



Over the last two years, DoD has issued additional guidance on its digital engineering (DE) policy, and other authoritative sources provided examples of best practices. These focus on requirements best practices, integrated hardware-software, Operational Test and Evaluation (OT&E), program management (PM) competencies, and digital acquisition. To review DoD's DE basic policy prior to the issuances in 2023 and December 2024, see my article in the *May-June 2022 issue of Defense Acquisition magazine*.

When the Air Force announced the contract award for the F-47 Next Generation Air Dominance Platform on March 21, 2025, it stated, "By leveraging cutting-edge DE techniques and government-owned architecture, the F-47 benefits from a streamlined and accelerated development timeline compared to previous fighter programs."

DoD on Dec. 21, 2023, provided up-to-date advice for program managers

(PMs) to leverage DE techniques with the best practices for systems engineering and project management.

DoD's policy. The department's overarching DE policy was established in DoD Instruction 5000.97. DoD is to use DE methodologies, technologies, and practices in supporting "a comprehensive engineering program for defense systems." DoD mandates incorporation of DE for all new programs (with some

exceptions); directs components to use DE practices in requirements, cost, business, and sustainment; and calls for replacing documents with the use of digital models as the primary means of communicating system information.

Requirements best practices. The *DoD Guide—Software Engineering for Continuous Delivery of Warfighting Capability* April 2023, provides guidance on the qualities and components of requirements

Program Management THROUGH DIGITAL ENGINEERING Updated

by PAUL SOLOMON

and the need to use automated tools for requirements traceability and tracking. Per Software Engineering (SWE), requirements are unambiguous, testable, consistent, and precise. Also, SWE provides guidance to track and prioritize requirements (Product Backlog) using automated tools that integrate with the development pipeline to provide traceability.

The following are best practices regarding requirements traceability and metric SWE:

- Develop a product roadmap that is traceable to the product vision, required capabilities, and to the product backlog.
- Define epics and features for the Minimum Viable Product (MVP) or upcoming release.
- Incorporate requirements as test cases into automated test suites.

- Map all test procedures to requirements.
- Develop software metrics that are consequential (connected to a program, project, or software development outcome).
- Develop technical measures of mission effectiveness to augment the software process metrics.
- Use function-related metrics involving function points (not story points).

Test and Evaluation

The Office of the Director of Test and Evaluation (OT&E) issued **DoDI 5000.98 OT&E and Live Fire T&E**, Dec. 9, 2024, requiring that the PM leverage mission engineering, DE, digital twins, and SMART (in a digital format, as defined later in this article.). The PM is also required to participate in

developing system requirements confirmed as measurable, testable, justifiable, achievable, and relevant to the operational mission.

On Dec. 9, 2024, OT&E also issued **DoD Manual 5000.100 T&E Master Plans and T&E Strategies (5000.100)** covering the Acquisition Program Baseline, a description of both the hardware and software-enabled features, technical performance requirements, and timelines related to delivery of test assets and development (Verification, Validation and Accreditation) [VV&A]) of critical test enablers). Excerpts are in Table 1.

SMART. The Project Management Institute's *Project Management Body of Knowledge—Seventh Edition (PMBOK®)* provides additional information on "SMART." Per PMBOK®, characteristics of SMART criteria

include *Specific* (as to what to measure), *Meaningful* (tied to the business case, baselines, or requirements), *Achievable*, *Relevant* (should provide value and allow for actionable information), and *Timely*.

Report of the Defense Science Board (DSB) Task Force on T&E. The DSB was asked to examine DoD and commercial approaches to T&E and recommend ways to improve test outcomes and efficiencies. The following actions were recommended in its report:

- Incorporate testability requirements in components, subsystems, and systems to speed evidence accrual.
- Develop approaches to report system status and data to enable feedback for improving system performance.
- Plan for structured evidence accrual during development and testing to validate performance.
- Capture data systematically across the life cycle, including evidence of cost, schedule, performance, and agility of model-based systems engineering (MBSE).

DoD 2024 PM functional competencies. PMs now must be competent in DE. Approved competencies are used as the basis to develop learning objectives for PM courses. In the DoD PM Functional Competencies are considered the core knowledge, capabilities and practices associated with formulating, planning, implementing, managing, tracking, and evaluating projects or programs and their associated requirements and risks, ranging from small one-time projects to major system-of-system programs.

The DE competency was added in December 2024, with the following details: Understand DE tools, methodologies, and standards to enhance system design, integration, and verification. It includes the subcompetency of developing a foundational understanding of how a digital twin or model can reduce costs, improve schedules, enhance performance, and

Table 1. DoD Manual 5000.100 Supports Digital Engineering

Topic	Excerpts
Technical Baseline Requirements	Acquisition Program Baseline: States the threshold and objective values for the cost, schedule, and performance requirements for a program.
Requirements	• Describe the DoD system design with a focus on those features that would affect the test design or scope. Such features include both hardware (e.g., subcomponents, components, and subsystems) and software (e.g., architecture, supply chain components, system and user interfaces, and security levels) for the planned increments. Include survivability enhancement features. • Describe software-enabled features of the system, including control systems, databases, algorithms, system boundaries, and any autonomous or Artificial Intelligence-enabled or capabilities.
Technical Performance	Identify the technical and operational performance requirements (e.g., key performance parameters, key system attributes, survivability requirements) as determined by the user. Reference requirements and concept of operations documents.
Automated Schedule Status VV&A	• Display a schedule that includes timelines relative to acquisition and program decisions and associated T&E plans, and reporting requirements to support those decisions, in alignment with the integrated decision support key. Include timelines related to delivery of test assets and the development and VV&A of critical test enablers (e.g., threats). • Ensure sufficient time between test periods and between modeling and simulation (M&S) events to allow for corrections of deficiencies. • List all required certifications and dates. The certifications are entrance criteria or requirements to support acquisition decisions.

support the testing and integration of weapon systems.

The topic, Digital Literacy, was also added to Engineering Management. This included the subcompetencies of understanding the following:

1. The process of Agile software development and the application to acquisition programs.
2. How to develop, integrate, and maintain software systems using best practices in Systems Engineering (SE) and align software development efforts with broad-

er program objectives. These best practices and guidance items are pertinent to digital literacy.

Data, analytics, and artificial intelligence (AI). The best practices and sources of truth cited support the DoD Data, Analytics, and AI Adoption Strategy (Data Strategy). Per Data Strategy, Agile, user-focused, product-centric development and experimenting with minimum viable products are essential. An agile approach emphasizes speed of delivery, prioritizing outcomes over processes,

and adapting best practices from non-traditional partners. Outcomes-based performance indicators will be established, refined, and monitored. Measures are supported by authoritative data sources and maximize the use of automated data collection methods for efficient performance monitoring.

Digital Acquisition. Recent publications provide a bird's-eye view of software-intensive weapon systems and digital acquisition.

The Atlantic Council Commission on Software Defined Warfare was founded to digitally transform the armed forces for success in future battlefields. The commission's final report advises the following: "Policies should delineate hardware and software requirements and enable each to operate on separate timelines and processes" and "use integrated hardware-software testing, DE, modeling, and simulation to verify desired system performance."

DE is an element of digital acquisition. As stated in a report by the Greg and Camille Baroni Center for Government Contracting and the National Defense Industrial Association, *From Breakthroughs to the Battlefield: Best Practices for Tapping into the Power of Prototyping (Baroni)*, digital acquisition is much more

“Outcomes-based performance indicators will be established, refined, and monitored.”

than just DE, technical data management, modeling, and simulation. It encompasses requirements and resourcing, continues through contracting to program management, and lives on in sustainment. Digital acquisition even supports audit compliance and ties together all acquisition and prototyping reform.

Deputy Secretary of Defense Stephen Feinberg commented on the transformation to digital acquisition at his Feb. 25, 2025, confirmation hearing: "It's my understanding that AI, digital twin technology, and MBSE significantly enhance the department's T&E approaches and decision-making. Advancements in these technologies lead to faster product development and reduced costs, ultimately supporting improved acquisition decisions and outcomes, even into sustainment."

B-2 Success Story. My 2022 article included a B-2 program success story. Schedule performance was

based on the status of engineering artifacts in the requirements traceability matrix. Performance-based metrics helped make the B-2 a very successful program and demonstrated how to measure progress of SE requirements management, traceability, and verification. For more background information see the May 2006 article, "Practical Performance Based Earned Value," in *CrossTalk, The Journal of Defense Software Engineering*. In a recent memorandum, Secretary of Defense Pete Hegseth gave this directive: "Implement performance-based contracting to reduce waste."

I hope that the effective SE and PM practices used in 2002 are incorporated into the DE ecosystem for the B-21 and F-47 programs.

SOLOMON received the David Packard Excellence in Acquisition Award in 1998 for his participation on the Integrated Management Joint Team that developed the first earned value management system standard. He also received a letter of appreciation from Sen. John McCain for his "continued efforts in working to improve our acquisitions process."

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Airmen assigned to the 509th Bomb Wing gather near a B-2 Spirit to greet aircrew members at Whiteman Air Force Base, Mo., May 9, 2025. The aircrew members returned from deployment to Diego Garcia, British Indian Ocean Territory.

Source: U.S. Air Force photo by Staff Sgt. Joshua Hastings



DAU Resources

- DAU Brings Digital Engineering/ Digital Acquisition to Workforce (online article)
- Let's Get Digital (webinar series)
- Project/Program Management Fundamentals Handbook