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Capabilities-centric Acquisition: A System of Systems View of Acquisition Management

by

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While heeding the profit of my counsel, avail yourself also of any helpful circumstances over and beyond the ordinary rules. *-Sun Tzu,* The Art of War

Introduction

The purpose of this paper is to begin a discussion on the need and complexity of managing the material acquisition process from a capability focused perspective. As warfighters develop doctrine, tactics, techniques, and procedures for the current and future fight, they do so from a joint and combined arms perspective. Battlespace success is viewed from the combined effects of multiple systems providing a synchronized force multiplier for the Commander. Conversely, our acquisition process remains trapped in a historical paradigm designed to meet Cold War requirements. This paper does not intend on offering the solution. This is merely a thought piece on perspectives from someone who is challenged daily with the opportunity of developing a capability management process for integrating future capability into the current force organizational construct.

The Department of Defense is challenged with balancing weapon system modernization and maintaining an operational force ready to fight and win the Global War on Terrorism. As the Department seeks to transform itself into a twenty-first century force, the acquisition process is stuck in a Cold War mentality focused on preserving the existing platform-centric approach to acquisition. Tomorrow's battlespace will be a network-centric environment derived from system-of-systems within which the sum of the parts generates an interdependent capability much more effective than the stand-alone, platform-centric environment of the past. Our DoD acquisition process is still oriented on building platforms that come to the fight as appliqué solutions, rather than seamlessly integrated warfighting systems designed to enhance the total capability. This dichotomy is straining the DoD budget by focusing our limited resources on an ever-decreasing number of platforms that are hugely expensive and fall short of meeting the ever-increasing number of capability gaps being endured by our warfighter.

This paper will examine the need to shape the DoD Acquisition Process and create an acquisition management system that is capability centered rather than platform centered. A knowledge-based process that synchronizes and optimizes capability solutions across the force is needed to ensure the warfighter needs are met within the fiscal constraints of the budgetary process. The acquisition process needs to be viewed in a more holistic manner. The various aspects of acquisition management can be viewed as layers in a system of systems acquisition architecture. A Capability Manager must be established to address all the layers of the acquisition process—not just the traditional cost, schedule and performance metrics typically

addressed by a platform Project Manager. The layers include: Standards, Requirements, Acquisition Organization, Material Solution, Material Subsystem, Operational Organization, and Battlespace.

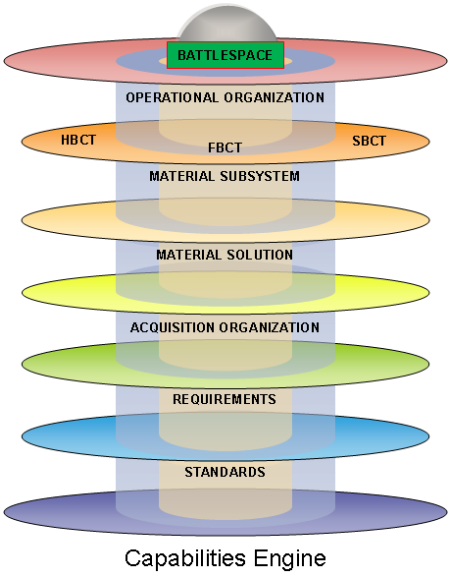

Figure 1. Material Acquisition Process Model, "Capability Engine"

These layers are interconnected in such a way that a perturbation on any layer evokes a response in all layers. By addressing capability management in a system-of-systems way, we can better align our management processes with the requirements generation process. Additionally, by inculcating a mindset that views acquisition management in a system-of-systems way that is synchronized with the capabilities-based approach to developing needs, one is better able to determine where our limited resources need to be applied—mitigating our current management approach which typically over-resources some capability at the expense of other warfighter needs.

Platform Centric Perspective

As the Department of Defense plans to invest over a trillion dollars into the acquisition process in support of new, more capable weapon systems, it is failing to address the root cause that has resulted in ever-increasing cost over runs: performance disappointments and program failures. Since 1970, the percentage of cost overrun has increased to as much as 40% or $15 billion dollars—even though there have been as many as eleven policy changes attempting to reform the DoD acquisition process. According to the GAO report, *Major Weapon Systems Continue to Experience Cost and Schedule Problems under DoD Revised Policy* (2006, April), the following table illustrates the problem facing the DoD.

Program	Percent Cost Growth	Percent Schedule Growth (months)	Percent Development Remaining
Aerial Common Sensor	45%	24	85%
Joint Strike Fighter	48%	48	78%
Expeditionary Fighting Vehicle	30%	23	60%
C-130 Avionics Modernization Program	122%	N/A	N/A
Global Hawk	166%	N/A	N/A
Future Combat System	48%	48	78%

Source: GAO. (2006, April). *Major weapon systems continue to experience cost and schedule problems under DoD revised policy*. Washington, DC: author.

As we invest more resources into fewer, more resource-intensive programs, we need to examine the root cause of the Acquisition Process's failure to gain control of its cost, schedule and performance challenges. The principle reasons often cited for cost overruns are the budgeting and requirements process; yet, this does not account for the ever-increasing dollars flowing into programs with less-than-impressive results. Additionally, the problem is not a lack of available policy and statutory guidance. Perhaps we are organized for inefficiency in that program offices are hardwired to solve material solution challenges from a singular system perspective and are not trained, organized, or resourced to leverage opportunities around them in other program offices with similar challenges.

Requirements

The battlespace, which our material solutions are supposed to support, is a highly complex, integrated environment; yet, our acquisition system continues to manage programs from a singular platform perspective without considering the relationships between all layers of the acquisition process. We often have multiple programs born from a single requirement that compete for the same scarce resources, even though these programs fundamentally provide the same capability.

We assume that the requirements process has accounted for the synchronization of capabilities, and we manage our programs from the platform perspective. No where are the total force requirements mapped against all the program of record material solutions to inform the process from a capabilities perspective. Indirectly, we create an environment that does not consider the whole more important than the subordinate parts. In an environment like this, it is impossible to manage from a capabilities perspective, since each of the Program Managers considers his/her system the ideal solution for the relatively ambiguous requirements being generated out of the DoD requirements process.

Leadership

To address the volatile, complex, uncertain, and ambiguous (VUCA) acquisition environment, the services choose the best of the best to manage our programs. We provide

them with an endless set of policies, statues, and directives and ask them to develop the best warfighting platform money can buy. Program managers are selected for their leadership and management skills to manage specific platforms or systems. Our process of selecting Program Managers reaches into our organizations and looks for individuals that are focused on getting the mission done. When we give them the mission of managing a specific platform, these same managers are programmed to succeed regardless of the program issues to their left and right boundaries. As long as their program succeeds, they are accomplishing their mission. Although our doctrine emphasizes system-of-system-level integration, we organize our program offices to look myopically at a system model rather than at system-of-systems.

Funding

Perhaps the most challenging aspect to this problem is the funding allocation. Budgets are allocated to align with specific material solutions. There is no specified Program Element in the budgeting process that recognizes the need to optimize material solutions. Consequently, Program Managers report their successes based upon a budget activity that views cost as an independent variable against schedule. Funding objectives need to support the capabilities model—which is less tangible than a hardware-focused model. The challenge is to determine the metrics by which success should be measured and how to place a dollar value on that metric.

In order to address this disconnectedness, we must change the very nature of our organizational processes and develop an acquisition process that considers the whole more important that the individual parts. Additionally, we must recognize that material acquisition is more than managing cost schedule and performance. System Program Management is a subset of capability management, which requires managing toward a collective capability and synchronizing all the relevant stakeholders from the foundation of standards to battlespace integration. It includes multiple layers that need to be synchronized for every program and balanced across the needs of the soldier and the needs of the nation as a whole.

Capability-centered Acquisition

Managing to a capability does not specify any unique material solution. Capability management strives to achieve the optimal solution across the organization—in which there may be many material solutions for a unique requirement or a single material solution for multiple platforms. The objective is to optimize the potential solution candidates that are designed to meet a requirement, ensuring the best-value solution set for the warfighter and the taxpayer.

The combined effect of multiple material or operational solutions might provide the relevant capability for the force and, subsequently, for the individual systems within the force. Figure 2 shows how multiple solutions are generated from a single requirement and blossom into multiple potential solutions based upon the individual Platform Manager's perspective. As the specified operational requirement is translated into material options, Program Managers each begin individual solution sets or material solutions with regard to their specific program. From the material solution is generated an expansive set of subsystem and software options. In today's environment, the Project Manager spends little time looking toward other Project Managers for material options, resulting in a plethora of programs designed to meet a single requirement. Ultimately, the Service has a suboptimal capability solution requiring ever-increasing time and money to support the individual material approaches derived in each program.

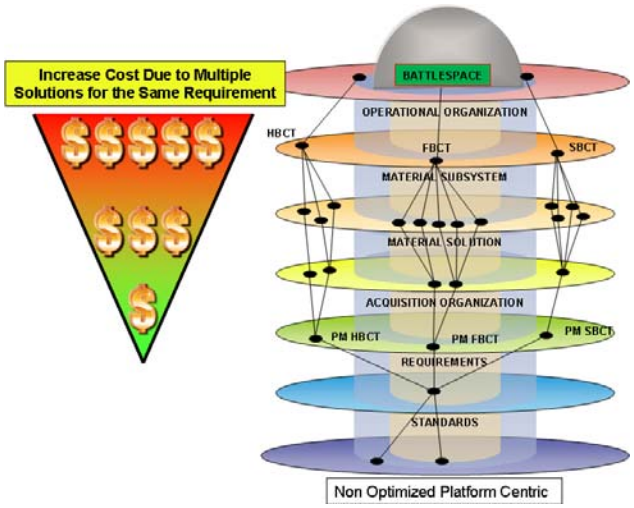

Figure 2. Acquisition Process Model "Capability Engine" Reflecting a Non-optimized Material Development Strategy

Conversely, Figure 3 depicts the same requirement being satisfied in a more optimized approach. All layers of what I refer to as the ***"Capabilities Management Engine"*** are addressed to ensure continuity in the requirement and the solution set. In order to "qualify" as an acceptable solution for a specified requirement, all layers of the "engine" must be considered and linked. The path through the engine must be optimized with the fewest number of subordinate connections. Minimizing these links requires a Capabilities Manager with the authority to influence systems horizontally across each layer of the engine with the intent on leveraging solutions sets across multiple programs.

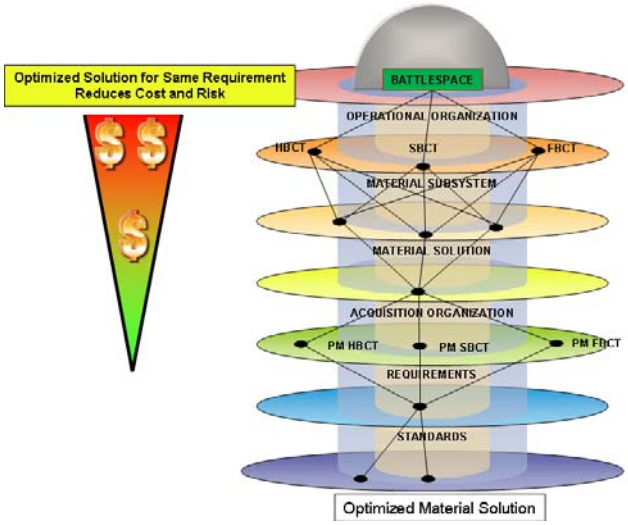

Figure 3. Acquisition Process Model "Capability Engine" Showing an Optimized Material Development Strategy Solution

Capabilities Engine:

The synchronizing process is the key to being able to ensure success in the capabilities-centered acquisition environment. The "Capabilities Engine" needs to consider all aspects of

the requirement, material, organizational, and policy environment and be able to synchronize this across multiple programs.

- Capability Layer 1 (CL1): Standards. The standards layer is the foundation upon which all acquisition programs are based. Standards encompass policy, statute, regulations, treaties, etc. All programs must be tied back to firm standards foundations lest they be developed in contravention to the authoritative documents upon which our institutions are formed. This may seem obvious, but it is a critical step that is often not well understood by Program Managers.
- Capability Layer 2 (CL2): Requirements. The requirements process is the beginning of all programs. The warfighter determines a unique need and validates the need must be satisfied with a material solution. Simply levying a requirement, however, is insufficient. All of the intended and unintended impacts of requirements must be completely vetted with regard to the systems that are already fielded and those in the development process. The Capability Manager will link the requirement to the appropriate program offices, the material solution and its subsequent subsystem contributors and ultimately back to the warfighter. The intent is to establish a clear path with an optimized solution from requirement inception to retirement.
- Capability Layer 3 (CL3): Acquisition Organization. This is simply the acquisition organization that is most appropriate to develop a specific material solution for a requirement. Often, a single requirement will be levied upon multiple program offices. Without a Capability Manager to synchronize the respective program offices, the risk remain that singular solutions will be developed for individual platforms.
- Capability Layer 4 (CL4): Material Solution. As material solutions are developed, the Capability Manager will match similar solutions and optimize the set to minimize the total capital outlay necessary to meet the specific requirement. This is the point at which the Program Managers must share resources in order to minimize the total cost and ensure a synchronized capability is maintained to meet the common requirement. Throughout this synchronization process, however, each Program Manager must develop a solution that is consistent with his/her platform-strategic plans. This, in fact, is how the Program Manager is chartered and funded. It is the Capability Manager's mission to ensure the overall solution is optimized across the organizations.
- Capability Layer 5 (CL5): Material Subsystem. CL5 is similar to CL4 with the exception that the total number of potential solutions is orders of magnitude greater. Here is where the "good idea" cost driver is most apparent. The multitude of subcomponents for a system are ripe picking; any vendor, government organization, or anyone with a good idea to solve an engineering problem will use whatever means necessary to convince a Program Manager to resource their project. Left unchecked, this is where programs run the greatest risk of being desynchronized with each other. Additionally, this is where programs tend to allow "requirements creep" and contribute to increasing program costs. The Capabilities Manager must synchronize subsystems between program offices and ensure they are consistent with each of the subordinate layers. Failure in this area manifests itself as inefficient, redundant, or worse: incompatible systems on the battlefield.
- Capability Layer 6 (CL6): Operational Organization. The operational test community and the user must look at the combined nature of the material solutions and assess whether or not the material solution is simply a slightly better appliqué of what already exists. The user must hold the acquisition community accountable for developing

system-of-system solutions that are mutually supporting and as common between systems as possible.

- Capability Layer 7 (CL7): Battlespace. The battlespace is the future state at which a particular service views its warfighting posture. All systems must support this objective. Lack of a clear link to the future state might reveal program flaws or non relevance to the objectives of the National Military Strategy and subordinate service objectives.

As a requirement is developed, a clear link from CL1 through CL7 must be established and managed. The Capability Manager can synchronize the seven layers for specific platform solutions across multiple program offices. Platform Program Managers manage their programs horizontally, with respect to time and program milestones. The Capability Manager manages "vertically" within each phase of the spectrum of Programs attempting to optimize the material solution across multiple platforms and through the seven layers of the capability engine.

Knowledge-based Decisions

Managing from a capability-centered perspective is significantly more complex than the traditional platform-focused approach. One must account for all aspects of the organization and be willing to accept being dependent upon the success of other organizations and managers. This is inherently counterintuitive for the "traditional" Project Manager, in that the "success at all cost" approach to doing business is significantly dependent on others outside of the Program Manager's sphere of influence. Consequently, managing toward an optimized capability is highly dependent on having a well-established knowledge-based process, a clearly defined execution strategy, and well-defined roles and responsibilities. Additionally, leadership at least two levels up must emphasize and support an organizational structure that facilitates the seamless execution of the capabilities model.

A knowledge-based capability model will enable developers to be reasonably certain at critical junctures, or "knowledge points" in the acquisition lifecycle, that their products are more likely to meet the cost, schedule, and performance baselines of the individual contributions of each project office and provide an optimized solution set which meets both the warfighter requirement and mitigates redundancy and excessive resource demand.

Knowledge-based capabilities management requires that someone manages the knowledge process and has the authority to influence the platform-centered processes. As the operational commander's weakest point on the battlefield is at the seams (the boundaries between units), the acquisition Project Manager's weakest point is the relationship between his program and that of another Project manager. This is the where the Capabilities Manager, using a knowledge-based process will strengthen the overall capability solution. Figure 4 represents key points at which the Capabilities Manager should influence the processes of the platform-centered Project Manager.

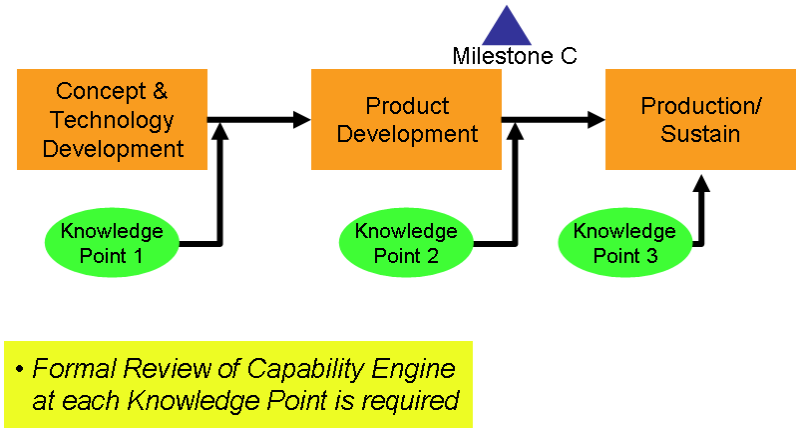

Figure 4. Knowledge Points at Which Capability Manager Validates Optimization of Material Solution for a Specified Program

The Capabilities Manager will synchronize all seven layers of the "Capabilities Engine" at each of the three knowledge points of the Platform Project Manager. The platform-centered Project Manager manages across time with regard to the five phases of the acquisition lifecycle. Those phases include the: Concept Refinement, Technology Development, System Development and Demonstration, Production and Deployment, and Operations and Support phases. At each phase, the Project Manager strives to attain the best-value solution for a specific requirement for his/her platform. If multiple Platform Managers have similar requirements, these Platform Managers will focus on obtaining best value for their platforms within the constraints of their resources and where they are in their respective lifecycle phases.

By managing the seven layers of the Capabilities Engine, the Capability Manager looks vertically at specific knowledge points in time to ensure that all potential solution sets are considered across multiple platforms. Formal synchronization points at which the Capability Manager reports success against a specified set of metrics (cost, schedule, and performance perspective) can be achieved across multiple programs. The Knowledge Points suggested in this paper are consistent with those recommended by the GAO study that reviewed the NASA process with which it made its investment decisions (GAO. (2005, December). *Implementing a knowledge-based acquisition framework could lead to better investment decisions and project outcomes.* Report to Congress. Washington, DC: author).

- Knowledge point 1 (KP1): Resources and needs match. Knowledge point 1 occurs when a sound business case is made for the product. According to the GAO, this requires a match between the customer's requirements and the product developer's available resources in terms of knowledge, time, workforce, and money. By synchronizing all seven layers of the Capabilities Engine at this point, the Capabilities manager not only matches requirements with resources and time, but ensures the requirement is consistent with standards, an optimized material solution, is appropriate for the specific organization receiving the system, and, most importantly, is consistent with the battle space within which the material solution will be integrated.
- Knowledge Point 2 (KP2): Product design is stable. Design stability is critical to reducing risk. At this point, the Capability Manager continues to validate that all the layers of the Capability Engine are synchronized and that no perturbations from any of the layers has caused a break in the connection from the Standards layer to the Battlespace layer. Additionally, the Capabilities Manager ensures that the solution(s) for

the initiating requirement are still consistent with the warfighter's intent and that the Platform Managers have not introduced potential dissimilarities within their platform-strategic plans than might manifest in subsequent phases.

- Knowledge Point 3 (KP3): Production Processes are mature. This is effectively the Platform Manager's milestone C point at which the risk must be low enough to precede into production contracting. The Capabilities Manager has less of a role at this point—with the exception of continuing to monitor the capability effects across the layers of the Capability Engine. Configuration management of the platform solution is critical to maintaining a consistent capability across the force. At this point, if the Platform Manager introduces changes to the production architecture, the potential exists for the synchronized solution to "stovepipe" into a unique platform solution. The Capability Manager must monitor the configuration control of all systems across multiple Program Offices, with regard to each other, while the Program Manager must continue to sustain and improve the capability on the unique platform.

Conclusion

Viewing material acquisition in a more holistic manner and striving to optimize solutions for specified requirements should be the goal for all the Services. Although the defense budget is low with regard to the GDP compared to past points in history, current-year dollar value is the highest it's ever been. The acquisition process, however, continues to develop fewer systems at greater expense. As the warfighter views the battlespace as an interconnected environment of mutually supporting systems, our Program Management process must also adapt to this environment. We must begin to view systems as contributors of capability in which systems are mutually supporting, in which the combined effect is greater that the individual parts. A Capability Management Process that supports the "traditional" Program Management process needs to be developed to inculcate a standardized approach to managing capability.

The thoughts presented in this paper look at the need to change the current paradigm and how one might approach a capability management model. The problem is complex, but the need for a solution is imperative. Developing an execution strategy to capability management is even more complex. Understanding the need to optimize and synchronize material solutions is merely the beginning. Developing an organizational construct to execute this mission is worthy of continued study and, ultimately, of implementation. It is important in this study to heed the words of Sun Tzu: "avail yourself also of any helpful circumstances over and beyond the ordinary rules"; for as in War, the systems we provide the warfighter will shape the outcome of the battle.

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