

Creating competitive advantage*

How to transform program management

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Both government and private customers in the aerospace and defense industry are demanding greater innovation and program execution from their contractors. As supply chains have become more global and outsourced, program management has become increasingly complex. This complexity has contributed to the well-publicized cost overruns, schedule delays, and quality issues currently plaguing the industry. The U.S. Congress is now mandating higher standards of program management from the Department of Defense and its contractors; fixed-price development contracts have elevated contractor risk; and the public sector is more than ever holding companies and program managers accountable for failing to meet schedules, budgets, and performance specifications. Competitive advantage and market capitalization are at stake, and the risk for penalties, cutbacks, or even program termination has never been higher.

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PricewaterhouseCoopers believes that the aerospace and defense industry must be proactive in elevating its program management effectiveness, adopting a balanced framework to mitigate or control risks and to cushion the impact when customer requirements change. Superior program execution requires management discipline throughout the extended enterprise, from internal contractor operations to suppliers, customers, and end users. To create the proper management structure to support program execution, companies should ensure that the program team is working with shared goals and open lines of communication; that program facets such as strategy, risk, cost budgets, planning, task schedules, and technical milestones are integrated; that program managers are taking a proactive approach to managing change; and that program knowledge is being managed effectively.

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The first step in improving performance involves building an objective and honest assessment of the current state of program management, based on a framework of five key management areas. PricewaterhouseCoopers provides example questions within each area, designed to explore organizational, cultural, process, and technological attributes. Companies that can evaluate their existing programs honestly and make the necessary course corrections will be better positioned to capture major programs, improve fiscal outcomes, improve employee morale, and enhance their reputation in the marketplace.

Situation

Customers have raised the bar on program management and execution.

Program management is far from a new concern in the aerospace and defense industry. The U.S. Government Accountability Office (GAO) and RAND Corporation have been tracking industry management issues for decades. Despite the fact that the defense industry remains robust and continues to do well with investors, and although aerospace and defense companies have always had deep program management expertise, a July 2007 *Aviation Week & Space Technology* report says that “poor program execution remains the Achilles’ heel of players across the industry.”¹ The recent challenges of dealing with marketplace pressures have led to a number of widely reported cost overruns, schedule delays, and quality issues. Government and private customers have raised the bar on program execution, and companies must elevate their program management effectiveness in order to meet the new mandate.

Illustrating this need to improve program management effectiveness, half of the respondents in a recent *Aviation Week & Space Technology* survey said that the aerospace and defense industry does only a “moderate” job of program management.² In the survey, nearly 60 percent of respondents “expressed deep concern about the ability of their suppliers or partners to meet schedule requirements.” This is hardly surprising, given that 80 percent reported they “were using different metrics than their suppliers,” a predicament that invariably leads to a misalignment of goals, which in turn may lead to disrupted budgets, schedules, and performance.

Customers increasingly want companies to ensure their programs are well managed, staffed with the right people, and backed by the right technology and processes. Managing programs well also includes ensuring that subcontractors receive appropriate oversight, and that risks within the supply chain are understood and mitigated. The industry, especially prime contractors, must show a greater ability to foresee and proactively manage challenges that impede the ability to deliver on time, on budget, and with the expected levels of quality and performance.

Programs that don’t meet expectations are at risk for major penalties, cutbacks, or even termination. Corporate reputations are at risk, as are corporate bottom lines. At issue is not whether companies can manage programs, but whether they can manage those programs effectively enough, given the challenges they are facing.

¹ *Aviation Week & Space Technology*, “Top Performers Reap Dividends of Discipline” (July 16, 2007).

² *Aviation Week & Space Technology*, “Over Budget, Behind Schedule: New Survey Underscores Aerospace and Defense Industry’s Less-than-Stellar Record of Program Management” (November 13, 2006).

Higher standards set by Department of Defense

Unstable funding in the U.S. Department of Defense (DOD) has always been a problem in managing programs. Wartime expenses in Iraq and Afghanistan are draining Pentagon coffers, while the DOD competes with other federal agencies for increasingly tighter budget resources. The GAO points out that the DOD is doubling its planned investments in new systems to about \$1.5 trillion and in theory has \$880 billion of this amount still to spend.³ But Congress can delay or eliminate funds for programs that fail to keep to budget, schedule, or performance. The Pentagon (and its contractors) assert that lack of stable funding from Congress adds complexity to long-term program schedules, yet Congressional control of the federal purse strings—and the oversight that goes with it—remain a constant.

Others besides Congress are also publicly scrutinizing DOD performance. In early 2006, testifying before the House Armed Services Committee, U.S. Comptroller General David M. Walker said, “At this time... DOD is simply not positioned to deliver high quality products in a timely and cost-efficient fashion. ... DOD starts more weapons programs than it can afford and sustain, creating a competition for funding that encourages low cost estimating, optimistic scheduling, over promising, and suppressing of bad news. ... Invariably, with too many programs in its portfolio, DOD and the Congress are forced to continually shift funds to and from programs—undermining well-performing programs to pay for poorly performing ones.”⁴

To address these issues, Congress is demanding higher standards of program management. In October 2006, it signed into law the John Warner National Defense Authorization Act for Fiscal Year 2007 (Public Law 109-364), which included requirements for the DOD to upgrade its program management workforce. In Section 853 (entitled “Program Manager Empowerment and Accountability”), Congress required the DOD to implement enhanced training, mentoring, empowerment, and accountability throughout its program management workforce.

³ U.S. GAO, *Best Practices: An Integrated Portfolio Management Approach to Weapon System Investments Could Improve DOD's Acquisition Outcomes* (March 2007; www.gao.gov/new.items/d07388.pdf) and *Defense Acquisitions: Assessments of Selected Major Weapon Programs* (March 2007; www.gao.gov/new.items/d06391.pdf).

⁴ U.S. GAO, *Defense Acquisitions: Actions Needed to Get Better Results on Weapons Systems Investments—Statement of David M. Walker, Comptroller General of the United States* (April 5, 2006; www.gao.gov/new.items/d06585t.pdf).

Increased competition

The mandate for more effective program management translates to the private sector as well. Winning contractors must also perform, despite tight budget constraints. The public sector is more than ever holding companies and program managers accountable for meeting schedules and budgets, and is increasingly penalizing them should they fail to meet design specifications and perform as promised. Intensifying the competition, the government is once again favoring the use of fixed-price development contracts (where contractors bear the risk for cost overruns and schedule delays) instead of lower-risk cost-plus contracts.

Contractors are under pressure to accomplish more with allotted funds. Increased competition will inevitably lead to canceled contracts for perceived weak program management and performance. Recently, the U.S. Navy cancelled a portion of the contract for the Littoral Combat Ship (LCS) program because of cost growth. In the same spirit, the Coast Guard is taking back oversight work it had awarded to contractors for its vaunted Deepwater program, a consequence of programs running over budget and behind schedule, and of Congressional testimony that alleged ship-design flaws.

Program pressures

In these cases and others like them, the contractors did not necessarily mismanage their programs. Most of today's major weapon programs are part of a systems-of-systems approach, an inherently complex network of interlocking platforms and technologies that requires the precise integration and unerring performance of disparate pieces. This also requires the successful program management of each of the systems—an undertaking that can be significantly challenged when suppliers fail to meet schedules, cost caps, or capability promises.

Moreover, budget overruns, schedule delays, and quality/performance issues often stem from a host of issues outside the control of the contractors. In many cases, these problems result from failing to properly account for the risks that lead to cost growth. For example, in recent years China has been cornering the market on raw materials, causing scarcity, delays, and price increases for commodities. Other issues include interest rate fluctuations, increased governance costs, and new customer requirements.

Even when these cost-growth risks are considered, cost estimates are often too low because the government may proceed with an underfunded program rather than risk losing the program completely. Case in point: *Aviation Week's Aerospace Daily* has reported that in 2003, when the Air Force started its post-9/11 program to marry Federal Aviation Administration and NORAD radars, the service released a \$30 million contract even though it knew the program would actually cost hundreds of millions of dollars.⁵

Another pressure is the widely reported “human capital crisis,” where the consolidation and downsizing of the industry has cut into the experience base. This can have a disastrous effect when a company loses seasoned program managers and experienced system engineers, then is faced with a situation where requirements change and specifications become more challenging. Another well-known impact is the shrinking defense supply base, where many suppliers are leaving the industry or losing their capability to meet challenging military specifications and tolerances.

⁵ *Aviation Week's Aerospace Daily*, “National Airspace Security System Deployed by AF before It Was Ready” (November 27, 2006).

Beyond U.S. defense: Challenges impact the broader global sector

While U.S. defense spending approximates that of the rest of the world combined, these problems are not just a U.S. problem; they are global issues. In the United Kingdom, while the Ministry of Defence (MOD) is taking steps to improve the management of project costs and current acquisition performance,⁶ it is reported to have cancelled several major weapon systems this decade because of cost, schedule, or other programmatic issues. Cancelled programs included the Medium-Range TRIGAT (third-generation anti-tank) missile, the Multi-Role Armoured Vehicle, the Counter Anti-Radiation Missile Suite, and the Laser Identification Experiment Airborne Technology Demonstration.⁷

Increasing complexity in program management extends beyond the defense industry, affecting the commercial side as well. In September 2007, Boeing announced its test flights for the new 787 Dreamliner would be delayed by three months. In a Boeing webcast, Vice President and 787 General Manager Michael Bair cited supply chain issues (specifically incomplete assemblies and flight control software issues) as a root cause for the delay. The first flight is due to occur in mid-November or early December of 2007. Bair says, “We are resisting the temptation to set an exact date.”⁸

Similarly, Airbus saw the budget for its A380 super-jumbo jet program rise to €12 billion from €8.8 billion amid delays to wiring systems and penalties for late deliveries, according to Bloomberg reports in March. Bloomberg also reported that parent company EADS reported a fourth quarter loss of about \$1 billion and said Airbus would lose a substantial amount of money in 2007 because of production delays on the A380 program.⁹

⁶ SBAC Brief, “National Audit Office Report on the Ministry of Defence Major Projects Report” (January 12, 2006).

⁷ House of Commons, *Public Accounts—Third Report* (October 13, 2005).

⁸ Boeing webcast, “787 Update Conference Call” (September 5, 2007; <http://phx.corporate-ir.net/phoenix.zhtml?c=85482&p=irol-eventDetails&EventId=1634026&WebCastId=678425&StreamId=965258>).

⁹ Bloomberg, “Airbus Plane Delays Probably Caused Second Straight EADS Loss” (March 8, 2007).

A call for transformation

Opinions differ over the root causes of program delays, budget problems, and quality/performance issues. Regardless of root cause, there is overwhelming agreement that the current situation is unacceptable and that program outcomes must improve. In early 2007, Ken Krieg, the Pentagon's chief acquisition official during the latter stages of the Bush administration and one of the lead enforcers of DOD procurement reform, crystallized program issues with a simple statement: "Performance matters If you can start programs better and you can hold discipline, then it creates an opportunity for program managers to be successful."¹⁰

What company management and their program managers need now is a balanced framework to guide them in transforming their culture, processes, and technology in order to meet the greater expectations—and scrutiny—being directed toward existing programs. They also need to have in place the right personnel, processes, and technological support.

¹⁰ DOD press briefing (March 15, 2007).

Nunn-McCurdy: A red flag for program management breakdowns

As part of its effort to better control wayward military program budgets, schedules, and contract performance, Congress has established a trigger for the Defense Department to report problem programs to lawmakers. When programs exceed their current acquisition program baselines (APB) by 15 percent or more, or their original APB by 30 percent or more, they breach these so-called Nunn-McCurdy unit cost limits.

The Pentagon reports these Nunn-McCurdy cases as part of the DOD semi-annual Selected Acquisition Reports (SARs). The end-of-year 2006 SARs identified eight highly recognized programs that required Nunn-McCurdy notifications.¹¹ Those programs identified must endure a rigid DOD review to determine whether they should continue. A key factor in that decision, as mandated by Nunn-McCurdy procedures, entails a Pentagon assessment of the contractors' program management effectiveness, scrutinizing the development plan, cash reserves, technological feasibility, requirements portfolio, schedule, and other major factors.

As important as the DOD deems the programs, there is no guarantee the department will keep them. Prompted by cost increases and delays relating to development of the Navy's Littoral Combat Ship, the Pentagon and Congress began to demand greater oversight of that and other major weapon programs, with an eye toward canceling those that continually run behind schedule and over budget, and show poor contract performance.

¹¹ U.S. Department of Defense News Release, "Department of Defense Releases Selected Acquisition Reports" (April 9, 2007; www.defenselink.mil/releases/release.aspx?releaseid=10714).

Our perspective
Program management
effectiveness must be
elevated across the
entire supply chain.

While there are differing opinions about whether the most complex programs can always be on time and on budget, and meet their design specifications with the required quality, the considered view—based on extensive consultations with program leaders, industry specialists, senior service personnel, and academics—is that industry must be proactive in changing its approach and take the initiative to transform program management. No management plan can be perfect, but a balanced framework can mitigate or control risks, as well as cushion the impact when a customer adds requirements or makes other significant later demands.

Superior program execution depends on a well-structured program management discipline instilled not just across the organization but also extending through the entire program team—and it is critical that the program team includes all entities/organizations, processes, and resources that actually accomplish work that is directly related to the program or contract statement of work (SOW). In today’s environment, the program team increasingly extends outside the four walls of the contractor to include the supply chain as well as the customer and end user—what is termed “the extended enterprise.” Failing to identify and address this enterprise’s “weakest link” on a timely basis can be the quickest path to schedule slippage, budget overruns, or performance issues.

While many of the defense industry’s top-tier companies have recognized their program execution challenges and taken steps to address program management and program team issues, there is little to indicate that the rest of the industry—the rest of the contractors and their supply chains—is moving systemically to foster and develop an effective program management structure, culture, and discipline.

Ken Krieg has warned all contractors to put more emphasis on proper program management and to link it to a strategic management approach. “You ought to select people who have management experience and management responsibility,” he said. “Strategic decision-making is one of the real challenges to acquisition performance.”¹²

¹² DOD press briefing (March 15, 2007).

Additionally, a company must be able to evaluate its ability to manage programs, assess its shortcomings, and commit the necessary resources and support to making program management a core competency. Management must develop a holistic, effective management model that involves all organizational, cultural, and business process aspects of the company (including its supply chain) and align them for program success.

Moreover, this mindset must be established early in the process. To create the proper management structure to support program execution, companies must focus first on five key management areas: shared goals, open communication, integration, a proactive mindset, and knowledge management.

Each deserves further explanation and insight as it relates to an effective management mindset.

Shared goals

Alignment through shared goals helps to establish common metrics and objectives so separate team members can make decisions in a unified context to support overall program execution. As part of instilling shared goals, companies need to align operational support functions with program teams to avoid friction between various organizational silos and to assure that programs have adequate execution support. Moreover, they must make sure the interests and skill sets of individuals match the objectives of the program and the company.

Again, program teams should take a holistic approach. Looking externally, the goals and interests of the supply chain across the extended enterprise must be aligned with those of the program. The primes must treat their suppliers as more than just individual business transactions. It does not matter if a company is a second, third, or even lower tier—they are alliance partners and integral to the success of the program. The same can be said of the customers and/or end users, and their interests and priorities need to be aligned as well.

When it comes to effective program management, alignment of shared goals takes on an even broader and more subtle connotation. Companies and their partners need to align tactical program decision-making with their strategic planning, both at the corporate and local level. All stakeholders must use common metrics and share a common definition of program success. Once so aligned, all stakeholders will have common expectations and they can focus their efforts on achieving common program objectives. Without such alignment, the stakeholders will likely have diverse and potentially competing goals, which will undermine program decision-making.

Open communication

An effectively managed program depends on open lines of communication, which foster a collaborative environment and empower individuals to give their best efforts to meet program needs. This collaborative environment bridges the information gaps between diverse stakeholders and between possibly competing entities within the supply chain, permits resources to be deployed optimally, and facilitates management visibility and control. Mature IT infrastructure may also play a role, potentially enabling an open and effective communication environment by improving the efficiency with which data and information are transmitted throughout the extended program team. Improved communication channels, self-reporting of risk issues, and a more rapid updating of program status all help companies and their partners to better manage risks.

If the communication lines remain blocked, the environment can turn adversarial. The flow of information moves in a hierarchical direction only from the top downward, and employees (or suppliers) lack the necessary information and empowerment to act, to take responsibility, and to innovate. Business partners in a one-way communication environment never realize the potential benefits of their partnership. As communication starts to fail, so too does program execution.

To foster open communication, the divide of administrative, financial, technical, and military responsibilities in the public sector and the industry must be bridged by several well-coordinated interfaces.

Lockheed Martin: Fostering skills and systemic discipline through effective training

Lockheed Martin sees what it calls “program management capability” as a competitive discriminator, and has named program management as a critical competency. Eight years ago, the company started an internal Program Management Institute (PMI). Initially, a class of about 20 students convened twice a year for about two-and-a-half days. At the encouragement of CEO Bob Stevens, the program has since extended to 35 students, convening three times a year for five days. During the course, management professionals participate with Lockheed Martin executive management to address critical, contemporary issues affecting program performance.

Lockheed Martin also has a corporate-wide Program Management Council, which encompasses a formal program to train and measure program management performance. The training addresses skills and competencies for establishing the integrated baseline and control requirements, managing risk, maintaining configuration control, and managing major subcontractors. Each of the learning areas reinforces the systemic discipline exercised across all Lockheed Martin business areas. The company considers the training as essential for on-time and on-budget program performance.

While the Lockheed Martin story is impressive, a view across the aerospace and defense industry shows that many of the top-tier companies have recently instituted similar initiatives that are in varying stages of maturity.

NPOESS: A case study in program management restructuring

Over the past 13 years, one of the most scrutinized programs in the aerospace and defense sector has been the National Polar-orbiting Operational Environmental Satellite System (NPOESS), a polar-orbiting network of satellites meant to provide unparalleled environmental, weather, and other data to a host of government, civilian, and military users.

Initial estimates in 2002 pegged the program's price at \$8.4 billion. By 2006, that cost had risen to nearly \$14 billion. How that happened appears to be a textbook case for inadequate program management. In contrast, the subsequent restructuring of the program by Northrop Grumman is a glowing example of how a turnaround effort can salvage a program.

Senior Air Force space acquisition officials say the NPOESS spacecraft was designed poorly from the start. For example, the satellite would have featured a large, spinning and vibrating conical microwave dish immediately adjacent to one of its most movement-sensitive sensors. Other senior program officials noted that the initial specifications assumed that sensor providers could simply provide the same components that exist on current military-grade satellites—but those components, made specifically for the military years ago, are no longer available. Commercial, off-the-shelf sensors would not meet the requirements, so new sensor components had to be manufactured, adding costs and creating delays.

NPOESS breached its Nunn-McCurdy thresholds and faced elimination. Military and civilian users looked to other space platforms to perform its target tasks and missions, but three NPOESS partners—the DOD, Department of Commerce, and the National Aeronautics and Space Administration—took another look and in July 2007 announced a restructured NPOESS program. The trio put industry through a rigorous year-long effort to re-plan virtually every aspect of the NPOESS program, detailing the development and delivery of the system through initial production in the next decade. The new schedule shows sensors delivered to the NPOESS Preparatory Project to support a 2009 launch, and calls for the launch of the first NPOESS satellite in 2013. The restructured contract puts in place a back-to-basics approach, with management controls and reporting requirements that will ensure strict oversight of the contractor. The fee structure has been made more objective through the inclusion of incentives for cost, schedule, and technical performance.

Gary Davis, the National Oceanic and Atmospheric Administration's Program Executive Officer for Environmental Satellites, said of the restructuring, "This is the most extensive and rigorous planning process I have ever witnessed."¹³

¹³ *Air Force Link*, "NPOESS Program Restructured" (July 30, 2007; www.af.mil/news/story.asp?id=123062724).

Integration

All program facets must be integrated, especially planning elements such as cost budgets, task schedules, and technical accomplishment milestones. Risk management, strategy, and planning must also be integrated into program planning.

To integrate a complex program, the program organization must have clearly defined roles, responsibilities, and escalation scenarios with the customers, the contractors, and all suppliers.

Integration is also more than just an internal goal. Within the supply chain, program planning, status reporting, risk management, quality assurance, and continuous improvement must also be integrated with the prime's business processes and systems. Customers and/or end users must be integrated in the process to reduce conflicts. Integrating the extended enterprise will encourage the discovery of innovation and synergies, and create a true program team.

Proactive mindset

Changes—including evolving requirements and expanding scope—are a given for any major program, especially one in the development stage. Effective program managers take a proactive approach and formulate plans from the beginning to manage those inevitable changes and support them with a robust change management framework. Unlike reactive approaches or crisis management, proactive program planning makes sure the analytical framework is in place from the onset to quantify trade-offs and impacts, and to deploy resources on long-term strategic organizational imperatives instead of just meeting the needs of the moment.

Much of program management involves managing risk and uncertainty. Here again, a proactive risk identification, assessment, and management framework acknowledges the constantly evolving state of the program and uses trip lines and early-warning indicators—often embedded deep in the program's supply chain—to give program managers time to evaluate options and address issues effectively before they impact the program's critical path or baseline budget.

Another critical attribute of a proactive management mindset is the ability to entrust decision-making to those who are aware of the circumstances and the implications of decisions—and who have the necessary data and information to make correct decisions that will facilitate program outcomes.

Knowledge management

Lessons learned are a part of nearly every stage of a major program lifecycle. A knowledge-based approach is essential to effective program management and control. The key is to capture, harvest, communicate, learn from, and finally retain that knowledge and use it as a basis for collaboration—and to make all those activities embedded and continuous parts of the culture and operations of the company and its business partners. The link between knowledge management and cost is real and predictable. By continually and effectively managing and reassessing their programs, companies and their workforces learn what's essential and what constitutes waste, whittling away unnecessary costs, procedures, and mistakes. They learn how to operate faster, cheaper, and with fewer errors.

Additionally, knowledge management includes designing and making available just-in-time training to meet the needs of the program, the company, and its partners. Personnel changes—including on-boarding and departure of program staff—are made in a formal, well-executed process that facilitates personal, program, and organizational effectiveness. That means coaching and developing employees (and suppliers) through both formal and informal means to facilitate growth and to prepare succession planning. This effort must also be coordinated with individual development plans that are aligned with program needs. No industry has experienced the need for this type of knowledge management more than the aerospace and defense sector, which, as previously noted, has lost a great number of experienced program managers and systems engineers over the past decade or so.

The key management areas mapped out above serve as guideposts for a powerful plan to deliver the required program results on time, on schedule, and according to contract. These areas serve as a solid starting point for companies and program management teams to begin raising the bar for their own program performance.

Airbus and Boeing: Advanced innovation, better program management

Aerospace industry giants Airbus and Boeing continue to wrestle one another with management and development of their biggest airplane programs.

Boeing had to overcome cost overruns and delays with its 737 production nearly a decade ago, and the aircraft went on to become one of its most successful products. Now, Boeing has seen even greater success with its 787 Dreamliner. In April 2007, *Aviation Week* reported that Boeing had received orders for 500 Dreamliners within 36 months of the

program's launch, making the 200- to 300-seat twin-aisle jet the fastest-selling plane in company history.¹⁴

The Dreamliner's fast-selling success has continued despite the fact that customers buying now won't get their aircraft into the production line until late 2013. That's because Boeing purposely managed the program to maintain a slower production pace in the initial years of operation, to ensure that plant and global supply network production executes as planned. Despite these best-laid plans, the path hasn't been completely smooth: Boeing recently announced it would postpone test flights three months due to supply chain issues.

Using lessons learned from well-publicized problems with its A380 program, Airbus is taking pains to make sure it manages the development and production of its new, single-aisle A320 more effectively. As *Aviation Week* reported in March 2007, the company is assessing every link in the supply chain, making sure second- and third-tier suppliers have the communications tools to identify problems. Airbus is securing its raw materials and keeping inventory costs low by, for example, holding off on installing engines until a day or two before first flight.

¹⁴ *Aviation Week*, "New JAL Sales Boost 787 Past 500-Order Milestone" (April 4, 2007).

Implications

How to make good investments with a scarcity of resources.

Developing a more effective program management mindset and the necessary supporting tools is no longer an option. Industry leaders have embraced plans to transform and/or improve their program management approach, and they're increasingly demanding the same of those they work with.

To compete effectively in markets around the world, in both civilian and public arenas, companies must strive to improve program performance across an array of program management competencies. They must use a balanced framework to identify areas of strength and weakness, and from there develop an actionable improvement plan against which progress can be measured. (Note that this is consistent with "Six Sigma" quality improvement methodologies, which require design of improvement goals and measurement of critical areas.) Transforming the management mindset to foster effective program management and execution will reduce unfavorable outcomes and distinguish companies from their competitors, and tends to maximize program win rates long into the future.

The first step in improving performance involves building a picture of the current state of program management. This initial assessment must have several features to help ensure that it is accurate and complete:

- It must be mapped to organizational, cultural, process, and technology attributes that embody the five key management factors discussed in the previous section: shared goals, open communication, integration, a proactive mindset, and knowledge management. Doing so will ensure a balanced and systematic approach that considers all aspects critical to a program's success.
- The assessment must be a dedicated activity that receives support from and is championed by the company's executive echelons.
- The assessment must be holistic in that it incorporates input from a cross-section of stakeholders and data points and perspectives. It is not enough just to gauge the program manager's perspective. To build an accurate overall picture of strengths and deficiencies, it's just as important to gauge the perspectives of line engineers, functional and process leads, human resources, marketing, business development, corporate executives and subordinates, clients, and end users. Further, it is not enough to gauge program health from within the company alone. Instead, the assessment should involve the full, extended program team (i.e., subcontractors and the extended enterprise).
- Companies should focus the assessment on the areas in their program portfolio(s) where they have identified a need for improvement. They can concentrate on a single program or multiple programs as the situation dictates.

The key to a productive assessment of the current state, above all else, is that it collects data that are objective and honest. Obtaining such data involves planning ahead and formulating the right questions to expose and analyze the company's pain points. The example questions that follow are designed to explore several organizational, cultural, process, and technological attributes of the five framework areas. Each area is addressed individually.

Shared goals

One of the single biggest (and most obvious) concerns for a company is the alignment of its programs to its strategic goals and how they fit into a long-term strategic value framework. Does the company pursue programs and projects that provide synergy and improve/reinforce business alignment and organizational core competencies and processes? Does the corporate level of the company provide the programs with the visibility and support they need? Prioritization of facilities, resources, and other needs comes from the top. Executives sponsoring the program must be proactively involved with the program and customer. Do they have the knowledge and expertise required to champion the program?

Companies should create robust supplier assessment and selection processes that take into account past performance as well as other program execution concerns. Are suppliers selected based on ability to meet needs across multiple programs? Are pre-placed alliances replacing individual procurement transactions? Along these same lines, is there a process the organization uses to determine customer needs, goals, and objectives, in order to foster a better understanding of requirements and specifications? To what extent are these processes dynamic? Are these processes in alignment, even from the point of a bid/no-bid decision?

A company's discretionary investments (such as independent research and development, key process improvements, and the like) should be aligned with program requirements and customer needs as much as possible. Can programs be used as opportunities to improve enterprise key processes, or is one a disruption to the other? To this point, will the customer incentivize and perhaps even help to fund such improvements? Is there a role for the customer in transforming the program management mindset?

Integration

The program team and all of its members must effectively operate as one seamless organization. Even from the initial qualification of an opportunity, the needs for integration are abundant: Is the capture team organized and integrated across the enterprise? To what extent are operational support processes and administrative

and infrastructure disciplines integrated into the program? At what point, and to what extent, are key suppliers linked to a proposed program? Are they part of the capture team? Is the proposal team fully embedded into the capture team process and does it include key members of the negotiation and post-award program execution teams? Are supplier technical, budget, and schedule negotiations concluded prior to the proposal submission?

Upon authorization to proceed, companies must decide the levels of visibility, support, and integration necessary for proactive technical, cost, and schedule management. To what extent should suppliers, customers, and end users be included? Are programs' integrated master planning/scheduling and earned value management systems (and even procurement systems) state of the art? Are they integrated, updated in real time, and reported to all stakeholders via online access? Are program cost/schedule variances and estimates-at-completion evaluated independently?

One leading industry practice is for all stakeholders to participate actively in shared risk identification and mitigation approaches. Management of the risk portfolio should be an integral part of the program dashboard to identify natural offsets (and opportunities) and aggregate common challenges. As such, how are risks affecting the program outcome included in the program management baseline? Are they assessed, tracked, and reported across multiple programs?

Open communication

Questions in this area should probe the extent to which communication across organizations and stakeholders is open and unfettered. Do intra- and inter-program teams collaborate to enable exchange of information and lessons learned, and work as a community of practice? Are all members of the program team empowered to voice concerns or request changes? In fact, are they inspired to do so? Is there a process whereby these concerns are documented, tracked, and addressed at the management or leadership levels?

A critical enabler to a collaborative environment is a mature and stable IT system that is adequately funded and easily used. Do existing IT systems fully support the program team's needs, both internal and external? Do they afford secure communications channels for electronic procurement and inventory systems, and to facilitate data exchange? Are improvement suggestions solicited and rigorously adjudicated? Do programs have dedicated resources to manage the IT infrastructure? Do the IT systems effectively support configuration management? How quickly do they propagate programmatic or technical changes to all team members throughout the extended enterprise?

Boeing: Rescuing the C-17 through innovative management

The Boeing C-17 Globemaster III is an example of how effective management can turn a program around. The C-17 Production Complex in Long Beach, California, opened in 1988, reportedly suffered under outdated command-and-control management techniques, and was unable to meet Pentagon performance expectations. The DOD was ready to cancel the program.

Getting the C-17 program back on course would be no easy task, with parts from 1,669 U.S. companies as well as suppliers in France, the UK, and Israel moving through its production line. Incorporating the best effective management techniques, Boeing focused on greater employee involvement and became process oriented and customer driven. Its transformation earned the company the Malcolm Baldrige National Quality Award in 1998.

In 1995 the company adopted a philosophy of Employee Involvement (EI) to help speed the departure from a command-and-control environment. The EI system of cooperation has four team initiatives: High Performance Work/Leadership Teams, Relationship by Objective/Doing Something Right, a Creative Edge Suggestion Program, and Gainsharing.

Boeing also boasts of the C-17 facility's seven-step plan for managing and improving processes, dubbed Process-Based Management (PBM). Anchoring the PBM process is interaction between process owners and process customers in defining, managing, and improving the process together.

The result: Boeing increased aircraft deliveries by 40 percent, decreased hours per aircraft by nearly a third, and reduced head count by 10 percent. Defects, rework, and repair are down by about half, while the costs associated with rework, repair, and scrap are down by 44 percent.

The aircraft coming off the line improved as well. Range increased by a quarter, and design improvements have included a terrain-avoidance warning system and a multi-function LCD cockpit display.

The Pentagon started to order more planes, including a 1996 \$14.2 billion deal to deliver 80 C-17s and a 2002 order for 60 more, extending production through mid-2008.

Proactive mindset

Changes—including evolving requirements and expanding scope—are a given for any major program, especially one in the development stage. There are therefore several attributes around the ability to foresee, declare, and disseminate changes that demonstrate a proactive mindset. For example, are cost and schedule variances identified prior to their occurrence, and do they prompt timely corrective action? How are changes to the technical baseline and/or statement of work identified and tracked? Is their impact to cost and schedule ascertained concretely, and have the associated trade-off analyses been conducted? Historically, change-control boards manage evolving program requirements, but are approved contract changes disseminated rapidly and visible to all stakeholders? Is there an online change-control and reporting mechanism that is fully integrated from the lowest-tier supplier to the customer and end user? As requirements evolve, are decision rationales recorded along with the decisions themselves?

Delegation of authority is critical to successful decision-making in a program. Is there a structured delegation-of-authority process throughout the program and the enterprise? Do people have full authority and accountability for the responsibilities they have been delegated? For example, is the program manager empowered to negotiate directly with suppliers, or is this function performed by another organizational silo? Does the program manager authorize others on the team to effect changes that they are in a better position to understand (e.g., redefining procedures when appropriate)?

Knowledge management

How companies treat their knowledge as a valuable and recyclable commodity, and demonstrate the ability to harvest and provide it to the right people at the right time, is a critical attribute with a direct bearing on success in the marketplace. There are several knowledge management areas that a company can examine:

- Are the company's program managers respected and networked throughout the enterprise and supply chain? Do program teams have members who can bring prior program success and continuity? Is there a formal upward learning or credentialing program with defined criteria for attaining increasing levels of expertise?
- Program execution is often about managing people and inspiring them to perform. To that point, consider delving into the following potential pain points: How are staff coaching and effective communication treated? Are they criteria in personnel selection, especially for program managers? Are they treated as skill sets that might require re-education and improvement?

- How the organization uses (or fails to use) its knowledge is critical. Are previous performance results and actual performance data recycled and factored into proposed bases of estimates? Are postmortems embedded in the culture and conducted rigorously on all programs, regardless of outcome? Do they drive process improvements that reduce variations in program outcome?
- Is there a formal online knowledge management tool in place to glean insights and lessons learned from programs throughout their lifecycle, and is it used widely? Who in the organization is responsible for ensuring its creation and promoting its use?

Responses to the above questions will provide a meaningful assessment of the company's program management culture and practices. An honest assessment of where the organization is today with respect to these questions is required, as is an open and forthright debate as to where the company should be, given its unique strategy and positioning within the sector. Identification of pain points throughout the framework can be used as the basis for such a debate, to determine areas in which the organization should invest for improvement. The discussion must also factor in other external pressures, such as the current economic environment, the market, the company's competitive position, and the geopolitical climate. The company can then decide where best to focus its resources as team members collaboratively pick a path toward transformation.

Assessment of each program management area of performance should be quantified with respect to a maturity model or competency framework, which provides a common reference point—a baseline for measuring improvement. Scoring the results with respect to a maturity model also helps when expressing the extent to which the company feels it can improve, and ultimately when benchmarking progress.

In the Darwinian world of aerospace and defense program competition, where the bar is continually set higher and the failure tolerance factor has all but disappeared, companies really have no choice: To survive, they must manage their programs effectively from the outset. To win commercial and government contracts, companies must prove they will deliver programs on time and on cost, with the expected quality. Further, companies must master the key issues detailed above to attain, retain, and grow major programs. Those that fail to do so face elimination as competitors or program contractors. But companies that candidly evaluate their programs and make proper course corrections will do more than capture major programs; they will also see better fiscal outcomes, higher employee morale, reduced turnover, increased retention, and enhanced reputation in the marketplace. All of this leads to competitive advantage and increased chances of winning future work.

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