33rd Annual INCOSE international symposium

hybrid event

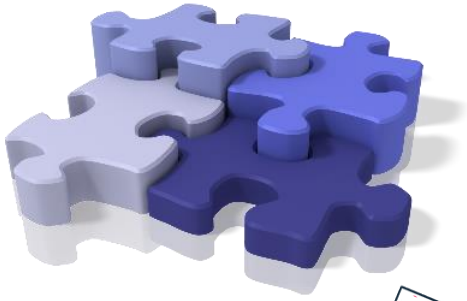
Honolulu, HI, USA
July 15 - 20, 2023

David Long
President, Blue Holon
INCOSE Director for Strategic Integration, Past President, and Fellow

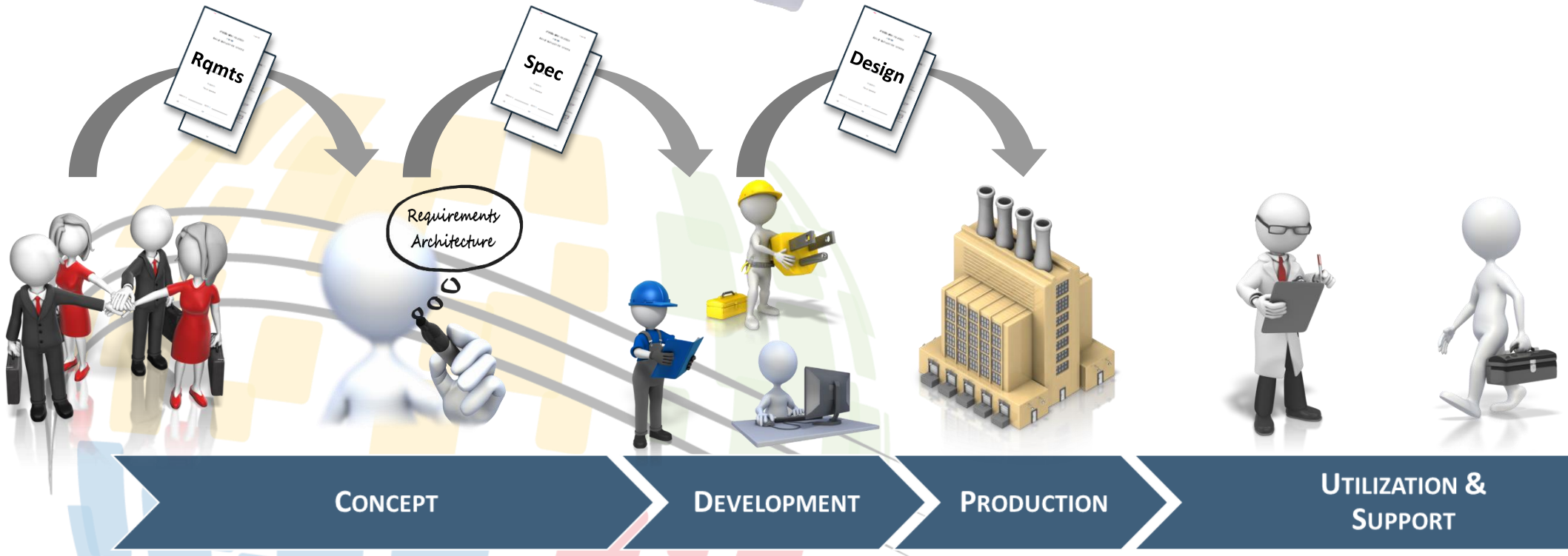
Beyond Digital: Bridging the Divides

Looking Back

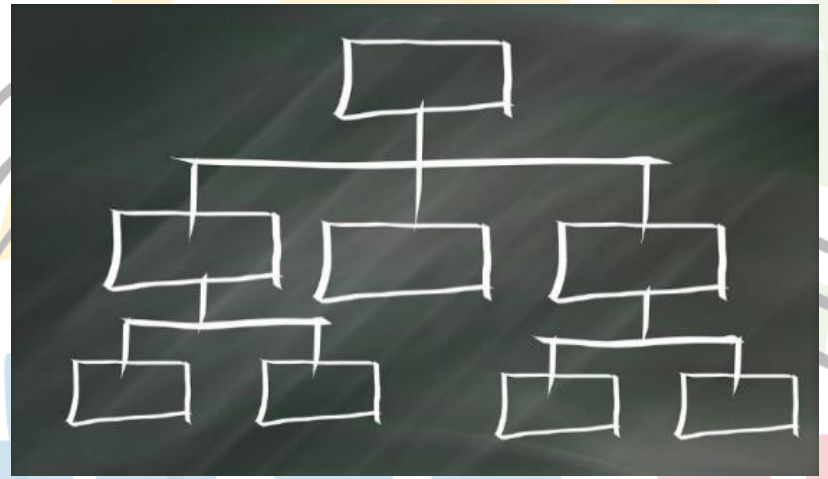
Classical Engineering in a Complicated World

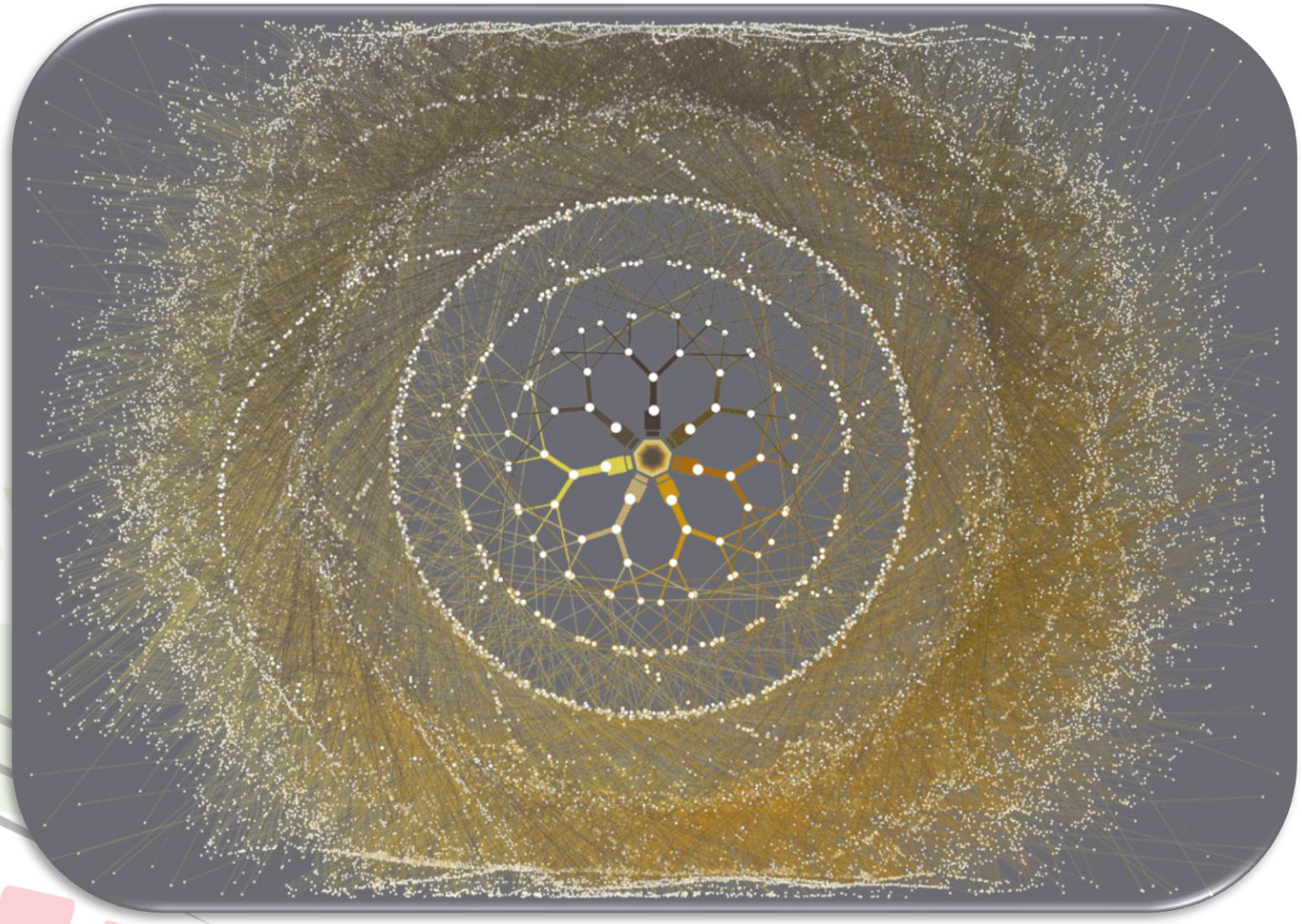


Ensuring the pieces work together to achieve the objectives of the whole



Exceeding the Capabilities of Traditional (S)E





Credit:: Alisa Farr for Letter27. farrimages.com

Understanding the Culprit

An Explosion in Complexities and Expectations

System scale

Mission complexity

Technology complexity

Project team complexity

Dynamic complexity

Cycle time

Delivering Success in the Digital Age

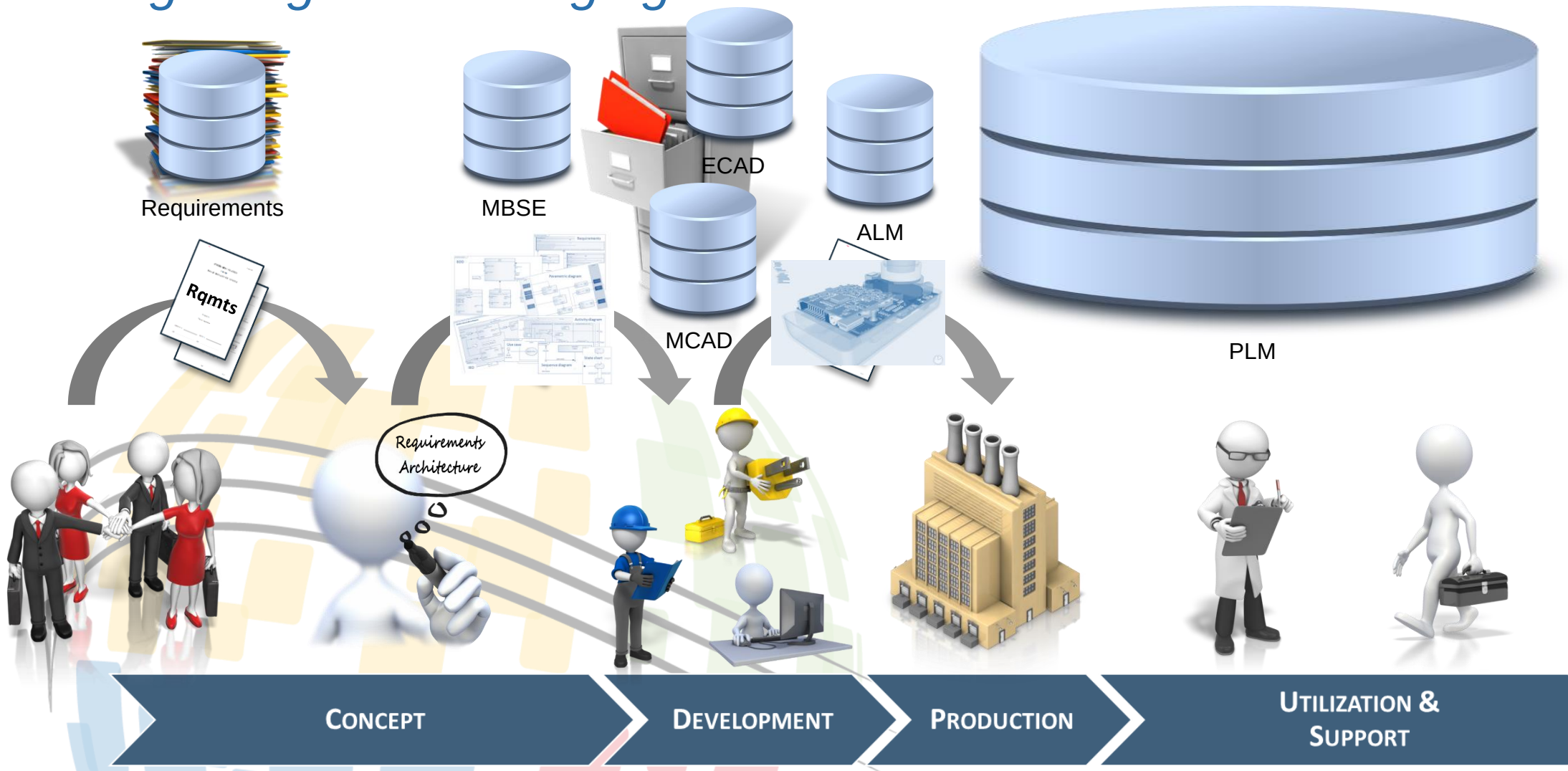
1. Embracing 21st century technologies

Credit: Los Alamos National Labs, Creative Commons 2.0

Credit: Victoria Borodinova

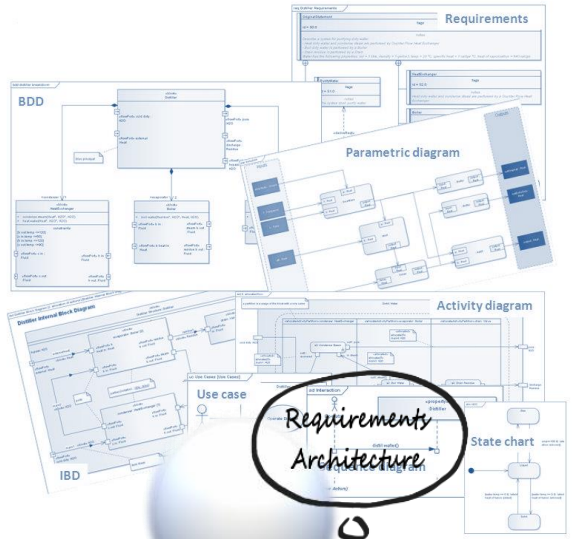
Addressing Increasing Complexity

Digitizing and Managing Information

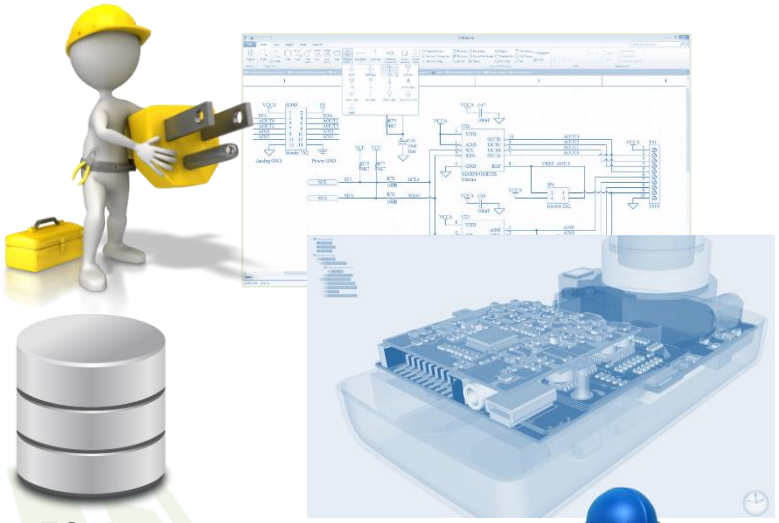


Avoiding the Trap of Silos of Excellence

Disconnected Engineering in a Complex World



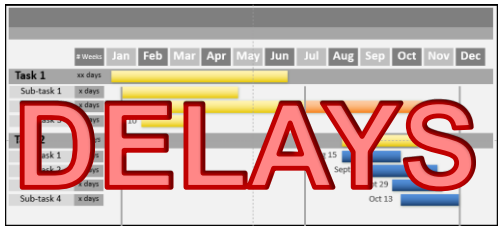
MBSE



ECAD

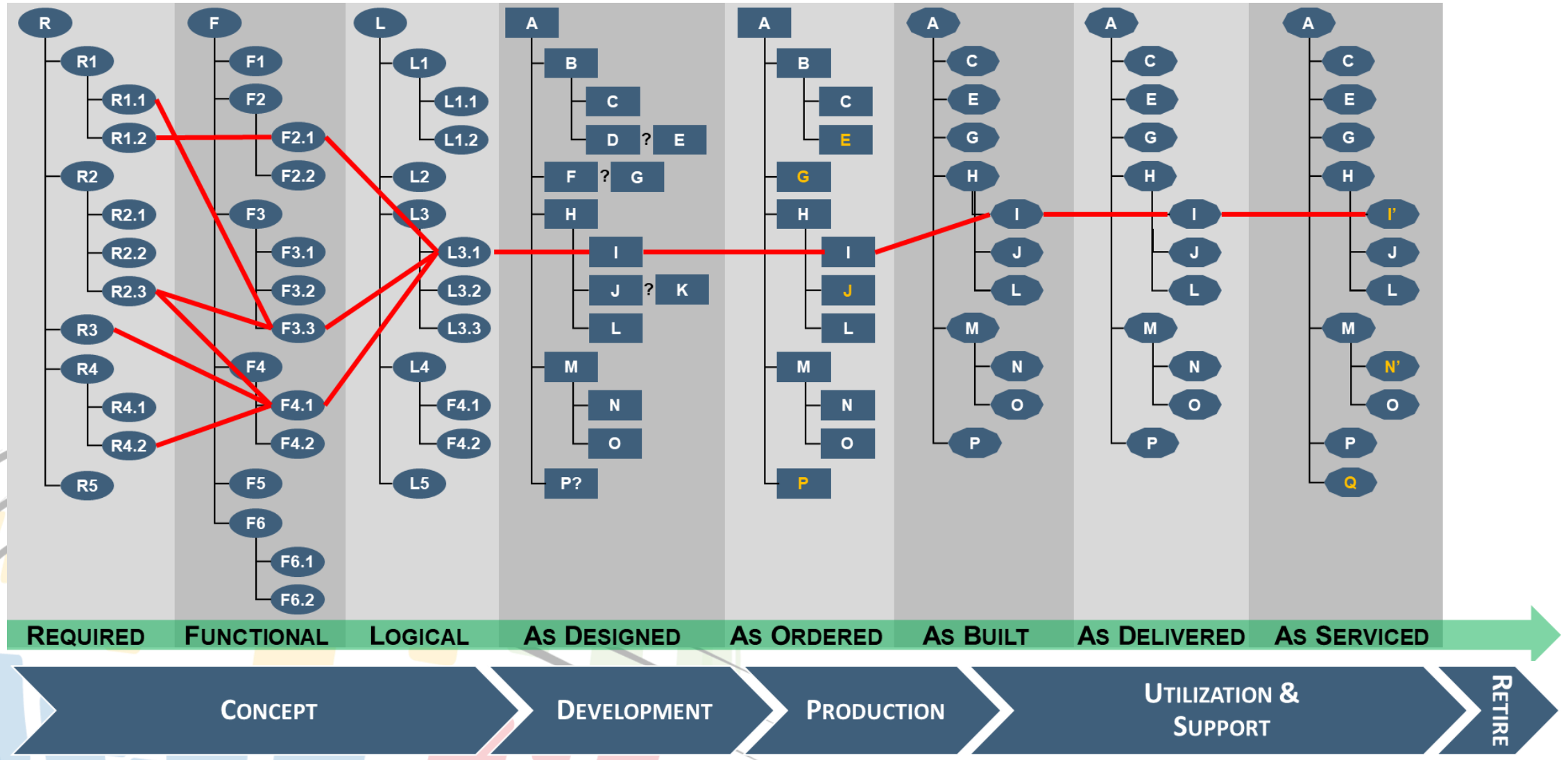
ALM

MCAD



CONCEPT | DEVELOPMENT | PRODUCTION

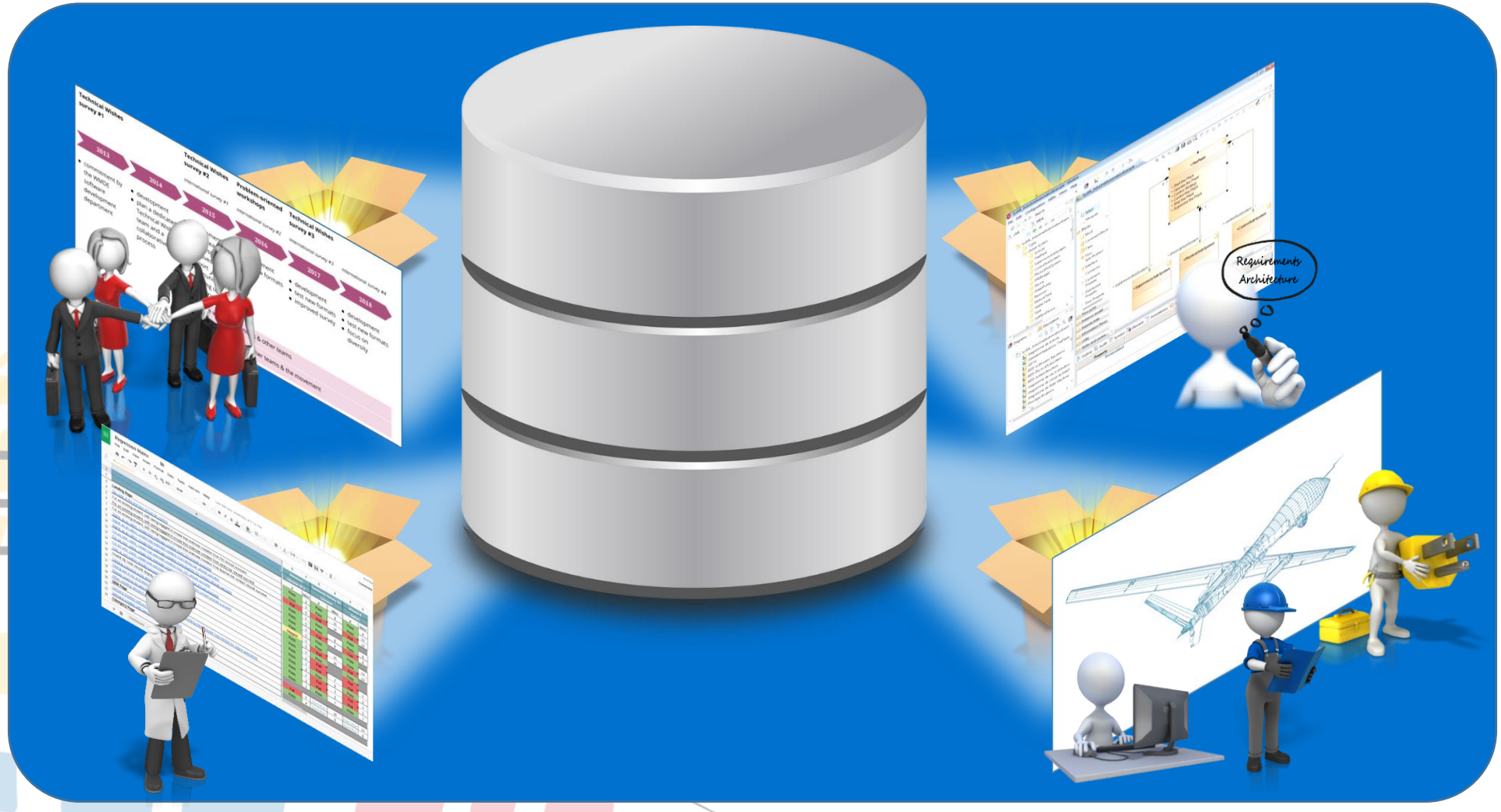
Maintaining an Unbroken Thread of Traceability



Adapted from Aras Corporation, 2018.

Aligning across the Engineering Enterprise

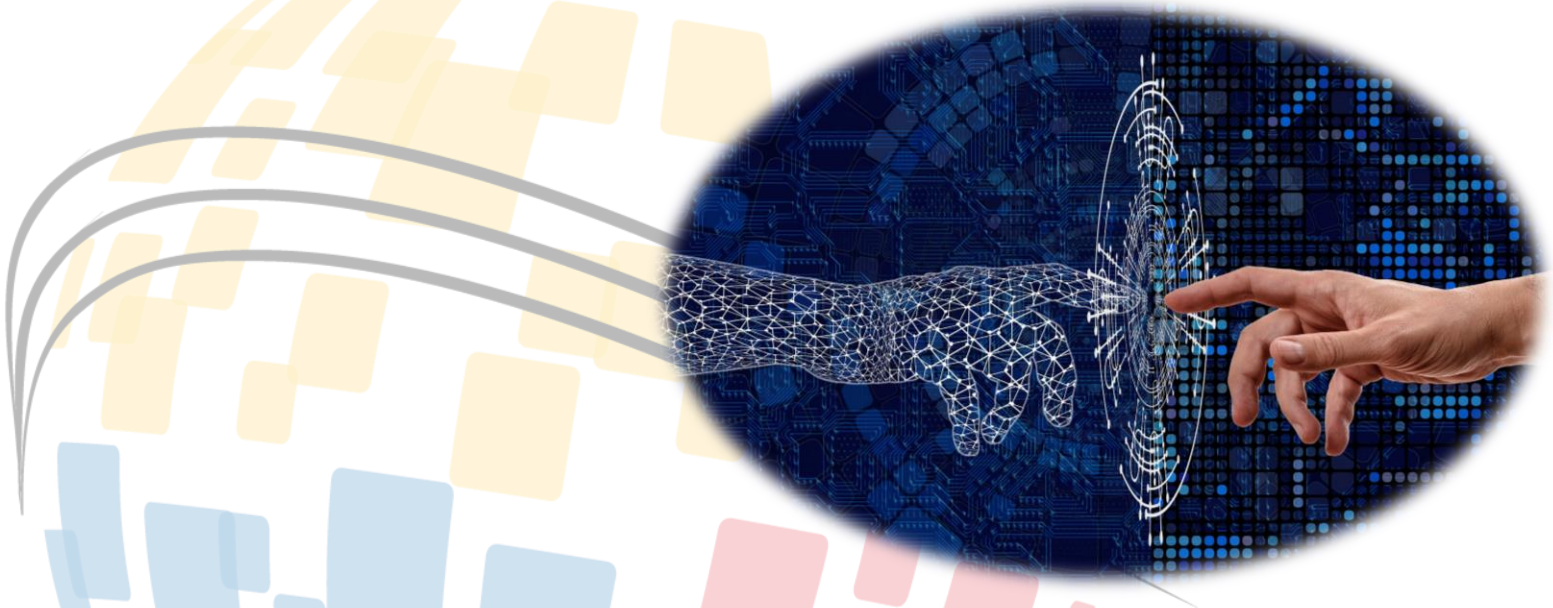
Right Data, Right Place, Right Time, Right Presentation

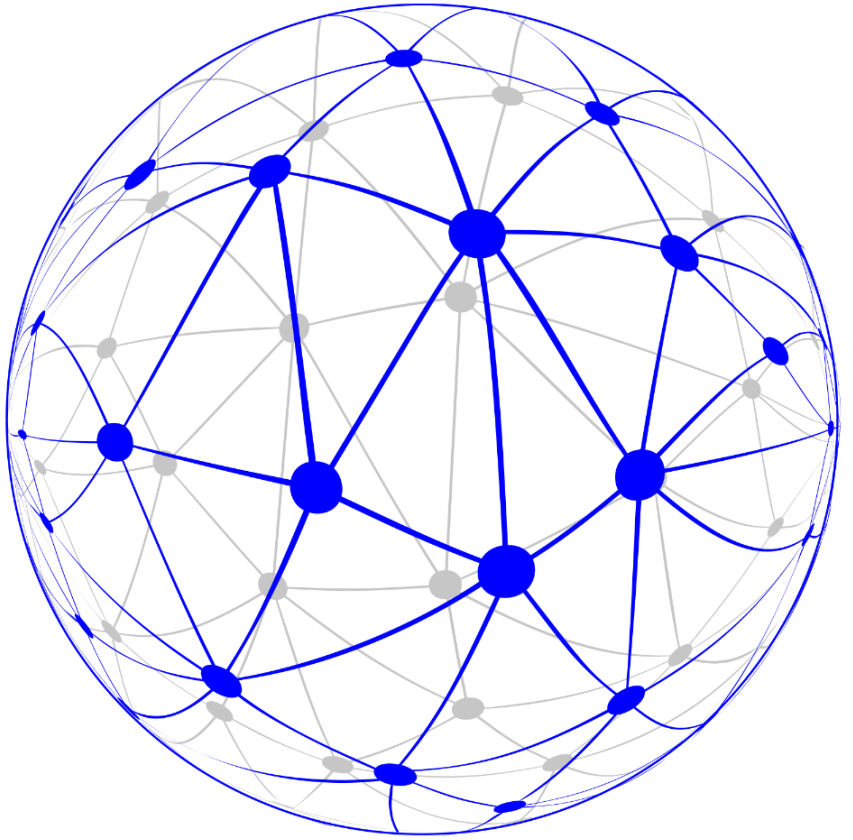


Delivering Success in the Digital Age

1. Embracing 21st century technologies

2. Transforming for today's world

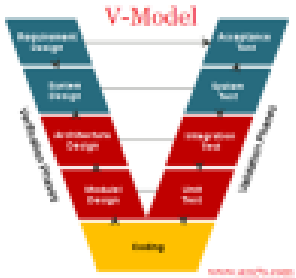




Meeting the Pace of Change

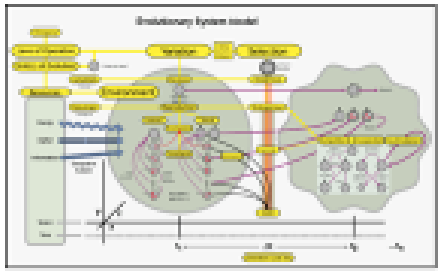
Serial Engineering in a Dynamic Parallel World

The Transition



From: Systems Engineering 1.0

- Systems built to last
- Opinion-based decision making
- Paper-based documentation
- Deeply integrated architectures
- Hierarchical organizational model
- Satisfying the requirements
- Phase-based Verification & Validation



To: Systems Engineering 2.0

- Systems built to evolve
- Model and Data-driven decision making
- Simulation-based documents
- Modularized architectures
- Ecosystem of partners
- Constant experimentation and innovation
- Continuous Verification & Validation

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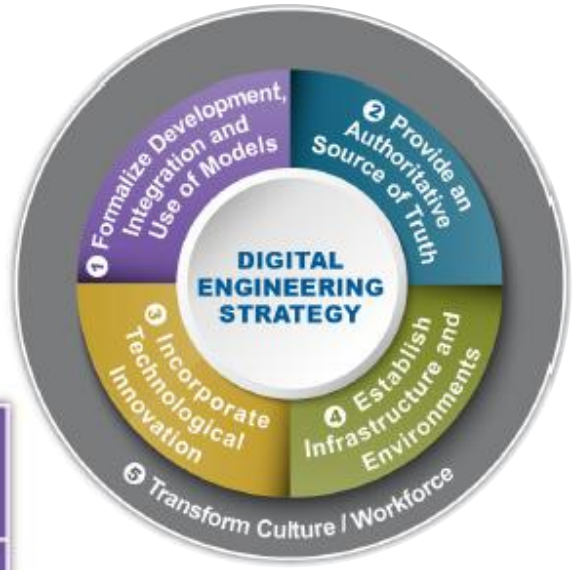
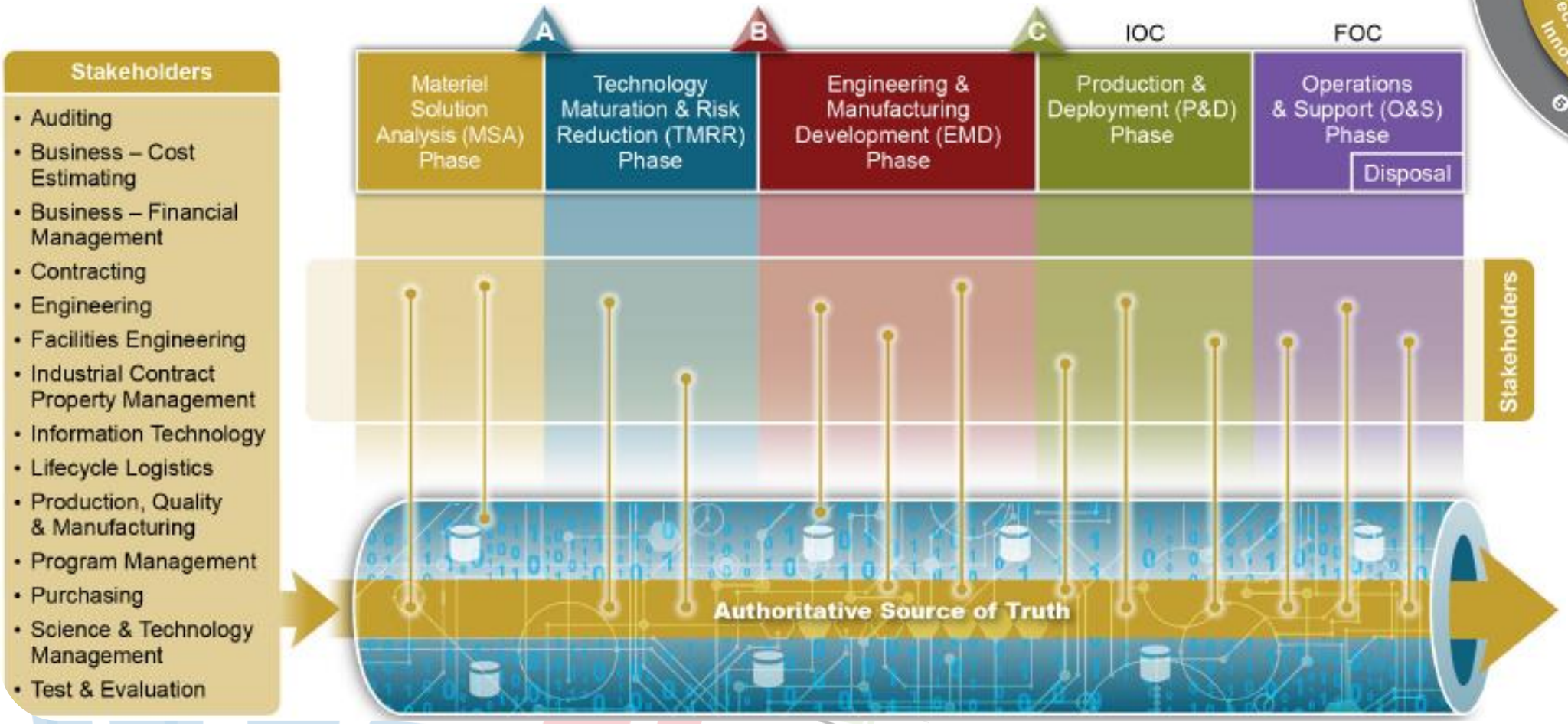
Credit John Wade, Engineering the Value Supply Chain: Ethical Sustainability, INCOSE International Symposium, June 2022

Connecting the Engineering Lifecycle

The Authoritative Source of Truth





Credit: US Department of Defense, 2018

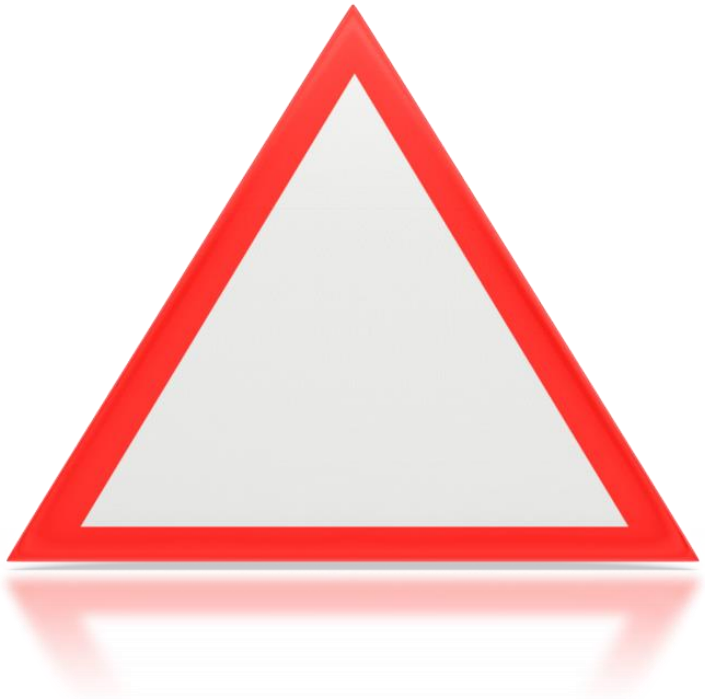
Connecting thru Architecture-Driven Engineering

The Hub of a Modern Engineering Lifecycle

Recognizing Technical Challenges Ahead

From Digitization to Digitalization

- Beginning with weak or inconsistent system semantics
- Connecting across IP and organizational boundaries
- Living with standards proliferation
- Dealing with surrogate models
- Managing configurations (cm and CM)
- Being system-centric or manufacturing-centric



Delivering Success in the Digital Age

1. Embracing 21st century technologies
2. Transforming for today's world
3. Looking beyond engineering

Exceeding the Capabilities of Traditional (S)E

Seeing the Human Dimension

System scale

Mission complexity

Technology complexity

Project team complexity

Dynamic complexity

Cycle time

Systems Engineering

Systems Engineering is a transdisciplinary and integrative approach to enable the successful realization, use, and retirement of engineered systems, using systems principles and concepts, and scientific, technological, and management methods.

INCOSE

Connecting People, Disciplines, and Insights

"The whole is greater than the sum of the parts"

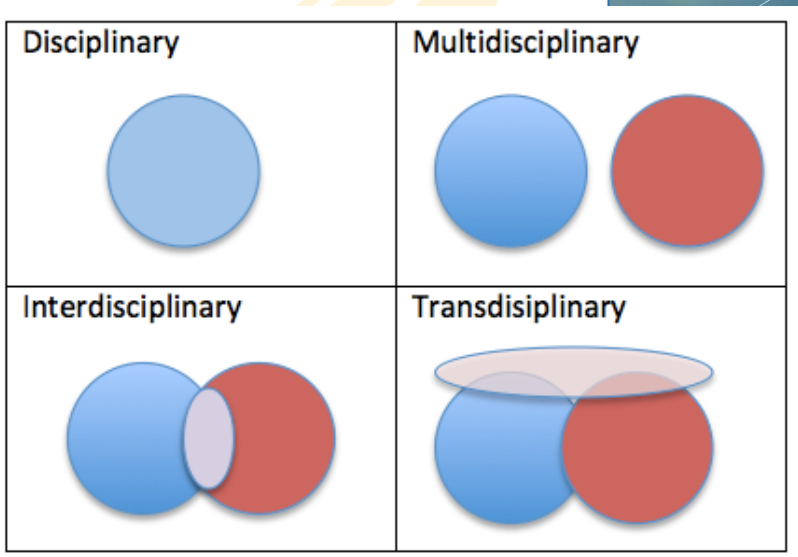


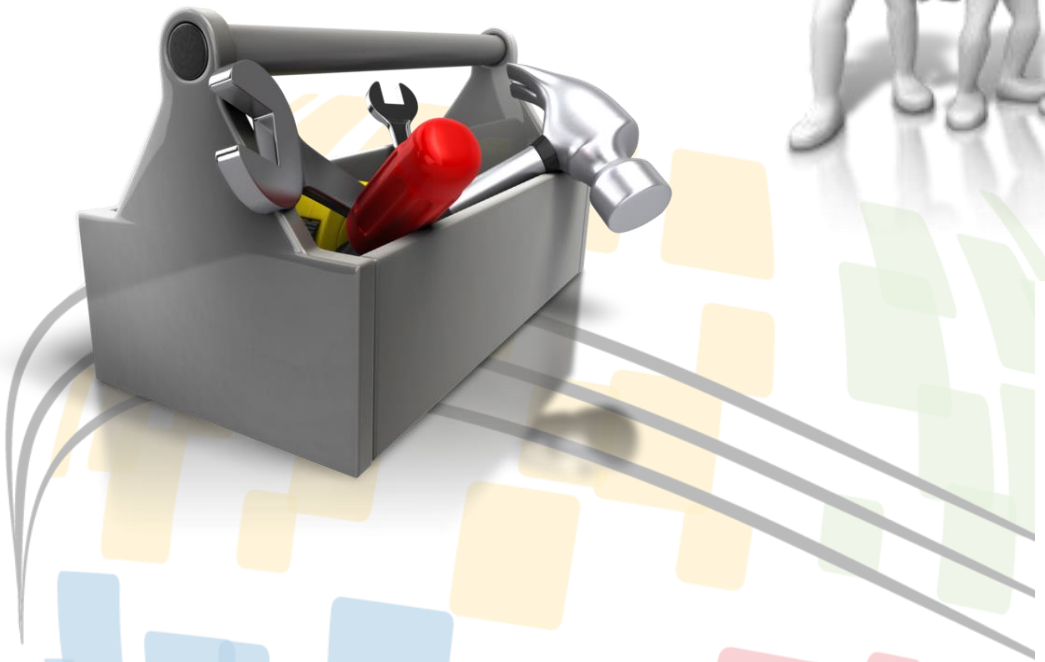
Image Credit: Magellan International School

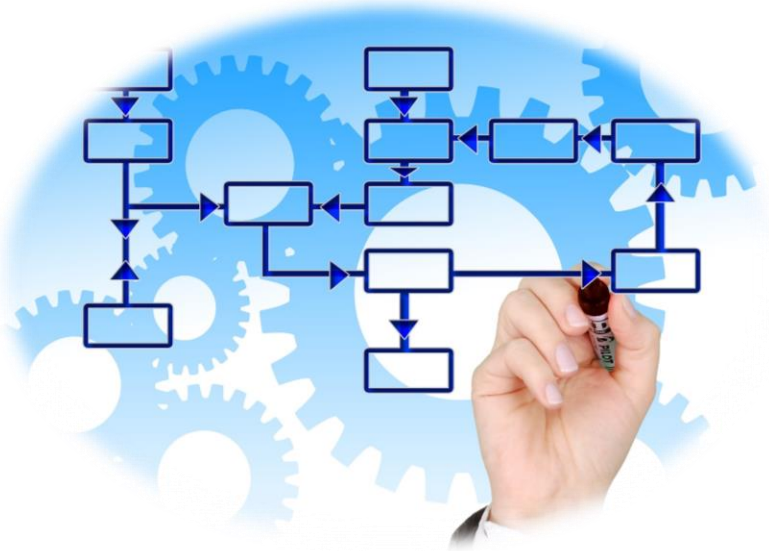
- Systems thinking is used by many.
- Systems engineering is understood and embraced by all engineers.

- Systems engineering is a career for a few.

Identifying the Full Scope

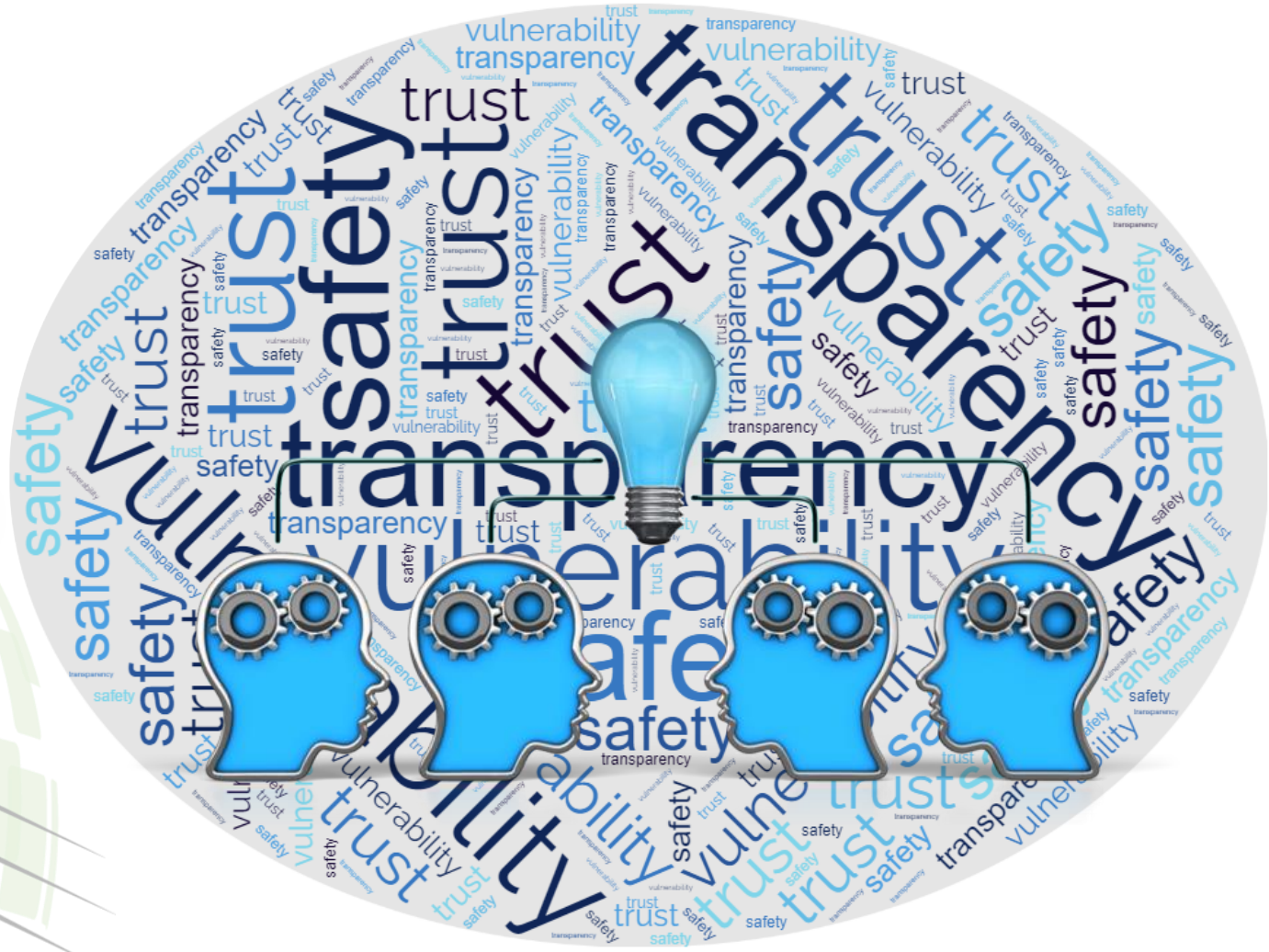
Tools, Information, Concept, Workflow, People, and Culture





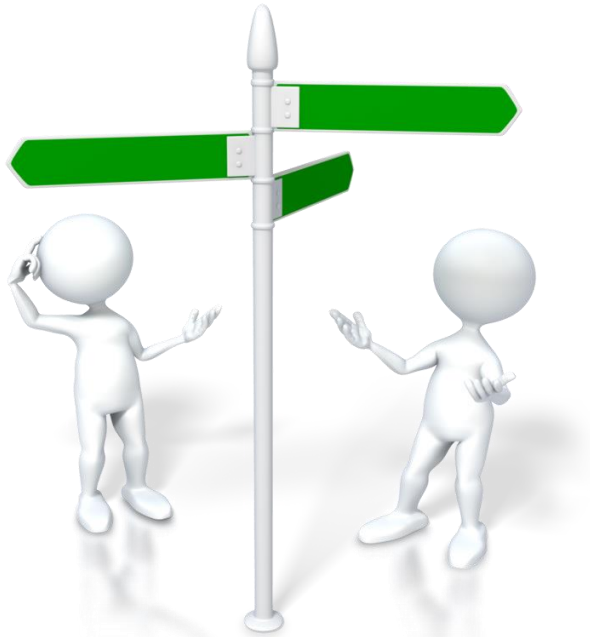
Embracing the Human Dimension

Unlocking Collective Intelligence

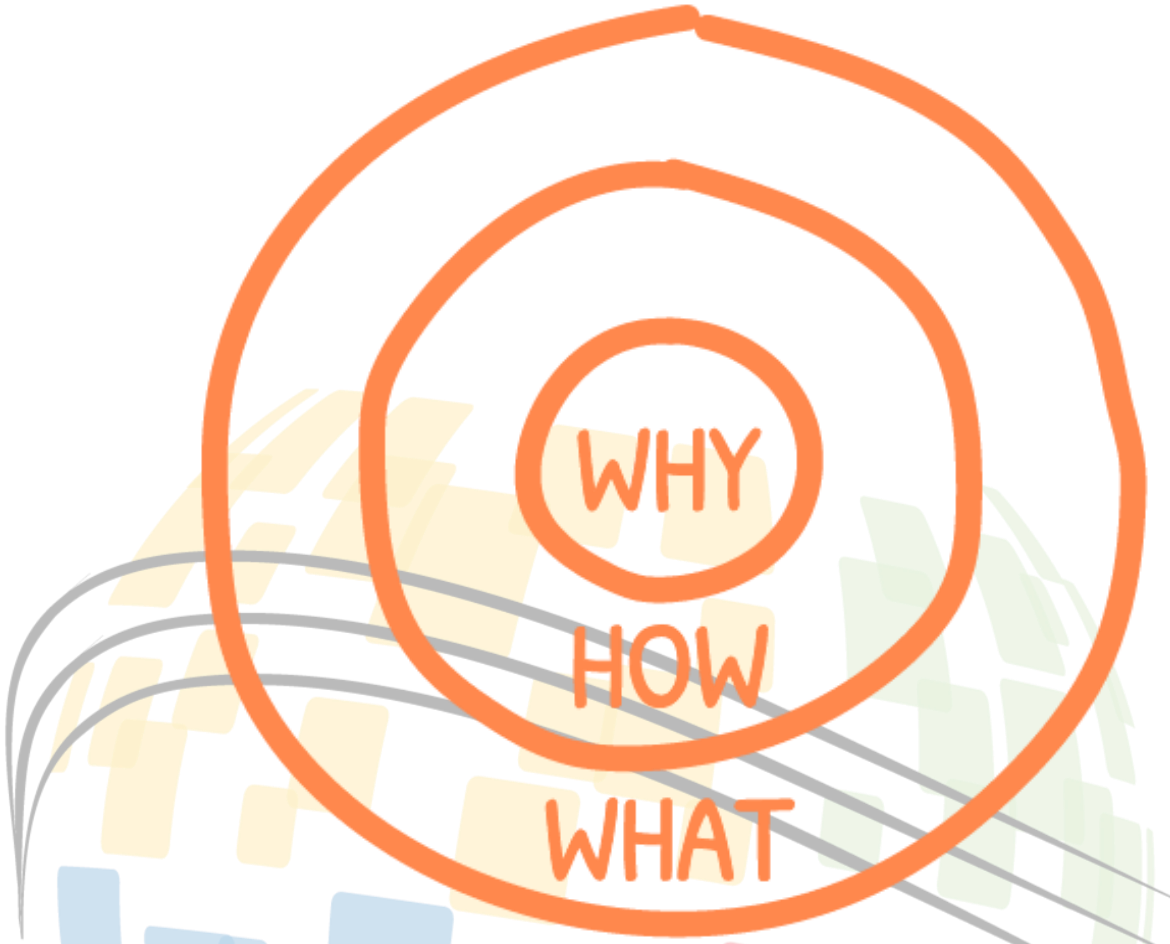


Delivering Success in the Digital Age

1. Embracing 21st century technologies
2. Transforming for today's world
3. Looking beyond engineering
4. Undertaking the journey

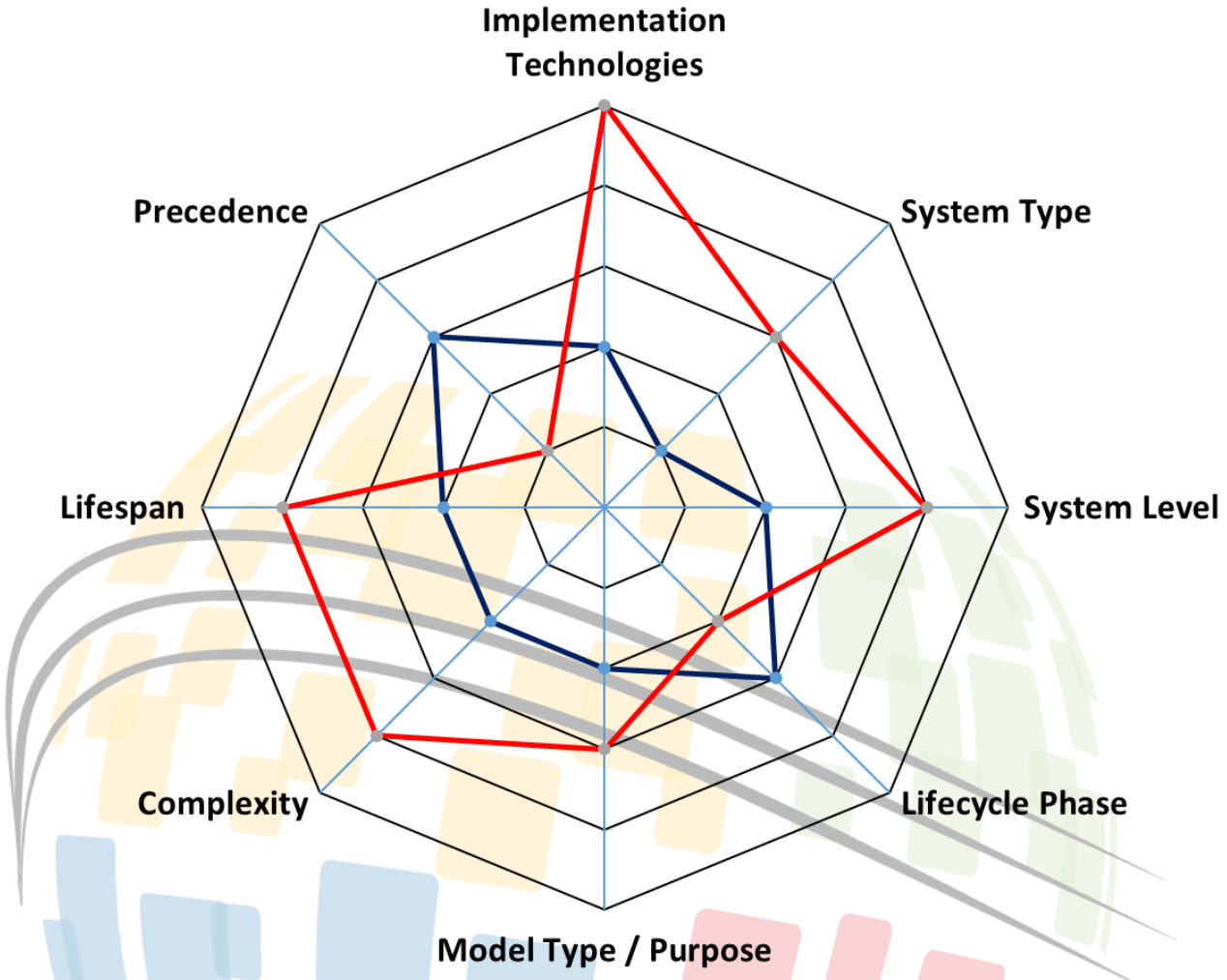


Connect through Motivation and Belief



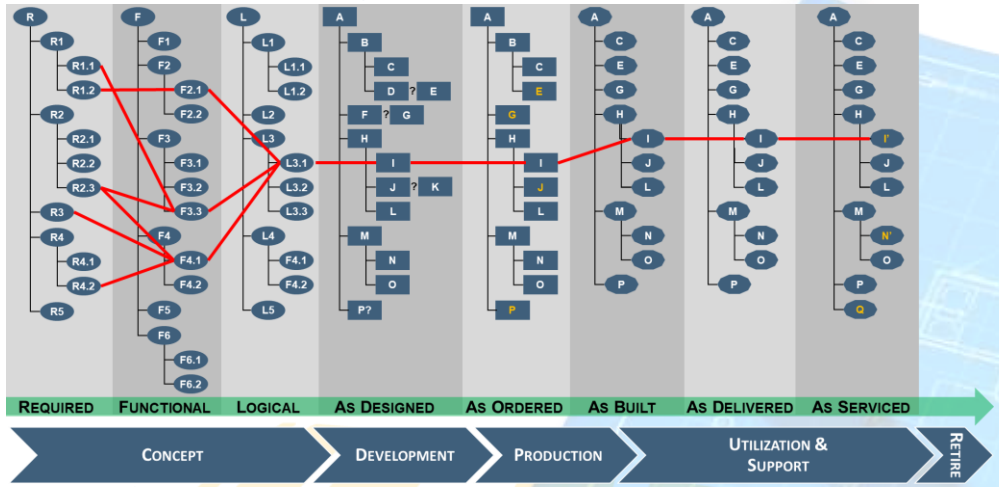
Shape a Fit-for-Purpose Vision

Business Value over Engineering Over Technology



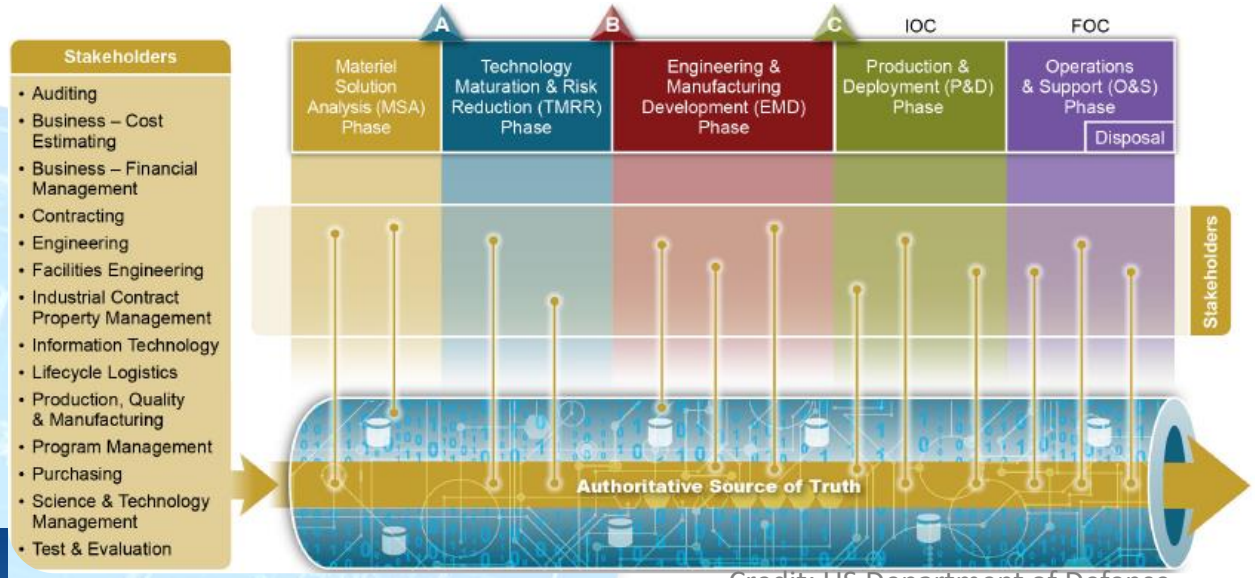
Know Where You Need to Be for Dx

Not Always the Same as Where You Want to Be



Adapted from Aras Corporation, 2018

Credit: Sumit Awinash, Creative Commons 4.0



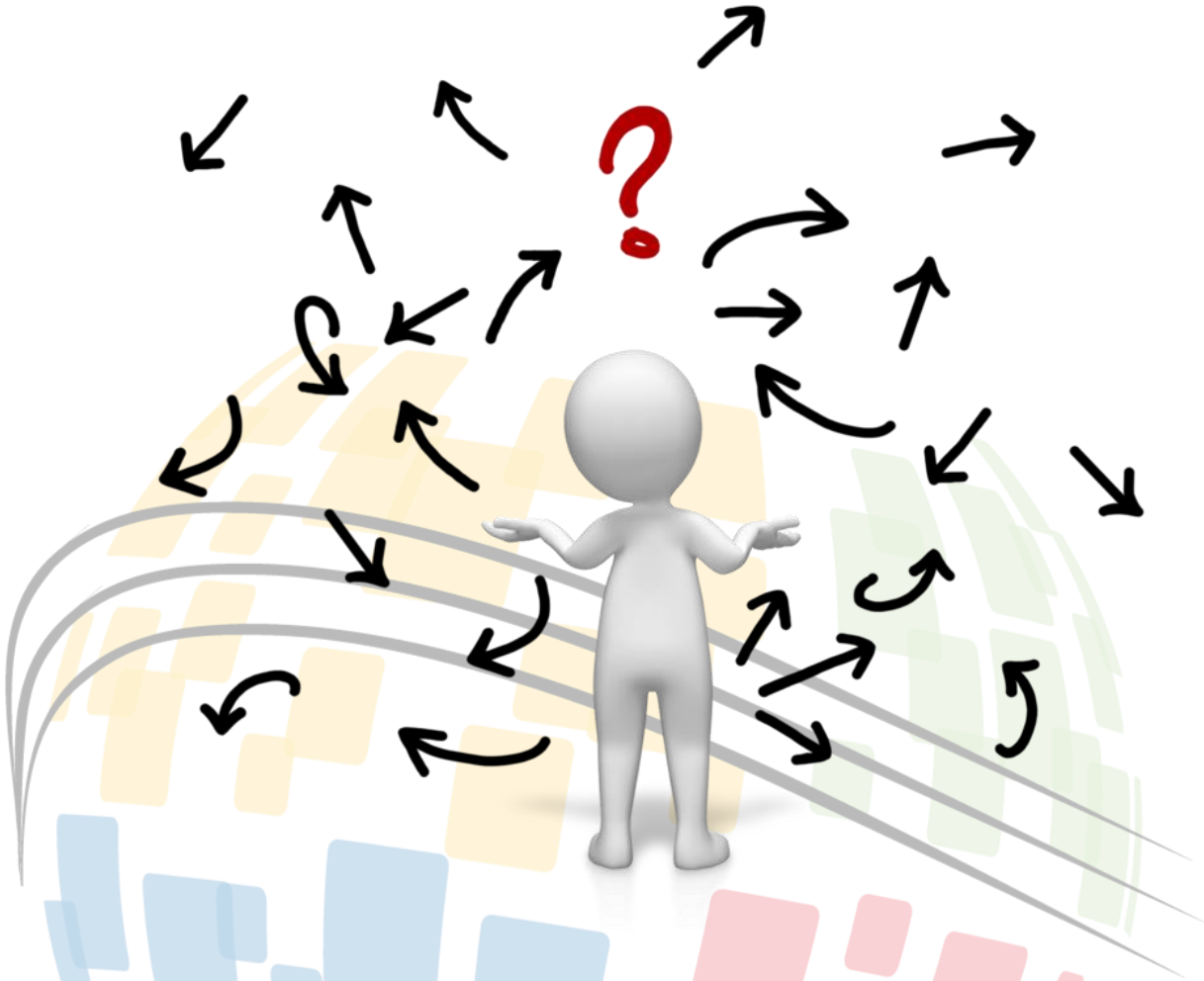
Credit: US Department of Defense, 2018

Know Where You Need to Be for Ax

Assistance, Automation, AI and ML, AR and VR

Elicit Requirements

Understanding Both Project and Journey



NEEDS

DESIRES

CONSTRAINTS

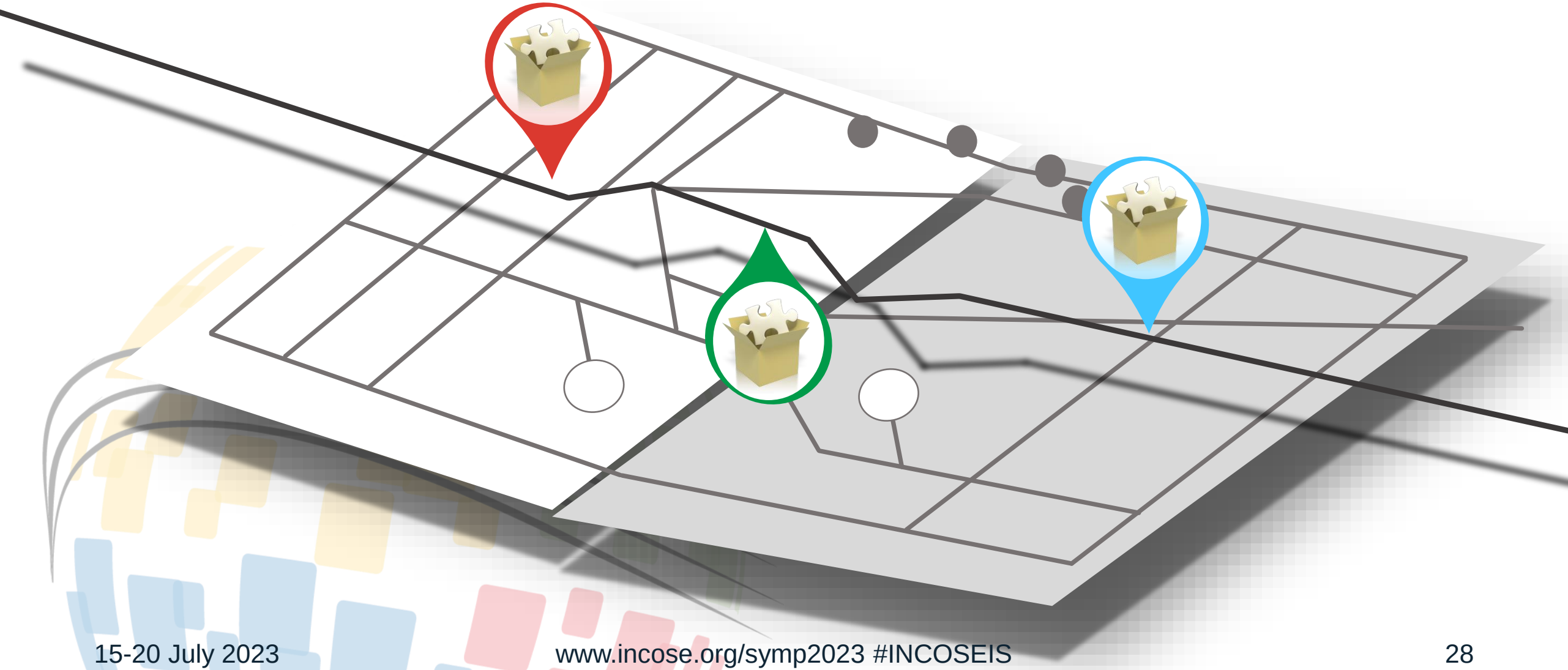
Leverage the Power of the Black Box

Managing the Change Boundary

- ✓ Compartmentalize change
- ✓ Empower change agents
- ✓ Honor existing interfaces
- ✓ Honor interface formats
- ✓ Expand intentionally

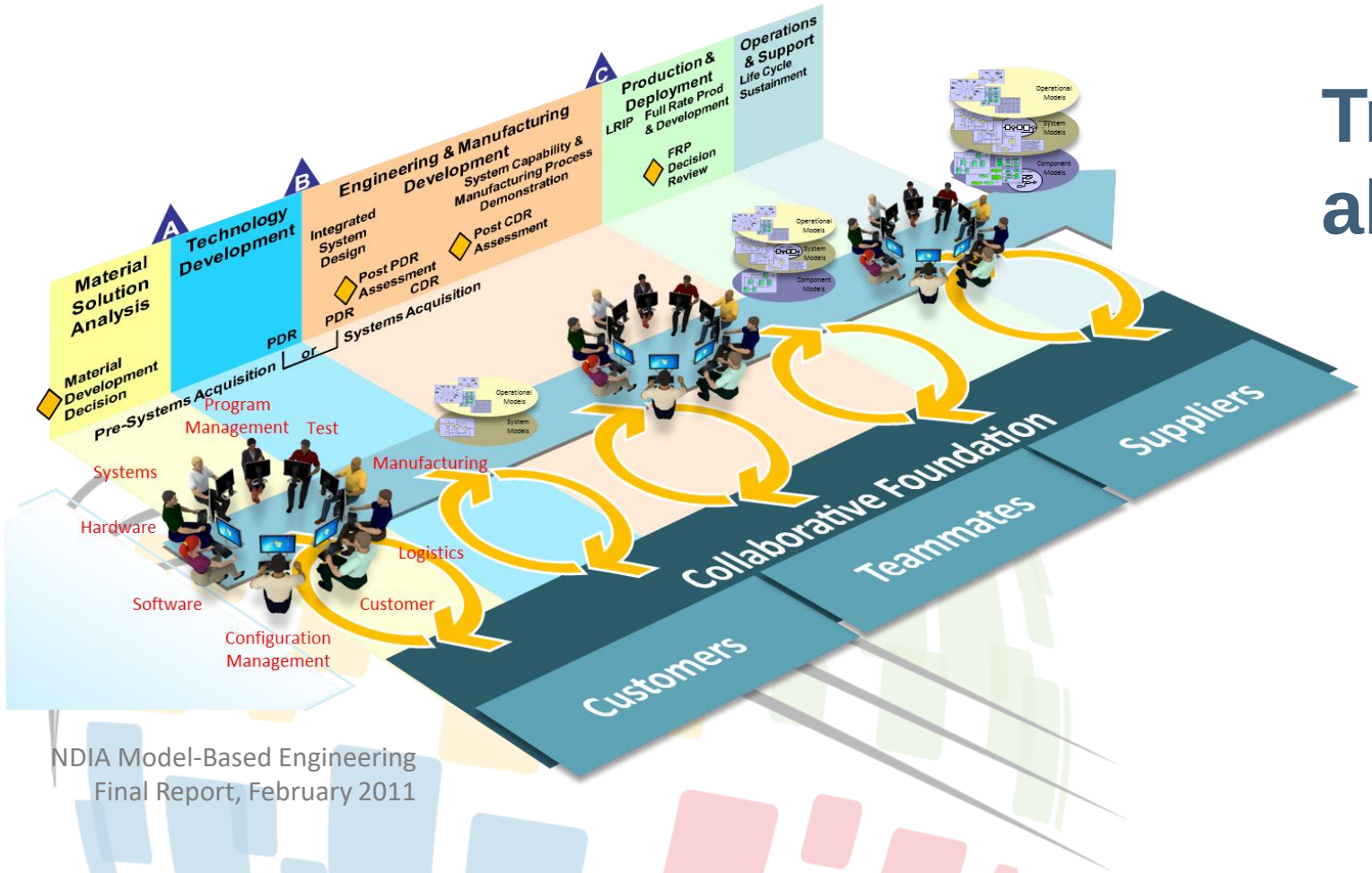
Plot and Adapt Your Journey Map

Engineer the Product, the Organization, and the Change



Applying Our Practices to the Divides and the Journey

Accidental, Integrated, or Engineered?



NDIA Model-Based Engineering Final Report, February 2011

Transformation must live above the silos

addressing the gaps

defining the seams

guarding the why

Continuing the Conversation

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Fellow

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