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Leveraging Digital Transformation Innovating the Acquisition Workforce – Product Support Edition

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Abstract

The DoD acquisition workforce has undergone some changes and updates in recent years. The Back-to-Basics initiative focused on revamping and streamlining the core functional areas and emphasized foundational knowledge and practitioner levels of experience. The addition of digital engineering courses is starting to modernize the curricula for already-underway initiatives to better prepare and establish core knowledge to advance digital transformation. Even with both of these thrust areas, one major component of the lifecycle and knowledge seems to be left behind, logistics and sustainment. Back-to-Basics added emphasis for the 12 integrated Product Support elements, but not much has been updated or shown to be advancing the field or expectations for the new generation of logistics professionals. This paper discusses for improvement, modernizing and trailblazing for logistics and sustainment to reside shoulder-to-shoulder with its engineering and testing counterparts. Additional discussion will highlight where logistics plays a more integrated role in the digital framework as well as where engineering and test can learn and leverage these newfound explorative formations.

Keywords: logistics, product support, sustainment, modeling, analytics, digital transformation, lifecycle, total ownership costs, workforce, acquisition

Introduction

In 1990, the Defense Acquisition Workforce Improvement Act (DAWIA) was established as a recommendation resulting from President Reagan's Executive Order (EO) 12526, which created a "blue ribbon commission on defense management" to "study the issues surrounding defense management and organization" (DAU, 2024a; Reagan, 1985). The Defense Authorization Act of fiscal year (FY) 1991 established the Defense Acquisition University (DAU) as one of its most important provisions (Layton, 2007). The Department of Defense (DoD) acquisition workforce, both civilian and military personnel, receive the majority of their training and development through DAU. Prior to 2022, there were 16 career fields, with an individual receiving certification through a three-tiered certification program. For more than 30 years, training was a one-size-fits-all approach and delivered early in an individual's career without a deliberate focus on continuous learning and development. The DoD reevaluated training and developed a new framework to foster a culture of lifelong learning for current and future acquisition professionals. This new initiative, Back-to-Basics (B2B), took effect February 1, 2022 (DAU, 2022). With the modernization, career fields went away, Functional Areas were established, and courses were added, updated, or removed to fit the new modern acquisition era.

The new era of acquisition is moving towards an emphasis on interoperable systems, data analytics throughout operations and business, and digital operating models, specifically digital transformation (DX). Outside of the DoD, many companies are undergoing DX to improve or rethink how their organization is structured and actively realigning their organization to make

the best use of this new way of operating. The concept has been described as anything from digitizing current processes to implementing digital tools, and even how a business or organization rethinks its entire structure and approach by leveraging a digital ecosystem and operating model. While there are differing opinions on an exact definition, DX is considered the adoption and integration of digital technologies to improve efficiency and streamline business operations across all sectors of a business and fundamentally altering how value is brought to customers (Gebayew et al., 2018; Hanelt et al., 2021; Libert et al., 2016). Examples of DX technologies are Artificial Intelligence (AI), cloud computing, autonomy, and advanced model and simulation (M&S; Waugh, 2022). Other benefits may be considered modernization of current methodologies, like what Model-Based Systems Engineering (MBSE) does for systems engineering or rapid prototyping for accelerating design and manufacturing. The benefits of these transformations are increased automation, increased traceability, organization agility, strengthened testing of system designs and breadth of testing, optimization, early verification and validation (V&V), and a higher level of support integration (Khandelwal, 2020; McDermott et al., 2020; Waugh, 2022).

In the engineering technical domains, the DX research is plentiful but disparate. In other technical domains, the gap of research is wider and sparser. Within the product support and logistics community, DX is often interpreted as model-based product support (MBPS) or linking databases, where the emphasis is placed on using tools to perform a subset or discrete set of analyses (Sashegyi, 2020). Alternatively, DX is also discussed in terms of model-based methods and where sustainment should be considered but is not discussed to the necessary level with a more holistic view of integration and feedback mechanisms for the product or system across the enterprise (Draham, 2017; Gaska, 2019).

Within the new engineering and technical management Functional Area and curricula for DAU B2B, the digital landscape in plentiful. New courses include a focus on mission engineering, systems thinking, digital literacy, data analytics, multiple digital engineering courses, value management and engineering, data rights, and more. In DAU currently, there are only two courses on modern topics under digital transformation, a 4-hour course on Digital Product Support fundamentals, and a 4-hour course on data analytics fundamentals for product support (DAU, 2024c). If product support, logistics and sustainment are to be truly integrated into the future of a digitally transformed, modern acquisition profession, the training must showcase the integral nature of these important concepts, not only in the logistics Functional Area, but integrating product support more throughout acquisition training.

What is Product Support

According to the Office of the Secretary of Defense for Sustainment (OSASD[S]), product support is, “the package of support functions required to field and maintain the readiness and operational capability of covered systems, subsystems, and components, including all functions related to covered system readiness” (OASD[S], 2024). This definition is consistent in DAU and other sources as well. Decomposing this statement, we see a few main components, support functions, readiness and operational capability, and “covered systems.” To better understand the scope and complexity of product support, these components need to be discussed and understood further.

Readiness and Operational Capability

According to the DAU glossary, Readiness is defined as a “State of preparedness of forces or weapon system or systems to meet a mission or to engage in military operations. Based on adequate and trained personnel, material condition, supplies/reserves of support system and ammunition, numbers of units available, etc.” (DAU, 2024d). “Preparedness of forces” is a topic of discussion in multiple circles, including at the Service Chief level, where “readiness is equated

with availability and "capability" took a lesser role (Brown & Berger, 2021). Is the count of aircraft, tanks or assets a true measure of "being ready," moreover, ready for what and when? Are we measuring a "fight today," "fight tonight," or "fight tomorrow" perspective? What are the time horizons or epochs that we're focused on? Additionally, do we need a quantity of assets or the right quantity, at the right place, at the right time to perform a set of missions to achieve a particular objective that aligns to national security? Operational capability is an even-handed counterpart to the availability discussion. One of the challenges with "availability" and "capability" is that traditional mindsets place "availability" with the logisticians and "capability" with engineers because we artificially self-impose a view of equating "availability" with maintenance and parts and "capability" with mission threads and system performance and design.

Covered Systems

Covered systems include the specific weapon system of interest (aircraft, missile, tank, submarine), as well as the support equipment, computer hardware, test equipment, etc. to fully and completely support the safe operations of the system. Referring to Secretary of Defense Mattis, the *Redefine Readiness or Lose* article states, "the former secretary rightly concluded the U.S. military was failing to deter adversary hybrid activities, losing the gray zone competition, and losing its warfighting advantage" (Brown & Berger, 2021), the idea being that the services have been so focused on availability of primary weapon systems that the U.S. advantage has eroded in deterring our adversaries with continued "grey zone" conflict and the island build-up in the South China Sea. Strategic guidance is not explicitly part of product support, but understand those strategic documents, like the National Defense Strategy, allows product support professionals to know what and how to prepare and address the full complement of "covered systems." In a briefing at the Association of the U.S. Army's Global Force symposium, U.S. Army Futures Command head Gen. James Rainey stated that he believes that the effectiveness of towed artillery is near its end (Roque, 2024). This realization, one of these "covered systems" has an era or period of usefulness that needs to be evaluated and addressed proactively, is important. Systems engineers and product support professionals plan for 10, 20, 30 years of service life for a weapon system, but in the business of defense, the enemy gets a vote, too, and our systems may become less effective, even if the performance of the system is unchanged. This may be the networks, weapon system or other "covered systems" that are the responsibility of sustainment and logistics professionals, and a modern way to develop and train the workforce to this reality requires a digital approach.

Support Functions

The support functions of product support are typically understood to be defined as the 12 Integrated Product Support (IPS) elements (DAU, 2024b). These include:

1. **Product Support Management** is the development and implementation of product support strategies to ensure supportability is considered throughout the system life cycle through the optimization of the key performance outcomes of reliability, availability, maintainability, and reduction of total ownership costs.
2. **Design Interface** is the integration of the quantitative design characteristics of systems engineering (reliability, maintainability, etc.) with the functional logistics elements (i.e., IPS Elements). This includes Reliability and Maintainability (R&M), testability, legal requirements, Human Systems Integration, and more.
3. **Facilities and Infrastructure** are the permanent and semi-permanent real property assets required to support a system, including studies to define types of facilities or facility improvements, location, space needs, environmental and security requirements, and equipment.

4. **IT Systems Continuous Support (formerly computer resources)** encompasses the facilities, hardware, software, firmware, documentation, manpower, and personnel needed to operate and support mission critical information technology (IT) systems hardware/software systems.
5. **Maintenance Planning and Management** establishes maintenance concepts and requirements for the life of the system. It includes, but is not limited to, levels of repair, repair times, testability requirements, support equipment needs, manpower skills, facilities, interservice, organic and contractor mix of repair responsibility, site activation, etc.
6. **Manpower and Personnel** involves the identification and acquisition of personnel (military & civilian) with the skills and grades required to operate, maintain, and support systems over their lifetime.
7. **Packaging, Handling, Storage, and Transportation (PHS&T)** is the combination of resources, processes, procedures, design, considerations, and methods to ensure that all system, equipment, and support items are preserved, packaged, handled, and transported properly, including environmental considerations, equipment preservation for the short and long storage, and transportability.
8. **Supply Support** consists of all management actions, procedures, and techniques necessary to determine requirements to acquire, catalog, receive, store, transfer, issue and dispose of spares, repair parts, and supplies.
9. **Support Equipment** is made up of all equipment (mobile or fixed) required to support the operation and maintenance of a system. This includes ground handling and maintenance equipment, tools, metrology and calibration equipment, and manual and Automatic Test Equipment (ATE).
10. **Sustaining Engineering** spans those technical tasks (engineering and logistics investigations and analyses) to ensure continued operation and maintenance of a system with managed (i.e., known) risk. Sustaining Engineering involves the identification, review, assessment, and resolution of deficiencies throughout a system's life cycle. Sustaining Engineering both returns a system to its baselined configuration and capability and identifies opportunities for performance and capability enhancement.
11. **Technical Data Management** consists of recorded information of scientific or technical nature, regardless of form or character (such as equipment Technical Manuals [TMs] and engineering drawings), engineering data, specifications, standards and Data Item Descriptions (DIDs).
12. **Training and Training Support** consists of the policy, processes, procedures, techniques, training devices, and equipment used to train civilian and military personnel to acquire, operate and support a system.

Product Support and Digital Transformation

The next generation of product support professionals must be more thoughtfully considered in the digital landscape as it relates to training and development. In supportability analysis, there is an expression of Design for Support, Design the Support, and Support the Design (Dallosta & Simcik, 2012). This holds true in training and workforce development, particularly as the DoD implements its digital transformation. For example, designing for support in engineering has included the use of MBSE, design the support has meant the specific tools and software to deliver the products and services, and support the design includes the software licenses, the training, and instructions to deliver effective digital designs in that MBSE solution. The Assistant Secretary of the Navy for Sustainment (ASD[S]) released a Strategic Plan which

highlighted the need to deliver sustainable logistics to support DoD mission requirements, deliver cost-effective materiel readiness to meet the DoD's warfighting requirements, enable effective, affordable, and sustainable warfighting capability, and optimize warfighter logistics (Lowman, 2023). In order to deliver on this strategic plan, product support must be included more foundationally in digital transformation initiatives, particularly the future training of the workforce.

IPS-Digital Integration

Deliberate actions must be taken to ensure product support is engineered and integrated into the digital thread of weapon systems development and business systems and become the new normal of acquisition and sustainment. Some options to more clearly call out the IPS elements with digital integration are listed below.

1. **Product Support Management** – all support functions, costs, manpower, contracts and requirements more clearly integrated into digital management models, such as a model-based program manager model akin to a MBSE instantiation of the weapon system. This allows the holistic view of needs early for partnership planning, funding requests, maintenance concepts and more.
2. **Design Interface** – identification and instantiation of the "-ilities" (i.e., maintainability, reliability, testability, interoperability, etc.) in the system weapon and mission engineering models for effectiveness and demands on the design.
3. **Facilities and Infrastructure** – analytics and data modeling of throughputs, demands and realistic delivery of products through our facilities and support structures.
4. **IT Systems Continuous Support** – redundant services to ensure product support and sustainment activities can continue if a disruption occurs, including when and where data needs to flow to ensure the warfighter is supported always.
5. **Maintenance Planning and Management** – detailed understanding of work packages and task analyses integrated into digital tools for evaluation and tracking to plan. Are the plans optimized and packaged appropriately based on lessons learned and active data feedback? How effective are the repairs, how skilled are the personnel, and can we integrate training with effectiveness of the maintenance plans? See Fisher's (2019) *Moneyball for Maintainers* for additional information.
6. **Manpower and Personnel** – What new rates or skill sets are needed and the most effective at performance of the duties? What do we understand about manning documents, ascension and rotations, and how does that affect our manpower documents and assumptions?
7. **Packaging, Handling, Storage, and Transportation (PHS&T)** – similar to service life design considerations and how are strategies conceptualized? What works, what does not, and are there special considerations for afloat, ashore or coalition practices with respect to these functions should be evaluated? There are a number of overlapping considerations with the "-ilities" in systems engineering, and reinforcing that connection only helps the design and support of the system.
8. **Supply Support** – Specific analysis on forecasting, optimal planning, just-in-time support, vendor producibility, condition-based maintenance, and other critical topics should be expanded upon when training on supply support. Those key concepts help reinforce or redirect our understanding to then develop a more realistic sustainment support strategy.
9. **Support Equipment** – Discussions on condition-based maintenance, software updates and network connectivity, shared assets and more are assisted with digital transformation

tenets and practices. What is capable in austere environments or at high operational tempo, and how does that affect training or maintainability?

10. **Sustaining Engineering** – one of the most important elements of integrated logistics, and it should be discussed more in the engineering and technical management functional area. Specific training on in-service repairs and requests and how local policy for deviations may affect throughput or ability to disposition support requests and the impact on manuals, publications and how does data availability help or hinder this element.
11. **Technical Data Management -** Modern workforce training should include product lifecycle management (PLM) capabilities and limitations to ensure what is required to utilize this important digital capability. The training should highlight the tools available but also the significant preparation work, data mapping, use case definition and other factors before integrating this key enabler. The engineering and technical management functional area should also have training in this area as it applies to airworthiness or safety of operations considerations.
12. **Training and Training Support** – Digital integration and workforce development is primed for this IPS element given the intersection and overlap with many of the other elements. This area should include how people learn and new methods of conveying training, as well as what do personnel "need to know," compared to "ought to know" and when each are relevant. The media in which people learn will increase or educe effectiveness, especially for the complexity of the work. Product support training in this element should be considered at each phased and design review for applicability, maturity, and effectiveness for the best solution and approach and not simple re-use of previous methods.

Whether the digitally transformed training for these elements are with DAU or another institution, specific courses should be developed or updated based on the above recommendations to truly modernize workforce training and development in this functional area. The training should be on each element as well as training where the elements overlap and interplay with one another. It is also important for other functional area professions to cross-train in the logistics functional area so interoperability and partnering occurs at a more professional and academic level, before the practical applications of program implementation and support create a "fog of acquisition and sustainment."

Other sources of professional development

In addition to DAU, there are other sources of training and professional certification for the product support community, including the International Society of Logistics (SOLE). Founded in 1966, SOLE (2024) is "a non-profit international professional society composed of individuals organized to enhance the art and science of logistics technology, education and management." SOLE offers three certification levels, with the latest version of qualifications released in 2012. For the highest level of certification, the Certified Professional Logistician Program, the exam topics cover concepts of systems management, principles and functions of management, system design and development, formal design review, acquisition product support, production support, distribution and customer support, customer support, and equipment phase-out and disposition. One can see the overlap with the 12 IPS elements such as Design Interface, Product Support Management, Supply Support, PHS&T, and Support Equipment. What appears to not be included are system performance, operational use and analysis and lifecycle management of the product. The certification focus emphasizes certain areas and is gapped in others. A holistic view of what constitutes product support in training must be addressed for the profession to atrophy is key areas.

Other certifications in logistics include the Certified Supply Chain Professional (CSCP), Certified in Planning and Inventory Management (CPIM), Certified Professional in Supply Management (CPSM), the Council of Supply Chain Management Profession (CSCMP) and

many others (Indeed, 2023). The glaring observation with the list is that the primary focus is on the Supply Support IPS element, with other elements either minimized, with the potential to align Program Management Professional to Product Support Management, or left out completely. This indicates a lack of awareness or connection to other specific training and focus that align to Product Support, including reliability, quality, human systems, maintainability, or testability.

The DoD acquisition workforce at-large now has access to modern digital learning platforms such as LinkedIn Learning and the U.S. Air Force's Digital University to augment their learning paths and curricula (*LinkedIn Learning*, 2024; USAF, 2024). LinkedIn Learning has a number of courses that would assist product support professionals, including IT certifications, data analysis, business and program management, and supply chain analysis. Digital University "provides anytime access to Silicon Valley accredited technology training & fosters a community of learners for tomorrow's warfighter." Courses that would assist the product support community include supply chain management, IT, and data analysis. What is lacking from these platforms and offerings are the specialized training the product support workforce could leverage, including system design, PLM, Instructional System Design (ISD), facility management, operational use cases for data analysis and modeling, data rights, and more. It is important to note that the focus of these training offerings focus on IT systems and analysis rather than model-based methods for product support, logistics or a deeper, more integrated approach for how product support and sustainment activities of our weapon systems should be addressed.

Policy Considerations

The DoD released a new Digital Engineering Instruction in December 2023 to establish policy, assign responsibilities, and provide procedures for implementing and using digital engineering in the development and sustainment of defense systems (USD[R&E], 2023). However, this guidance gives only passing reference to logistics and product support with inclusion of "product lifecycle management" and "sustainment of a system" in a couple of areas. In the *Requirements for the Acquisition of Digital Capabilities Guidebook*, the only coverage to product support or sustainment is in regards to purchasing the data rights to support the weapon system and operation and support of requisite IT (DoD CIO, 2022). Policy documents are intended to be high-level and not tactical in nature; however, more clarity could prove useful for multiple communities on integrating their perspectives into a more holistic solution. Policy documents, including those regarding digital transformation and digital engineering, should be deliberate in referencing and integrating product support to strengthen the ties across the lifecycle. Equally, sustainment and product support policies should include reference to where the design and operational performance development and trade-offs have an impact on overall system availability and effectiveness. This bi-directional linkage only serves to reinforce the acquisition workforce to think, act, and operate differently in the acquisition and sustainment of our weapon systems and capabilities. The digital landscape makes this alignment a reality and apparent in the day-to-day operations at all levels of planning and execution. It is the only way to truly reach digital acquisition and sustainment.

Recommendations and Future Work

The product support community, made up of operations experts, logisticians, business financial professions and more, has not updated their workforce development and training curricula to keep pace with the digital revolution. Some of the course ware is updated but remains limited in breadth and depth to properly cover the scope of product support and cross-cutting dependencies. Specific areas for consideration are provided and recommended to change the status quo of previous program experience to a truly new approach. For example, we rely on people who use the systems to develop the training, which may be sufficient as a

secondary aspect that complements the need for a primary, deliberate focus by trained professionals in systems or maintenance training. The acquisition community spends a lot of time developing the weapon system specification but considerably less time specifying the sustainment of that weapon system, including system degradation, system training and continuous feedback and continuous certification assessment utilizing advance analytics and digital methods. This research makes the following recommendations:

1.) Develop new courses in DAU that discuss and address the IPS elements for the new modern approach to the acquisition community
2.) Develop courses in the logistics functional area that address specific applications of the IPS elements and digital transformation tenets
3.) Align product support more intentionally with digital engineering policy, guidance and instructions
4.) Develop a new product support certificate program or master's track with universities specifically targeted for the acquisition workforce similar to the Master of Science in Engineering Management and Systems Engineering curricula for the Engineering and Technical Management functional area.

Future work in this space includes the need for prioritization of what aspects of product support are the biggest contributors or degraders of overall availability and capability of our weapon systems. This includes both system level and integrated system performance within an integrated operational capability. Additional insights as to what areas of product support are either obsolete or contributing less to mission outcomes than previous system designs and support constructs. These areas should be addressed with advanced analytics, conceptual and data modeling, artificial intelligence and other capabilities within digital transformation to keep pace with the necessary decision superiority to support and defend our interests around the world. Workforce development must keep pace and be infused with these necessary skills to ensure the transformation is supported and sustained. Product support is primed to leverage digital transformation to innovate its workforce and broader reach to deliver decisive combat power in warfighting, strengthen our navy warfighters, and reestablish a foundation of being ready for the demands of the future.

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