2015-04-01

Portfolio Acquisition

Modigliani, Peter

Monterey, California. Naval Postgraduate School

https://hdl.handle.net/10945/53579

SYM-AM-15-103

PROCEEDINGS
OF THE
TWELFTH ANNUAL ACQUISITION RESEARCH SYMPOSIUM

THURSDAY SESSIONS
VOLUME II

Portfolio Acquisition—How the DoD Can Leverage the Commercial Product Line Model

Peter Modigliani, MITRE Corporation

Published April 30, 2015

The research presented in this report was supported by the Acquisition Research Program of the Graduate School of Business & Public Policy at the Naval Postgraduate School.

Portfolio Acquisition—How the DoD Can Leverage the Commercial Product Line Model[1]

Peter Modigliani—is the Acquisition Innovation Area lead at The MITRE Corporation. He supports DoD acquisition and CIO executives' strategic initiatives in Agile, cyber, IT, and services acquisition. He manages a research portfolio to foster innovative acquisition solutions. Previously, as an assistant vice president with Alion, he supported the Air Force Acquisition Executive on C4ISR systems. As an Air Force program manager, he developed strategies for billion dollar acquisitions. Modigliani holds a BS in industrial engineering from the Rochester Institute of Technology and an MBA from Boston College. He is DAWIA Certified Level III in program management. [pmodigliani@mitre.org]

Abstract

The Department of Defense (DoD) can foster dynamic, efficient, and innovative solutions for tomorrow's warfighter by structuring acquisition portfolios that deliver an integrated suite of capabilities. Such portfolios would permit execution of many core acquisition elements and processes at a level above the individual program to enable enterprise management, economies of scale, and faster capability deliveries. While large DoD programs navigate the acquisition life cycle individually, large commercial businesses manage integrated product lines for items ranging from automobiles and personal electronics to software and health services. The portfolio framework proposed in this paper establishes broader entities that involve an active government and industry community throughout the acquisition life cycle. Portfolios would scope programs and increments from high-priority requirements, mature technologies, and rigorous analyses covering a comprehensive mission area. Portfolio strategies, roadmaps, and architectures would guide development of a suite of smaller programs, allocating budgets, personnel, and other resources dynamically to the highest priority efforts. Reorganizing from a product-based model to a portfolio model would enable more successful and faster delivery of integrated mission capabilities.

Introduction

Challenges of the Program-Centric Acquisition Model

In today's defense acquisition system, each program navigates the acquisition life cycle individually. This results in an acquisition enterprise that leads to stove-piped solutions, long acquisition cycles, and a highly inefficient use of resources. Initial conceptual requirements drive program scope and budgets, yet often inappropriately constrain the solution space for long-term programs that develop major systems. The lengthy congressional approval process for new start programs contributes to setting a high bar up front to DoD exploration of new solutions.

Developing systems individually makes it extremely challenging to deliver the integrated, net-centric systems and services required for the DoD's complex and dynamic operations. Acquisition programs design, develop, test, and produce isolated systems that must meet a defined set of requirements within an allocated budget. Analyses of alternatives (AoAs) occur at the program level, with minimal consideration of enterprise performance,

[1] Approved for Public Release; Distribution Unlimited. Case Number 15-0862.

costs, or risks. Each program must conduct its own research and development (R&D) to mature its critical technologies in order to begin development (see Figure 1).

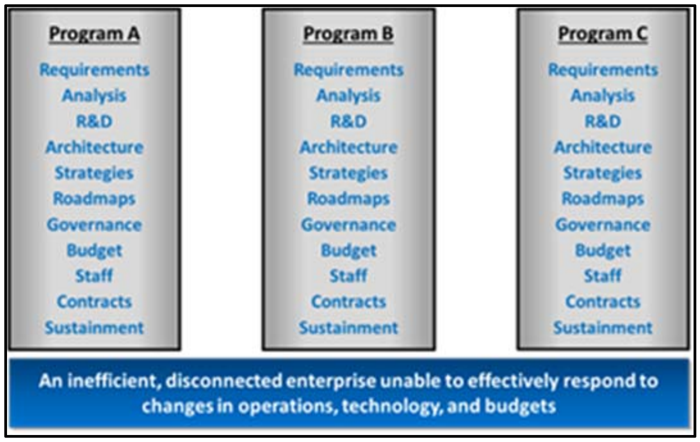

Figure 1. Program Silos in the Current Acquisition Framework

Guiding large systems through the acquisition life cycle over a period of 10–20 years has proven inefficient and ineffective as technologies, operations, and budgets change. Selecting a development contractor alone takes a year or longer, and in the process programs often lose critical insights that could be gained from subsystem prototypes and preliminary designs. As other nations rapidly adopt commercial technologies and exploit global networks, the DoD's technological advantage confronts greater risk.

In the years 2001–2011, the DoD spent over $46 billion on Major Defense Acquisition Programs (MDAPs) that were ultimately canceled (Harrison, 2011). A major contributing factor common to these failures is that the programs tried to do too much at once: they used a big-bang approach to develop and integrate a wide array of technologies to meet all envisioned requirements. For example, the Army's Future Combat System (FCS) attempted to develop a dozen classes of ground systems, unmanned aerial and ground vehicles, and an integrated network as a single MDAP; FCS was cancelled after spending $18 billion. The Air Force's Expeditionary Combat Support System (ECSS) sought to replace over 250 legacy logistics information technology (IT) systems with a single new system and invested $1.1 billion and nearly a decade of effort before program cancellation (Levin, 2014).

The DoD's acquisition budget has been reduced by tens of billions of dollars annually from the levels of the previous decade. The DoD's fiscal year (FY)2015 research and procurement budgets alone have declined by 21% and 29%, respectively since FY2010 (Weisgerber, 2014). In an era of continued global threats, the DoD could lose its technological edge unless it takes bold steps to structure and streamline the acquisition framework to deliver capabilities to the warfighter more effectively (Kendall, 2014). To accomplish this, the DoD must leverage the structure and methods of large commercial enterprises, including auto manufacturers, consumer electronics companies, and professional services firms, all of which use product lines to obtain the greatest benefits from their investments.

Commercial Product Lines

Commercial firms use an approach that evolves a product to its ultimate capabilities on the basis of mature technologies and available resources. This

> allows only the product features and capabilities achievable with available resources in the initial development. Further product enhancements are planned for subsequent development efforts when technologies are proven to be mature and other resources are available. (Walker, 2013)

Many large corporations organize along product lines to leverage economies of scale and react swiftly to emerging trends and changes in consumer demands. For example, Apple revolutionized consumer electronics because it did not simply develop products that outperformed others in the marketplace but focused on delivering a full integrated user experience across products and services. Toyota designs, develops, and produces its cars, trucks, and SUVs by leveraging technology innovations across all of its models.

With many Fortune 500 companies facing strong challenges from emerging startups, executives are aggressively breaking down corporate silos and reengineering operations to pursue innovative solutions. Leading companies embrace “design thinking” that prompts them to observe market nuances, experiment with many options, and rapidly prototype ideas to bring the best ones to reality. They maintain strategic variety, to include creating portfolios of new strategic options, building a magnet for great ideas, and minimizing the cost of experimentation (Hamel, 2012).

Companies designate product line managers to maximize revenue and profit from the company’s investments and executives grant these managers significant latitude to shape the products they manage. This includes marketing, developing new products, forming corporate partnerships, and conducting R&D. The success of a product line depends on the company’s ability to track the market closely and react faster than the competition to emerging trends, technology advancements, and changes in consumer tastes. The success of this strategy, in turn, stems from aligning each product line manager’s responsibilities with accountability: Those who perform these tasks effectively receive handsome rewards, while those who do not quickly find themselves in a new line of business.

Successful companies continuously analyze market demands, technology performance, and resources to optimize their product lines. Competitors quickly integrate the key product features of industry leaders into their own designs based on consumer preferences and sales forecasts. Short- and long-term investments in R&D, production facilities, and support services undergo extensive performance analyses for financial (e.g., return on investment), technical (e.g., performance benchmarks), and business (e.g., market share) aspects. Businesses invest in data to regularly update and fine tune analytical models to support strategic and tactical decisions to maximize revenue, profits, and market share. They rigorously identify and prioritize market demands to exploit these opportunities with an optimal balance of portfolio solutions.

Time-to-market represents one of the most powerful drivers in commercial product development. Some companies seek to achieve “first mover advantage” by introducing a new product into the marketplace. Others then offer products or services with additional features, better performance, or a lower price point to gain market share. The more time that companies waste on perfecting “the next big thing” the more time competitors have to sell their products. Rarely are the best products on the market a business’s first version. Instead, an iterative series of competing models usually generates the strongest, innovative products, from the current year’s model hybrid car to the latest smartphone. While commercial enterprises operate in a different environment, the DoD can adopt many valuable private sector practices to structure and execute acquisition portfolios.

What Is a Portfolio?

A DoD portfolio would comprise a collection of programs, projects, increments, and related development efforts designed to achieve a set of strategic outcomes. A portfolio could expand on the system-of-systems model or span a program executive officer's (PEO) full suite of programs. Many DoD headquarters organizations use portfolio management from a functional oversight perspective, rather than on designing integrated solutions. This portfolio vision is a more tactical approach to structure acquisition elements above a program by those closest to the program execution.

To avoid the common DoD pitfalls of complexity and bureaucracy, portfolios should encompass a small group of related programs, such as those within a PEO's portfolio. For example, IT portfolios could manage a suite of applications and services that run on a common infrastructure platform, while aircraft portfolios could leverage a common airframe (e.g., C-130) with different payloads for each mission profile. Portfolios could also leverage common subsystems across programs, to include engines, sensors, communications suites, or avionics software (e.g., Special Operations helicopters). The DoD may find it easier to begin with portfolios of programs that are easily divisible, such as IT systems, rather than with large programs developing new bombers, ships, or space systems. Over time, if successful, the DoD could expand and scale these portfolios.

Overview of the Portfolio Acquisition Model

Just as industry has succeeded by applying a portfolio model around product lines, the DoD could achieve similar success by structuring and managing acquisition via portfolios. This would require decomposing large systems into multiple smaller programs, projects, or increments. These portfolios would group related capabilities across programs and commercial off-the-shelf (COTS) products and services, thereby elevating the time-consuming acquisition processes to the portfolio level, reducing program workload, and allowing programs to deliver products faster (see Figure 2).

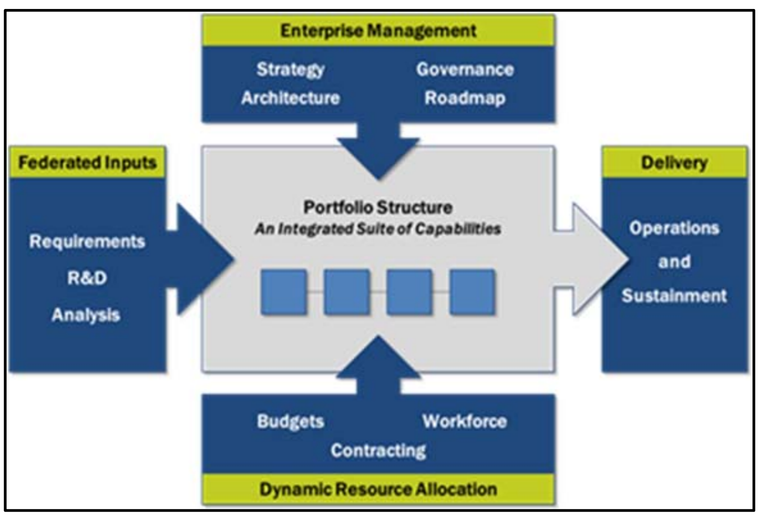

Figure 2. Portfolio Acquisition Framework

A portfolio structure can foster innovation to deliver affordable solutions that achieve mission outcomes. The DoD would construct programs and increments from federated inputs, priority requirements, mature technologies, and rigorous analysis focused on a mission area. This would include an active government and industry R&D community aligned to advancing technology solutions. Enterprise management via portfolio strategies, roadmaps, and architectures would guide development of a suite of smaller capabilities. Dynamic allocation of budgets, personnel, and other resources would lead the DoD to invest in the highest priority efforts. Portfolios would extend beyond delivery of an initial capability to optimize operations and sustainment of the capability suite.

Table 1. 12 Major Elements of Portfolio Acquisition

REQUIREMENTS	Dynamic, prioritized list based on operations, technologies, and threats
ANALYSIS	Continual assessment of cost, schedule, performance, and alternative realism
R&D	Collaborative environment of government labs, FFRDCs, and industry
STRUCTURE	Smaller programs scoped by priority requirements and mature technology
ARCHITECTURE	Enterprise-wide designs and standards for an integrated suite of capabilities
STRATEGY	Long-range plans to integrate acquisition, requirements, budgets, industry
ROADMAPS	Integrated strategic schedules of legacy systems and new capabilities
GOVERNANCE	Delegated program decisions, shared governance, and increased visibility
BUDGETS	Dynamic, incremental allocation of funding to highest priority programs
WORKFORCE	Technology and process SMEs to complement long-term program staff
CONTRACTING	Active industry participation, competition, and rapid timelines
SUSTAINMENT	Enterprise strategies, investments to maximize readiness, minimize costs

Acquisition Elements

This section presents details on the acquisition elements shown in Table 1, describing the program model (as-is) and offering a vision for a portfolio model (to-be).

Requirements

Program Model

Programs capture initial requirements in an Initial Capabilities Document (ICD) at the start of the acquisition life cycle to outline a broad capability gap. They then refine and solidify requirements in a Capability Development Document (CDD) that contains key performance parameters. The Joint Requirements Oversight Council (JROC) must approve the CDD before system development begins. MDAPs usually take an average of 24 months to complete CDDs that in essence lock down the program scope for the next 10 to 15 years of development and production (Sullivan, 2015). During this time frame, change occurs constantly across operations, threats, priorities, budgets, technologies, and related systems, but the requirements remain fixed.

Operational sponsors often inflate the scope of a CDD by including all known requirements, as potential subsequent increment or program would follow many years later. This compounds risk by expanding the program scope, the number of critical technologies to mature, and variances in estimates, creating longer timelines to achieve initial operational capability.

Portfolio Model

Given the rapid pace of technology change, the DoD can no longer afford to lock in requirements for a decade or more. Instead of attempting to predict long-term operational and technical needs prior to defining short-term operational capabilities, programs must focus on incremental advances. Managing via a broader set of portfolio requirements would enable greater system interoperability than a series of large, fixed CDDs for major weapon systems.

A dynamic and agile requirements model with users at its center would serve as the foundation for effectively scoping programs in a portfolio model (Figure 3). ICDs would cover a broad mission or capability area and align with the scope of a portfolio rather than that of a single program (Winnefield, 2015). They would be broad documents central to ensuring that the operational, acquisition, and intelligence communities align around common outcomes, priorities, and expectations. In coordination with operational commands, operational sponsors could manage capstone requirements via portfolio ICDs as living documents. This would include annual updates to reflect their current concept of operations, strategic guidance, priorities, threats, capability gaps, and desired effects.

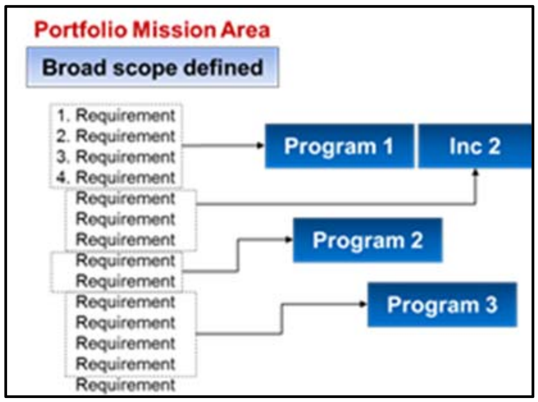

Figure 3. Mapping Portfolio Requirements

A database or requirements management software would capture the next level of portfolio requirements, which many products or services in the portfolio could ultimately satisfy. A requirements board and team of operational sponsors would manage the dynamic requirements list, reprioritizing it on the basis of operational priorities, threats, and desired effects. The acquisition community and potentially industry would translate the items on the list into engineering requirements while exploring notional technologies and solutions for each. Portfolios would reprioritize and revisit the requirements regularly to ensure increased fidelity. The Defense Intelligence Agency could continue to supply inputs on mission and system threats as well as adversaries' current and planned capabilities to help shape and prioritize requirements.

Programs and increments would have a smaller scope than today's systems. The smaller the scope, the easier it would be to analyze, plan, estimate, design, develop, test, and produce capabilities with reduced technical and programmatic risks. Portfolios would scope the next program or increment on the basis of the highest priority requirements and the availability of mature technologies and affordable solutions. Delivering capabilities to users faster would reduce risk while responding more rapidly to changes in operations, technologies, and budgets. For example, portfolios would seek to deliver weapon system capabilities in five to 10 years rather than the 15 to 20 years common today and IT capabilities in less than 18 months rather than five to eight years.

To do so, portfolios would leverage the Joint Staff's IT Box model, allowing more speed and agility in software system requirements (Winnefield, 2015). The IT Box model delegates requirements oversight and validation of documents following an ICD to a flaglevel organization rather than the JROC. Portfolios would streamline and tailor successor documents according to the oversight authority and program needs.

Analysis

Program Model

During the Materiel Solutions Analysis (MSA) phase, programs conduct an AoA to compare the operational effectiveness, suitability, and life-cycle costs of potential alternatives. The Cost Analysis and Program Evaluation (CAPE) director provides guidance for major programs and approves the final analysis. AoAs are led by the operational sponsor with support from the acquisition community. The analyses often reveal a bias toward alternatives that look and feel like the legacy system the new program will replace, but with more modern technologies and improved performance.

Contrary to the perception that acquisition executives stress due diligence in this up-front analysis, programs often experience pressure to complete the analysis so that they can advance to the next acquisition phase in pursuit of the preferred alternative. Once a program achieves Milestone A approval, it rarely revisits the AoA to validate constraints and factors and ensure that the program is still pursuing the best solution. Programs refine their cost estimates in each phase, with the life-cycle costs determined on the basis of tradeoff decisions made early on.

Portfolio Model

Portfolio structures would enable robust, integrated, continual analysis to optimize cost, risk, performance, and mission impact. Portfolio AoAs would be robust, continual processes designed to optimize the performance and/or efficiency of a suite of programs over their life cycle. Analysts would regularly assess the portfolio capabilities (fielded, in development, and planned) to maximize mission impact and minimize portfolio life-cycle costs. In-depth knowledge of technical baselines tightly aligned to cost models would drive affordability and trade-space analysis at the program and portfolio levels. Portfolio-level modeling and simulation (M&S) and experimentation would optimize system performance, operational effectiveness, and suitability. Threat assessments would track adversaries' military capabilities and the risk they pose to U.S. personnel, systems, and national interests. These analyses would continuously monitor and evaluate a variety of technologies, systems, services, and nonmaterial considerations such as doctrine, training, or procedures. Technology advances would drive requirements changes and the resulting system capabilities supported by a flexible contract and budget structure. Analyses of programs in development would consider their acquisition performance and operational priorities to ensure the programs continue to represent worthwhile investments. Data would drive the design and adaptation of portfolio capabilities. Divestment analyses would assess if and when to terminate a program and what alternative approaches to consider as a way forward.

Research and Development (R&D)

Program Model

Programs in the Technology Maturity and Risk Reduction (TMRR) phase focus on prototyping and maturing the technology to a point where the program can begin development in the Engineering and Manufacturing Development (EMD) phase. Most programs today develop the full scope of capabilities to meet all the approved requirements, and the resulting systems can take a decade or longer to field. Individual programs are responsible for maturing all critical technology elements and demonstrating them in a relevant operational environment.

Program offices face pressure to transition to EMD as soon as possible so that they can deliver capabilities before the requirements and technologies become completely outdated. The Government Accountability Office (GAO) regularly criticizes the DoD for allowing far too many MDAPs to advance into EMD with immature technologies that create cost, schedule, and technical risks (Sullivan, 2014).

During the TMRR phase, many interested companies may contribute technology research and competing preliminary designs. Once a program reaches Milestone B, most R&D stops and a single prime contractor develops and produces the system.

Portfolio Model

A portfolio R&D environment would enable mission-focused research and rapid exploitation, both critical to maintaining technological superiority over adversaries. Establishing a long-term R&D environment for a portfolio would allow an active community to contribute to advancing innovative capabilities. Each portfolio could include government labs, federally funded research and development centers (FFRDCs), universities, DoD University Aligned Research Centers (UARCs), and diverse industry players in a collaborative environment. Portfolios could include pools of industry players large and small, traditional defense contractors, and innovative new entrants (see Figure 4). An open innovation culture would pursue ideas across contractors, partners, users, and even adversaries to shape R&D goals (Kelley, 2010). Both government and industry could contribute R&D funding to portfolio solutions and share intellectual property when appropriate. They would also make long-term investments in M&S, experimentation, and rapid testing capabilities. Portfolio leaders would provide their priorities for research and feedback to shape investments and determine which technologies to integrate into the next program. R&D organizations focused on technology maturity would reduce program risk and improve delivery speed.

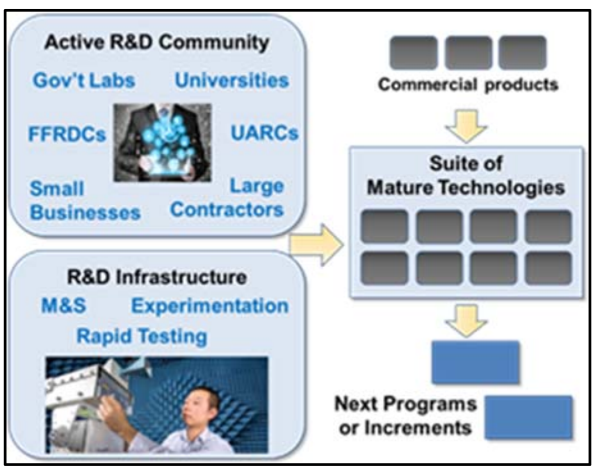

Figure 4. Portfolio R&D Environment

As the DoD would increasingly rely on commercial technologies rather than military-unique developments, portfolios would make long-term investments in assessing current and emerging technologies. A portfolio R&D group knowledgeable about technology solutions would intelligently shape operations, requirements, and designs. This group would demonstrate capabilities, prototype emerging technologies, and compete in challenges to achieve performance goals. Robust M&S capabilities and experimentation would evolve, drawing on the latest technologies and threat assessments. Given the current era of exponential technological growth, rapid and inexpensive testing would be critical for the portfolio.

Structure

Program Model

Huge, monolithic MDAPs develop all CDD requirements in a single, big-bang approach. MDAPs take 10 to 15 years from Milestone A to initial operational capability, with many of the largest systems taking even longer. Programs enter EMD with immature technologies, which leads to design instability, technical challenges, and significant cost and schedule overruns. Lengthy timelines between deliveries drive operational sponsors to add requirements to the scope of each increment, thereby compounding risks and increasing cost and schedule delays. For example, the F/A-22 took 22 years to become operational, with a 71% quantity decrease and 62% cost increase against initial plans. The Air Force could have delivered more capability sooner via a three-block incremental approach (Walker, 2013). The block upgrade model for B-52, F-15, and F-16 proved successful over decades, yet with its big-bang structure the F-35 program is struggling with costly retrofits.

> In the year 2054, the entire defense budget will buy just one tactical aircraft … which will have to be shared by the Navy and the Air Force 6 months each year, with the Marine Corps borrowing it on the extra day during leap years. —Augustine's Law XVI (Augustine, 2015)

Portfolio Model

Given competing missions, priorities, budgets, authorities, and many other factors, designing any element across platforms has historically added risk across programs, particularly joint programs. One of the biggest benefits of a portfolio structure would be the ability to design common platforms, subsystems, and services across programs. Stakeholders could shape these common elements to optimize portfolio performance, efficiencies, and mission impact.

Portfolios would structure developments to deliver a continual set of capability releases via small programs or increments. Smaller programs carry lower risk because of their well-understood scope, simpler design, more accurate cost/schedule estimates, and rapid delivery of capabilities. Speed reduces exposure to change and aligns requirements and capabilities delivered.

As illustrated in Figure 5, portfolios would scope each program or increment by leveraging the highest priority portfolio requirements and mature technologies from the portfolio R&D environment. This would help programs to deliver capabilities within five years for weapon systems and 18 months for IT systems, with estimated costs falling within the allocated budget.

Figure 5. Bounding the Program Scope

For example, instead of designing C4ISR aircraft independently, the DoD could examine the viability of a common aircraft platform with a modular design to allow for a diverse set of payloads. Common vehicles, communication suites, sensors, or ground stations would improve interoperability and cost efficiencies. Common services from IT infrastructure networks to system sustainment could improve mission impact and lead to cost savings.

Architectures

Program Model

Programs are designed individually and focus primarily on subsystem interfaces and performance. Each program develops a series of DoD Architecture Framework (DODAF) products to capture the capability, operational, services, and systems viewpoints (Winnefield, 2015). While these architecture products help programs to understand the bigger picture, designs remain program centric. A diverse set of defense industry contractors often integrates proprietary design elements, which creates risks to interoperability and system evolution. The maturity of architectures varies widely across the DoD, with few areas of a strong enterprise architecture driving program designs and interfaces. Programs have collaborated to jointly develop common subsystems, but often encountered considerable risk due to competing designs, distributed budgets, and cross-organizational dynamics. Many interfaces between systems are costly point-to-point designs difficult to evolve in a dynamic environment.

Portfolio Model

Establishing a portfolio for a mission area would provide a structure to develop and mature an effective enterprise architecture. Collaboratively developed and proven standards, interfaces, and processes would guide each program's development. This strategic design approach would enable optimization in production, operations, and sustainment. A central portfolio authority for an enterprise architecture would ensure that new program designs leverage the architecture from the outset. Portfolios could more effectively design the modular open systems strongly advocated by Congress, the GAO, and the DoD's Better Buying Power initiative (Kendall, 2014). Portfolio systems engineers would develop notional designs for each acquisition program using mature technologies from the portfolio's development environment to address the top capability gaps identified in the relevant ICD. Robust portfolio enterprise architectures and collaboratively developed notional designs would outline how each capability fits within the portfolio suite. Portfolios would resist over-engineering complex architectures by driving simplicity and maximizing use of commercial technologies.

Strategies

Program Model

Major acquisition programs develop dozens of documents to support major milestone decisions. On average, programs take over two years to complete milestone documents, expending an average of 5,600 staff days (Sullivan, 2015). These documents force the program office to explore effective strategies for the next acquisition phase, yet the sheer quantity and complexity become overwhelming. As conditions change during the acquisition phase, programs rarely update strategy documents and resubmit them for approval. In short, program strategies are shortsighted and often do not reflect current approaches. Lengthy program strategies simply gather dust in file cabinets. "Working without a plan may seem scary, but blindly following a plan that has no relationship to reality is even scarier" (Fried & Hansson, 2010).

After awarding the contract, agencies are often locked into a single vendor for the program life. This eliminates competition—the single best method to control costs and improve performance.

Portfolio Model

Portfolio strategies would provide a long-term vision of how to deliver an integrated suite of capabilities most effectively and efficiently. The vision would include a clear set of portfolio goals, outcomes, risks, and performance measures. Unifying around an inspiring vision or challenge would provide clarity on investment decisions and rally a diverse community to develop innovative solutions. Portfolios should embrace LinkedIn's CEO Reid Hoffman's two rules for strategy decisions: speed and simplicity (Casnocha, 2015).

Consistent, repeatable processes across programs would foster a dynamic workforce, accelerate program execution, and allow for tailoring as necessary. Portfolio documentation would serve as the foundation for each program, thus reducing the amount of program-unique content to develop and coordinate. Common portfolio strategies and practices would ensure that each program leverages best practices and provide new programs an established framework on which to build.

Portfolio strategies would take industry considerations into account to optimize production lines across systems and foster an active, competitive environment. Integrating OSD/AT&L's Sector-by-Sector, Tier-by-Tier (S2T2) industrial base analysis into program strategies would support a vibrant supply chain and affordable, stable development and production rates (Manufacturing and Industrial Base Policy [MIBP], n.d.). Strategies would explore innovative approaches to nurture an active industry community in R&D and in program development/production, and would consider sponsoring competitions to address critical risks or opportunities. Strategies could encompass more dual awards, split buys, and parallel developments to keep participants in an active contractor base leapfrogging each other with evolutionary upgrades or new, revolutionary solutions.

Contracting

Program Model

Contracting today involves a set of lengthy processes, with source selections that often take a year or more to complete. The contractor or contractor team selected to design and develop a new system often gains monopolistic power over the government for a majority of a program's life span. As the DoD has moved toward acquiring larger and fewer major systems, this has changed the dynamics of the defense industry. Instead of creating a steady pipeline of potential work through periodic competition for new work, many of these large contracts become all-or-nothing, make-or-break outcomes that shape a major market segment for a decade or longer.

Portfolio Model

Portfolio contracting would focus on developing active, long-term partnerships with many companies rather than only a few. The goal would be to build a vibrant community of large and small companies actively contributing to R&D, architectures, designs, development, production, and sustainment of portfolio capabilities.

Competition remains the best way to drive down costs and increase innovation in defense programs. Therefore, a portfolio strategy should actively foster continuous competition over a program's life cycle via broad industry participation. Decomposing large systems into a smaller set of programs would increase opportunities for industry, especially small businesses, to compete for DoD work. A potential portfolio contract strategy could use multiple-award, Indefinite Delivery/Indefinite Quantity (IDIQ) contracts to establish targeted pools of large and small businesses with key technological and domain expertise.

The DoD could streamline contract timelines by establishing portfolio contracts with standardized business practices and pre-competed contract vehicles to enable rapid generation of task orders for programs and increments. Standardized business practices would include pricing, terms and conditions, templates, and selection criteria. Portfolios could maintain continuous competition by restricting the size of the contract vehicles with on and off ramps to refresh the vendor pools. Past performance on task orders within the portfolio would represent a valuable selection criterion for future work, as it would reward superior performance by contractors.

A portfolio approach should incentivize innovative companies to pursue defense work. New entrants, more than the major defense companies, offer the greatest promise for designing and integrating technologies in new ways to achieve a military advantage. The DoD has a variety of contracting programs to reach companies willing to offer new technologies, collaborative research, and experimentation. Broad Area Announcements (BAAs) foster competition to advance state of the art research and prototypes. Small Business Innovative Research (SBIR) and Small Business Technology Transfer (STTR) programs fund cooperative R&D projects with small businesses and universities (DCAA, n.d.). Portfolios could provide these small companies with an environment to prototype and demonstrate a focused set of capabilities tightly aligned with an operational mission. Promising small businesses could partner with established defense companies to navigate the DoD's regulatory gauntlet to develop and produce a new system.

Roadmaps

Program Model

Each program must develop and maintain a strategic schedule and detailed integrated master schedule (IMS). The quality of program schedules often increases in the lead-up to major milestones, while dropping off during acquisition phases. Detailed IMSs should integrate government and contractor activities, yet are often managed as contractor deliverables. Some operations, acquisition, and budget headquarters may have roadmaps or enterprise view of program schedules, yet the underlying data often lacks sufficient fidelity or currency.

Portfolio Model

A portfolio roadmap such as the one shown in Figure 6 would serve as a central, long-range planning tool for operations, acquisitions, and budget domains and include the following:

- Schedules of all legacy systems and planned programs/capabilities
- Quantities of operational systems and new production planned
- Identification of gaps, overlaps, and migrations from legacy to modern systems
- Current and projected performance levels for systems or mission areas
- Identification of legacy system risks due to technical factors, sources, or O&S costs

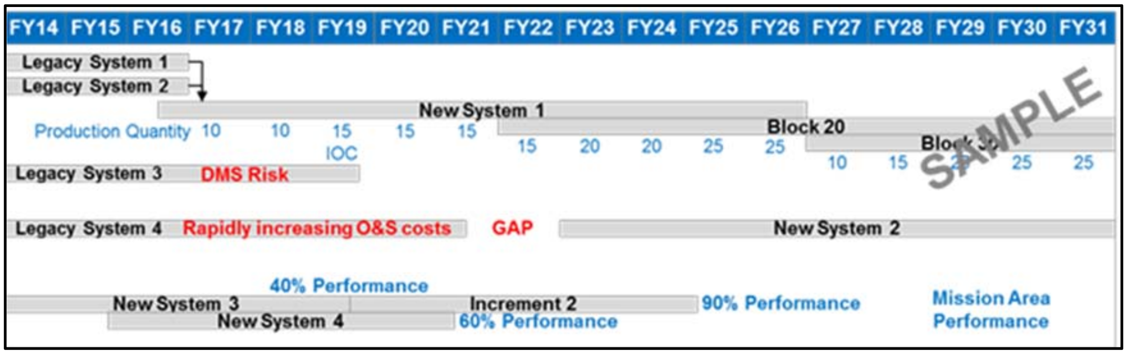

Figure 6. Notional Portfolio Roadmap

Portfolio roadmaps would provide operational, acquisition, and budget leaders and stakeholders with an integrated plan. They would support collaboration across these domains on status, risks, and plans, and foster discussions on priorities. Identifying risks or gaps would support decisions on accelerating new systems, delaying retirement of legacy systems, or implementing interim fixes. Aligning roadmaps with portfolio cost estimates and budgets would enable portfolios to optimize investments, ideally supported by analytical tools and methods. Many leading schedule software products already enable linking of program schedules. A portfolio schedule framework that integrates program dependencies would show the impacts of program schedule slips and support scenario planning.

Governance

Program Model

Governance presents one of the biggest challenges to effective portfolio management. Different stakeholder organizations across domains and levels have a competing set of priorities, incentives, cultures, and constraints. PEOs oversee the execution of the individual programs in their portfolio, but dedicate little time and resources to cross-program integration and optimization. The larger the portfolio, the harder it is to manage. Each layer of oversight across requirements, acquisition, and budget communities and functions groups programs differently, with little alignment around common portfolios. In some instances up to 56 organizations at eight levels reviewed program milestone documentation (Sullivan, 2015). With no two portfolios the same, it is difficult to reach consensus across communities on program priorities and budgets. The DoD incentivizes program managers to ensure that their program delivers the required performance within cost and on schedule. External dependencies are seen as risks. Therefore, many PEOs believe that the best way to minimize risk consists of scoping each program to include its own infrastructure as well as all subsystems and support equipment. Each program then progresses through the acquisition life cycle on an individual schedule and meets with its Milestone Decision Authority only at major milestones.

Portfolio Model

Portfolios would govern through collaborative, strategic partnerships with five key elements:

- Shared responsibilities of operational, acquisition, budget, and sustainment executives
- Portfolio alignment to ensure stakeholders represent the same mix of programs

- Decision authorities delegated to the appropriate level to enable timely decisions
- Central knowledge repository to provide stakeholder transparency and leadership insight
- Incentives aligned to ensure all organizations are working to common outcomes

Carefully limiting portfolio scope would ensure a manageable governance level. Program managers should be empowered to make decisions about technologies and subsystems (Berteau, 2014). Regular discussions among a diverse stakeholder group on priorities, status, risks, resources, and opportunities would ensure that the pipeline of programs supports the desired portfolio outcomes. Partnerships between operational commands and acquisition portfolios would foster collaboration on operational details and on which technologies/capabilities can be rapidly tailored for their missions. The partners would have wide latitude to shape the program scope and features.

Portfolio charters would clearly define authorities, roles, and responsibilities. Online repositories would capture and share portfolio knowledge to provide real-time insight and a common understanding. Embracing a servant leadership mindset would foster program support, integration, and innovation. Robust portfolio analytics would enable the data-driven decisions essential in these complex environments.

Governance would balance gate-check reviews (e.g., milestones) with time-phased portfolio and program reviews. Establishing a battle rhythm to discuss program status, issues, and ways ahead would minimize the burdens imposed by major milestone reviews. Portfolio strategy documents would reduce the burden on programs by requiring only constrained annexes that contain program-unique information. Reviews would still take place to ensure programs have a sound enough strategy and mitigated risks to warrant entry into and funding for the next acquisition phase. With delegated authorities, common processes, and regular insight, programs would minimize the documentation and reviews required to make informed decisions.

Budgets

Program Model

Historically, the DoD programs with the largest budgets have been the most likely to overrun costs and fail to deliver capabilities, while those with the smallest budgets were most likely to underrun cost and exceed performance expectations (Ward, 2014). Most acquisition programs today are funded via budget accounts called program elements (PEs), which are outlined in the president’s budget to Congress and included in the annual appropriations bills. Funding for each program is closely monitored by Congress, the DoD comptroller, each service and agency, and the program managers. PEs often fail to provide Congress with consistent, complete, and clear information (Sullivan, 2007). The lengthy DoD Planning, Programming, Budgeting, and Execution (PPBE) process requires budget requests and approvals years before programs are executed, with frequent adjustments made each year. The biggest challenge posed by the current budget constraints involves responsiveness to changes in operations, threats, opportunities, program performance, and priorities. Transfers of funds between PEs are limited to 10% of the budget for the current execution year, with congressional approval needed for larger transfers.

Portfolio Model

Some PEs today include multiple programs, with each broken out at a subaccount level called a budget program activity code (BPAC). Transferring funds between BPACs requires lower approval thresholds than transfers between entire PEs. Thus, allocating a portfolio budget at the PE level with programs at the BPAC level would offer funding flexibility and agility, while also providing sufficient transparency to oversight officials.

This funding approach would increase the effective use of constrained resources and would direct funds toward the highest-priority capabilities with the greatest enterprise impact. Pentagon executives would focus on strategic budget allocations at the portfolio level. Portfolio stakeholders would allocate program funding following key milestone reviews. Portfolio managers would then establish funding lines for technology development, enterprise platforms, and personnel for enterprise efficiencies. Fortunately, such a change would not require a wholesale restructuring of the PPBE process but would simply call for shaping a few PEs for an initial set of portfolios.

Workforce

Program Model

Program office staff are often assigned to a single effort for an extended period of time, limiting their exposure to and experience with other programs or DoD-wide procedures and often leading to atrophy of their skills. Military personnel rotate every three to four years, with program management turnover frequently highlighted as a systemic program risk. While stability of key leadership positions can be beneficial, an inflexible staffing model that ties staff to a program for a decade is grossly inefficient and ineffective.

Hundreds of acquisition programs go through roughly the same major acquisition processes, yet often reinvent the wheel each time rather than tailoring a common approach to program specifics. As a result, a program planning for a major event—for example, a Preliminary Design Review (PDR)—may have few staff with recent PDR experience, and most staff may need to relearn some of the key elements to prepare for and execute the PDR.

Portfolio Model

Programs and acquisition workforces would perform more efficiently and effectively in a portfolio matrix organization. In an era of budget and workforce challenges, a dynamic staffing model would yield cost efficiencies, a strengthened workforce, and improved program outcomes.

Each program would have a balance of long-term staff with deep historical program knowledge and technical and process subject matter experts (SMEs) dynamically assigned throughout the program's life cycle. In a portfolio structure, individual programs or increments would have shorter durations, which itself would reduce the skill decay that can result from lengthy program assignments.

In a portfolio matrix model, a percentage of the workforce could serve as process or technical experts who augment program office staff via short-term assignments. Process experts, for example engineers who specialize in system design, could advise program offices in the preparation and execution of PDRs and Critical Design Reviews and their associated design drawings. Schedule experts could assist in development and implementation of integrated master schedules to effectively manage the program and its dependencies on external efforts. Market research or commercial technology experts could ensure programs have a sound understanding of market offerings and technology solutions to shape the program scope and strategies.

Technical experts, by contrast, would offer deep insight in particular technical domains (e.g., avionics, sensors, stealth, or cyber). As programs progress through the acquisition life cycle, these SMEs would phase in and out of the program office as conditions warrant. Using expertise only when required, instead of committing personnel to long-term assignments while demand for specialized skills ebbs and flows, would provide an optimal staffing model. SMEs could support multiple programs at the same time, thus establishing repeatable processes and horizontal integration across the portfolio.

Process and technology SMEs would focus on mastering their niche areas by collaborating with other SMEs across the DoD. Process SMEs would develop and maintain guides, templates, and repeatable processes for easy program adoption. Technology SMEs would research and collaborate with labs, FFRDCs, and industry in a focused technology domain to support program designs and innovative solutions. As staff members progress through their careers, they could transition between program and process focused roles.

Sustainment

Program Model

Government depots and prime contractors sustain the DoD's weapon systems following a variety of operational models. Related major programs in a similar mission area are often sustained at diverse locations across the country, leading to massive inefficiencies in facilities, personnel, and support equipment.

Portfolio Model

Portfolio enterprise architectures and designs would enable strategic sustainment strategies to leverage common subsystems, parts, and support services. Portfolio sustainment strategies would leverage economies of scale via strategic investments and operations. Designing a holistic approach to sustaining portfolio capabilities would enable government and industry to make smarter long-term capital investments for production and sustainment. Subdividing monolithic systems into capability suites would create a smaller, steady pipeline of new systems to sustain. An enterprise analysis of costs, benefits, and risks could support a balanced portfolio of leasing versus buying solutions. Portfolios could establish public–private partnerships across programs, considering resources, demand, and expertise. Portfolio-level sustainment performance metrics and measures could incentivize industry to move from system-specific measures toward integrated mission-area capability rates.

Summary

Acquisition programs today are burdened by the complexity of the acquisition environment, the difficulty of maturing critical technologies, and the inability of the acquisition system to respond to changing operations, technologies, and budgets. Budgetary, workforce, and regulatory constraints further compound program risk. In a complex, integrated environment, defense acquisitions can no longer rely on a structure based on individual systems. Embracing a capability-focused portfolio structure modeled on the commercial sector offers many solutions to the DoD's top challenges.

The principles of simplicity, commonality, and agility should guide all acquisition portfolios. By adopting the commercial product-line approach, the DoD could address long-standing acquisition issues associated with speed, resilience, and interoperability. Elevating the time-consuming acquisition processes to the portfolio level would reduce program workload, allowing each program to deliver products faster. Managing requirements, budgets, and staffs at the portfolio level would enable dynamic allocation to high-priority programs. Portfolio strategies, roadmaps, and architectures would guide program development.

In a portfolio structure, an active government and industry community would collaboratively develop technologies and designs and employ continuous competition to develop and produce the individual systems. Portfolios would design and optimize acquisition processes to deliver a suite of smaller programs rapidly, ensuring that warfighters regularly receive integrated, incremental capabilities with the latest technologies designed to achieve operational missions.

Advancing a portfolio model will require the DoD to address various strategic challenges. Congress maintains strict control over program budgets and location of depots to sustain systems. Reaching agreement between the DoD and Congress on the proper balance of insight, authorities, and accountabilities will take time. Each functional area (e.g., requirements, systems engineering, testing) would require tailored processes and possibly new policies to enable portfolio strategies, and the DoD would need to identify which suite of programs would comprise the initial portfolios. Finally, the culture of the acquisition workforce would have to shift to support a new portfolio acquisition model. With forward-thinking acquisition leaders in place across the Pentagon and Capitol Hill, the DoD has a prime opportunity to pursue a portfolio acquisition model that can achieve transformational solutions.

References

Augustine, N. R. (2015). Augustine's Laws and major system development programs. *Defense Acquisition Review Journal*. Retrieved from http://www.dau.mil/publications/DefenseARJ/ARJ/ARJ72/ARJ-72_Augustine.pdf

Berteau, D. (2014). *Identifying governance best practices in systems-of-systems acquisition*. Monterey, CA: Center for Strategic and International Studies (CSIS). Retrieved from http://acquisitionresearch.net/files/FY2014/NPS-AM-14-C11P05Z01-089.pdf

Casnocha, B. (2015, March 5). Reid Hoffman's two rules for strategy decisions. *Harvard Business Review.*

DCAA. (n.d.). *Small business innovative research, small business technology transfer*. Retrieved from http://www.acq.osd.mil/osbp/sbir/

Fried, J., & Hansson, D. H. (2010). *Rework*. New York, NY: Crown Business.

Golati, R. (2010). *Reorganize for resilience*. Cambridge, MA: Harvard Business Press.

Hamel, G. (2012). *What matters now*. San Francisco, CA: Jossey-Bass.

Harrison, T. (2011). *Analysis of the FY12 defense budget*. Washington, DC: Center for Strategic and Budgetary Assessments. Retrieved from http://csbaonline.org/publications/2011/07/analysis-of-the-fy2012-defense-budget/

Kelley, B. (2010). *Stoking your innovation bonfire*. Hoboken, NJ: Wiley.

Kendall, F. (2014). *Better Buying Power 3.0.* Washington, DC: OSD/AT&L. Retrieved from http://bbp.dau.mil/docs/2_Better_Buying_Power_3_0(19_September_2014).pdf

Levin, C. (2014). *The Air Force's Expeditionary Combat Support System*. Washington, DC: U.S. Senate.

Manufacturing and Industrial Base Policy (MIBP). (n.d.). *Sector-by-sector, tier-by-tier* (S2T2). Retrieved from http://www.acq.osd.mil/mibp/s2t2.html

Segall, K. (2012). The secret of Apple's success: Simplicity. *The Guardian*. Retrieved from http://www.theguardian.com/money/2012/jun/15/secret-apple-success-simplicity

Sullivan, M. J. (2007). *Defense acquisition: DoD's research and development budget requests to Congress do not provide consistent, complete, and clear information* (GAO-

07-1058). Washington, DC: GAO. Retrieved from http://www.gao.gov/new.items/d071058.pdf

Sullivan, M. J. (2008). GAO best practices: Portfolio management. In *Proceedings of the Sixth Annual Acquisition Research Symposium.* Monterey, CA: Naval Postgraduate School.

Sullivan, M. J. (2014). *Assessment of selected weapon programs* (GAO-14-340SP). Washington, DC: GAO.

Sullivan, M. J. (2015). *DoD should streamline its decision-making process for weapon systems to reduce inefficiencies.* Washington, DC: GAO. Retrieved from http://www.gao.gov/assets/670/668629.pdf

Walker, D. M. (2013). *Better acquisition outcomes are possible if DoD can apply lessons from F/A-22 Program*. Washington, DC: GAO.

Ward, D. (2014). *FIRE: How fast, inexpensive, restrained, and elegant methods ignite innvoation*. New York, NY: Harper Collins.

Weisgerber, M. (2014). *Slow and steady is losing the acquisition race*. Government Executive.

Winnefield, J. A. (2015). *Joint Capabilities Integration and Development System (JCIDS) manual*. Washington, DC: Joint Requirements Oversight Council (JROC).

ACQUISITION RESEARCH PROGRAM
GRADUATE SCHOOL OF BUSINESS & PUBLIC POLICY
NAVAL POSTGRADUATE SCHOOL
555 DYER ROAD, INGERSOLL HALL
MONTEREY, CA 93943

www.acquisitionresearch.net