

# Naval Postgraduate School Acquisition Research Symposium

May 10, 2023

## An Integration Framework For Digital Transformation Of DOD Systems Engineering And Acquisition

### Authors:

- Dr Kelly Alexander, SE Modernization Engineering Lead | System Innovation
  - Contractor Support to OUSD(R&E) SE&A
- Mr Thomas McDermott, Systems Engineering Research Center

### Government Sponsor:

Ms. Nadine Geier

Director, Systems Engineering

Office of the Executive Director, Systems Engineering and Architecture

Office of the Under Secretary of Defense for Research and Engineering





# Research Questions

Systems Engineering Research Center (SERC) research task description  
"Program Managers Guide to Digital and Agile Systems Engineering  
Process Transformation."



## CURRENT STATE

What is the Current State of Systems Engineering in DoD?

What are the enablers to modernization?

What are the barriers to modernization?

How do we create an SE Modernization Enterprise?

## COLLABORATION

How do we increase collaboration & knowledge sharing?

Who are potential partners/information sources?

How can we leverage NDIA, INCOSE & consortiums (or other government-industry groups)?

## INNOVATION

What is the Future State of SE?

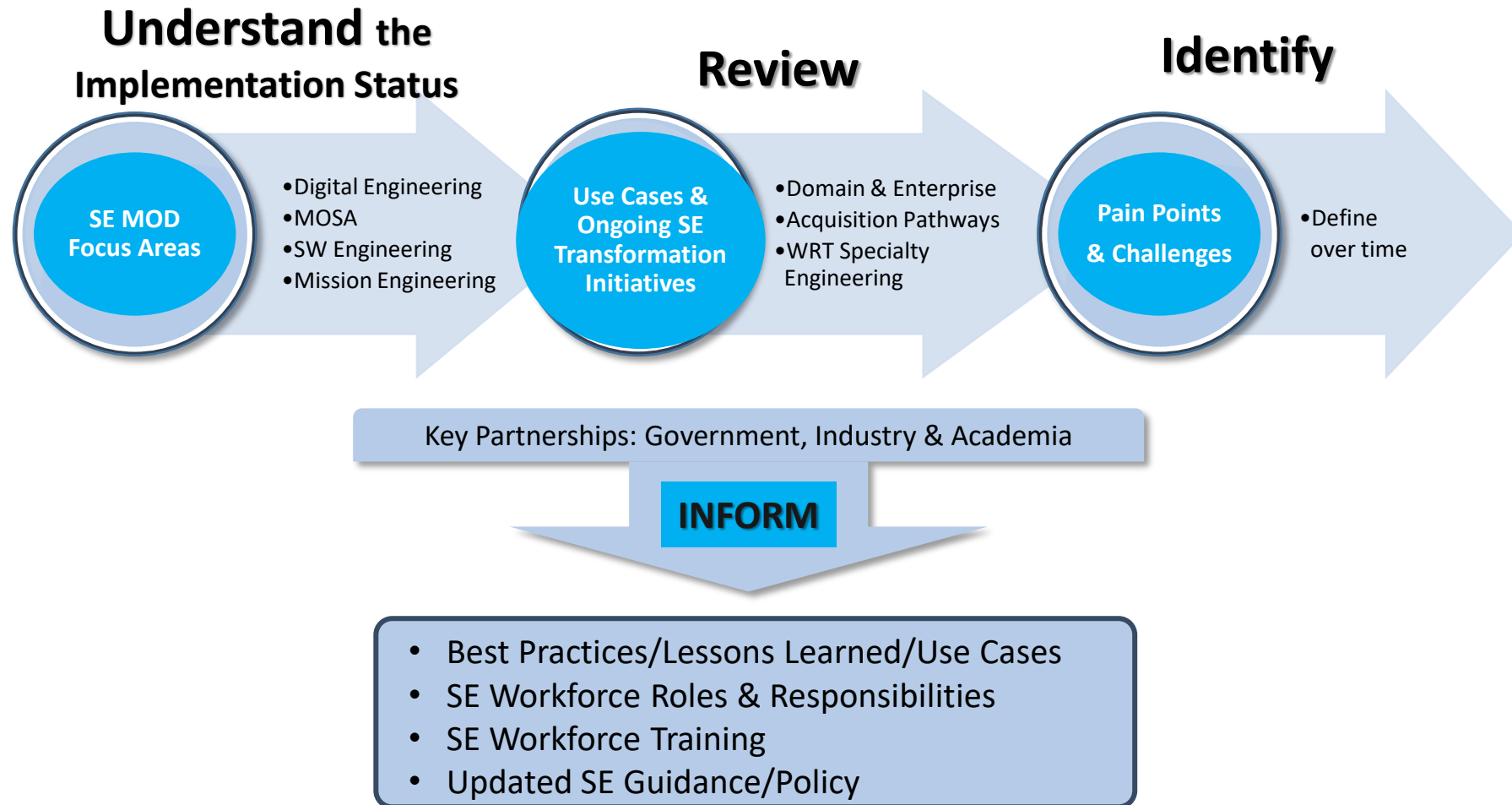
How do we bring innovation to the SE environment (process, artifacts, reviews, etc.)?

How do we know that we have achieved our goal? What are the indicators of success?

How do we shift the culture to embrace modernization principles and practices?



# SE MODERNIZATION APPROACH



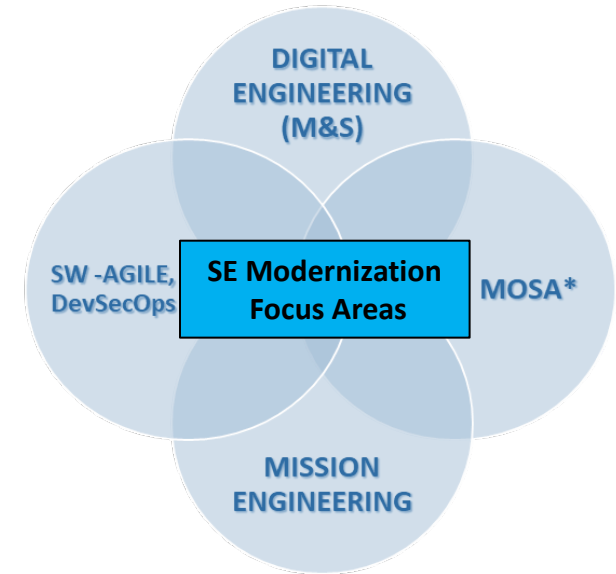
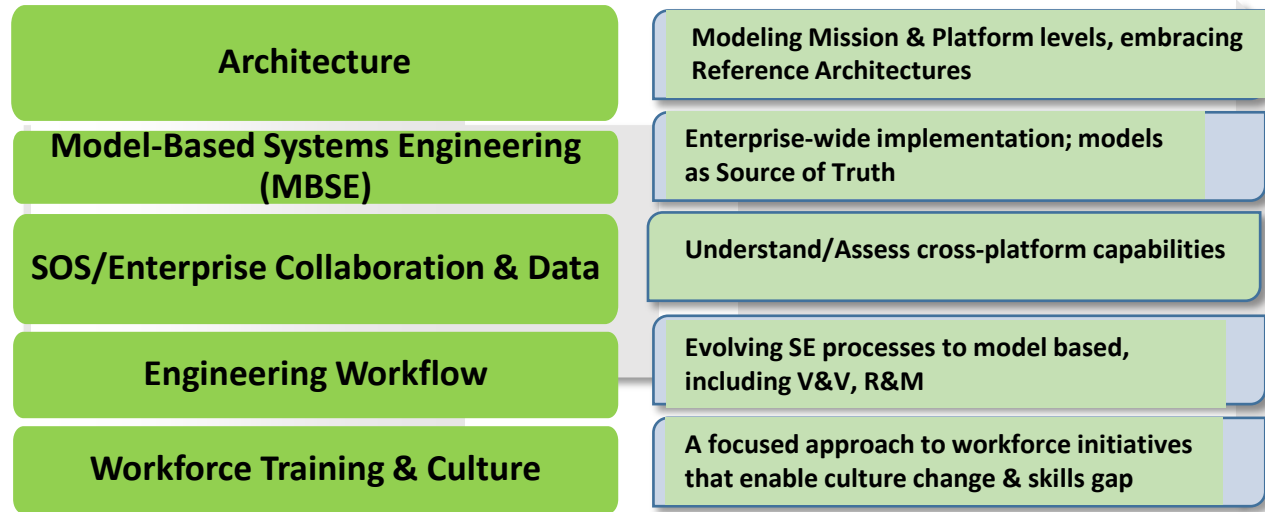


# SE Modernization Approach

## SE Modernization Problem Statement

“There is a lack of an integrated approach to implementation of SE Focus Areas that is creating a delay in full implementation of the Digital Transformation which is necessary to ensure the relevant guidance, skills, and training are available to deliver a robust, disciplined approach to weapon systems acquisition.”

## Cross-Cutting Key Enablers

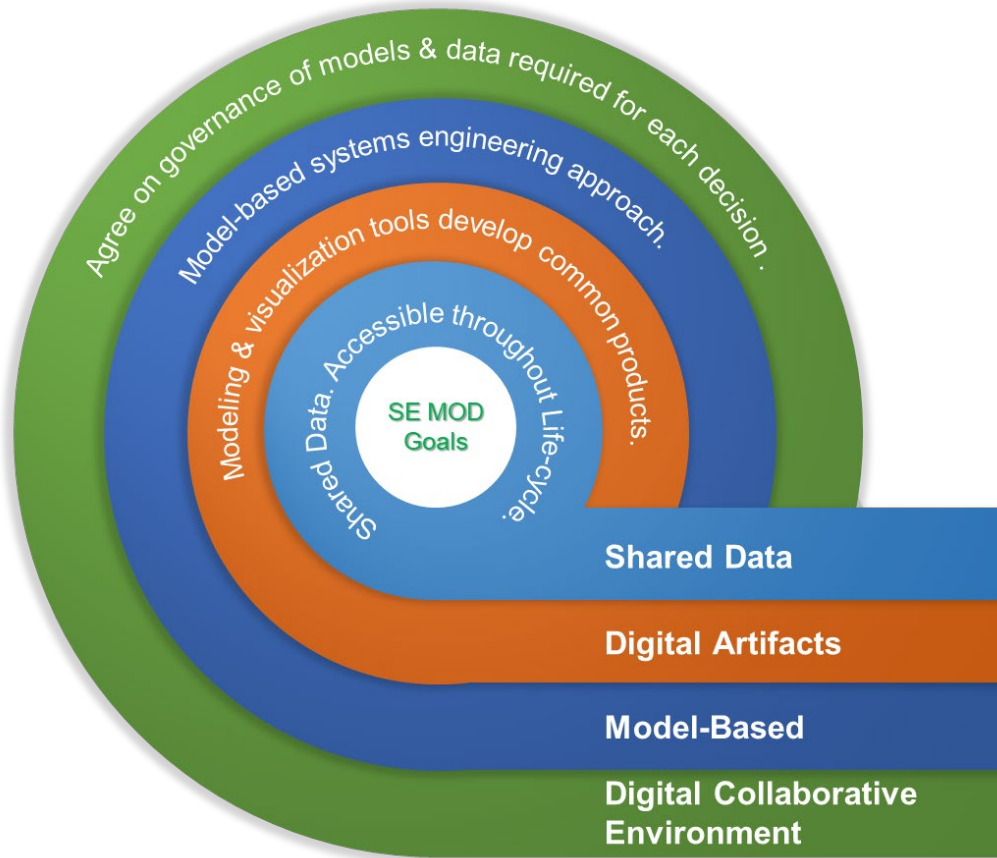


**Collaborating with Government, Industry & Academia**

**ENABLERS RESULTED FROM OUTREACH/INFORMATION SESSIONS**



# SE MODERNIZATION GOALS & LINES OF EFFORT (LOEs)



LOE 1 - SEMOD BoK & Community of Practice

LOE 2 - Policy & Guidance Review & Update

LOE 3 - Model Based Artifacts, Data Workflow

LOE 4 - Roadmaps & Framework (Iterative Mental Model)

LOE 5 - Digital Acquisition Thread Exemplar

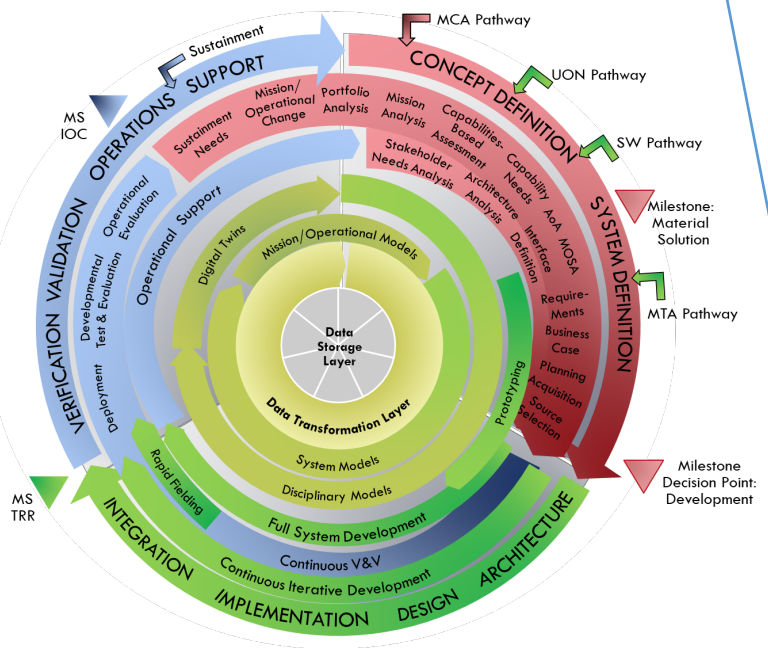
LOE 6 - Workforce: DE/SE Topic Workshops & Webinars

**“The vision of SE Modernization is to use data and models to create a more agile and responsive acquisition system that can quickly and effectively meet the needs of the warfighter.”**

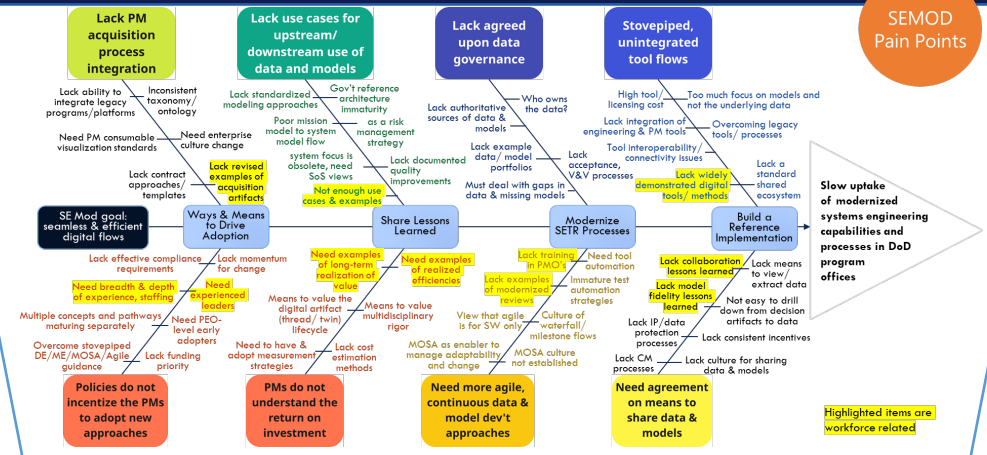


# What

We envisioned a new mental model for systems engineering in a fully digital, iterative world



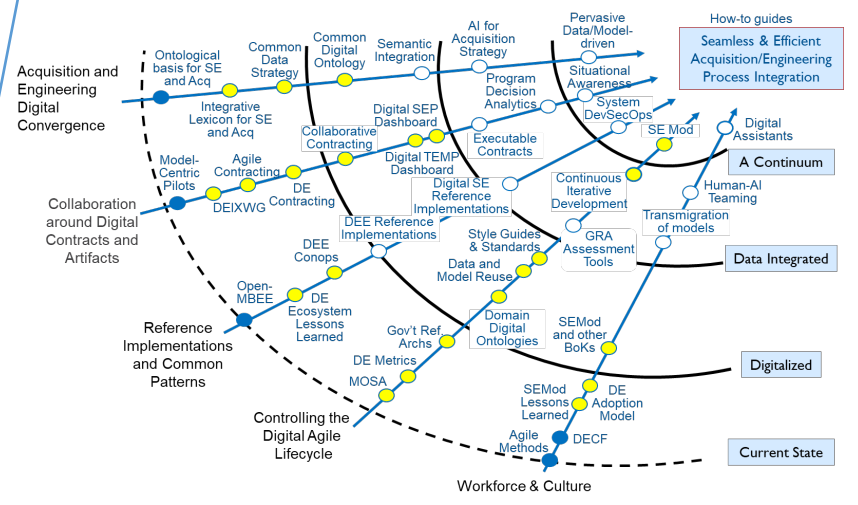
# Why



We captured a set of interrelated issues/ pain points/ challenges to implementation of this mental model

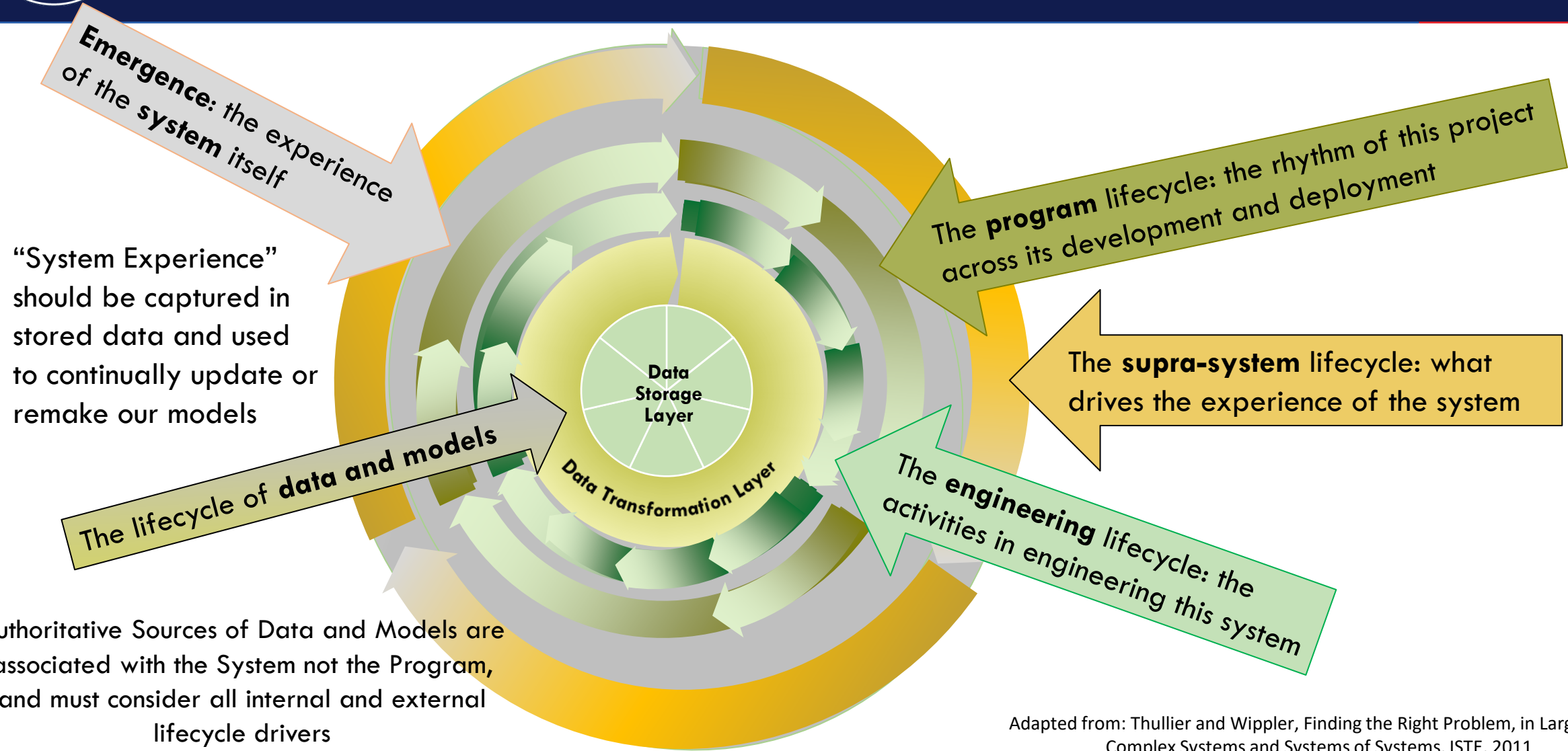
# How

We drafted a roadmap of developmental needs and recommendations to improve the uptake of modernized systems engineering





# GENERALIZATION: THE SUPRA-SYSTEM MODEL



**Emergence: the experience of the system itself**

“System Experience” should be captured in stored data and used to continually update or remake our models

**The program lifecycle: the rhythm of this project across its development and deployment**

**The supra-system lifecycle: what drives the experience of the system**

**The engineering lifecycle: the activities in engineering this system**

**The lifecycle of data and models**

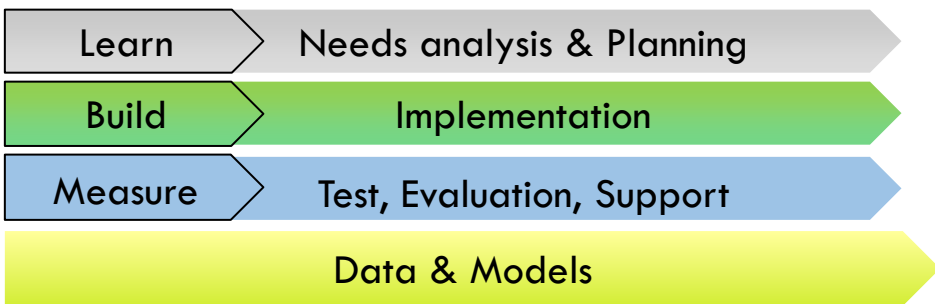
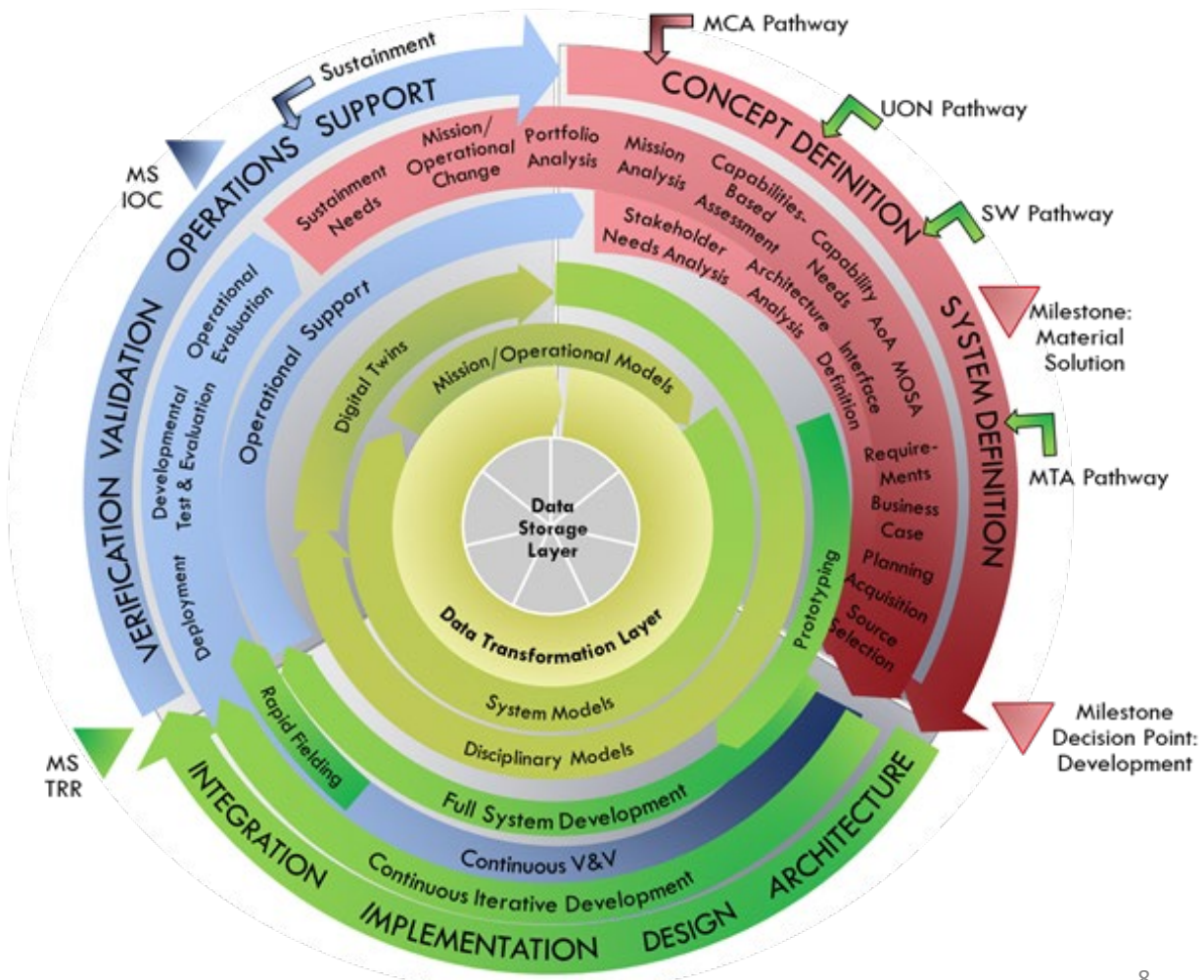
Authoritative Sources of Data and Models are associated with the System not the Program, and must consider all internal and external lifecycle drivers

Adapted from: Thullier and Wippler, Finding the Right Problem, in Large Scale Complex Systems and Systems of Systems, ISTE, 2011



# Notional VIEW: Full SE Modernization Life Cycle

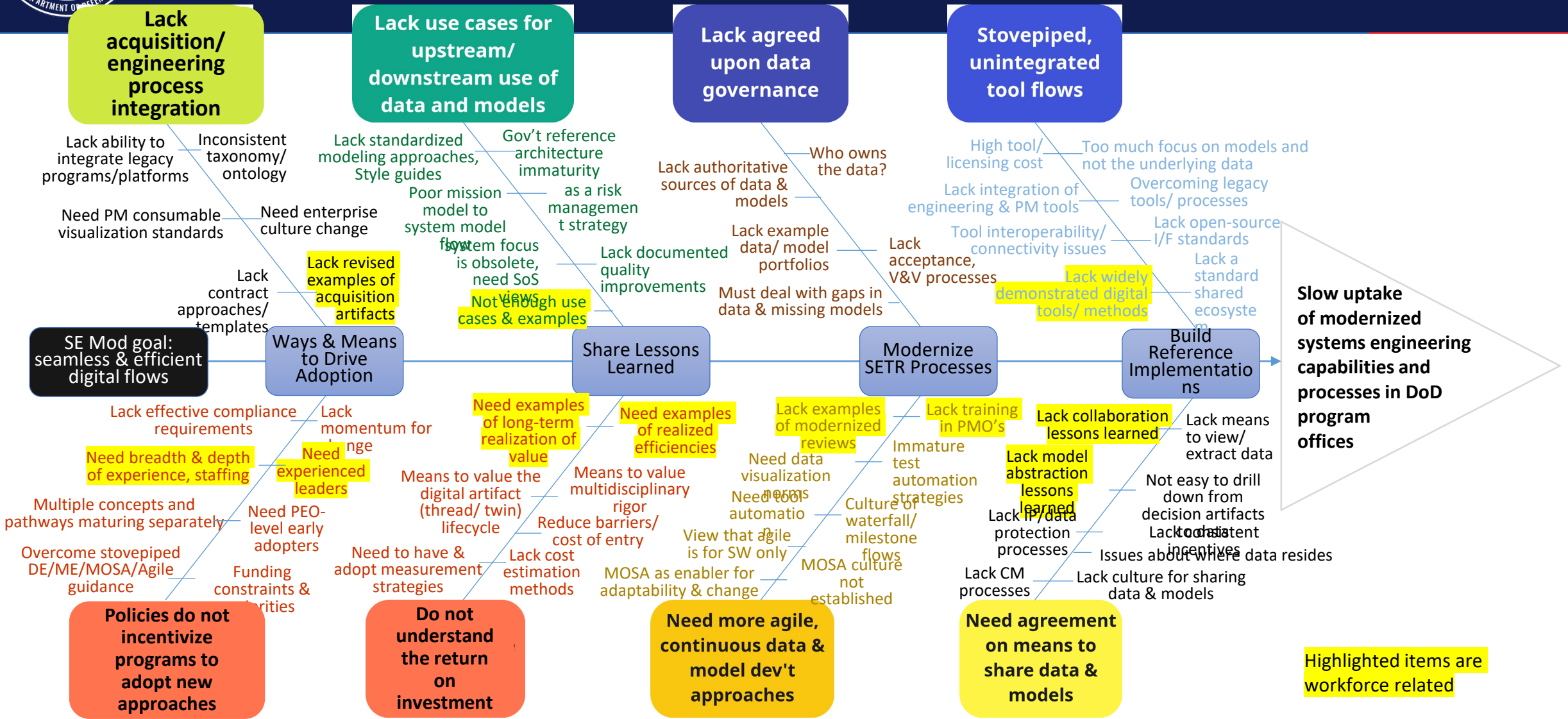
- Cyclic nature of modern SE
- Still milestone-based
- SE core principles in every Acq pathway
- Flexible system life cycle entry points:
  - Learn-Build-Measure (MCA)
  - Build-Measure-Learn (Mid-Tier, SW, UON)
  - Measure-Learn-Build (Sustainment)
- Continuous Iterative Development processes (around the circle)
- Continuous Data Management and Transformation processes (at the core)





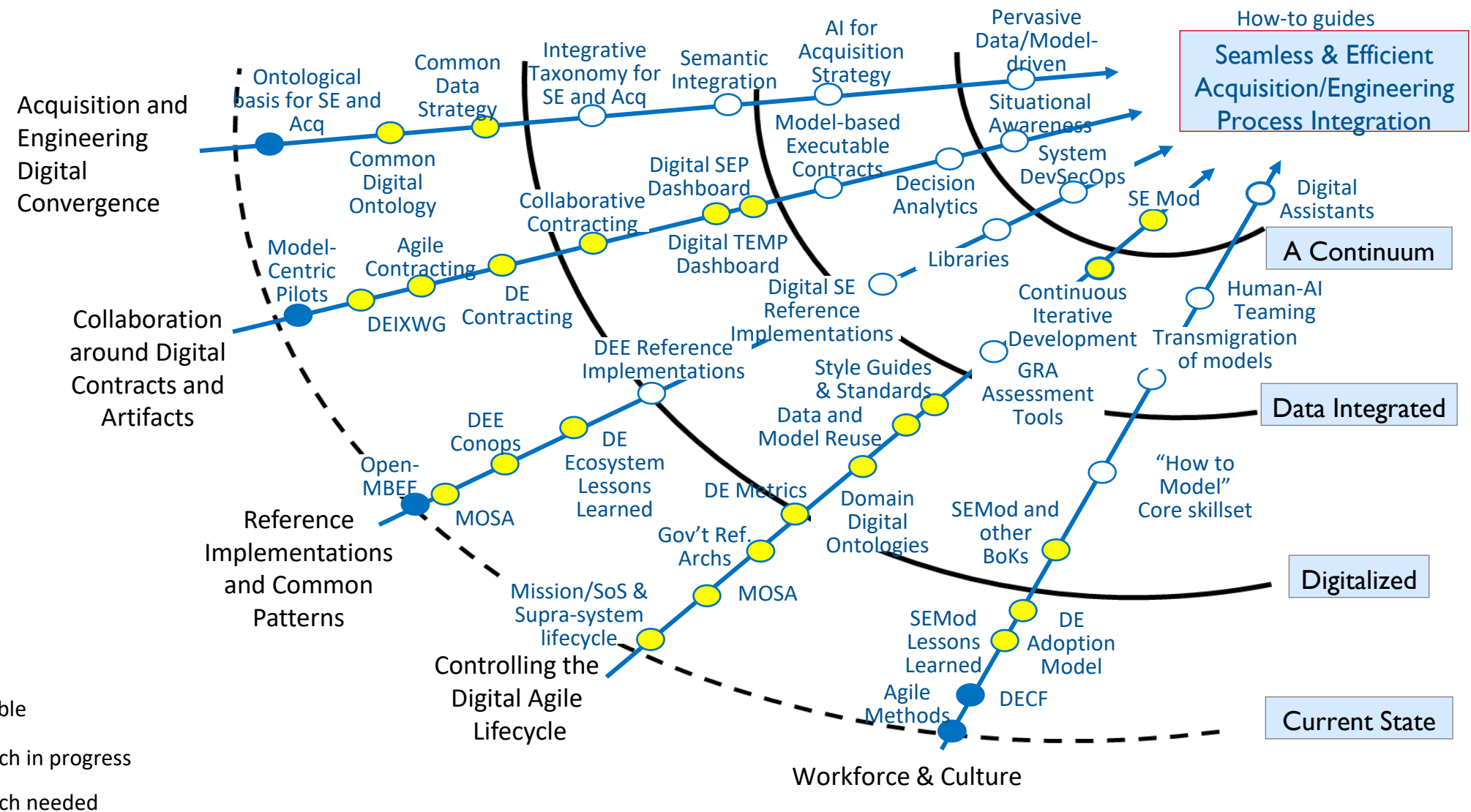


# PAIN POINTS FISHBONE





# Digital SE Modernization Roadmap





# Contact

Office of the Under Secretary of Defense for  
Research and Engineering

[osd.r-e.comm@mail.mil](mailto:osd.r-e.comm@mail.mil) | Attn: SE&A

<https://www.cto.mil>

<https://ac.cto.mil/engineering>