

Enabling Systems Engineering Technical Review (SETR) Modernization

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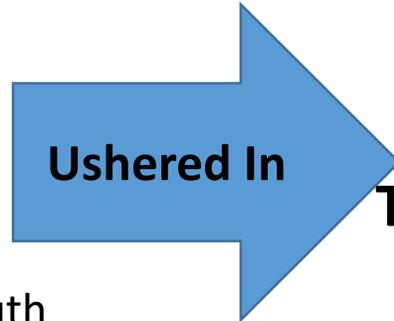




SE - DE Industry Accepted Relationships

Digital Engineering

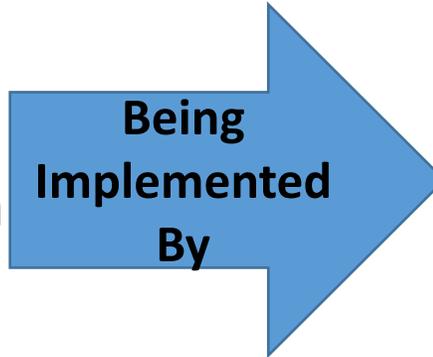
- Formalize use of models at enterprise & program to support decisions
- Authoritative Sources of Truth
- Incorp Tech Innovation
- Establish Infrastructure for collaboration
- Transform Culture & Workforce



Ushered In

Digital Transformation

...digital engineering represents a transformation of how they normally conduct systems engineering (INCOSE SEBOK)



Being Implemented By

SE Modernization

SETR Modernization

- Test Continuum
- R&M MBSE Initiatives
- Digital Contracting – MBAcq
- SWE Modernization
- Mission Engineering
- Sustainment
- ...lots of others



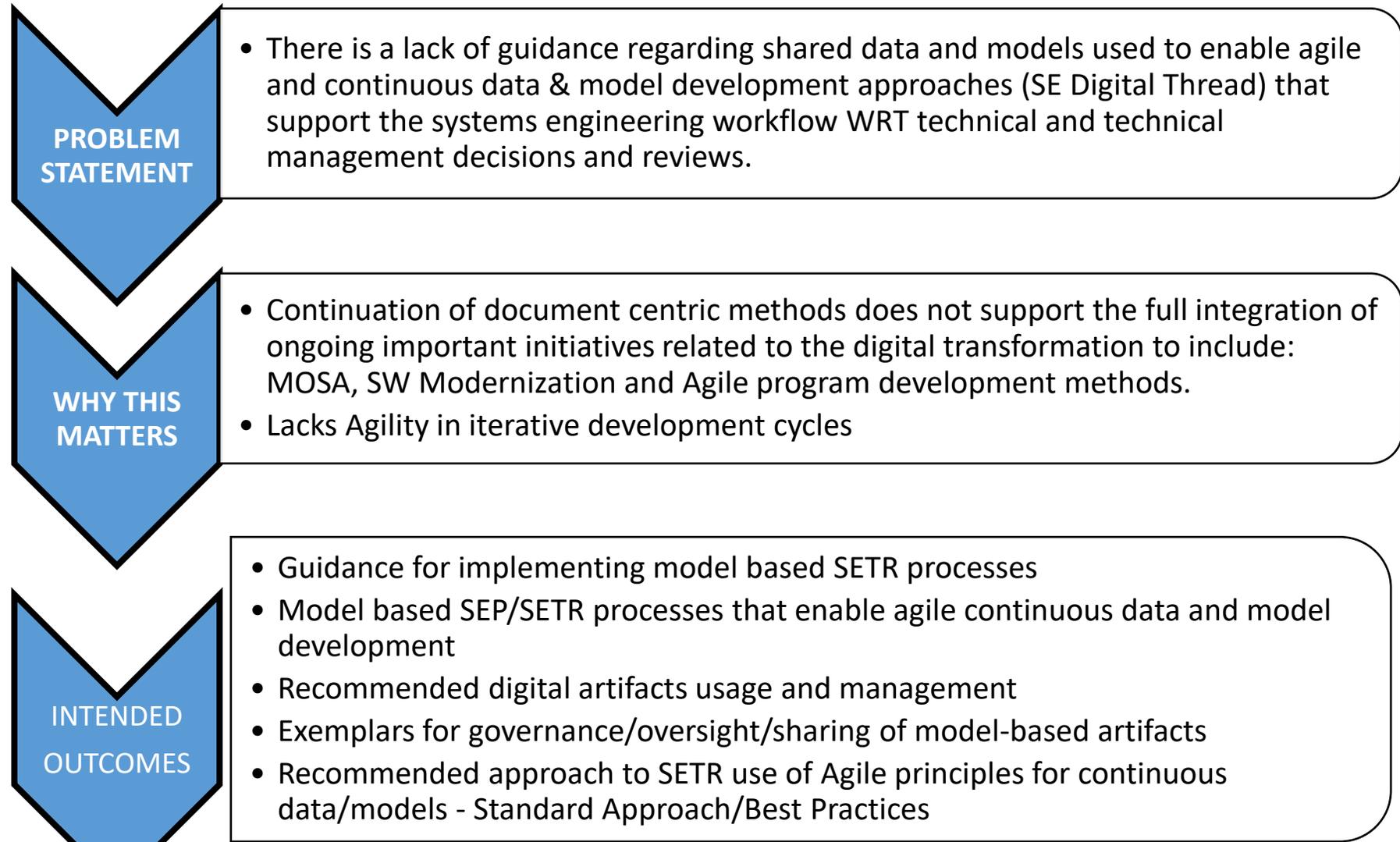
INFORM & IMPROVE

Model-based systems engineering (MBSE) is a subset of digital engineering. MBSE supports the systems engineering activities of requirements, architecture, design, verification, and validation. (INCOSE SEBOK)



SETR Modernization Abstract: Problem Statement & Outcomes

BOTTOM LINE:
Systems engineering processes remain valid, but practices and methodology need to change to take advantage of the digital transformation that supports Agile system development. (SERC, 2023)





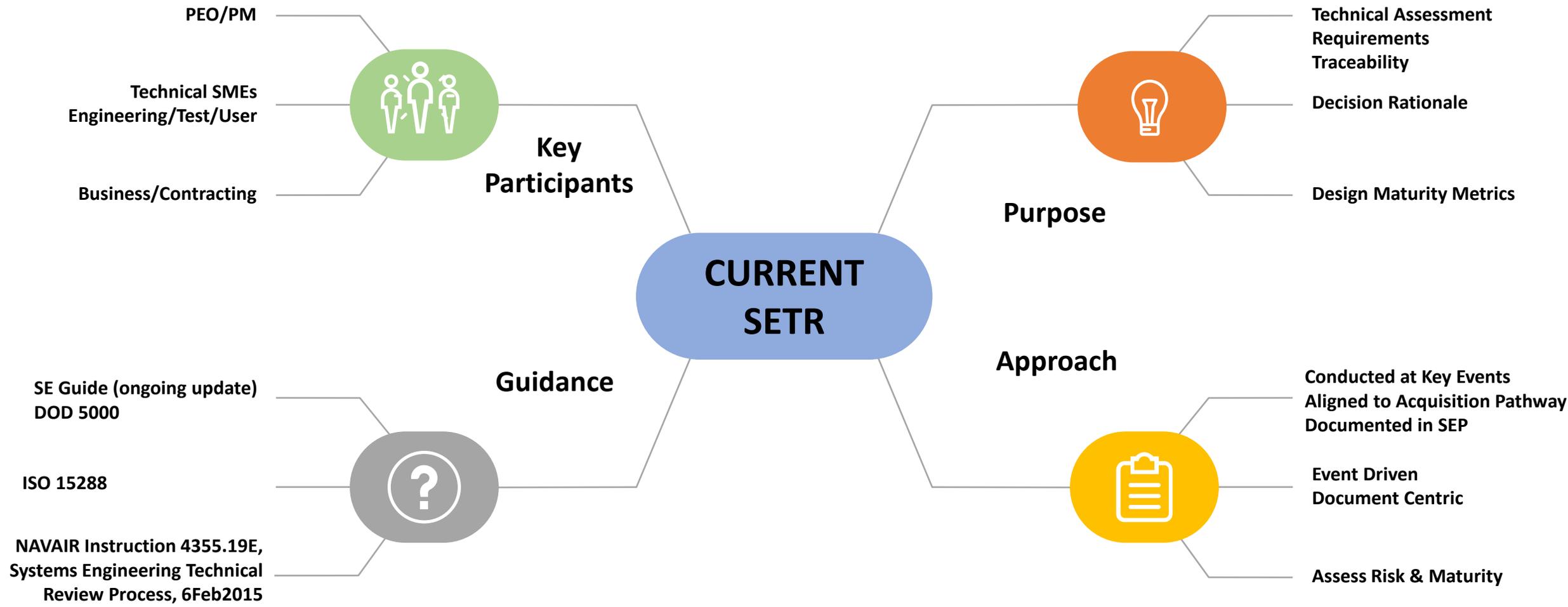
SETR Modernization: Research Questions

Table 1 - RESEARCH QUESTIONS

- (1) How do we implement the digital transformation into the current systems engineering technical review (SETR) process?
- (2) What are the key artifacts that should be modeled?
- (3) How do we share and manage model-based artifacts and the associated data during the SETR process?

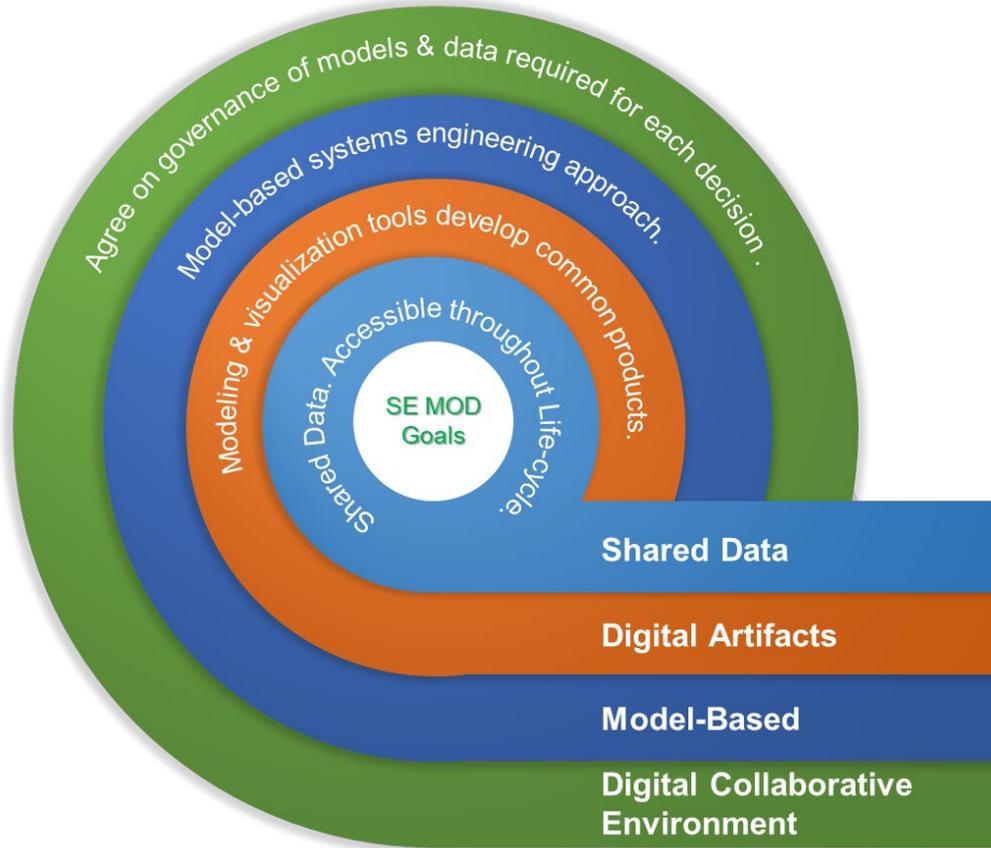


Traditional SETR





SE Modernization Goals & Lines of Effort (LOEs)



LOE 1 - SEMOD BoK*located in DEBoK
DAU COP – under update

LOE 2 - Policy & Guidance Review & Update

SETR Modernization

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.” WRT-1058 Final Technical Report: Systems Engineering (SE) Modernization

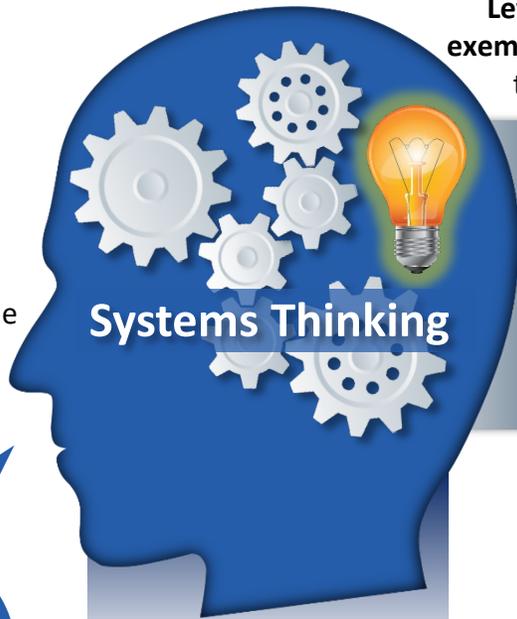


So...How Do We Enable SE Modernization?

SE Supra-System describes 3 concurrent processes:

- SE life cycle
- Data and model life cycle
- Engineering life cycle

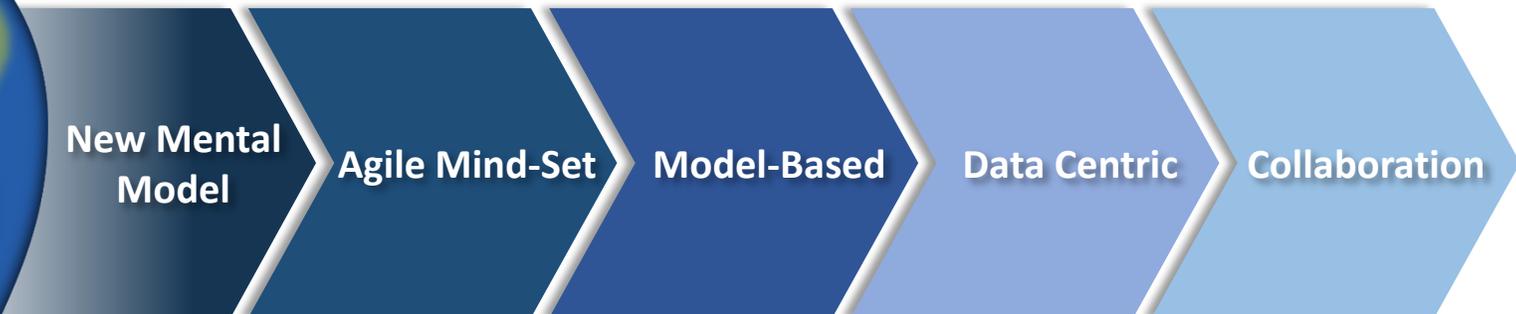
Here's How...



Systems Thinking

SE Modernization is a continuous process that is iterative with a seamless and efficient transfer of data and models.

Leverage SW Modernization as an exemplar of Agile practices – responsive to changing stakeholder needs



Iterative Approach to SE Processes with **data and models across the lifecycle**

Requires **Ontologies** to build common understanding

Exemplar Reference implementations will provide templates to help programs get started

“Knowledge needs to be liberated from the artifacts”
Dr. Steve Jenkins
JPL/NASA (Retired)

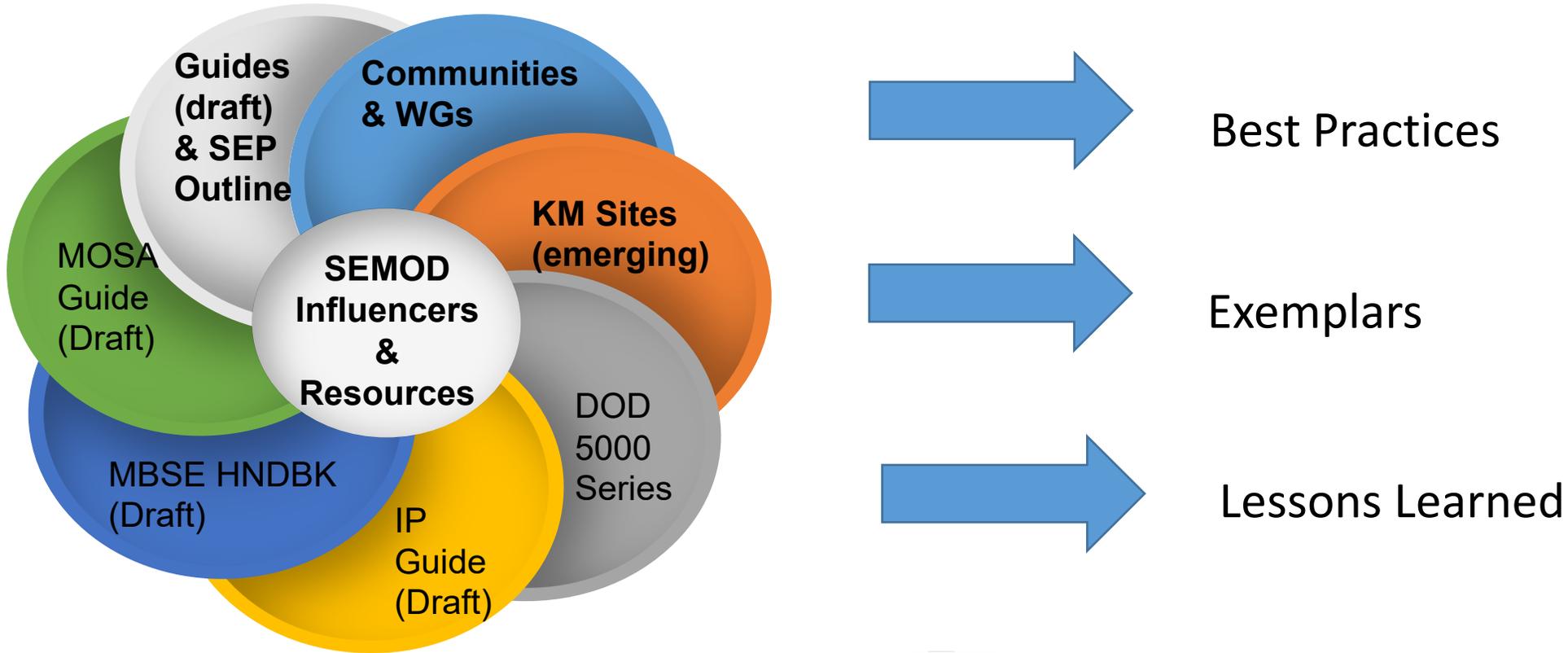


SETR Transformation Aligned to – Digital Transformation





Evolving The SE-DE Transformation Ecosystem

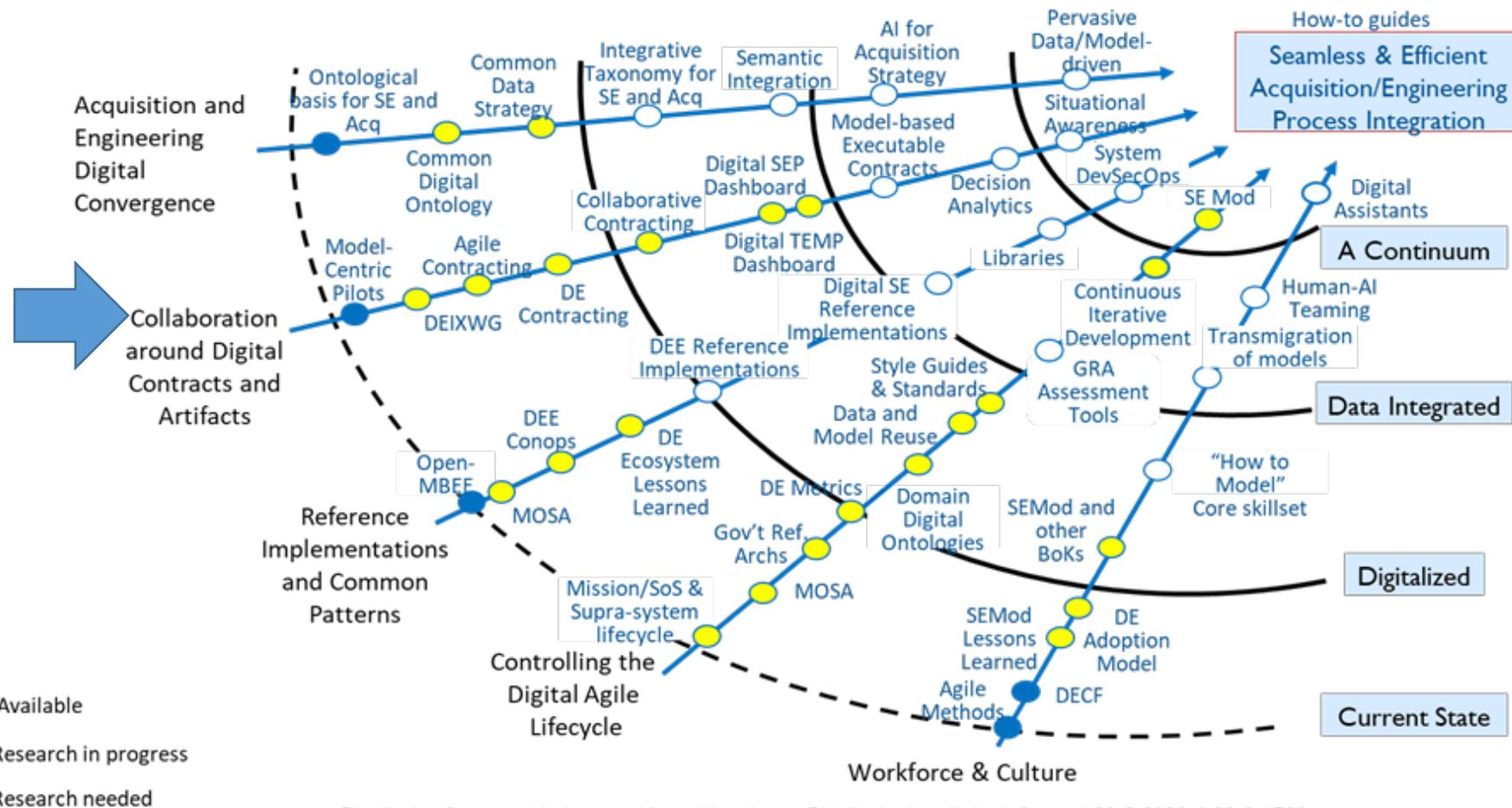


CHALLENGE: Several SE guidance documents provide “emerging content” with key information to support the **SE Workflow (SETR)** that guides the planning & execution for acquisition programs but not all are complete or mature enough to be included in guidance.



SE Modernization – Research Roadmap

Ongoing: Systems Engineering Plans (SEP) and Test and Evaluation Master Plans (TEMP) conversion to digital artifact driven formats



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Collaboration around Digital Contracts

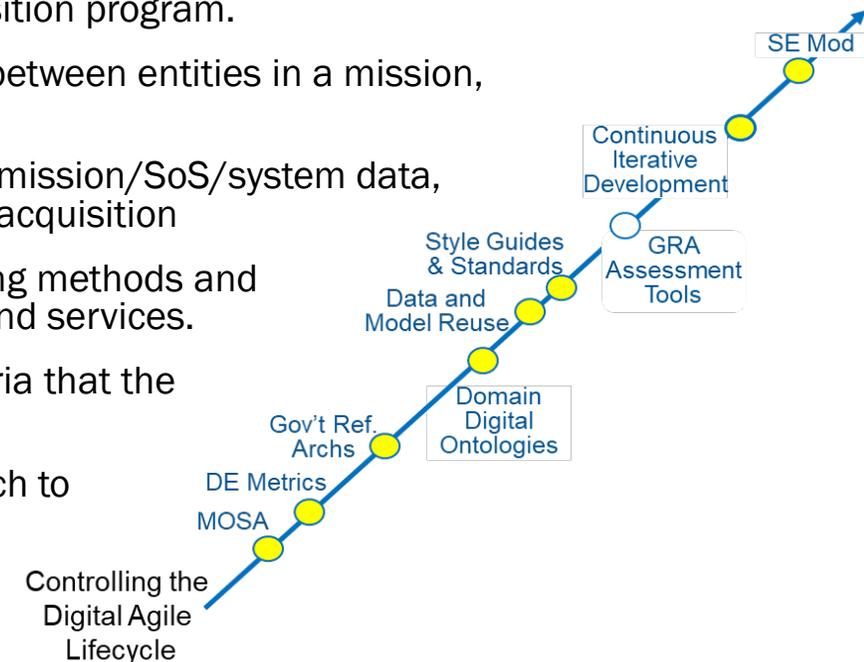
- **Model-Centric Engineering:** Demonstration pilot programs exploring the art of the possible to achieve a full set of SE and Acquisition activities 100% “in the model”
- **Digital Engineering Information Exchange Working Group (DEIXWG):** a community activity to develop a set of “common views” for executing digital, model-based engineering & technical reviews
- **Collaborative Contracting:** flexible contracting approaches for collaboration around data and models
- **SEP Dashboard:** A digital version of the Systems Engineering Plan (SEP) that provides an interactive dashboard for a program office to plan, monitor, and control the SE development process
- **TEMP Dashboard:** A digital version of the Test & Evaluation Master Plan (TEMP) that provides an interactive dashboard for a program office to plan, monitor, and control the systems integration, developmental test, and operational evaluation processes
- **Executable Contracts:** bridging the gap between current legal language and digital data exchange using declarative (outcome-based) transaction models, and software orchestration (dynamic workflows for multiple task automation)
- **Program Decision Analytic Tools:** common digital ontologies and data strategies enable development of new digital decision analysis tools using emerging artificial intelligence and visualization technologies to improve acquisition decision making
- **Program Situational Awareness:** digitally connected visualization dashboards that achieve full near real time situational awareness and measures of performance across all engineering, technical, and management activities





Controlling the Digital Agile Lifecycle

- **MOSA**: a complete government business and technical approach to manage adaptability and affordability of defense systems over time, managed at the portfolio level. Title 10 U.S.C. 2446a.(b) and 2320(e) provide a basis for better government definition and control of the systems they acquire.
- **Digital Engineering Metrics**: measuring and improving efficiency and quality of defense systems development to improve deployment, cost, and schedule outcomes.
- **Government Reference Architectures**: government developed, owned, and maintained authoritative sources of data and models that guide system design, development, production, and sustainment in an acquisition program.
- **Domain Digital Ontologies**: the digital graph of domain-specific models and relationships between entities in a mission, SoS, or system. Necessary for constructing data models underlying authoritative sources.
- **Data and Model Reuse**: development of government maintained and provided libraries of mission/SoS/system data, models, and reference architecture templates to reduce ambiguity and increase speed of acquisition
- **Style Guides and Standards for Systems Models**: guides for consistency in system modeling methods and design as well as tools to improve interoperability and reuse across programs, portfolios and services.
- **GRA Assessment Tool**: What data is needed to say a GRA is acceptable, what are the criteria that the data and models need to meet?
- **Continuous Iterative Development**: both an architecting and development process approach to manage risk by separately architecting platforms and capabilities and more frequently deploying and validating capabilities.
- **Systems Engineering Modernization (SEMod)**: evolution of SE lifecycle processes and digital tools to improve the efficiency and quality of defense systems development.



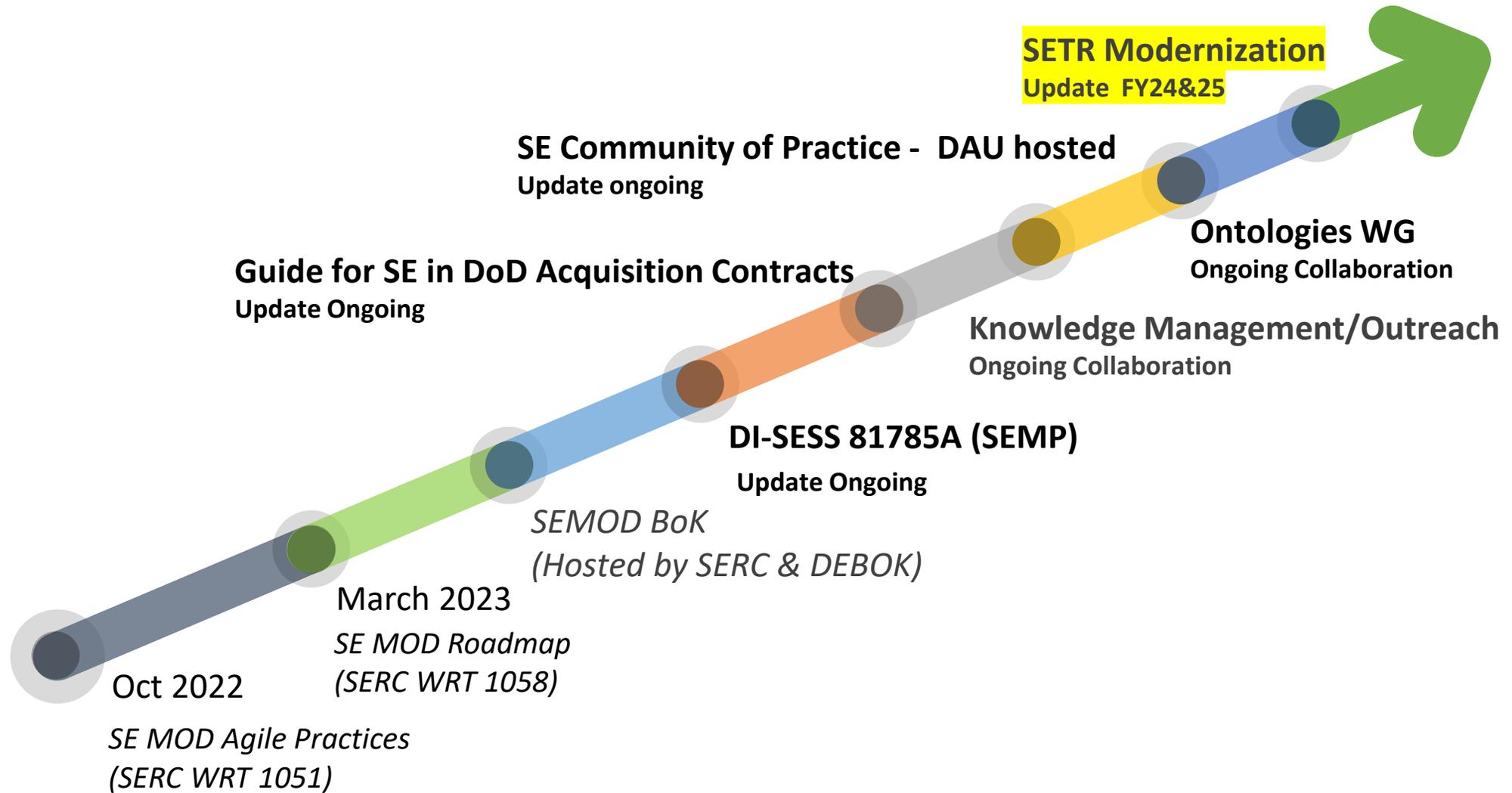


SETR Modernization – Next Steps

INTENDED OUTCOME	Ongoing Activities
Guidance for implementing model based SETR processes workflow	SE Modernization Service Modernization/Transformation
Exemplars for governance and oversight of model-based artifacts	MBTEMP, MBSEP, OMG MBAcq WG, DEM&S COP
Recommended approach to Agile and continuous data and model development to support the SETR	SERC Roadmap Research Activities SE Emerging
Recommended digital artifacts usage and management during the SETR	SERC Roadmap Research Activities, Service Use Cases, Industry Collaboration



SE Modernization Activities





Contact

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