



Digital Engineering Strategy and Implementation

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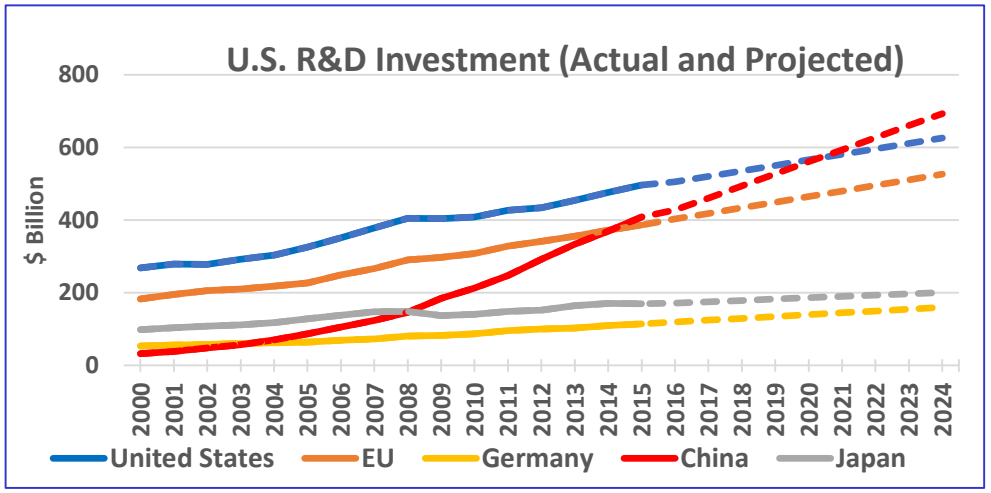
Office of the Under Secretary of Defense for Research and Engineering

National Institute of Standards and Technology
Model-Based Enterprise Summit 2019 | April 3, 2019

The World Today

Technology Is Transforming the Battlespace

- The proliferation of knowledge and technology erodes historic U.S. advantages
- Our near-peers are increasing their rate of investment in military R&D
- A hyper-competitive environment for National Security technologies
- The discriminators are speed and cycle time



- NSF 2015 data predicted R&D investment parity with China in 2020
- Feb 2018, NSB estimates China R&D investment parity with U.S. by end of 2018

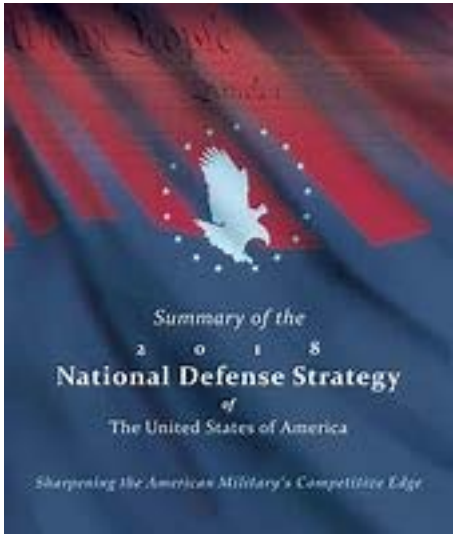
- 2017 GLOBAL R&D FUNDING FORECAST WINTER 2017 Industrial Research Institute, R&D Magazine

R&D – Research & Development
NSB – National Science Board

National Defense Strategy and Digital Engineering Strategy

Reform the Department for Greater Performance and Affordability:

- The current bureaucratic approach, centered on exacting thoroughness and minimizing risk above all else, is proving to be increasingly unresponsive. We must transition to a culture of performance where results and accountability matter



Our Response:

- to prioritize speed of delivery, continuous adaptation, and frequent modular upgrades.

Objective:

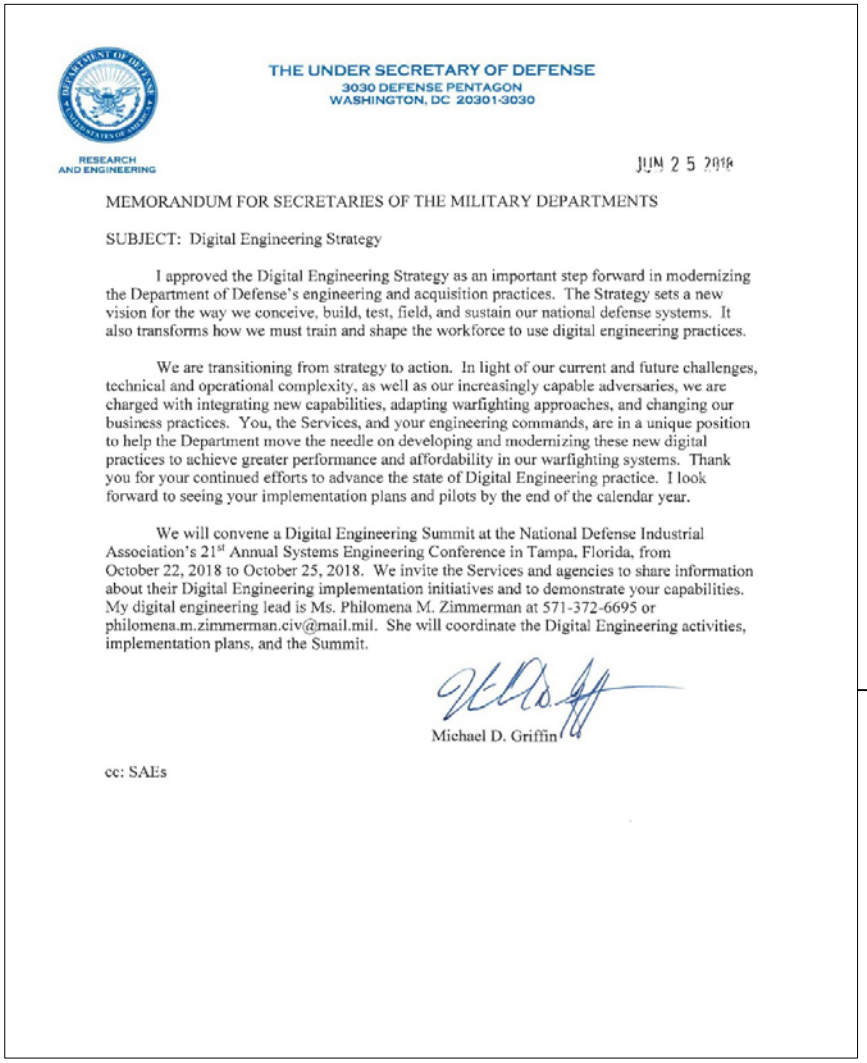
- Guide the planning, development, and implementation of digital engineering across the services and agencies

Expected Impact

- Increase technical cohesion and awareness of system in lifecycle activities
- Reform the Department's business practices for greater performance and agility

https://www.acq.osd.mil/se/initiatives/init_de.html

Digital Engineering to Service Secretaries and DEPSECDEF



THE UNDER SECRETARY OF DEFENSE
3030 DEFENSE PENTAGON
WASHINGTON, DC 20301-3030

RESEARCH AND ENGINEERING

JUN 25 2018

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS

SUBJECT: Digital Engineering Strategy

I approved the Digital Engineering Strategy as an important step forward in modernizing the Department of Defense's engineering and acquisition practices. The Strategy sets a new vision for the way we conceive, build, test, field, and sustain our national defense systems. It also transforms how we must train and shape the workforce to use digital engineering practices.

We are transitioning from strategy to action. In light of our current and future challenges, technical and operational complexity, as well as our increasingly capable adversaries, we are charged with integrating new capabilities, adapting warfighting approaches, and changing our business practices. You, the Services, and your engineering commands, are in a unique position to help the Department move the needle on developing and modernizing these new digital practices to achieve greater performance and affordability in our warfighting systems. Thank you for your continued efforts to advance the state of Digital Engineering practice. I look forward to seeing your implementation plans and pilots by the end of the calendar year.

We will convene a Digital Engineering Summit at the National Defense Industrial Association's 21st Annual Systems Engineering Conference in Tampa, Florida, from October 22, 2018 to October 25, 2018. We invite the Services and agencies to share information about their Digital Engineering implementation initiatives and to demonstrate your capabilities. My digital engineering lead is Ms. Philomena M. Zimmerman at 571-372-6695 or philomena.m.zimmerman.civ@mail.mil. She will coordinate the Digital Engineering activities, implementation plans, and the Summit.

Michael D. Griffin

cc: SAEs

*"The strategy **sets a new vision** for the way we conceive, build, test, field, and sustain our national defense systems."*

*"It also **transforms how we** must train and **shape the workforce** to use digital engineering practices…"*

*"We will convene a **Digital Engineering Summit**…"*

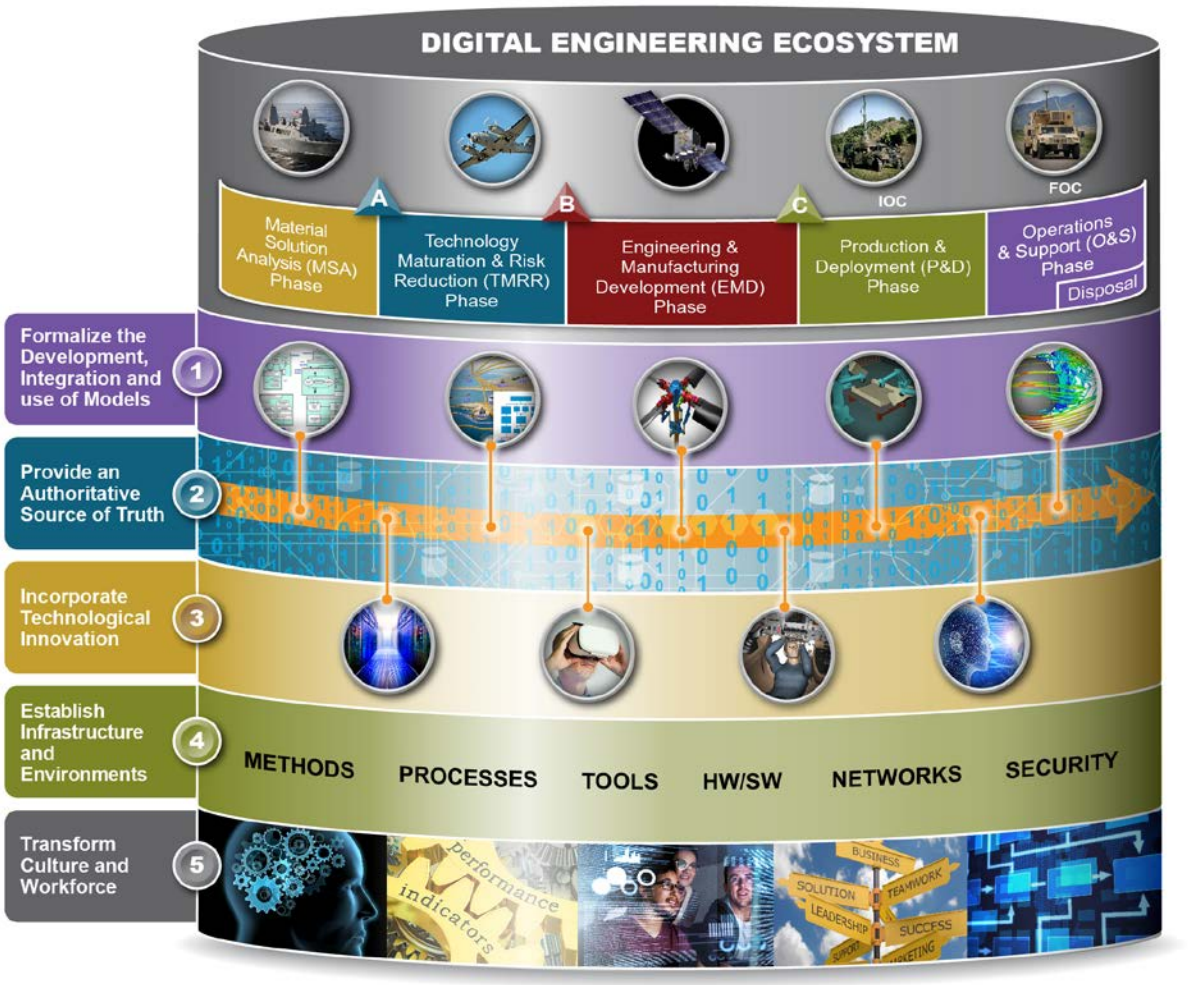
*"We **invite the Services and Agencies to share** their Digital Engineering Implementation initiatives…"*

Separate memo to DEPSECDEF:

"I expect the first implementation plans from each Service by end of December 2018"

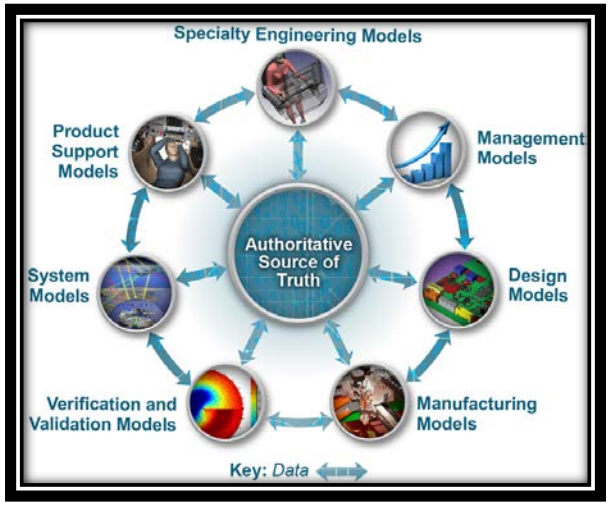
Digital Engineering Overview

- **What is Digital Engineering?**
  - Combines model-based techniques, digital practices, and computing infrastructure
  - Enables delivery of high pay off solutions to the warfighter at the speed of relevance
- **Reforms Business Practices**
  - Digital enterprise connects people, processes, data, and capabilities
  - Improves technical, contract, and business practices through an authoritative source of truth and digital artifacts



Modernizes how we design, operate, and sustain capabilities to outpace our adversaries

Goal 1: Formalize the development, integration, and use of models to inform enterprise decision making



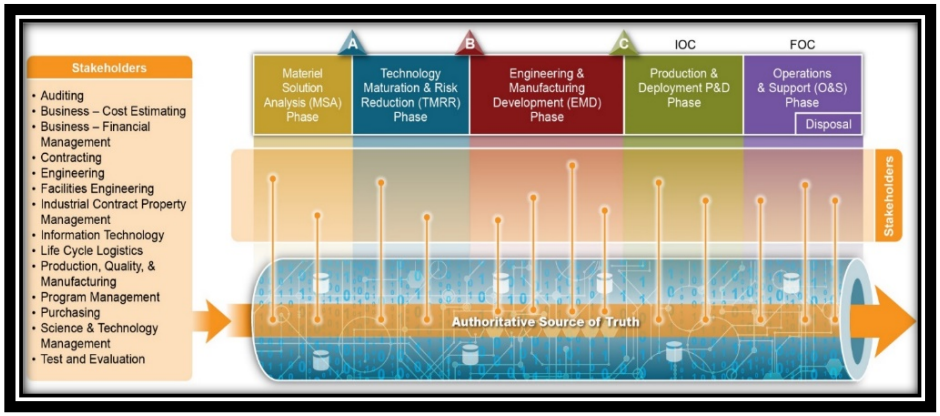
Challenges

Topic	Short Description
Model Integration	Models are not developed or used across domains, acquisition phases, and programs.
Model Curation	Models are not curated such that information can be preserved, discovered and used across the lifecycle.
Model Credibility	Traditional VV&A approaches do not account for model credibility and trust in the digital age.

Focus Areas:

1. Formalize the planning for models to support engineering activities and decision making across the lifecycle
2. Formally develop, integrate, and curate models
3. Use models to support engineering activities and decision making across the lifecycle

Goal 2: Provide an enduring authoritative source of truth



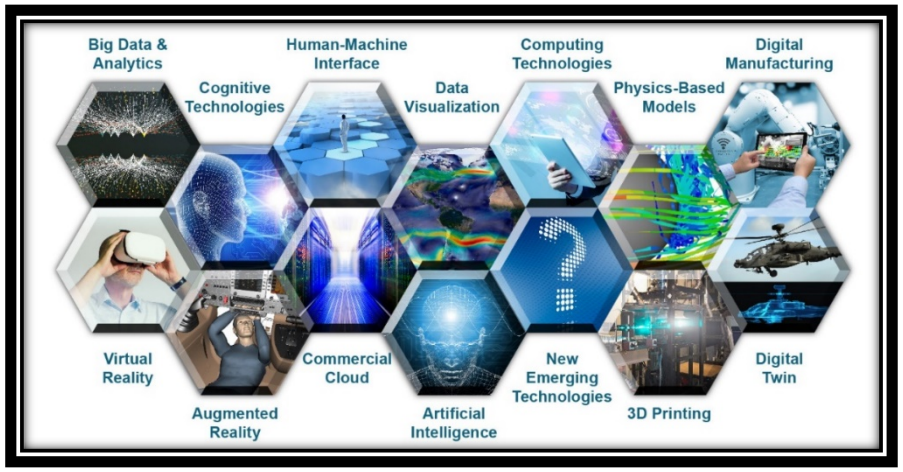
Challenges

Topic	Short Description
Authoritative Data	Vast amounts of data are scattered across multiple stove-piped systems and organizations in various forms
Governance	Managing and controlling data sources are fragmented or ad hoc
Digital Artifacts	Exchanging digital artifacts in a document-based culture

Focus Areas

1. Plan and develop the authoritative source of truth
2. Govern the authoritative source of truth
3. Use the authoritative source of truth across the lifecycle

Goal 3: Incorporate technological innovation to improve the engineering practice



Focus Areas

1. **Establish an end-to-end digital engineering enterprise**
2. **Use technological innovations to improve the digital engineering practice**

Challenges

Topic	Short Description
End-to-End Solutions	Digital engineering activities are disjointed across the lifecycle
Engineering Practice Innovation	Transforming the way engineers leverage technology to be responsive to change

Goal 4: Establish a supporting infrastructure and environments to perform activities, collaborate, and communicate across stakeholders

Focus Areas

1. Develop, mature and use digital engineering IT infrastructures
2. Develop, mature, and use digital engineering methodologies
3. Secure IT infrastructure and protect intellectual property

Challenges

Topic	Short Description
IP & Critical Technology Protection	Limited strategies for protecting and securing the integrity of classified and proprietary digital data
IT Infrastructure	IT infrastructures not designed for complex digital model-based engineering activities
Methods, Tools, & Processes	Current methods process and tools do not holistically support the digital engineering activities

Goal 5: Transform the culture and workforce to adopt and support digital engineering across the lifecycle

Focus Areas

1. Improve the digital engineering knowledge base
2. Lead and support digital engineering transformation efforts
3. Build and prepare the workforce

Challenges

Topic	Short Description
Workforce Skills Training	Limited incentives workforce skills, insufficient training capacity and resources to meet the demand
Policy, Guidance, & Standards	Limited policies, guidance, and standards to comprehensively address digital engineering activities
Metrics	Lack of a common set of metrics that serve as leading indicators of adoption and effectiveness

Digital Engineering Way Ahead

Collaborators/Partnerships

- Armed Services
- DoD Components
- Interagency
- Industry/OEMs/ Industrial Orgs
- Academic

Strategy & Service Plans

Outlines DoD's five strategic goals for Digital Engineering initiatives

Service Implementation Plans

Next Steps

- Regular monitoring of Service Implementation Plans by USD(R&E)/AC leadership
- Service, Industry, Academic, and Standards organization collaborations to further the Digital Engineering implementations
- Address challenges
- INCOSE/NDIA Digital Engineering Information Exchange Working Group to advance concepts
- Research areas initiating in curation and credibility

Implementing Digital Engineering Across the Department

DoD Research and Engineering Enterprise

Solving Problems Today – Designing Solutions for Tomorrow










DoD Research and Engineering Enterprise
https://www.acq.osd.mil/chieftechnologist/

Defense Innovation Marketplace
https://defenseinnovationmarketplace.dtic.mil

Twitter
@DoDInnovation

For Additional Information

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Digital Strategy Goals and Focus Areas

Digital Engineering (DE) Vision:
Modernizes how the Department conceives, builds, tests, fields, and sustains our national defense systems.

	1	2	3	4	5	
GOALS	Formalize the development, integration, and use of models to inform enterprise and program decision making	Provide an enduring, authoritative source of truth	Incorporate technological innovation to improve the engineering practice	Establish a supporting infrastructure and environments to perform activities, collaborate, and communicate across stakeholders	Transform the culture and workforce to adopt and support digital engineering across the lifecycle	GOALS
FOCUS AREAS	Formalize the planning for models to support engineering activities and decision making across the lifecycle	Plan and develop the authoritative source of truth	Establish an end-to-end digital engineering enterprise	Develop, mature, and use digital engineering IT infrastructures	Improve the digital engineering knowledge base	FOCUS AREAS
	Formally develop, integrate, and curate models	Govern the authoritative source of truth	Use technological innovations to improve the digital engineering practice	Develop, mature, and use digital engineering methodologies	Lead and support digital engineering transformation efforts	
	Use models to support engineering activities and decision making across the lifecycle	Use the authoritative source of truth across the lifecycle		Secure IT infrastructure and protect intellectual property	Build and prepare the workforce	
MEANS	METHODS, PROCESSES, TOOLS, TECHNOLOGY, DATA, PEOPLE					MEANS

Challenges

- **Identified cross-Service Challenges for each DE Strategy Goal**
  - Working with Services to develop way ahead to address challenges