



ACQUISITION INNOVATION
RESEARCH CENTER

Mission-Aware Integrated Digital Transformation for Operational Advantage

EXECUTIVE SUMMARY
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EXECUTIVE SUMMARY

The Department of Defense (DoD) is undergoing a digital transformation to enhance defense capabilities through advanced technologies and streamlined lifecycle management. Key initiatives include adopting model-based definitions and incorporating a system-of-systems (SoS) portfolio-centric approach, along with integrating digital twin technology. Advanced simulation capabilities and decentralized production, facilitated by recent advancements in additive manufacturing, play a central role in optimizing defense system management. These efforts are critical for fostering collaboration across defense sectors, strengthening digital infrastructure, and accelerating innovation in manufacturing processes, all essential for maintaining technological superiority amidst global security challenges.

This report delves into various aspects of the DoD's digital transformation in defense acquisition and operational readiness. The report examines lessons learned and opportunities identified from ongoing digitalization efforts within the DoD, drawing insights from collaborative initiatives between the Purdue-Texas A&M team and DoD representatives. The report highlights the challenges of utilizing digital models and data to make rapid operational decisions. Specifically, the current Technical Data Package (TDP) standard, as described in Military Standard-31000 (MIL-STD-31000), is geared towards supporting routine sustainment activities but is limited in flexibility to support new missions that require adaptation of the military capabilities.

Based on the findings, the report identifies three research gaps: 1. cost-data decoupling, 2. comprehensive TDP coverage throughout the acquisition lifecycle, and 3. overarching directions for defense acquisition research. The report proposes targeted recommendations for these areas. First, it suggests integrating data alongside cost considerations early in the defense acquisition phase to optimize costs and data acquisition. Second, the report recommends enhancing TDPs by introducing Level 4 to cover operations, emphasizing agile decision-making in operational scenarios and sustainment. A practical example of a metamodel for a ground vehicle demonstrates the benefits of enhanced TDPs in defense acquisition contexts. Third, the report advocates advancing defense acquisition with robust data standards like MIL-STD-31000 and leveraging technologies such as digital twins and additive manufacturing. Emphasizing interoperability, agile decision-making, and cybersecurity, the report urges the adoption of agile acquisition methodologies and integration within a cohesive digital engineering framework.

These recommendations aim to optimize efficiency, support decentralized manufacturing, enhance readiness, and reduce lifecycle costs. Defense organizations can achieve greater interoperability and faster decision-making capabilities by integrating agile acquisition methodologies and leveraging robust data standards such as MIL-STD-31000, along with cutting-edge technologies like digital twins and additive manufacturing. This comprehensive approach ensures that defense acquisition practices remain adaptive and efficient in navigating the complexities of the digital landscape. In conclusion, the strategies discussed in this report ensure that defense acquisition programs remain adaptable and efficient, ultimately bolstering national security and mission success.

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