simulation
- Code Generation

STANDARDS

| | |
|---|---|
| 1994 | Perry Memo |
| 1997 | UML |
| 1998 | IEEE 1220 |
| | EIA-632 |
| | EIA-649 |
| | EIA-731 |

- ※ *Naren Gupta / Sunil Shah* — *MATRIXx*
- Internet
- International Space Station
- ※ *Jack Little / Cleve Moler* — *MatLab/ Simulink*
- ※ *Robert Lano* — *N-Squared*
- ※ *Cleve Moler* — *LINPACK, EISPACK & MatLab*
- Airbus 380
- Boeing 777
- Joint Strike Fighter
- ※ *Ivar Jacobson* — *OOSwE*
- ※ *Brian Mar* — *INCOSE*
- ※ *David Harel* — *State Charts…*
- ※ *Grady Booch* — *Booch Method*
- ※ *James Rumbaugh* — *OMT*

## SE 4.0

CHARACTERISTICS
- Standardization
- Foundational MBSE

STANDARDS

| | |
|---|---|
| 2002 | ISO-15288 |
| 2005 | SysML 1.0 |
| 2008 | ISO-16326 |
| 2010 | ISO-24748-1 |
| 2011 | ISO-42010 |

- INCOSE SE Handbook
- NASA SE Handbook
- James Web Space Telescope
- Boeing 787
- Airbus 350
- Future Vertical Lift
- ※ *Michael Grieves* — *Digital Twin*
- ※ *Sandy Friedenthal and Richard Soley* — *SysML*

## SE 5.0

CHARACTERISTICS
- Digital Engineering
- MBSE
- Mission Engineering
- MOSA

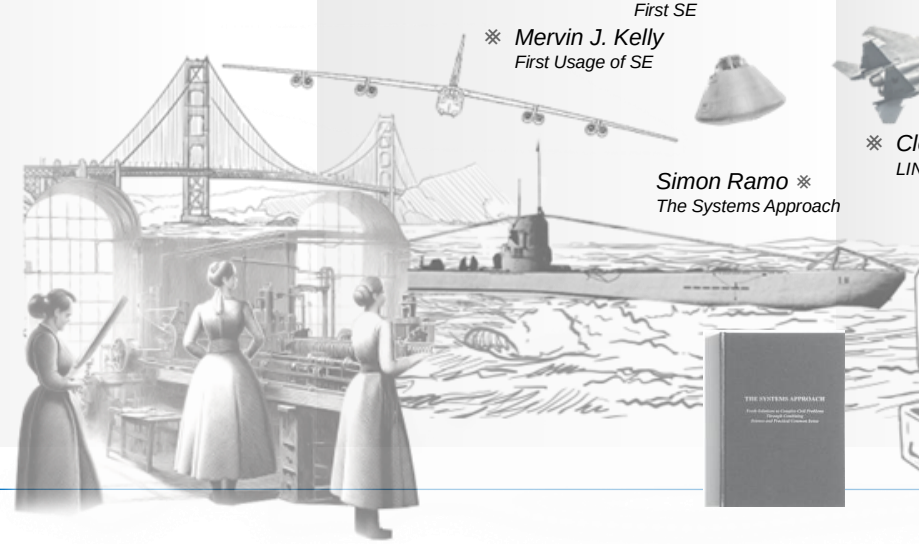
STANDARDS

| | | | |
|---|---|---|---|
| 2014 | IEEE 15288.2 | 2021 | ISO-10303-243 |
| 2016 | ISO-24748-4 | 2023 | ISO-24641 |
| 2019 | ISO-42020 | 2025 | SysMLv2 |
| | ISO-42030 | | |

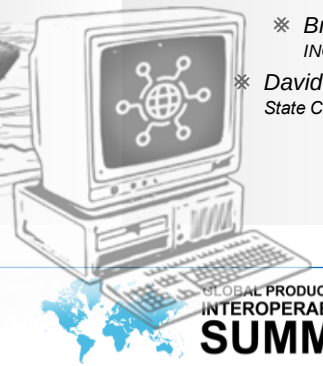
- Digital Engineering Strategy
- MITRE MOSA Lifecycle Governance
- MOSA Reference Framework
- SAOC
- CJADC2
- TACAMO
- ※ *Michael Grieves* — *Intelligent Twin*
- Engineering of Defense Systems DoDI 5000.88 & Guidebook
- DoDI 5000.97 Digital Engineering
- MIL-HDBK-539 Digital Engineering & Modeling Handbook
- Mission Engineering Guide
- Mission Architecture Style Guide

## SE 6.0

CHARACTERISTICS
- Outcome Driven Innovation
- Flexible Governance
- AI Augmentation
- Interoperability







GLOBAL PRODUCT DATA INTEROPERABILITY SUMMIT 2025

# Systems Engineering 6.0 – Characteristics and Selected Impact on Solutioning Principles



| SE 6.0 Characteristic | Desirability (Do stakeholders want it?) | Feasibility (Can we build it?) | Viability (Is it worth it / affordable?) | Sustainability (Can it be maintained/adapted?) |
|---|---|---|---|---|
| **AI-Augmented Execution** | Supports faster, better-informed decisions ●●● | Enhances modeling and validation accuracy ●●● | Reduces cost of rework via automation ●● | Adapts with evolving AI methods ●● |
| **Flexible Governance & Lifecycle Orchestration** | Aligns governance with stakeholder needs ●● | Ensures specialty integration and acquisition compliance ●● | Reduces program risk and cost overruns ●●● | Provides stewardship for long-term evolution ●●● |
| **Scalable Interoperability** | Improves user/developer collaboration ●● | Enables toolchain and data integration (ISO 10303-243) ●●● | Avoids vendor lock-in, supports reuse ●●● | Future-proofs investments with standards ●●● |
| **Outcome-Driven Innovation** | Ensures design aligns with mission impact ●●● | Links resources to mission-level effects ●● | Prioritizes high-value outcomes ●● | Maintains relevance as missions evolve ●●● |
| **Transdisciplinary Systems Engineering** | Delivers systems aligned with real user needs ●●● | Integrates hardware, software, human, cyber ●●● | Optimizes trade-offs across domains ●● | Builds resilience across disciplines ●●● |
| **Digital Threading** | Improves transparency for stakeholders ●● | Provides end-to-end continuity & traceability ●●● | Reduces duplication, lowers lifecycle costs ●●● | Supports continuous adaptation to change ●●● |
| **Digital Engineering Assurance** | Builds trust in delivered capability ●● | Ensures compliance with DoDI 5000.97 and standards ●●● | Avoids costly compliance failures ●●● | Keeps systems aligned with policy updates ●● |
| **Improved Assurance** | Increases user confidence ●● | Enhances testability & verification ●●● | Reduces defects, lowering support costs ●●● | Maintains system reliability over lifecycle ●●● |
| **Technical Debt Management** | Improves developer & user satisfaction ●● | Ensures architecture quality & hygiene ●● | Reduces long-term maintenance costs ●●● | Sustains agility and adaptability over time ●●● |

●●● - high impact
●● - moderate impact
● - low impact

# Systems Engineering 6.0 – Connective Outcomes



| SE 6.0 Characteristic | Desirability (Do stakeholders want it?) | Feasibility (Can we build it?) | Viability (Is it worth it / affordable?) | Sustainability (Can it be maintained/adapted?) |
|---|---|---|---|---|
| **AI-Augmented Execution** | Supports faster, better-informed decisions ●●● | Enhances modeling and validation accuracy ●●● | Reduces cost of rework via automation ●● | Adapts with evolving AI methods ●● |
| **Flexible Governance & Lifecycle Orchestration** | Aligns governance with stakeholder needs ●● | Ensures specialty integration and acquisition compliance ●● | Reduces program risk and cost overruns ●●● | Provides stewardship for long-term evolution ●●● |
| **Scalable Interoperability** | Improves user/developer collaboration ●● | Enables tool/data integration (ISO 10303-243) ●●● | Avoids vendor lock-in, supports reuse ●●● | Future-proofs investments with standards ●●● |
| **Outcome-Driven Innovation** | Ensures design aligns with mission impact ●●● | Links resources to mission-level effects ● | Prioritizes high-value outcomes ●● | Maintains relevance as missions evolve ●●● |
| **Transdisciplinary Systems Engineering** | Delivers systems aligned with real user needs ●●● | Integrates hardware, software, human, cyber ●●● | Optimizes trade-offs across domains ●● | Builds resilience across disciplines ●●● |
| **Digital Threading** | Improves transparency for stakeholders ●● | Provides end-to-end continuity & traceability ●●● | Reduces duplication, lowers lifecycle costs ●●● | Supports continuous adaptation to change ●●● |
| **Digital Engineering Assurance** | Builds trust in delivered capability ●● | Ensures compliance with DoDI 5000.97 and standards ●●● | Avoids costly compliance failures ●●● | Keeps systems aligned with policy updates ●● |
| **Improved Assurance** | Increases user confidence ●● | Enhances testability & verification ●●● | Reduces defects, lowering support costs ●●● | Maintains system reliability over lifecycle ●●● |
| **Technical Debt Management** | Improves developer & user satisfaction ●● | Ensures architecture quality & hygiene ●● | Reduces long-term maintenance costs ●●● | Sustains agility and adaptability over time ●●● |

- Adaptability
- Execution Rate
- Assurance
- Predictability
- Transparency
- Differentiation
- Visibility

●●● - high impact
●● - moderate impact
● - low impact

# SE6.0 Outcome Enablement with SysML v2.

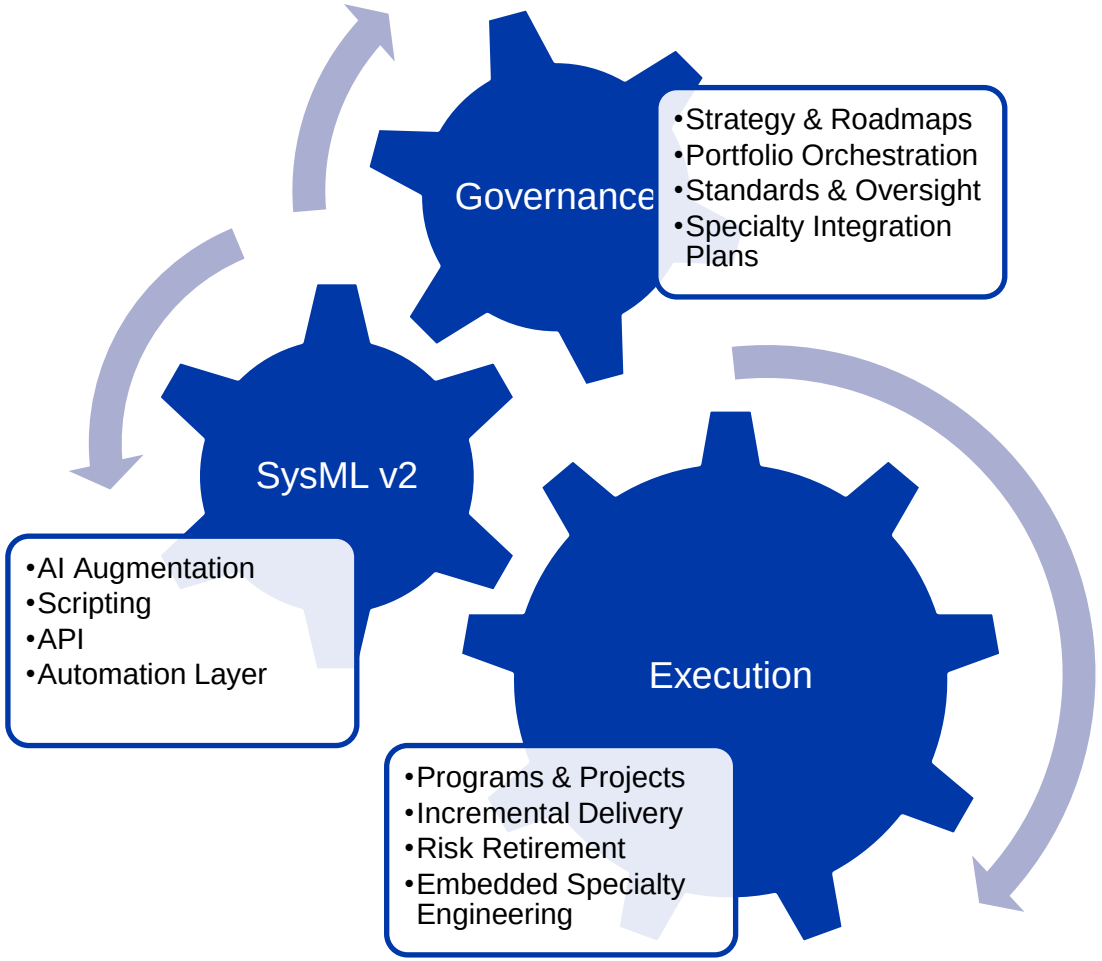


| SE 6.0 Outcome | SysML v2 Enablement |
|---|---|
| **Adaptability** | API-driven architecture supports rapid iteration and integration |
| **Execution Rate** | Textual modeling, reusable patterns, dual authoring = speed + consistency |
| **Assurance** | Formal syntax and validation structures enable built-in quality and auditability |
| **Predictability** | Threaded, governed models reduce ambiguity and manual handoffs |
| **Transparency** | Explicit, queryable semantics provide shared understanding across stakeholders |
| **Differentiation** | Enables modular, flexible architectures that reduce vendor lock-in and enable agility |
| **Visibility** | Elaboration of roadmaps and alternatives leads to foresight over-the-time-horizon. |

# The Role of SysMLv2 – Synchronizer Between Governance and Execution



**SysML V2 is a modeling language, but if deployed in a genuine digital ecosystem, it becomes the synchronizer between governance and execution.**



# ADAPTIVE ENTERPRISE FLYWHEEL



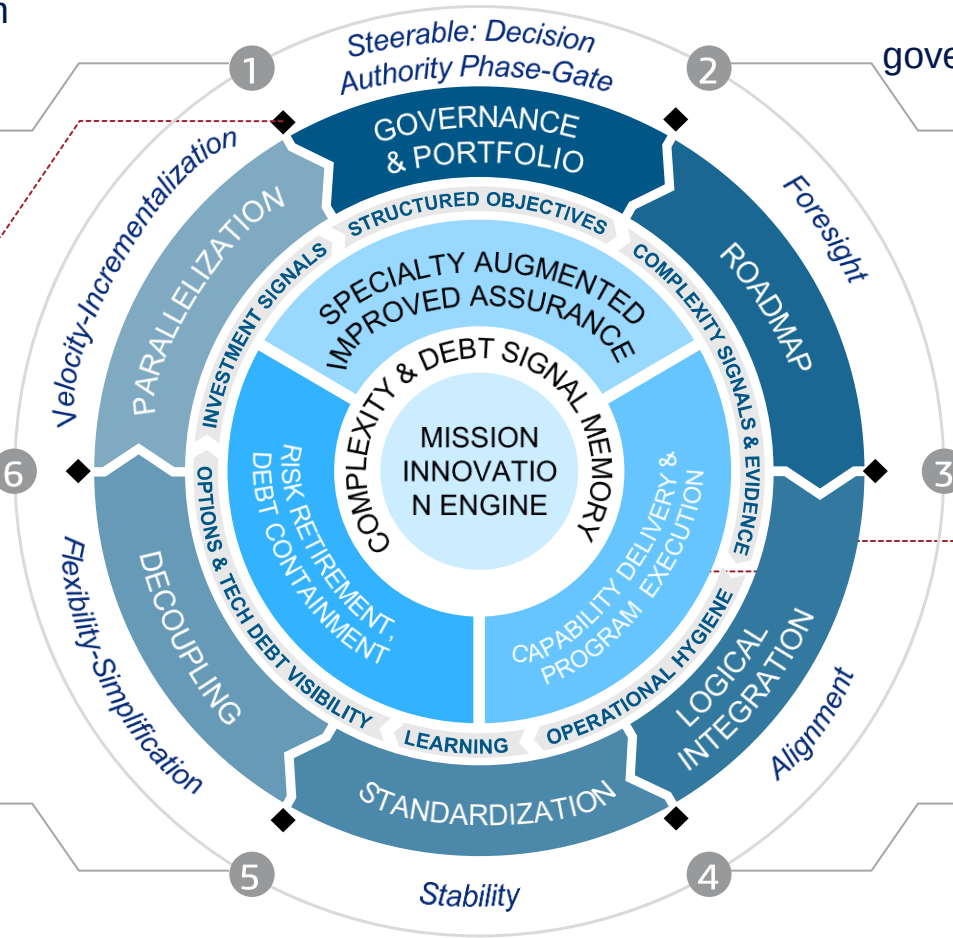
**Achieve compounding beliefs & benefits - Faster delivery, lower cost of change, resilience against disruption, and the ability to "see over the horizon"**

Validated roadmaps sharpen governance and portfolio choices

Governance decides whether to continue, adapt, or sunset — options are exercised deliberately.

Parallelization sustains progress under uncertainty, avoiding bottlenecks

Governance ensures initiatives remain modular, severable, and predictable




Roadmaps provide clear governance handles for steering initiatives

Execution delivers on roadmaps with measurable outcomes

Capabilities fielded via Value Streams & CONOPS/OPSCONs

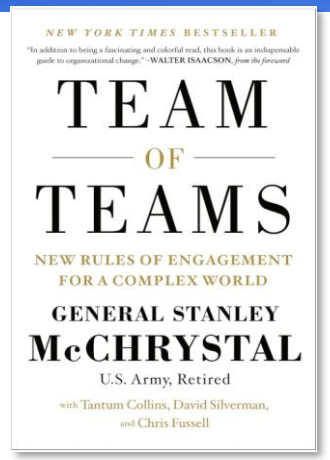
Evidence reduces uncertainty, pays down debt, and validates roadmap assumptions

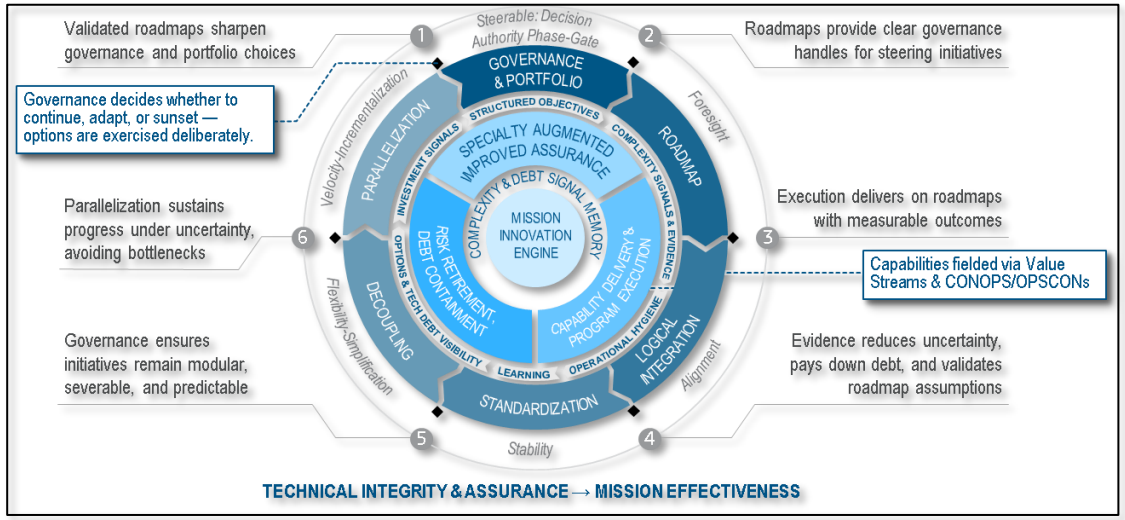
# ADAPTIVE ENTERPRISE FLYWHEEL

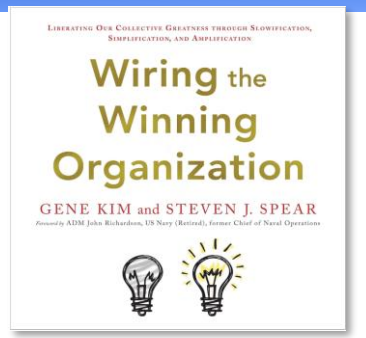
Global Product Data Interoperability Summit | **2025**

Innovation Pathways ◆ Capability Portfolio ◆ Real Options

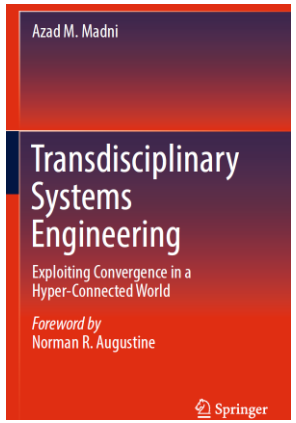
Adaptability
Configurability



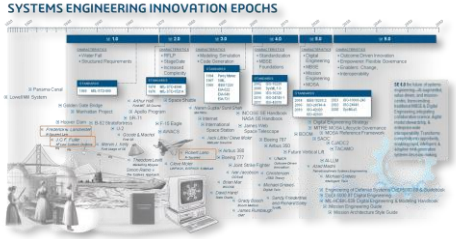




Social Wiring
Amplification
Slowification
Simplification



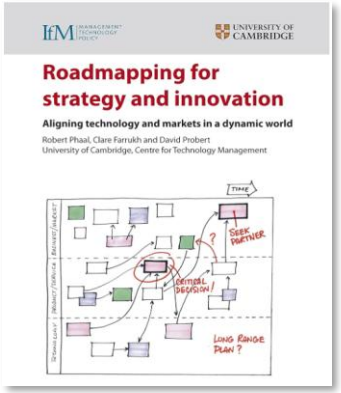

Purpose Beyond Performance
Synthesis Over Specialization
Resilience by Design

## SE 6.0

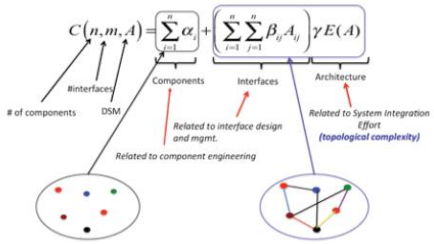



- Outcome Driven Innovation
- Transdisciplinary SE
- AI-Augmented
- Interoperability
- Collaboration Science
- Stewardship
- Automation
- Intelligence Virtual Twins


Flexible
Governance



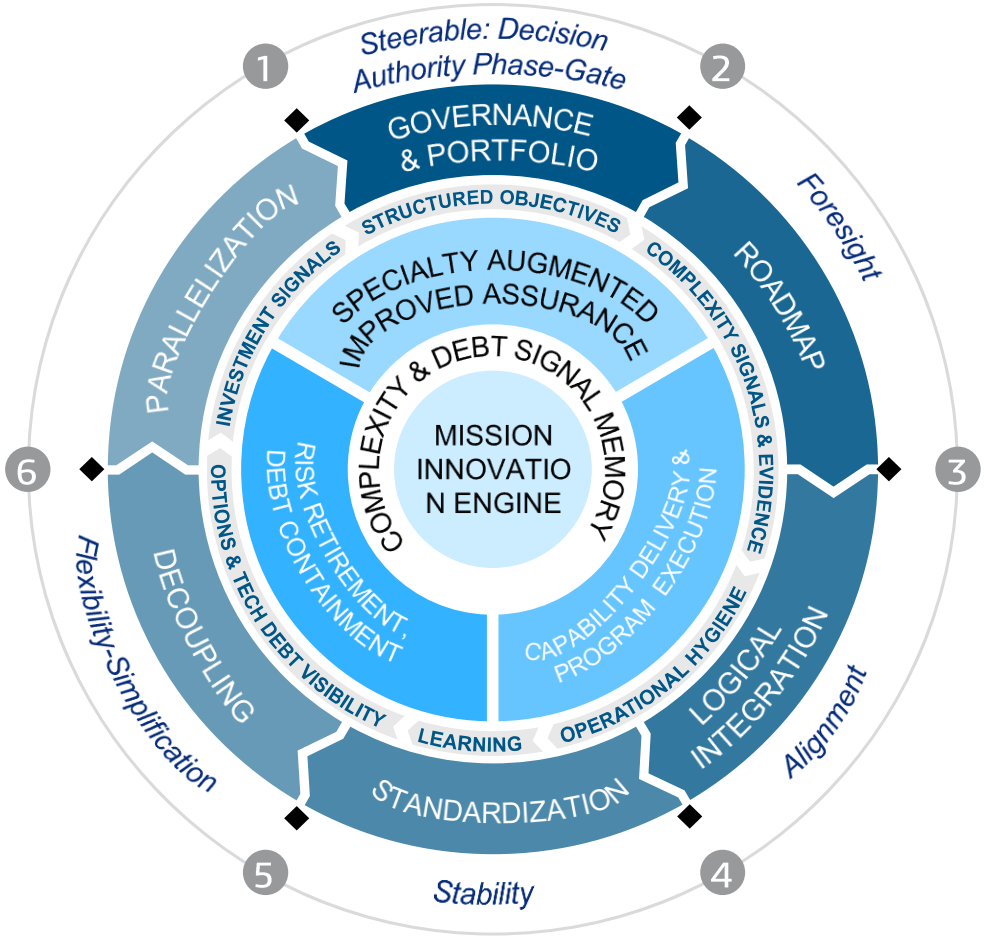

Foresight
Visibility
Transparency
Trust


Sinha &
de Weck
Alpha
Beta
E(A)

# Closing – Tie it all back to belief






- Strategy flows inward to guide execution (from governance)
- Evidence flows outward to sharpen strategy (from execution)
- The interaction reinforces belief through:
  - Faster Delivery
  - Lower Cost of Change
  - Resilience against Disruption
  - Foresight “over-the-time-horizon”