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Acquisition, Technology and Logistics

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Calling on Mission Assistance

The Original Better Buying Power
Frank Kendall
Under Secretary of Defense for Acquisition, Technology and Logistics

Bridging the Gap

Contract Oversight in a Contingency Environment

Determining the Probable Cost

Leading Complex Projects in the DoD

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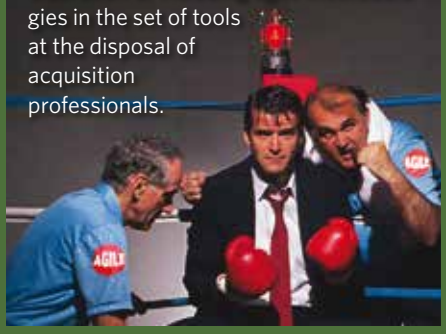

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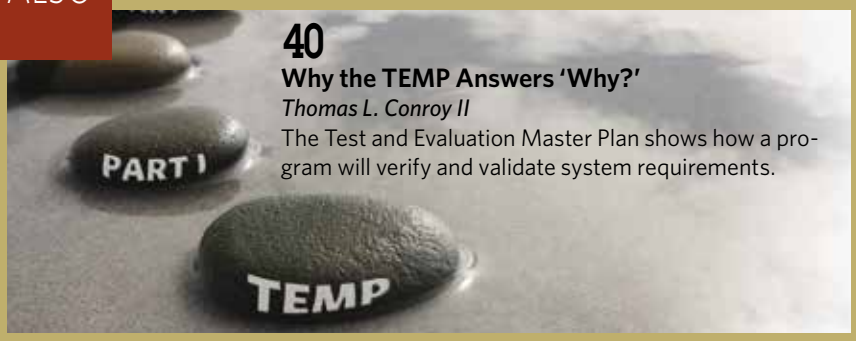

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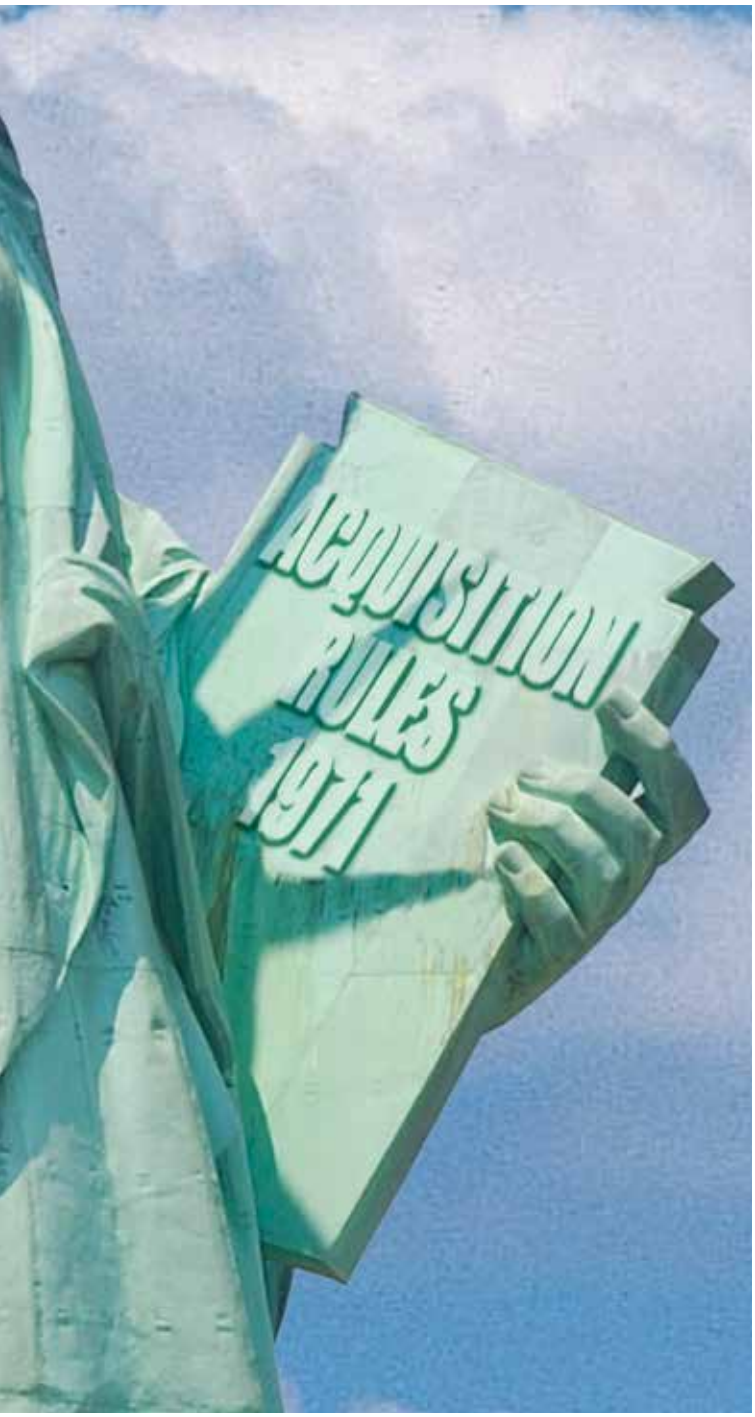
The Original Better Buying Power—David Packard Acquisition Rules 1971

Frank Kendall



In this article, I thought I would give us all a break from our budget woes, sequestration, and continuing resolutions—issues I hope will be resolved before this goes to print.

In 1971, I graduated from West Point. This was also the same year that David Packard, the Packard in Hewlett Packard, who was then the Deputy Secretary of Defense (there was no Under Secretary for Acquisition), published his rules for Defense Acquisition. I wouldn't say there has been nothing new under the sun since then, but some things do endure.

Recall that by 1971 we had already been to the moon, and the digital age, enabled by solid state electronics, had just begun. By the fall of 1971, I was at Caltech where I designed logic circuits using solid state integrated components that included a few specific logic functions—several orders of magnitude from current technology, and I was reducing experimental data using the first engineering math function digital calculator. My slide rule had become obsolete. Deputy Secretary Packard's rules, however, still resonate. I recently had them put on a poster and hung it in the Pentagon in the room we use for Defense Acquisition Board (DAB) meetings. Here they are with a little commentary from both David Packard and me. You should recognize a number of areas of overlap with Better Buying Power.

1. Help the Services Do a Better Job.

Improvement in the development and acquisition of new weapons systems will be achieved to the extent the Services are willing and able to improve their management practices. The Services have the primary responsibility to get the job done. OSD offices should see that appropriate policies are established and evaluate the performance of the Services in implementing these policies.

I continue to struggle with achieving the appropriate degree of staff "oversight," but I certainly agree with this sentiment. Services manage programs. As Defense Acquisition Executive (DAE), I set policy and I make specific decisions about major investment commitments for large programs, usually at Milestone Reviews. The staff supports me in those decisions, and I expect solid independent "due diligence" assessments for

those decisions from the staff of the Office of the Secretary of Defense (OSD). All other staff activities should be about helping the Services be more effective, ensuring that our policies are well defined, and getting feedback on what works and what needs to be improved in our acquisition practices.

2. Have Good Program Managers with Authority and Responsibility.

If the Services are to do a better job, they must assign better program managers to these projects. These managers must be given an appropriate staff and the responsibility and the authority to do the job, and they must be kept in the job long enough to get something done.

I don't know anything more basic and important to our success than this imperative. Having seen more than 4 decades of defense acquisition policy changes, I am absolutely convinced that nothing matters as much as competent, professional leadership. Once you have that, the rest is details. It was my concern for the professionalism of the acquisition workforce that led to the inclusion of an additional category of initiatives focused on our workforce in BBP 2.0. We have a lot of good, even great, extremely dedicated, professionals working in Defense Acquisition. But we need a deeper bench, and every one of us can improve on our own abilities. In the tough budget climate of today, managers at all levels, including Military Department and Agency leadership, should pay a great deal of attention to retaining and managing our talent pool. At the tactical level, I'm looking for some opportunities to take a "skunk works"-like approach to a pilot program in each Service. The key to implementing this approach, however, and what I want to be sure of before I authorize it, will be a highly qualified and appropriately staffed government team that will be with the project until the product is delivered.

In the tough budget climate of today, managers at all levels, including Military Department and Agency leadership, should pay a great deal of attention to retaining and managing our talent pool.

3. Control Cost by Trade-Offs.

The most effective way to control the cost of a development program is to make practical trade-offs between operating requirements and engineering design.

The affordability as a requirement element of Better Buying Power is intended to provide a forcing function for just this purpose. I've seen several variations of this; during my first tour of duty in OSD, we used "Cost as an Independent Variable" to try to capture this idea. The approach we are using now relies on the affordability caps (which are based on future budget expectations—not on cost estimates) that we are establishing early in the design process or product life cycle (Milestones A and B). The requirement to deliver products that meet the affordability caps is intended to force requirements prioritization and trade-offs among competing needs. I plan to insert a Requirements Decision Point prior to Milestone (MS) B to help facilitate this. I will continue to put these affordability caps in place and will be enforcing them over the next several years. For non-ACAT I programs, the Services and Agencies should be doing the same.

4. Make the First Decision Right.

The initial decision to go ahead with full-scale development of a particular program is the most important decision of the program. If this decision is wrong, the program is doomed to failure. To make this decision correctly generally will require that the program be kept in advanced development long enough to resolve the key technical uncertainties, and to see that they are matched with key operating requirements before the decision to go ahead is made.

I have long regarded the decision to enter Engineering and Manufacturing Development (EMD) as the single most important decision in a program's life cycle. The name has changed several times over my career, and Deputy Secretary Packard refers to it as full-scale development—but we are talking about the commitment to go on contract for design of a producible product that meets stated requirements, engineering development test articles, and for the tests that will be necessary to confirm performance prior to starting production.

At this point, we are committing to on average about 10 percent to 20 percent of the product's life-cycle cost to years of development work, and to getting a product that we will field ready for production. Among the most disturbing sources of waste in our system are the programs we put into EMD, spend billions on, and then cancel—sometimes before EMD is complete and sometimes after some initial production. Part of getting this decision right (in addition to affordability) is having the

risk associated with the product and its requirements under control and sufficiently understood and reduced so EMD can be executed efficiently and successfully. In recent years, we have focused on the Technology Readiness Level (TRL) as a metric for maturity. I find this metric to be useful, but not adequate to the task of assuring readiness to enter EMD, and not a substitute for a thorough understanding of the actual risk in the program—necessary but not sufficient, in other words. In addition to technology risk, we have to manage engineering and integration risks. More importantly, we have to deeply understand the actual risk, what it implies, and what the tools are to mitigate it before and during EMD. I commissioned a review of programs transitioning from Technology Development into EMD over a year ago and discovered we are not paying adequate attention to the actual risk associated with the actual product we intend to acquire. In many cases, industry was not being incentivized to reduce the actual risk in a product it would produce; it was being incentivized to claim a TRL and to do a demonstration. This isn't necessarily the same thing as reducing the risk in an actual product. The label of a TRL isn't enough to ensure that the risks of a product development are under control; we have to look deeper. This decision is too important to get wrong.

In many cases, industry was not being incentivized to reduce the actual risk in a product it would produce; it was being incentivized to claim a TRL and to do a demonstration.

5. Fly Before You Buy.

Engineering development must be completed before substantial commitment to production is made.

If you have read any article about the F-35 Joint Strike Fighter in the last year, you probably saw a quote of my comment about "acquisition malpractice." I was talking specifically about the decision to enter production well before the first flight of a production representative EMD prototype. The earlier Milestones in our Materiel Development Decisions (MDD) system for weapons acquisition—MS A and MS B—generally are based on planning documents and analysis. MS B also is based on risk-reduction activities, but if these have been completed, the balance of the review is about intended business approaches, engineering, test planning, and funding adequacy. The decision to enter production at MS C is different. Here the emphasis is on whether the design meets requirements and is stable. I would regard this decision as a close second to the EMD decision in importance. Once we start production, we are effectively committed, and it will be very difficult to stop. I seriously considered stopping F-35 production a year ago, but I believe I made the right decision to continue. We shouldn't put ourselves in the position of having to make that sort of a choice.

Before the commitment to production, the ability to meet requirements and the stability of the design should be demonstrated by developmental testing of EMD prototypes that are close to the production design. Some degree of concurrency usually is acceptable; all testing doesn't usually have to be complete before the start of low-rate production. The degree of concurrency will vary with the urgency of the need for the product and the specific risks remaining. But as a general practice, we should "fly before we buy."

6. Put More Emphasis on Hardware, Less on Paper Studies.

Logistics support, training, and maintenance problems must be considered early in the development, but premature implementation of these matters tends to be wasteful.

Most of the costs of our products are neither development nor production costs. It is support costs that predominate. These costs do need to be considered up front, early in the requirements and design processes and as the acquisition strategy is being formulated. They drive considerations of the data and property rights we will acquire and the implementation of open systems and modular designs (all features of Better Buying Power). While we should avoid setting up support functions too much in advance of need, we also should ensure that the ability to meet support requirements is designed in and tested at the appropriate places in the development program, and we must ensure that an adequate budget will be available to sustain the product. Better Buying Power's affordability caps on

sustainment costs are designed to ensure that these upfront analyses are conducted early in development, preferably while there is still competition for the development work, and before the design concept has matured to the point that trade-offs to improve supportability no longer are possible.

7. Eliminate Total Package Procurement.

It is not possible to determine the production cost of a complex new weapon before it is developed. The total package procurement procedure is unworkable. It should not be used.

Total Package Procurement is one of those acquisition ideas that come along occasionally and are embraced for a time until it becomes apparent they are not panaceas. I'm speculating, but I would guess the Deputy Secretary had seen some disasters come out of this approach. The idea is to get prices (as options, presumably) for the production run at the time we start development. I'm not quite as pessimistic as Deputy Secretary Packard was about the ability to predict production costs, but I'm pretty close. We are tempted occasionally to ask for production prices as options at the time we are doing a competitive down-select for EMD. This is tempting because we can take advantage of competitive pressure that we will lose after we enter EMD. While I wouldn't close out this idea entirely as Deputy Secretary Packard did in this rule, I think we have to consider this approach carefully before adopting it. There are other ways to provide incentives to control production costs, and we need to consider the full range of options and the pros and cons and the risks associated with them before we decide on an acquisition strategy or a contract structure for a specific product. BBP 2.0 takes this approach.

8. Use the Type of Contract Appropriate for the Job.

Development contracts for new major weapons systems should be cost-incentive type contracts. (a) Cost control of a development program can be achieved by better management. (b) A prime objective of every development program must be to minimize the life-cycle cost as well as the production cost of the article or system being developed. (c) Price competition is virtually meaningless in selecting a contractor for a cost-incentive program. Other factors must control the selection.

We seem to work in 20-year cycles. In 1971, David Packard supported the use of cost-plus contracts for development. About 20 years later in the late 1980s, we tried a policy or requiring firm fixed-price contracts for development. I lived that dream from the perspective of having, in the early 1990s, to extricate the Department from the disasters that ensued—not least among them the Navy's A-12 program cancelation, which still is in litigation more than 20 years later. Fast forward another 20 years, and we are seeing suggestions of using this approach again. Recently, I wrote at length about the times when a fixed-price development approach might be appropriate, and I won't repeat that material here. There are times when fixed price is the right approach to development contracts, but it is the exception rather than the rule. I completely agree with David Packard that costs can be controlled on a cost-plus contract by better management. It requires hands-on management and a willingness to confront industry about excessive and unnecessary costs or activities. It also requires strong incentives to reward the performance we should expect, coupled with the will and expertise to use those incentives effectively. The importance of controlling life-cycle costs has been discussed earlier. I don't entirely agree that price competition is meaningless in selecting a contractor for a development contract, but I do agree that other factors should usually be of greater significance to the government. Most of all, I fully concur with Deputy Secretary Packard's overarching point: Use the contract type appropriate for the job.

If you get a chance to attend a DAB or DAES meeting, or just to come into the Pentagon, you can see David Packard's rules on the wall in Room 3B912. They still resonate. We have tough jobs, and the professionalism needed to do them effectively is a constant. There are no rules that can be a substitute for that.

MDAP/MAIS Program Manager Changes

With the assistance of the Office of the Secretary of Defense, *Defense AT&L* publishes the names of incoming and outgoing program managers for major defense acquisition programs (MDAPs) and major automated information system (MAIS) programs. This announcement lists all such changes of leadership, for both civilian and military program managers for January and February 2013, with some dating to December of last year.

Marine Corps

Col. Steven Girard relieved **Col. Harry Hewson** as program manager for USMC Light/Attack Helicopter Program (PMA 276) on Feb. 1.

Air Force

Lt. Col. Michael W. Bishop relieved **Scott C. Hardimann** as program manager of the Global Broadcast Service on Feb. 11.

Col. Shaun Q. Morris assumed the duty of program manager for the KC-46 Tanker as part of the Air Force Materiel Command reorganization on Jan. 14.

Lt. Gen. Christopher C. Bogdan relieved **Vice Adm. David J. Venlet** as program manager for the F-35 Lightning II on Dec. 6, 2012.

Mr. Randall Culpepper assumed the duty of program executive officer of combat and mission support on Dec. 2, 2012.

Calling on Mission Assistance

John Higbee ■ Jesse Stewart

At the Defense Acquisition University, we spend a lot of time with incoming program managers (PMs) as they attend their courses, and help them plan strategies for achieving their acquisition goals. What's not as well known is that we also spend a lot of time in the workplace with PMs and their program teams, collaborating with them to solve issues and to capitalize on opportunities. Based on that experience, we would like to share some of the insights we've gained from these collaborations. We'll start with a short laydown of one of our core program assist tools, the Acquisition Program Transition Workshop (APTW), and follow that with insights gained from APTWs and other interactions.

So why do we need a transition workshop? It started with a joint Raytheon and DAU effort aimed at addressing how to tailor a new contract startup for an increased probability of success. How well a contract startup is conducted

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is an accurate indicator of how well the contract will execute. The DAU-Raytheon team took a proven Raytheon program startup process, and then adapted it for general DoD use. After successfully piloting the APTW process, the APTW team was joined in a fine-tuning process by Lockheed Martin, Boeing, Harris, and Northrop Grumman. Ultimately, Dr. Ashton Carter—then under secretary of defense for acquisition, technology and logistics—signed a Directive Type Memorandum (April 1, 2011) strongly recommending APTWs for new program and contract starts, as well as for managing change in programs and their contracts as they proceed through the acquisition life cycle.

APTWs start with in-depth preparation, including interviews with the industry-government team, team surveys, and assessment tools covering pertinent issues. The surveys, interviews, and tools allow the PM and the DAU APTW team to shape APTW content in support of the PM's goals/expectations, which also include the integrated expectations of his or her key leaders.

Lesson Learned No. 1: The PM must be seen by the government-industry APTW participants as having clear goal definition, fully committed to the APTW process, and must actively participate.

Lesson Learned No. 2: Listen to your team. Part of the thorough preparation must be consulting with the team members to obtain their inputs.

This collaborative preparation establishes actionable APTW outcomes honed by the participants, both government personnel and (where participating) contractors.

As we move into the actual workshop, the government should enter with clear expectations about contract execution for the short (next 6 months) term, and a real understanding of the integrated master plan and schedule. Normally, a key APTW activity involves industry and government collaboration on preparing a plan for a successful Integrated Baseline Review (IBR), with a parallel in-depth look at the integrated master schedule and the critical path. In support of this goal, the APTW stresses aligning both portions of the team to a well-defined RAM (Responsibility Assignment Matrix). Planned and executed well, these activities are truly a program jumpstart toward a successful IBR and successful contract execution.

So what do we see in our dialog with DoD program offices? Probably the same things you're seeing—lots of capable professionals, a fairly high turnover of team personnel. Experience is usually high at the senior levels, not necessarily so for the new or junior persons in the program. Teams often aren't aligned—either within the government or the combined government-contractor team.

Change in government acquisition also is a constant (pun intended). Change includes new policies, new contracts, coping with resources and schedule changes, downsizing, and (now) sequestration. What are some of the "golden nuggets" we've taken away from our work?

Let's take an acquisition transition workshop that addresses the need to create a major new contract:

Lesson Learned No. 3: Engaging the government and industry teams is better done earlier in the contracting cycle (e.g., via Broad Area Announcements or Requests for Information).

If the APTW happens later, as the Request for Proposal is drafted:

Lesson Learned No. 4: Align your program team to optimally support the new contract (e.g., using the product work breakdown structure).

Tell the potential bidders about your projected organization. That helps the contractor better support the government team. It also supports rapid program IPT setup and chartering.

If these areas aren't covered early, we repeatedly see a great deal more time and energy required in the post-award effort to fully align the government and contractor.

Managing this part of the change equation is where DAU's workshop products can be of great help. Products such as joint government-contractor team charters seem simple, but defining "who is to do what, and by when" is essential to deconflicting government/industry efforts. It is also a key to gaining a common understanding of the complete body of contract work.

Roles and responsibilities aren't always clear in either legacy or new organizations.

Lesson Learned No. 5: Focus on the task at hand—setting the basic organizational structure and tying together responsibilities.

Just because things worked under the old contract, doesn't mean they will continue to do so under the new or modified contract. What the government portion of the team expects to do needs to be bounced against the contractor's concept of what his or her team is contracted to do. Contractor roles and responsibilities may have changed (e.g., shifting from development to production of a product). One tool we have found very useful in working through these changes is RASCI—"responsible, accountable, supporting, consulted, and informed." RASCI allows us to help you match your team to your contractor equivalents, the IPT duties, the communications plan, and your metrics . . . helping you get your extended team organized optimally prior to the start of the effort.

Communications issues seem to come up again and again.

Lesson Learned No. 6: Lack of clear communications always needs to be rapidly analyzed and corrected.

Team members with whom we talk keep bringing communications to the forefront. It's about their perceived lack of office or program communications, poor meeting execution,

meeting overload, and disregard of team analysis and recommendations, often resulting in "unmade" decisions or "perpetual decision revisiting." Poor-communications root causes are never quite the same from organization to organization. Analyzing communications patterns, decision-making processes, and detailed planning becomes a key to solutions for the organization.

We also have achieved valuable insights from APTW structured interviews and surveys on how to achieve solid success in program execution.

Lesson Learned No. 7: PMs' goals need to be viewed from the implementer's perspective ("a view from the deck plates") to thoughtfully build a practical, executable plan.

Lesson Learned No. 8: Managing the internal and external program success expectations must be an integral part of any successful acquisition strategy.

The DAU APTW team often talks with and surveys the contractor, stakeholders, and others in the decision chain. It's very common for the program team to have pockets of misunderstanding or lack of trust that need fixing. Quality of data sharing can be "all over the map" within the government, with disconnects between the government team and the prime contractor and between the primes and their subcontractors.

Lessons Learned: Encourage transparency throughout the extended program.

Early program data transparency from the start improves the quality of day-to-day management in areas as various as processing CDRLs and drawings, system engineering reviews, program progress assessments, responding consistently to requests from external stakeholders, and many, many more.

The APTW, and organizational "deep dives," are among DAU's most complex workshops. Most of their supporting tools can be adapted for short assist visits—e.g., strategic workshops for PMs. In those short assists, we seek to understand the PMs' and leaders' goals, interview the teams, and build quick reaction workshops. Surveys (we have a large database of survey questions developed from looking at many programs in different lifecycle phases) can help a program office analyze organizational issues or internal issues. The surveys also may be tailored to analyze specific program activities. Program office interviews and short workshops can help identify the need for program office streamlining or issues in preparing for a milestone. In support of Better Buying Power, we also are aiding programs in the "how to" for implementing BBP initiatives.

This DAU mission assistance toolkit is focused on helping acquirers and their organizations adapt to program changes in our dynamic acquisition world. If we can be of help, please give us a call!

The authors can be contacted at **John.Higbee@dau.mil** *and* **Jesse.Stewart@dau.mil**.

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Bridging the Gap

Dedicated Technology Transition Programs Accelerate Technology Adoption

Brad Pantuck

Dedicated technology transition programs can be highly effective and efficient at moving technologies across the "valley of death" from technology providers to acquisition. The programs that work best do this by facilitating alignment among the key stakeholders (developers, acquisition officials, resource sponsors, and users) and requiring a short timeline for completion, typically 2 or 3 years. By implementing these and a few other best

Pantuck *is a technology transition manager for RAE, LLC. He focuses on building the partnerships and setting up the processes necessary to accelerate technology adoption.*

practices, dedicated transition programs can produce high success rates that are essential for our nation to keep its technical edge and save operational costs during a period of constricting budgets.

Why Dedicated Transition Programs Are Needed

Three primary factors reinforce the need for dedicated transition programs. First, the multiyear acquisition planning process is inadequate for keeping our forces a step ahead of our adversaries; technology changes too quickly, and new threats emerge every day. While acquisition programs can and do integrate new technology, all too frequently the timelines and established processes of the acquisition system prevent new ideas that can improve capability or reduce operational costs from getting into the hands of the warfighters in a timely fashion.

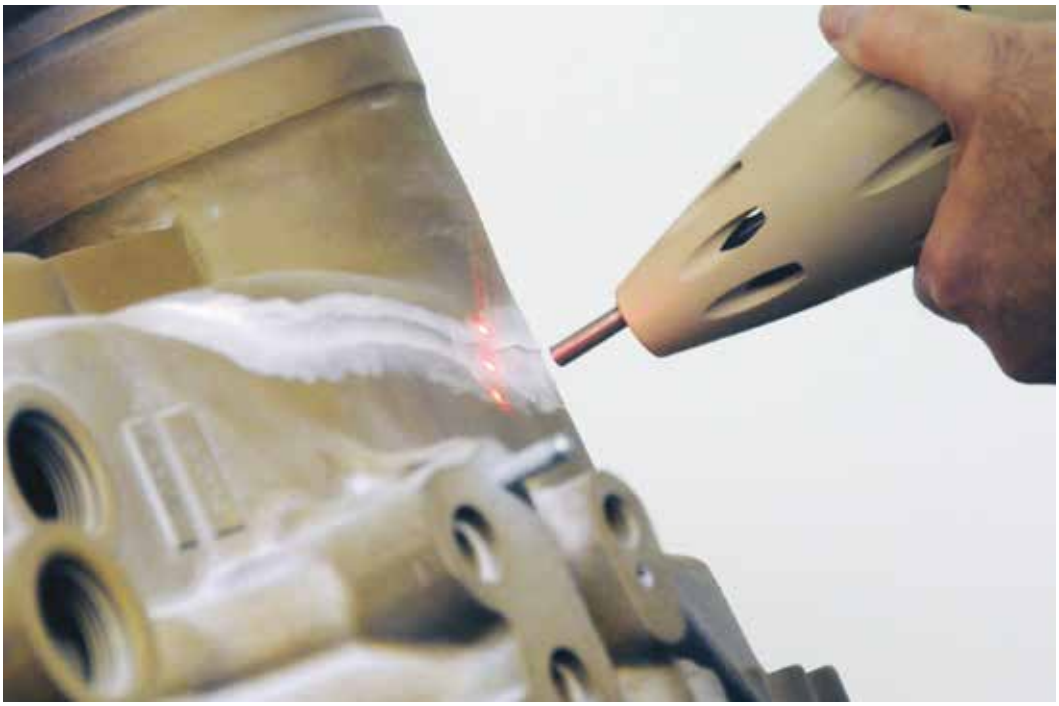
Another contributing factor addresses the "last hurdle" to adopting technology. Whether one is refining technology from military science and technology investments or adapting commercially available technology, some level of maturation, testing, certification and/or integration often is needed to transform technologies into useful military products and to ensure that the products successfully make it to operational users.

In addition to fielding technologies sooner, focused technology transition programs can be very cost efficient. First, a short time horizon (3 years or less) reduces the risks of requirement changes and technology obsolescence—increasing the likelihood that the technology will be fielded. Expeditious insertion also allows technologies intended to save money to achieve operational cost savings sooner. Lastly, because the funding for each effort in such programs is typically less than a few million dollars, the cost of failure is cheap. While success rates vary, in the best-managed dedicated technology transition programs more than 70 percent of the prototypes are in acquisition or fielded within 3 years of initial funding.

What Transition Programs Accomplish

Dedicated transition programs often are focused on either individual (stand-alone) devices or improving/replacing one piece of a larger platform or system. The output therefore is not a tank but an improved turret rotation motor; not an aircraft carrier but a high temperature-resistant coating for aircraft carriers' flight decks; not an F/A-18 but an onboard high-speed, large bandwidth network to connect an F/A-18's computer systems.

To help new technologies cross the finish line, OSD and the various Services designate funds for technology transition. According to the Small Business Technology Council of the National Small Business Association, there are almost 50 technology transition funding programs within the Defense Department, with 20 of those programs oriented toward accelerating transition. Some of these programs are focused on transitioning technology originating in military S&T programs; others are focused on adapting commercial technology; a few are agnostic regarding the technology source. Regardless of the technology's origin, each program's desired outcome is that better and/or cost-saving technologies are quickly integrated into end users' operations—expeditious fielding of technologies addresses critical capability shortfalls that can result in loss of life and/or failed missions.



An operator demonstrates repair of an AH-1 helicopter combining gearbox housing using cold spray technology, which enables repairs closer to the field. This will save the Navy $39 million over the next 7 years.

One example of a successful Department of the Navy short-term transition effort is a gearbox repair technology for AH-1 helicopters (see photo). It was funded by the Navy's Technology Insertion Program for Savings in FY 2011 ($1.8 million) and fielded at the beginning of FY 2013. Before this new cold-spray technology was transitioned, abraded AH-1 combining gearbox housings would be transferred to the depot for repairs and at least 50 percent would end up scrapped. This technology now enables maintenance personnel to quickly and cheaply repair gearboxes

Figure 1. Transition Venues

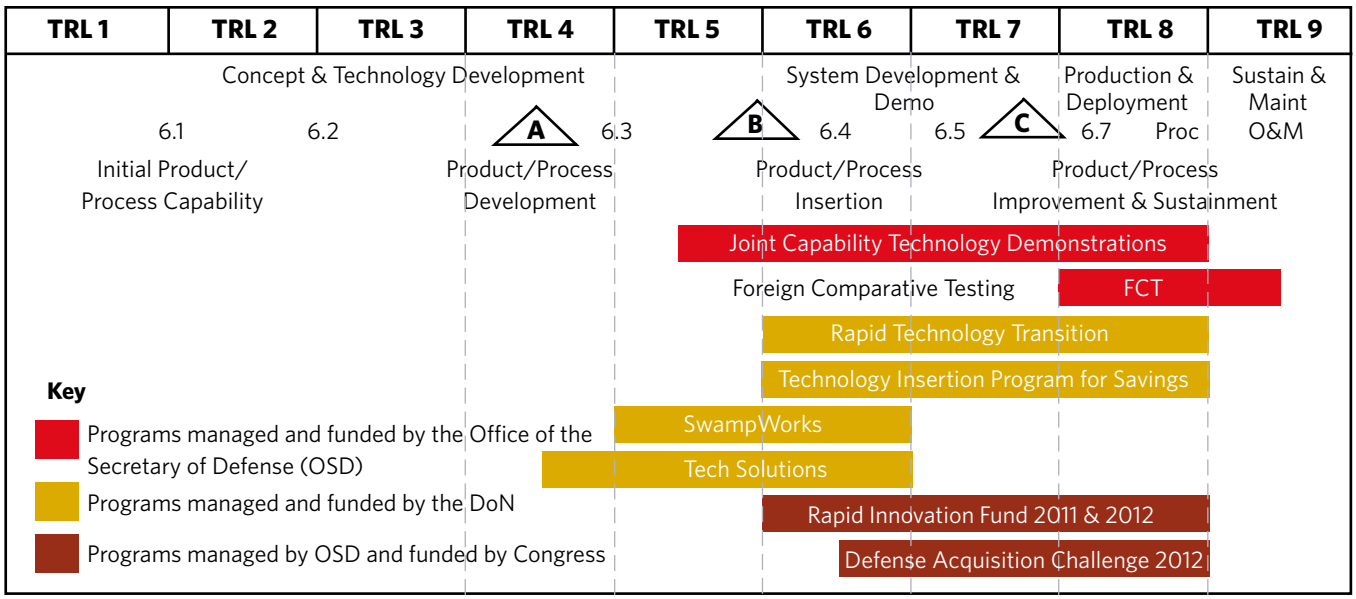


Figure 1 highlights some of the programs the Department of the Navy (DoN) uses to transition technology to operational users. These programs typically attempt to advance technology from a Technology Readiness Level (TRL) of 5 or 6 to a TRL of at least 7 or 8, a maturity level that, in general, presents acceptable technical risk for the acquisition community and is often achievable within 2 to 3 years.

closer to the field, decreasing scrap rates and increasing operational readiness. Originally anticipated to save the Navy $18 million, it is now projected to save $39 million over the next 7 years—a significant return on investment.

Another Navy transition project that targets an immediate problem is the Composite Patch Technology for Aluminum Structure Repair. The Navy faces substantial maintenance costs associated with stress-corrosion cracking in aluminum ship superstructures. The fiber-reinforced bonded patch that will be transitioned through this effort will seal cracks and provide structural support to resist further crack growth. When fully implemented, this technology is projected to reduce maintenance costs by $30 million across the CG-47 ship class within 5 years, compared to the crack welding approach currently used. The cost to transition this technology is $1.7 million.

The Future of Transition Programs

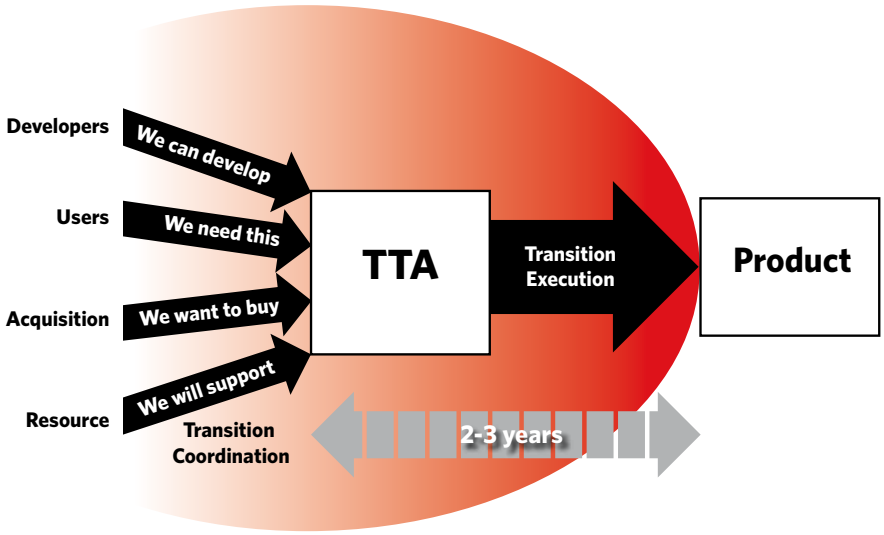
Recent appropriations decisions indicate a renewed focus on transition. For example, Congress, through the National Defense Authorization Act for FY 2011, created the Rapid Innovation Program (known within DoD as "Rapid Innovation Fund"), which focuses on transitioning technologies from industry into military systems within 2 years. The National Defense Authorization Act of 2012 contains provisions intended to increase the number of Small Business Innovation Research (SBIR) Phase III contracts issued, the final phase of the SBIR program which leads to transition. The emphasis on transition is not constrained to the military; the civilian sector recently adopted similar initiatives aimed at fielding technology sooner. In the past few years, Department of Homeland Security's (DHS) Science and Technology Directorate (S&T) has emphasized its Apex program, which aims to quickly transition high-impact technologies to DHS Components.

Given current environmental factors, there likely will be some changes to transition programs. With the wars in Iraq and Afghanistan drawing down, some programs may take a longer-term view, focusing on fewer technologies with a larger, longer-term impact. Given the need to cut overall costs, some transition programs may emphasize cost-savings technologies over those that increase capability. Because private sector developments outpace those of the government in areas such as consumer electronics, cyber-security technologies, and information technology, some transition programs may focus more on adapting technology originated outside of the government. Nevertheless, dedicated transition programs will continue to play a key role in fielding technologies.

Elements of a Successful Transition Program

The biggest challenge in technology transition is stakeholder alignment. The key partners in any technology transition effort—developers, acquisition officials, and users—have different cultures and incentives. Developers are incentivized toward optimism and risk taking, while acquisition officials are less risk tolerant and are driven by cost, performance, and schedule objectives. Developers tend to think in long time horizons, while acquirers have firm deadlines. Users are much more interested in practical utility than in technical sophistication and are concerned with having sufficient units available for deployment in the near term. "Wonderful" technology in some

Figure 2. Stakeholder Alignment



Transition Coordinators align the stakeholders to quickly produce a fielded product.

distant future has less value to the warfighter than "good" technology today.

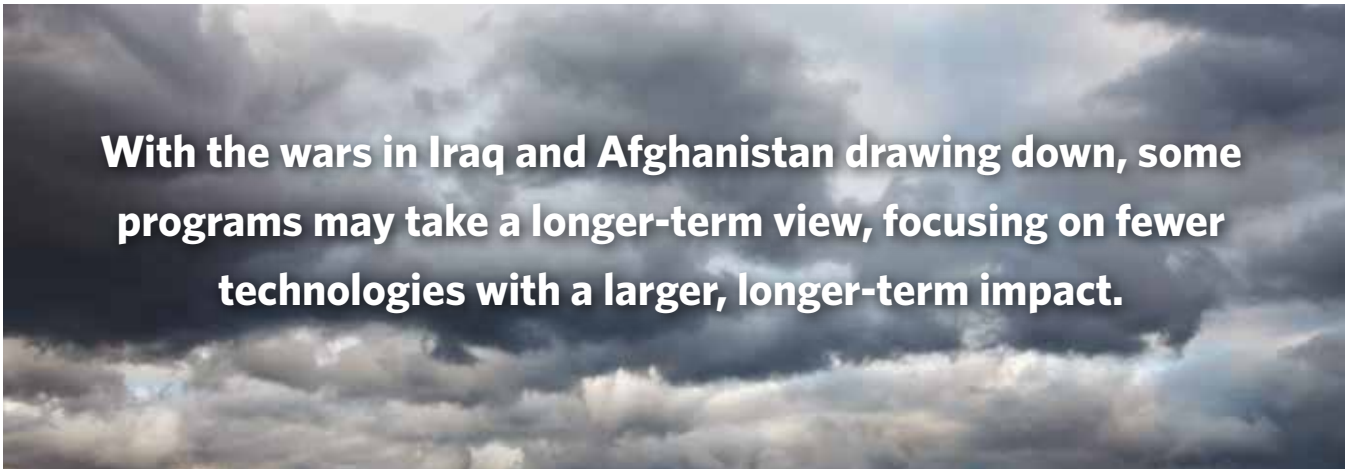
Successful technology transition organizations address this cultural diversity through a variety of "best practices." One of the most useful is to employ an independent team of coordinators who facilitate communications and reconcile differences among the disparate stakeholder communities. In such a coordinator or "relationship manager" model, these individuals guide the movement of technology from the development phase into the acquisition and production phase. At the beginning of the process, they work with developers to articulate a technology's business case, just as venture capitalists do with entrepreneur principals in startups. Then, they conduct the necessary technical, business, and programmatic due diligence to raise acquisition customer confidence and reduce risks to transition. Transition coordinators also establish resource sponsor and user buy-in, and facilitate and document agreements among the stakeholders, creating cohesion and accountability (see Figure 2).

Another best practice is to spend time and resources aligning the stakeholders early in the process. From the start, it should be clear that warfighters need the new technology, the acquisition community wants to buy it, the resource sponsor has the funds to pay for it, and the engineers/vendors can build it. Proper coordination at the early stages of transition helps developers avoid successfully demonstrating a technology only to find that neither the acquisition nor user communities are prepared to accept it.

Stakeholder engagement should culminate in a technology transition agreement (TTA), signed prior to the project's funding. The TTA describes the transition path and codifies the partners' agreements, binding them together for a common purpose. It typically includes the following components:

Technology Opportunity and Business Case: A description of the technology to be transitioned, including the scientific basis, the maturity of the technology, and how the technology will fit into any larger system. The business case presents the reasons for the acquisition, resource, and user communities' compelling interest in obtaining the technology, often by describing the comparative benefits of the technology in reference to alternate or emerging technologies in the same area. Focusing on one technical goal per agreement is an important way to minimize technical risk.

Scope of Work and Risks: A detailed list of the tasks to be performed, along with the attendant roles and responsibilities.



A composite patch repairs a CG-47 class ship's cracked aluminum superstructure. If successful, it will save $30 million over 5 years.

This ensures that a complete solution is achieved and supports resource project planning and management. Identification of the risks (technical, business, and programmatic) educates the acquisition and resource decision makers and provides a basis for risk mitigation plan development.

Recipient and Acquisition Cost: The organization and individuals that will receive the technology and their out-year integration and sustainment funding costs once the technology is transitioned. This allows the customer to plan ahead and budget for receiving the technology.

Milestones: Key events and dates that are identified to align the stakeholders and to provide for accountability and "off ramps" during the course of the project.

Seminal Transition Event and Metrics: A clear end point for the engineers who develop, integrate, and test the technology. Making the acceptance criteria transparent from the start reduces the risk that the approval authority will change its mind midstream.

Signatures from the Partner Organizations: A TTA signed by senior decision makers who are able to make commitments on behalf of their organizations. The TTA's goal is not to hold the organization legally accountable, but to drive awareness and commitment. If any one of the partners (developers, users, acquisition official, and resource sponsors) waivers in commitment, the agreement provides a basis for reengagement.

Once the TTA is signed, successful transition programs apply resources to monitoring. Transition coordinators identify and mitigate risks and obstacles (before they become roadblocks) on the path toward acceptance by the acquisition community and adoption by the user community. If milestones are missed or the receiving program's plans change such that the transition cannot be completed on time, the transition program can pull back remaining funds and reassign them to a project that will transition.

Conclusion

Successful transition programs align the key stakeholders to accelerate the adoption of new or cost-savings technologies. By increasing the speed and efficiency with which science and technology investments are exploited, they make maximum use of limited funding, a quality all the more important to our warfighters and nation at a time when resources are more constrained and every dollar must count.

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U.S. Marine Corps photos by Lance Cpl. Robert R. Carrasco.

Contract Oversight in a Contingency Environment

We Bought It, You Own It

Maj. James E. Thomas, USAF

During my latest deployment in Afghanistan, I led a Joint office consisting of Air Force, Army and Navy personnel (active duty, reservists, Defense Department civilians, and contractors) as NATO Training Mission-Afghanistan/Combined Security Transition Command-Afghanistan's (NTM-A/CSTC-A)) Contract Management Oversight (CMO) Office.

The office was stood up in April 2010 to rectify multiple Inspector General (IG) and Government Accountability Office (GAO) reports indicating a lack of "hands on oversight" for contracts throughout the Afghanistan Theater. We were charged by senior leadership to ensure that "contract owners" provide effective management

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and oversight of more than 340 service contracts and 1,000 construction contracts with total value in excess of $5 billion (FY 2011 data). Basically, our main focus was to ensure others were doing their job in evaluating contractor performance and to provide assistance and guidance when and where necessary. Pretty clear, executable guidance—right?

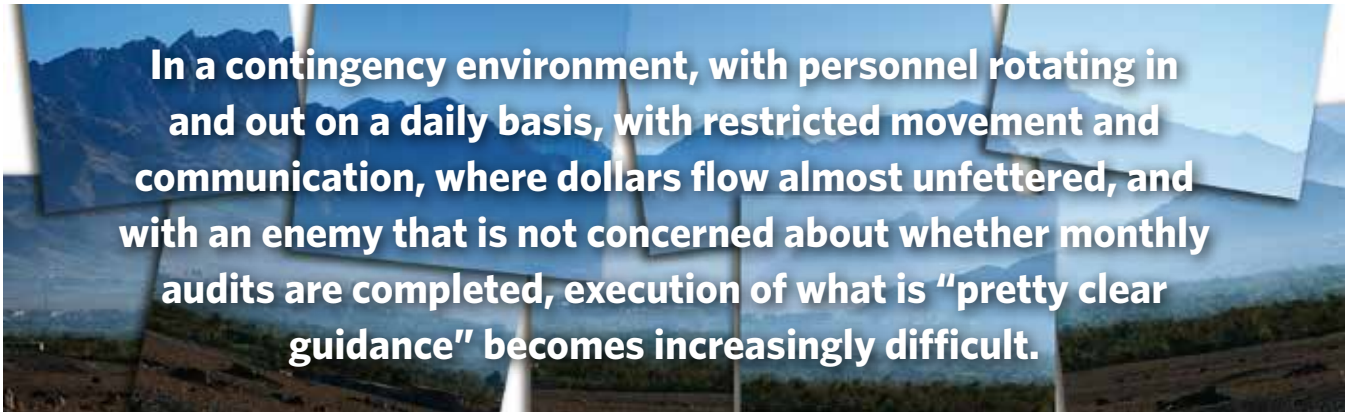
The Afghan National Security Forces (Afghan National Army, Afghan National Police) rely heavily on contractor support for many equipping/training/sustaining functions such as facility maintenance, construction, combat skills training, life support, and vehicle/weapon procurement and maintenance. While Headquarters NTM-A/CSTC-A provides funding for these efforts through the Afghan Security Forces Fund (ASFF), Regional Command (RCs), Regional Support Commands (RSCs), Headquarters Directorates, and other organizations generate requirements, "own the contract," and are responsible for providing stewardship and oversight of contracts funded with ASFF.

RCs, RSCs, and Headquarter Directorates and any other organizations using ASFF are required to ensure effective contract execution and surveillance by assigning an adequate number of trained contracting officer representatives (CORs) to conduct hands-on audits measuring contractor performance. Again, sounds easy ... but in a contingency environment, with personnel rotating in and out on a daily basis, with restricted movement and communication, where dollars flow almost unfettered, and with an enemy that is not concerned about whether monthly audits are completed, execution of what is "pretty clear guidance" becomes increasingly difficult.

The Contract Management Office (CMO) attacked the difficult problem of tracking new and existing contracts, requiring using organizations to take ownership and stewardship of those contracts, and reporting progress to senior leadership using a three-pronged approach. First, a group of hard-working, smart, and dedicated professionals who preceded me in theater undertook the Herculean task of identifying existing local and Continental U.S. (CONUS) contracts by working with Central Command (CENTCOM) Regional Contracting Centers (RCCs), using organizations throughout Afghanistan and CONUS Contracting Centers stateside. In general, NTM-A/CSTC-A contracts can be commonly referred to as "local" or "CONUS." The term "local" applies to contracts awarded by CENTCOM Contracting Command's RCCs operating in Afghanistan. The term CONUS applies to all ASFF contracts awarded in the United States, usually via a Pseudo-Foreign Military Sales case with execution in Afghanistan.

Once a contract was identified, CMO personnel would obtain a copy (harder to do than it sounds), read the contract to find clues as to who was the initiating organization and then associate the contract to a Regional Command, Regional Support Command or Directorate. This led to the development of a database , which became the authoritative source for tracking status and reporting to the three-star NTM-A/CSTC-A commander, and also provided information to numerous watchdog agencies (IG, GAO, Commission for Wartime Contracting, etc.), that are involved in reporting status to Congress.

The database included contract number, dollar amount associated with execution year and options, points of execution, contracting officer and surveillance personnel, and audit dates along with many other data points. This tool and the person who created it were amazing as it would create stoplight charts reflecting number of contracts, audit complete percentages, status of surveillance personnel (i.e., present/departed/departing) and contract status (active/expired/expiring).



The database and associated stoplight charts became a tool for holding commanders and directors (contract owners) accountable for contract execution and surveillance. Stoplight charts were displayed at the three-star's staff meetings and commanders/directors were afforded the opportunity to explain status (green=good, red=bad). Lastly, educating an ever-changing cast of leaders and surveillance personnel at the point of execution became our biggest challenge. We spent many hours on the phone and traveling throughout the theater to help commanders and CORs understand the multiple levels of contracting activity within their "battle space."

One of the many challenges we faced was a lack of situational awareness on the part of regional commanders and staff directors. In some cases, these leaders simply didn't know that in taking the lead of an organization, they might

in fact be taking responsibility for cost, schedule, and performance of dozens of multimillion-dollar contracts. This can be frustrating for the leader as this: (a) may come as a surprise; (b) taxes finite manpower resources; and (c) drives reporting requirements that may seem to fall outside the normal chain of command. A case in point: A new Army general officer takes over a Regional Command. He or she is overseeing a Relief in Place/Transfer of Authority (RIP/TOA). His or her priorities are surely focused on managing hundreds of troops by providing transport, shelter, security and basic life support, executing the mission, etc. One of our jobs was to ensure these leaders understood for which contracts they were responsible and to help them develop an effective oversight and reporting system.

As part of the reporting process, commanders and directors were required to brief the NTM-A/CSTC-A deputy commander for programs (the position that manages all ASFF for the command) on the execution of each of their contracts. They would have to answer tough questions regarding contract performance, contract effectiveness, and cost effectiveness. Examples of such questions: Is this contract relevant to the mission as it exists today? Is the contractor doing what we've paid him to do? Are we paying the contractor to do the right thing? To what extent is the customer satisfied? Are we getting expected value from the contract relative to cost? Is the contract worth the investment relative to cost? How effective is the contractor at fulfilling his requirements? Do our requirements still exist? How do you measure success?

This in and of itself created a threefold problem for commanders and directors:

- They had to take a hard look and dive deep into contract requirements and contractor performance.
- In most cases, the Deputy Command for Programs does not fall within the operational control or administrative control of the regional commanders/directors.
- In many cases, the commander/director outranked the deputy commander for programs (then a colonel filling a brigadier general position). In all cases, CMO personnel engaged to work through issues, soothe egos, and educate personnel.

Another aspect of training included educating COR personnel. While there are mandatory courses required prior to becoming a COR, this training in and of itself does not prepare someone to function efficiently as a COR. Contracting officers provide contract-specific training, to include how to fill out an audit form and explaining contract requirements, but in reality a "qualified" COR has to have a deep understanding of why a contract is in place, the technical issues associated with its execution, as well as a clear picture of the end state. All this is required while the COR keeps the contractor at arm's length so personal bias does not interfere with effective performance evaluation.

CMO personnel wrote a Standard Operating Procedure implemented throughout the theater outlining roles and responsibilities for both pre-award and post-award contracting phases to help educate senior leadership and surveillance personnel. We also spent a lot of "one-on-one time" talking about how to form a multifunctional requirements development team, how to develop an executable Performance Work Statement and a Quality Assurance Surveillance Plan, and how to effectively organize surveillance personnel to measure performance and effectiveness. This was an ongoing process because, as stated before, personnel were rotating in and out constantly.

Another issue was a lack of experienced personnel to conduct surveillance at the point of contract execution. In many cases, a contractor may be working at hundreds of different locations to fulfill contract requirements. For instance, our language training contract had in excess of 100 points of execution throughout theater. We hired a group of Red River Army Depot personnel, trained them, and assigned them to RCs and RSCs to become full-time CORs. This fact, coupled with bringing on experienced former government contracting officers to help requesting activities generate solid requirements documents, aided both contract execution and performance measurement.

At the end of my tour, I was proud of the hard work we had done and confident that those who followed would continue our work of holding requiring units accountable for effectively managing contractor performance.

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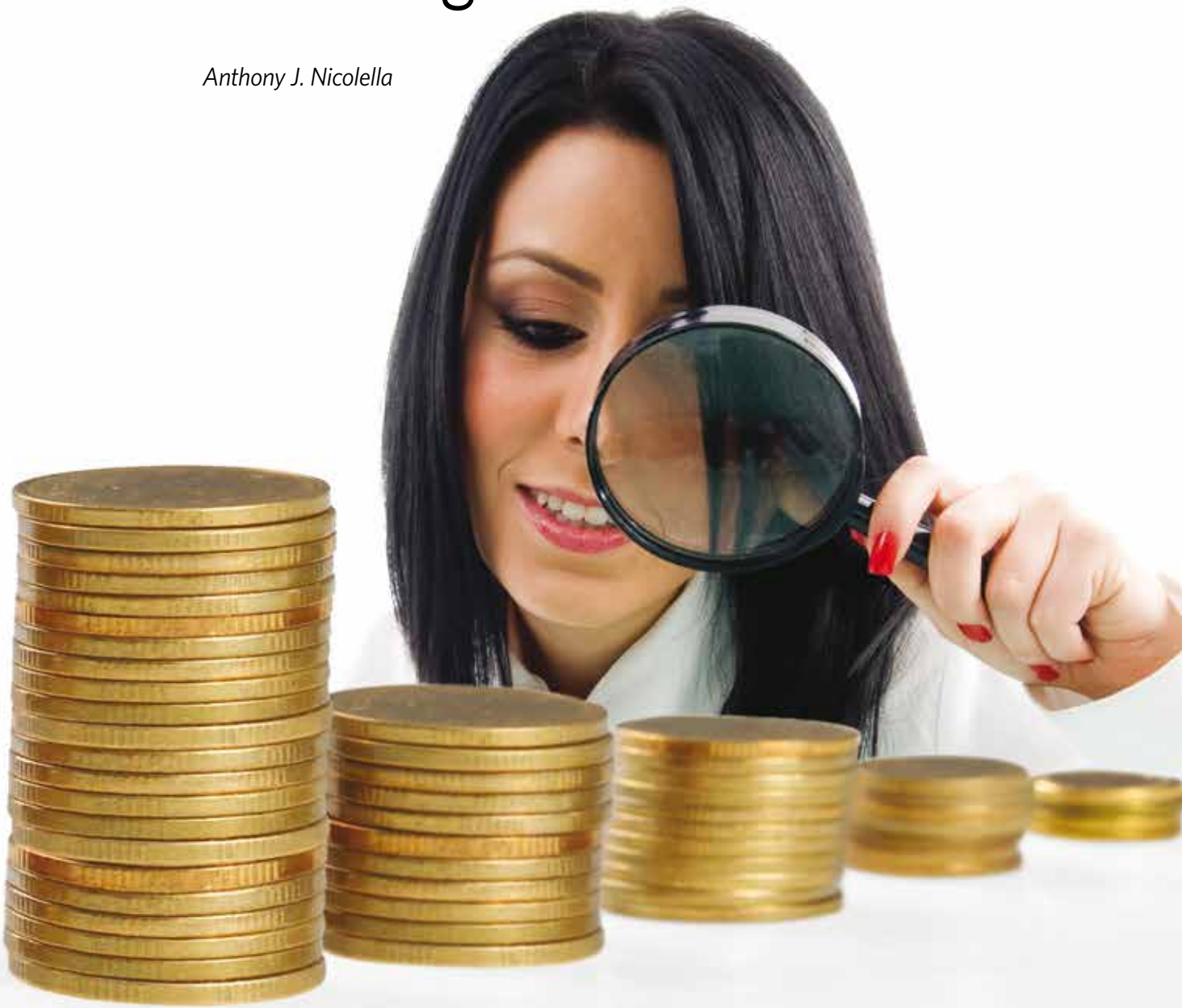
Determining the Probable Cost

Anthony J. Nicolella



Your organization has just issued a Request for Proposal (RFP), and, in response, you have received several proposals. In your RFP, you stated that the government was contemplating the award of a cost-reimbursement contract.

You are preparing to perform your analysis. Before starting, you go to the Federal Acquisition Regulation (FAR), specifically FAR Part 15.404-1(d), and realize that the FAR requires you to perform cost realism analysis to determine the probable cost of performance for each offeror. You start asking yourself a series of questions such as: What is cost realism analysis? When does cost realism need to be done? How do I determine the probable cost? What resources are available to assist me in developing a probable cost? Does the government get many protests regarding cost realism analysis? It is hoped that this article will help answer these questions and more.

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Per FAR 2.101 and 15.404-1(d) and Contract Pricing Reference Guides (CPRG), Volume 4, Chapter 8, Paragraph 8.1, cost realism analysis is "the process of independently reviewing and evaluating specific elements of each offeror's proposed cost estimate to determine whether the estimated proposed cost elements are realistic for the work to be performed; reflect a clear understanding of contract requirements; and are consistent with the unique methods of performances and materials described in the offeror's technical proposal."

Let's dissect the above definition a little bit more by focusing on several key terms. First, it is an "independent process," which means that as a contracting professional you have to do the reviewing and evaluating. This does not mean you cannot solicit input or help from other government personnel (contracting officer representatives—CORs; Technical Points of Contact—TPOCs; engineers, etc.), or agencies like the Defense Contract Audit Agency (DCAA). However, it does mean that you, the contracting officer, will make the judgment independent of any of the before mentioned personnel or agencies. Second, cost realism analysis includes the "reviewing and evaluating process of specific elements." The elements to which this definition refers are cost elements as defined in FAR Part 15.408, Table 15-2, Roman Numeral II (Cost Elements), such as direct labor, indirect costs, other costs, etc. Does that mean you have to look at each cost element when performing cost realism analysis? Not necessarily. If a cost element appears reasonable based on your preliminary review and analysis, you may not have to analyze it any further. Also, reviewing and evaluating specific cost elements can be limited to substantial costs (Controller General Case: B-271302.2).

Finally, the cost realism definition further states that in doing your analysis you must look at each "offeror's proposed cost estimate." This is important. You must analyze and develop a probable cost for each offeror. You cannot simply do one analysis and one probable cost and apply it to all offerors' proposals. If you did this, you would not be in compliance with FAR Part 15.404-1(d)(2) and CPRG. Also, realize that each offeror will have a different technical approach and accounting system, so using a single probable cost and applying it across the board to all proposals would be impractical. By defining cost realism analysis and then breaking down its key terms, we were able to answer the question "What is cost realism analysis?"

Now that we know what cost realism analysis is, we need to answer the next question: When does it need to be done? FAR Part 15.404-1(d)(2) states that cost realism analysis shall be performed on cost-reimbursement contracts to determine the probable cost. All contracting professionals should know that the word "shall" means "must." So as a contracting professional, you must perform cost realism analysis on all cost-reimbursement contracts. It does not get any clearer than that.

The next two questions—"How do I determine the probable cost, and what resources are available to assist me in developing a probable cost?"—kind of go hand and hand because you cannot do one without doing the other. Knowing what sources of information are available to you when trying to determine the probable cost will make your job much easier. As a government contracting professional, there are numerous sources of information you can use to help you determine the probable cost, including an Independent Government Estimate (IGE), cost estimating relationships, wage determinations, technical evaluations, audit reports, forward pricing rate agreements (FPRA), and results from cost estimating system reviews, just to name a few. In addition, you can obtain assistance from other members of the government acquisition team like your technical specialists (CORs/TPOCs) and personnel from both DCAA and the Defense Contract Management Agency (DCMA). Each of these members is uniquely qualified to assist you in evaluating technical and pricing proposals. For example, an in-house technical expert, COR, can provide you with valuable input regarding how realistic an offeror's proposed cost estimate is with regard to material costs, labor mix, and labor hours. DCAA is familiar with offerors' accounting systems and indirect rates and can help you determine if indirect rates are significantly lower than projected rates. DCMA can provide you with an array of experts (Quality Assurance Specialists, Engineers, Cost/Price Analysts, Industrial Specialists, etc.), that can help answer any questions that your in-house technical personnel may have about a proposal. DCMA also can help answer any questions regarding FPRAs or Forward Pricing Rate Recommendations (FPRRs).

Knowing what sources of information are available to you when trying to determine the probable cost will make your job much easier.

Table 1 shows sources and resources that may help illustrate how one can determine the probable cost.

FAR Part 15.404-1(d)(2)(i) states that the probable cost may differ from proposed cost and should reflect the government's best estimate. Section (ii) of the same reference further states that the probable cost is determined by adjusting each

Table 1. Match-up of Source and Resource with Cost Elements

Cost Elements	Proposed	Probable Cost	Resources and Sources Available
1. Material	$13,000	$10,000	COR—Technical Evaluation
2. Eng. Direct Labor	$1,000,000	$1,250,000	Contract Specialist—Wage Determination
3. Eng. OH	$1,250,000	$1,250,000	DCMA—Forward Pricing Rate Agreement (FPRA)
4. ODC (Travel)	$2,000	$2,000	Contract Specialist—Joint Travel Reg. (JTR)
5. Subtotal Production	$2,265,000	$2,512,000	DCAA—Total Cost Input or Value Added
6. G&A	$226,500	$251,200	Cost Price Analyst—Regression Analysis

Note: Some elements may have more than one source or resource.

offeror's proposed cost to reflect any additions or reductions in cost elements to realistic levels based on the cost realism results. As you can see from the above diagram, a reduction to the cost element of material was made and then additions to Engineering Direct Labor and general and administrative expenses were made. The former reduction was made based on feedback from the COR, and the latter additions were made based on Contract Specialist and Cost Price Analysts input.

Other sources and resources were used to evaluate the best value of the remaining cost elements. But, since these cost elements (Engineering Overhead [OH] and Other Direct Costs [ODC]) appeared realistic, the contract specialist determined that no adjustments were necessary.

The process outlined above would need to be repeated in order to determine the government's probable cost of each offeror's proposal. This simple but fairly accurate illustration demonstrates the process a contracting professional should go through when trying to determine the probable cost of performance. In our illustration, we had sources and resources identified to assist us in determining the probable cost, but this may not always be the case. FPRAs, historical data for regression analysis, and wage determinations may not always be available or in existence. In these circumstances, it makes determining the probable cost more difficult but not impossible. You will need to improvise (use other methods) to determine the government's probable cost.

So at this point some of you are undoubtedly thinking cost realism analysis and especially determining the probable cost sounds like a judgmental process and must lead to numerous protests filed against the government. This takes us to our last question, "Does the government get a lot of protests regarding cost realism analysis?" The cost realism analysis bid protest results of the last 3 years, listed in Table 2, may provide a pleasant surprise.

According to the Government Accountability Office (GAO) official website, www.gao.gov/legal/bids/bidprotest.html, from Jan. 1, 2010, to Dec. 31, 2012, DoD received 501 bid protests. Of the 501 protests, only 42, or 8.4 percent, were cost realism related. For 2012 and the 17 protests received (not including the three that are still open), the sustained vs. denied ratio was one-fourteenth, or 7 percent. The one protest that was sustained was due to the government not following one of the cardinal rules of FAR 15.404-1(d) and Volume 4, Chapter 8 of the CPRG. Instead of developing a probable cost for each offeror's proposal, the agency compared one offeror's proposal to the median price proposed by other offerors, some of which already were deemed unacceptable due to unreasonably high prices.

This rationale was unsound, and taking a one-size-fits-all approach is not in accordance with the FAR or CPRG and can lead to a protest and a subsequent victory for the protester. However, the number of bid protests is remarkably low and indicates that the majority of the government agencies are performing cost realism analysis and determining the probable cost in accordance with FAR and CPRG guidance and solicitation criteria.

With cost realism analysis now being taught in the contracting curriculum in such Defense Acquisition University (DAU) courses as CON 170 (Fundamentals of Cost and Price Analysis), CON 270 (Intermediate Cost and Price Analysis), and CON 280 (Source Selection and Administration of Service Contracts) and with more government contracting professionals receiving such training earlier in their careers, it would be reasonable to expect the number of cost realism analysis protests to steadily decline in the future.

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Table 2. GAO Protests Relating to Cost Realism, DoD

CY 2010	CY 2011	CY 2012	Total	Breakdown by Service
8	17	17	42	Air Force - 13 Army - 10 Navy - 9 Other - 8 Marines - 2

Current as of 11/08/2012

Leading Complex Projects in the DoD

Steven R. Meier, Ph.D.

Many of today's projects require novel approaches to handle increased complexity and large uncertainty. Complex projects are both difficult and challenging even for the most seasoned project managers. Leading these types of projects requires a versatile skill set, the ability to manage the unforeseen, and a strategic vision. Complex projects require more than just management; they require leadership.

Meier, *Ph.D., Program Management Professional (PMP), has more than 20 years of federal and private industry experience focused on the defense, intelligence, and civil aerospace communities. Meier is the founder of SRM Consulting, LLC, a consulting firm that specializes in linking strategy and execution to business results. He was a vice president at the Lockheed Martin Corp., and a member of the federal Senior Executive Service at NASA.*

Leadership is important in every project but can be even more challenging for complex projects since there is a multitude of variables to manage all at once. Complex projects lie between traditional project management and extreme project management and they:

- Utilize new or unproven technology.
- Consist of independent, interacting elements that require integration.
- Involve two or more stakeholders.
- Entail a dynamic human resource environment.

These traits are common to many Department of Defense projects. First, most DoD projects have a goal of demonstrating unproven technology to meet the increasing needs of the warfighter or to address a new threat. Second, in most cases, DoD projects involve the designing, building, and delivery of a system or subsystem that fits into a larger architecture and requires integration at multiple levels. Third, in these times of shrinking budgets and affordability, many programs have adopted cost-sharing partnerships with other agencies to ease the financial burden. And fourth, many DoD organizations involved in complex project developments have military and civilian personnel who rotate every 2 to 3 years, creating a dynamic human resource environment.

Project Leadership Best Practices

The purpose of this article is to: (1) add to the existing knowledge base of best project management leadership practices, (2) confirm the results of other publications and studies on complex DoD projects, (3) provide seven practices for leading complex projects, and (4) discuss the causes of unsuccessful complex DoD projects.

Specifically, this article identifies seven leadership practices that have been utilized to lead complex ground, air, and space projects to successful outcomes. They include:

- Be decisive.
- Battle overzealous advocates.
- Mature new technology early and in a serial process.
- Experiment early and fail early.
- Stop requirements creep.
- Take great care in managing interfaces.
- Create a software integrated product team.

In the remaining sections of this article, I will discuss each of these best practices in detail and provide data to support each practice.

Be Decisive

One of the most critical roles of a DoD project leader is to make decisions. To a large degree, the success of any project comes down to project personnel making good decisions on a daily basis. Many leaders are reticent to make timely decisions for fear of making the wrong decision, or require additional studies to provide more data to execute a decision. The inability to make timely decisions contrasts to past and current leaders who were well aware of the critical need to make timely decisions. To quote President Theodore Roosevelt, "In any moment of decision, the best thing you can do is the right thing, the next best thing is the wrong thing, and the worst thing you can do is nothing." Moreover, John Chambers, the longstanding and admired CEO of CISCO, echoes Roosevelt's sentiments with, "Without exception, all of my biggest mistakes occurred because I moved too slowly."

Decisions need to be made in a timely manner to keep a program moving forward and to maintain high motivation levels for the project team. Being decisive does not refer to making haphazard, uninformed decisions but making decisions that are based on data, facts, and experience. Since most defense projects are demonstrating new technologies to provide new capabilities or enhance existing capabilities, there are many variables to juggle such as cost, schedule, technology maturity, requirements, contracts, and staffing. When it comes to decisions that involve assessing several random variables at once, psychological studies have shown that the human brain has difficulty thinking forward with any accuracy. Moreover, these papers provide evidence that the most simplistic statistical models are more accurate than human predictions. Based on this information, project leaders should seek and use data to create simple charts such as a comparison table, histogram, Pareto chart, or scatter plot. These charts will enable the team to view and analyze data and perform a sensitivity analysis to understand how changing one variable affects the other variables. This approach will allow project leaders to predict future project trends and understand how project variables interact.

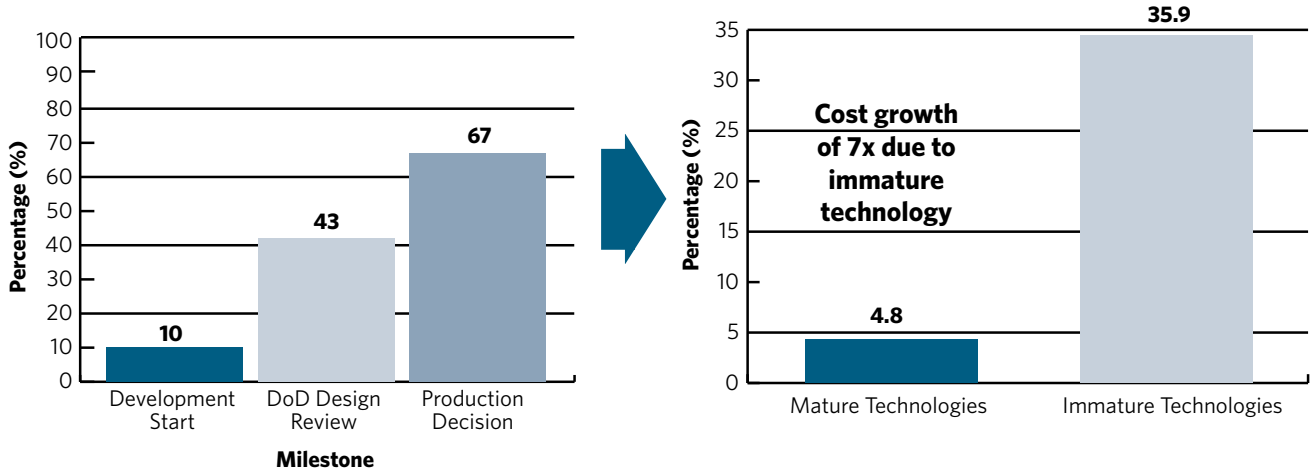
The cost and schedule impacts of delaying a decision can be severe. For example, a complex major defense acquisition program may have 2,000 full-time equivalent (FTE) personnel employed on a contract including government personnel, prime contractors, subcontractors, vendors, and suppliers. Assuming a yearly cost of $400,000 per FTE, this amounts to an approximate cost of $16 million per week on the contract. Now if work is stopped for 2 weeks while a decision is pending or being adjudicated, the impact will be a sunk cost of $32 million and a schedule slip of 2 weeks to the project.

In summary, project leaders of complex DoD projects must make timely decisions to keep the progress moving forward and to maintain high motivation levels. Project leaders also should utilize data and implement simple quantitative techniques and models to understand sensitivities and interactions among several project variables.

Battle Overzealous Advocates

Overzealous advocates are overly enthusiastic individuals who overpromise and underdeliver on projects. While project advocates can have a positive impact, overzealous advocates promise extraordinary capabilities at a fraction of the actual cost and schedule. These advocates can be extremely detrimental to the long-term prospects of a complex project

Figure 1. Program Cost Overruns from Immature Technology



Percentage of programs that achieved critical technology maturity levels at key milestones from GAO-06-391 (2006) from data on 52 programs.

Average program research, development, test, and evaluation cost growth from first full estimate from GAO-06-391 (2006) from data on 52 programs.

since they develop overly optimistic project cost, schedule, and performance baselines. Overzealous advocates can be senior leaders in government who want to gain positive political light, senior leaders in private industry looking to win a large contract that will produce a long-term revenue stream, and government program managers looking to be promoted to senior government or military ranks.

Even in the face of contrary facts, overzealous advocates will trend to optimistic outcomes instead of realism. Data to support this viewpoint are presented in a March 2008 article I authored on best project management and system engineering practices for large-scale federal acquisition programs. A few comments from that paper include: "The program suffered from excess optimism," "Frequent turnover makes it hard to establish accountability," "Decision makers need to reexamine decisions as new information is disclosed," and "the prime contractor should not fear retribution for bearing bad news." All these data beg the question: What can be done to battle overzealous advocacy? Here are a few steps that may help:

- Ensure the project manager and key team members are assigned to project for 4 to 5 years to establish accountability and continuity for the program office.
- Conduct an unbiased, independent review of the program with outside experts prior to Milestone B and at key design points to counter overly optimistic estimates.
- Develop a detailed end-to-end risk management plan in the pre-acqusition phase—prior to Milestone B—that identifies program risks early in the project life cycle. This is crucial.
- Develop rigorous Milestone B entrance and exit criteria and ensure they are adhered to. Issue liens if the criteria are not satisfied.

In summary, the best methods to battle overzealous advocates on DoD projects is to ensure team continuity and accountability; identify and document all risks early in the project life cycle; conduct independent review prior to Milestone B; and develop rigorous entrance and exit criteria at Milestone B and other key design points.

Mature Technology Early and in a Serial Process

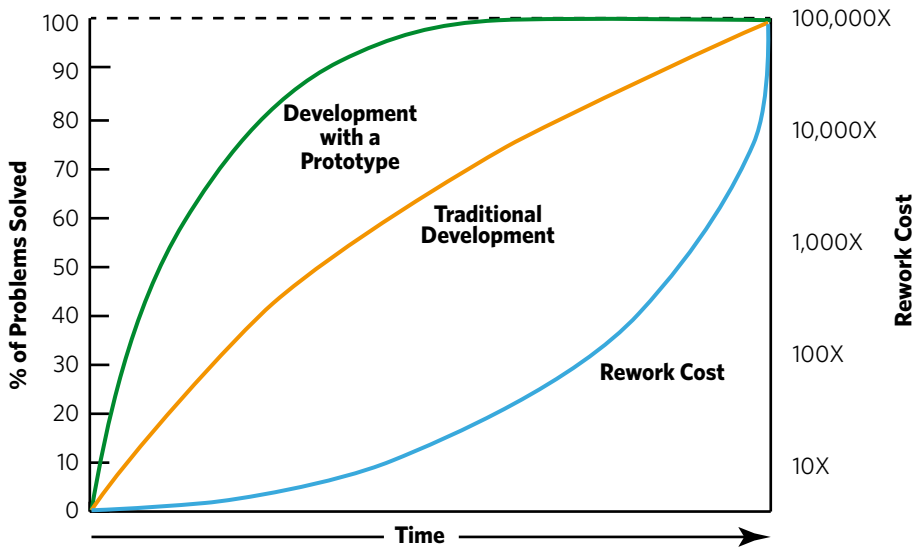
Numerous Government Accountability Office (GAO) reports detail how many major DoD acquisition programs began the program execution phase without verifying that critical project technologies had reached the proper maturity level. As shown in Figure 1, data collected from 52 DoD programs clearly provide evidence that not maturing technology early in the program life cycle had a factor of 7 cost growth compared to programs that had matured critical technologies at the appropriate design milestone.

To avoid suffering the same fate as many of the programs in Figure 1, a best practice is to mature critical technologies to a Technology Readiness Level (TRL) 6 prior to Milestone B. TRL 6 is defined as "testing a system or subsystem model or prototype relevant environment." By achieving TRL 6, the project will have burned down significant technology, cost, and schedule risk.

Another best practice for technology in complex projects is that it should be managed in a serial acquisition process—not in parallel with system development—in order to lower risk to the project. For example, one of the most ambitious and costly programs in the DoD, the Joint Strike Fighter (JSF), implemented a concurrent development approach and has suffered significant cost and schedule overruns.

Instability in the JSF program has been and continues to be the result of highly concurrent development, testing, and production activities. This has led to retrofitting already procured aircraft to correct deficiencies discovered during testing. The JSF is a complex project that is trying to simultaneously develop and field three aircraft variants for the Air Force, Navy, Marine Corps, and eight international partners. With respect to cost, the JSF project baseline in 2001 was for 2,866 planes at a total acquisition cost of $233 billion and in 2012 skyrocketed to a total cost $395 billion for 2,457 planes. Furthermore, the unit cost per aircraft has doubled since start of development in 2001 from $69 million to $137 million in 2012.

Figure 2. Prototypes Enable Earlier Problem Resolution



In summary, technology, system, and testing should not be done concurrently. A good rule of thumb is to mature technology to a TRL 6 prior to Milestone B. By meeting this technology metric, a project will burn down significant project risk and reduce the likelihood of cost overruns, schedule delays, and meeting technical performance requirements.

Experiment Early and Fail Early

Thomas Edison eloquently captured experimenting early and often with his famous quote, "Negative results are just what I want. They're just as valuable to me as positive results. I can never find the thing that does the job best until I find the ones that don't." Edison was well aware of the importance of testing early through rapid and frequent experimentation. He was also very aware that failing is part of the process of learning.

Many leading-edge innovation firms exercise Edison's philosophy by testing out new ideas by rapidly building mock-ups to test features and functions. At their simplest level, mock-ups may take the form of cardboard, clay, papier-mache, or three-dimensional simulations. The idea is to quickly build a visual representation of a product with its desired functions and features—a prototype.

Prototypes can serve multiple purposes. They can:

- Show the design is stable.
- Demonstrate that the user requirements are achievable.
- Serve as a learning tool.
- Provide early information on the system.
- Encourage communication among the customer, contractor, stakeholders, and team members.
- Provide a planned milestone iteration to adjust the design specification.
- Serve as a go/no-go decision point.

Besides serving multiple purposes, prototypes help solve program issues early and burn down risk early in the program life cycle. There are numerous examples in the literature—from automotive climate control systems, software team life cycle approaches, and automotive manufacturing—that demonstrate how prototypes significantly reduce manufacturing development time and effort. This is particularly relevant for complex DoD defense weapons projects that manufacture large quantities of weapons systems.

Figure 2 provides a graphical description of how building prototypes can accelerate problem resolution faster compared to traditional developments and reduce costly rework, which increases by roughly a factor of 10 between project acquisition phases.

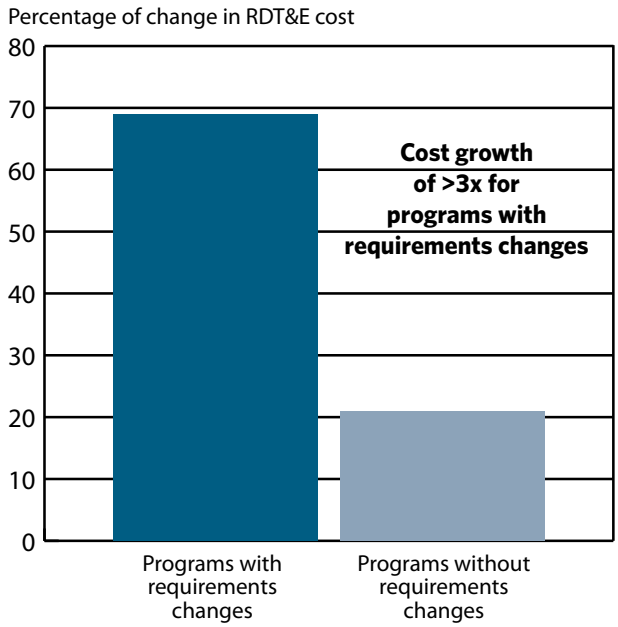
In summary, build prototypes—either hardware or software—to gain knowledge early, to reduce technology development time and effort, and to solve interface issues early. This approach will enable complex DoD projects to avoid costly rework and subsequent cost overruns and schedule delays later in the project.

Stop Requirements Creep

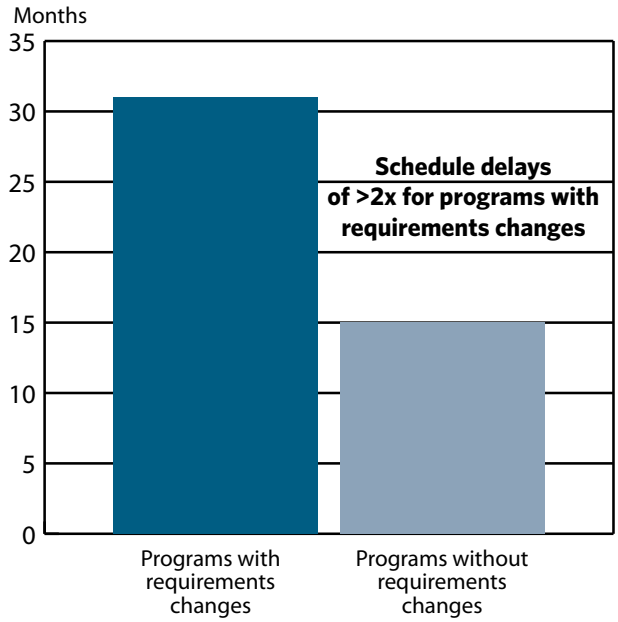
Requirements creep is one of the most cited reasons for cost overruns and schedule delays on DoD acquisition projects. Stopping requirements creep takes exceptional political acumen and a deep understanding of systematic impacts. When pressured to change requirements, it is the project leader's job to explain to stakeholders that changing requirements in the project execution phase usually leads to program cost and schedule overruns.

In order to support this view, let's look at GAO data in Figure 3 that show the impacts of changing requirements. Figure

Figure 3. Program Impacts of Changing Requirements



Average cost growth for programs over initial estimates (GAO-09-326SP) from data on 52 programs.



Average delay in providing initial operating capability (GAO-09-326SP) from data on 52 programs.

3 (left) provides data on 52 DoD weapons programs that changed requirements and shows that these programs suffered average cost growths of greater than a factor of 3, and Figure 3 (right) shows that the average schedule delay is greater than a factor of 2, compared to programs that did not change requirements.

In general, requirements change for several reasons: too many stakeholders with divergent needs and wants; no project approved requirements baseline at Milestone B; and agencies routinely accepting requirements changes post-Milestone B with no understanding of system impacts.

Requirement changes are a widespread problem in the DoD, and strong leadership is required to combat this trend. The most effective approach to avoid requirement changes is to enact the following steps:

- Have a vetted, approved requirements baseline prior to Milestone B.
- Implement a no-change requirements policy. Stick to it.
- Implement a change control board (CCB) and mandate a cost-benefit evaluation for any requirement change.
- Have a strong, politically astute project champion to help manage stakeholders.

Minimizing or having no requirements changes gives complex projects a chance to deliver a system that meets cost, schedule, and technical targets. In summary, have a vetted set of requirements early in the project; have a government-led CCB; and, most important, have a strong project champion.

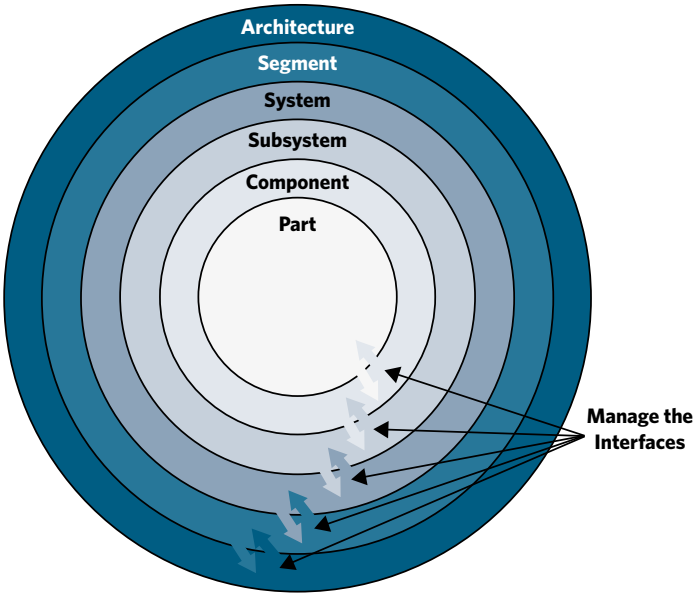
Take Great Care Managing Interfaces

Many complex projects suffer setbacks and failures by not clearly defining technical and organizational interfaces. Interfaces are points where a transfer of information occurs. A technical interface can be an optical, mechanical, electrical, thermal, or data transfer point. Internal organizational interfaces can be among the project managers, system engineers, contracts leads, budget leads, designers, builder, testers, operators, and users, while external organizational interfaces may occur between government agencies, the prime contractor, and subcontractor. As one can imagine, a complex DoD project may have millions of technical interfaces and tens of organizational interfaces that need to be managed (see FIgure 4).

On most programs, the technical interfaces are managed by a system engineering integrated product team (IPT). This IPT is tasked with ensuring all interfaces are captured, specified accurately, and documented when changes occur. One best practice is to create a comprehensive, detailed interface control document (ICD) that identifies and documents all project interfaces as well as all unattended and mismatched interfaces. The ICD also should contain a configuration management (CM) plan to document and communicate all interface changes to the project team. There also should be a change control board (CCB) that meets daily or weekly to discuss and communicate interface changes. The organizational interfaces should be captured in a stakeholder communication plan.

Another best practice to minimize interface control and plan for obsolescence is to design in modularity and commonality to the system under development. Modularity refers to

Figure 4. Technical and Organizational Interface Management



designing in volumes on a system that can accommodate future technology 2, 4, or 8 times larger or smaller, while commonality refers to using standard interfaces. Additional benefits of incorporating modularity and commonality are that they will reduce the number of interfaces to manage and reduce switching costs for future systems.

By creating a comprehensive ICD, documenting and communicating interface changes with a rigorous CM process, creating a stakeholder communication plan, and incorporating in modularity and commonality, a project manager will significantly decrease the likelihood of interface issues on a complex project.

Create a Software Integrated Product Team

Functions performed by software continue to increase on many DoD weapons systems. For instance, data from the 2010 House Armed Services Committee (HASC) report show that the percent of functions performed by software has increased considerably over the past few decades on several weapons systems (see Table 1).

The same report provides dismal statistics on the success rate of DoD IT projects: Only 16 percent of IT projects were completed on time and on budget, 31 percent were canceled before completion, and 53 percent were late or over budget with typical cost growths exceeding 89 percent. Even more disturbing is that of the IT projects completed, the final products contained only 61 percent of the originally specified features. This is a poor report card for DoD software development programs.

The leader of a complex DoD project should ensure that software development be treated the same as hardware, with phases and milestones. In addition, the project manager should ensure that most the efficient software development approach, such as spiral, agile, or waterfall be utilized. This task should be led by a software integrated product team (IPT).

Another best practice for software development is to perform rigorous regression testing for any software change. On one highly successful, large-scale, complex software project for a ground station, the contractor team implemented regression testing on every new or modified line of code and delivered the software system to the ground site with zero errors. Finally, prior to developing software, the project manager should take into account the final system configuration and ensure that the development code and software system interfaces are compatible, the computational complexity is not too high, and that the algorithms meet the system specifications and are scalable.

In summary, treat a DoD software project like a hardware project with phases and milestones; create a software IPT; utilize a development lifecycle consistent with the project's complexity and requirements; track and document software interfaces; ensure the software is scalable; and, finally, perform regression testing to ensure that a high-quality product that meets all specifications is delivered to the final system.

Summary

There is a quote from Albert Einstein that is very relevant to complex projects: "Any intelligent fool can make things bigger and more complex. ... It takes a touch of genius—and a lot of courage—to move in the opposite direction." In many cases, it is organizations, agencies, and senior committees that make projects bigger and more complex than they need to be. My hope is that this article will provide leaders of complex projects with the data and the courage to reduce complexity and deliver complex projects within scope, cost, and schedule.

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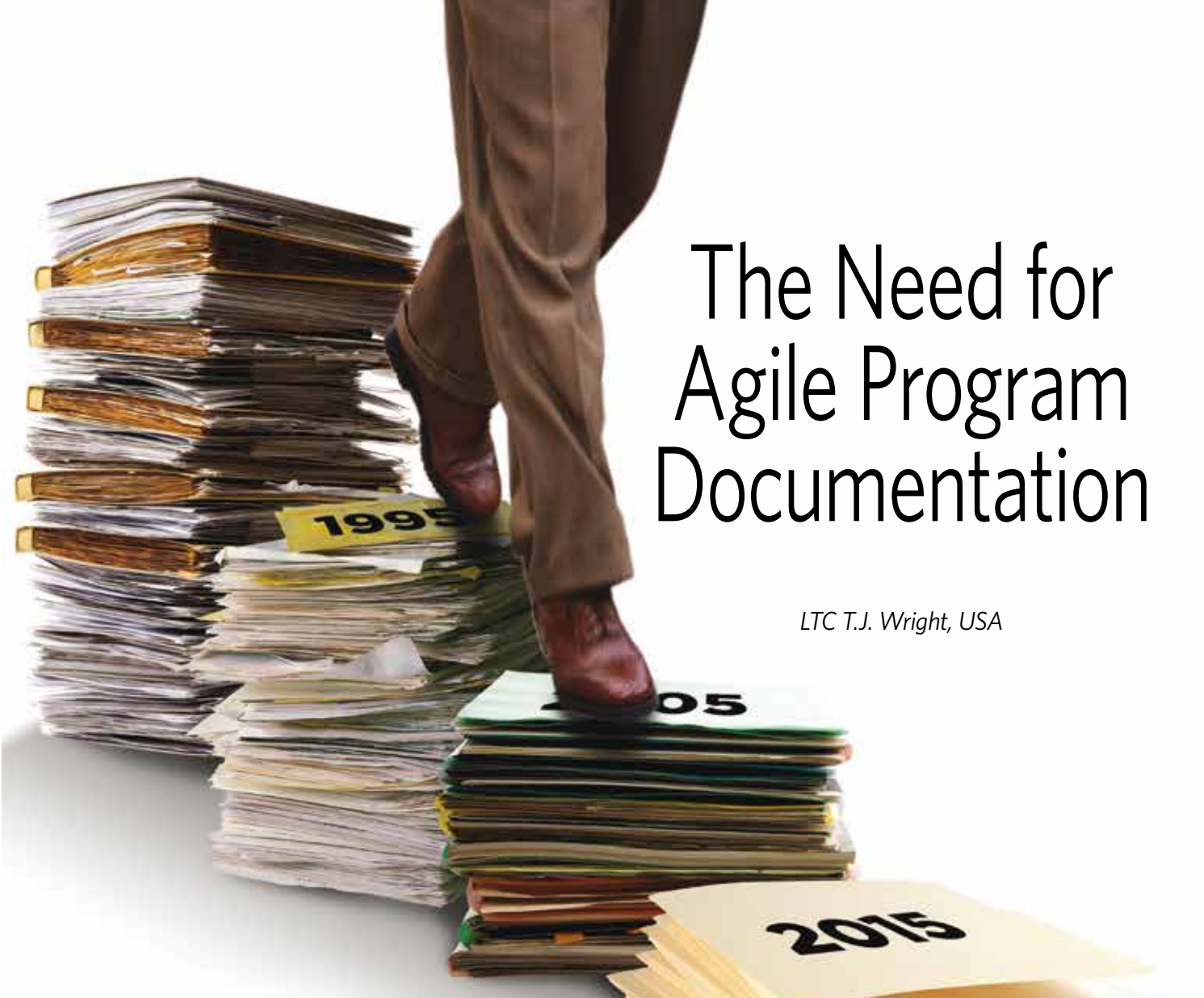
Table 1. Percentage of Functions Performed by Software on Several Weapons Systems

Weapon System	Year	% of Functions Performed in Software
F-4	1960	8
A-7	1964	10
F-111	1970	20
F-15	1975	35
F-16	1982	45
B-2	1990	65
F-22	2000	80



The Need for Agile Program Documentation

LTC T.J. Wright, USA

The past decade has brought much change for warfighters, necessitating new materiel solutions to ensure our soldiers have what they need to accomplish the mission. Over the course of the last 10 years, doctrine, strategy, operations, tactics, techniques, procedures, as well as the threat and battlefield environments have changed significantly.

From the initial invasion, to the withdrawal from Iraq, to the transfer of mission to Afghanistan, requirements for soldier's equipment, vehicles, surveillance, and weapons systems have challenged materiel developers to keep pace with the speed of war. A known program that demonstrated the government's remarkable ability to streamline the process to develop, evaluate, and field within 2 years is the Mine Resistant Ambush Protected Vehicle. When an urgent requirement necessitated a rapid response, all the stakeholders from the resourcers, developers, evaluators, and sustainers executed a more streamlined process to get capability to the field faster, albeit with some challenges.

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Table 1. Milestone B Documentation

OSD Statutory	OSD Regulatory	Army Regulatory
• Acquisition Program Baseline (APB) • Analysis of Alternatives (AoA) • Benefit Analysis and Determination • Business Case Analysis (for 2366b) • Clinger-Cohen Act (CCA) Compliance • Competition Analysis • Consideration of Technology Issues • Cooperative Opportunities • Core Logistics Analysis/Source of Repair • Data Management Strategy • Determination of Contract Type • Independent Cost Estimate (ICE) • Industrial Base Capabilities Considerations • Low Rate Initial Production (LRIP) Quantities • Manpower Estimate • Market Research • MDA Program Certification • Post Implementation Review • PESHE • Replaced System Sustainment Plan • Selected Acquisition Report (SAR) • Submission of DD Form 1492 & Cert. of Spectrum Support	• Acquisition Decision Memorandum (ADM) • Acquisition IA Strategy • Acquisition Strategy • Affordability Assessment • Capability Development Document (CDD) • CIO Confirmation of CCA Compliance • Corrosion Prevention Control Plan • CARD • DoD Component Cost Estimate • Exit Criteria • Information Support Plan (ISP) • Initial Capabilities Document (ICD) • Item Unique Identification (IUID) Plan • Life Cycle Signature Support Plan • Life Cycle Support Plan (LCSP) • MDA Assess of compliance w/CBRN Rqmt • Net-Centric Data Strategy • OTA Report of OT&E Results • Preliminary Design Review (PDR) Report • PPP for Programs with CPI • Spectrum Supportability Determination • Staffing Plan • System Security Management Plan • System Threat Assessment Report (STAR) • Systems Engineering Plan (SEP) • Technology Readiness Assessment • Test and Evaluation Master Plan (TEMP)	• Acquisition Plan • Applied Embedded Diagnostic Assessment Memo • Army Cost Position (ACP) • Basis of Issue Plan (BOIP)/Qualitative and Quantitative Personnel Reqmts. Info (QQPRI) • Business Case Analysis • CPI Identification Memo • Environmental Quality Life-Cycle Cost Estimate • Interoperability Certification—Intra Army • MANPRINT Assessment/MER • Materiel Fielding Plan draft • MIPS • New Equipment Training Plan (NETP) • Performance-Based Agreement • Safety Release (if req'd) • Safety Confirmation • Simulation Support Plan (SSP) • System Safety Management Plan • System Training Plan (STRAP) • Transportability Report/Transportability Assessment • Program Office Estimate

Is it possible to place this concept across the Army and Department of Defense (DoD)?

The Challenge

In most programs, the lack of an urgent requirement dictates the standard acquisition process with its historical use of lengthy and costly program resources. In 2010, Secretary of the Army John McHugh stated in an Acquisition Review that, "We need an agile system that rapidly develops, purchases, and fields innovative solutions for our soldiers." Recently, senior defense leaders have directed program managers to pursue avenues that are smarter and more efficient and to pursue optimal program structures to deliver capability that aren't just cookie cutter program plans. However, the modernization of the current documentation requirements has not kept pace with this optimal guidance and does not readily support nontraditional approaches. There is a critical need for the defense acquisition community to create a more agile documentation process to support and permit the documented approval of programs that will rapidly and timely provide the warfighter with the capability to defeat current and potential adversaries in future contingencies.

The Current Documentation Process

The common denominator for coordinating a program across the required DoD offices and agencies is documentation. Yet, the traditional documentation requirements are a common factor of extended program schedule. There are approximately 70 statutory and regulatory documents required to successfully negotiate a major program milestone. Each document necessitates considerable man-hours to write, coordinate within the program office, and staff across dozens of higher echelon offices; the program executive officer, Army, and DoD. Additionally, rework and rewriting due to frequent changes to templates or documentation increase the already significant resources spent from start to final approval.

Significant resources are spent developing, coordinating, and staffing the program support documentation for a Materiel Development Decision, Milestones A, B, C, and the Full Rate Production decision. This environment limits the acquisition process responsiveness. By the time a weapon system is fielded (as long as 7 years per the DoDI 5000 series), the doctrine, strategy, and theater may have changed and the tactics, techniques, and procedures may even require a new materiel solution. We need to review the required documentation to reflect the improvement we are witnessing in rapidly developing and fielding program capabilities.

Streamline Required Documentation

Streamlining the documentation process can be accomplished simply by more extensively tailoring required

documentation to the program, eliminating nonvalue-added documentation, and postponing the submission of low-risk documents until after fielding. Maybe there is even a quick-look review for some documentation requirements to be followed by a more extensive review and submission for specific low-risk cases. These cases could be identified by higher technology readiness levels, established production capability, or commonality of system reuse due to an incremental upgrade. The goal is to deliver a safe and reliable product to the warfighter as quickly as possible and in some cases follow up with the required documentation where technology maturity allows.

review and approval. Workforce members need to be empowered to get rid of the status quo and, more important, allow nontraditional approaches. There are numerous lean methods to revamp the documentation process and only require documents where there is value added in delivering capability effectively and efficiently to the warfighter: value stream mapping, cutting redundancies and process delays, and minimizing unnecessary reviews through internal and external agencies.

Another method is to delegate authority for approving documentation to the lowest level possible and ensure accountability while enforcing a new process, incentivizing creativity, and rewarding efficiency.

When an urgent requirement necessitated a rapid response, all the stakeholders from the resourcers, developers, evaluators, and sustainers executed a more streamlined process to get capability to the field faster, albeit with some challenges.

Let Program Purpose Drive Documentation

The primary purpose of a tactical commander's intent is to provide the framework for subordinate actions. Why does the documentation not follow the same concept? The more the program manager's freedom of movement is limited, the fewer are the means and methods available to pursue an optimal program structure. Rather than document proponents reviewing document responses to ensure they satisfy "go/no-go lists," a better process might entail reviewing responses to ensure they meet the document's intent at an acceptable risk level. In some cases, this could save substantial time by focusing on what is truly needed to assess the risk while minimizing nonvalue-added time and effort. If a document's content meets the intent with little risk, it is sufficient. How can we emplace a program that requires only the necessary documents, assesses program risk, and is approved once the intent of the document is met?

Revise to Reduce Review and Approval Steps

The key to affecting a documentation paradigm shift is a collective enterprise response to changing the way we do business. The defense acquisition community is receiving well strategized and insightful guidance from our senior defense leaders. The challenge is the implementation of a process that supports that guidance. This change will not be easy, especially for organizations that have a substantial number of personnel assigned the task of documentation

A concerted effort is necessary to align our warfighters' needs to defeat current and potential adversaries in future contingencies with our obligations to the taxpayer. To effect a significant paradigm shift, leadership at each level must support process change.

One good candidate is the reduction of the number of required supporting documents and the process used to staff and approve them. Navigating the existing documentation process in pursuit of the optimal structure will continue to be difficult unless the "document checklist mentality process/method" is changed to a more purpose-driven process that focuses only on what is necessary to deliver capability to the field as efficiently as possible. Program managers should be granted authority to meet the "intent" of only publishing those documents that apply to their programs within an acceptable level of risk. The current acquisition system cannot accept this recommended "program-specific purpose driven documentation" paradigm without senior leadership support, and likewise the document owners embracing process change in how we coordinate documentation with the program stakeholders.

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The Acquisition Community and Engineering Expertise Development

Robert Galway

Acquisition community members are part of a team tasked with making affordable and operationally effective procurement decisions for the Department of Defense (DoD). To achieve this goal, workforce engineers and engineering teams must have and maintain a well-balanced skill set that includes an understanding of government acquisition policies and technical skills that provide the level of expertise required for their role in the acquisition process.

Providing acquisition workforce engineers this skill set balance requires a partnership between the acquisition and technical communities within DoD. The Defense Acquisition University (DAU) has taken on the role of providing acquisition workers the skill sets required for success in learning the required acquisitions policies and procedures for various acquisition roles. The training provided is directly applicable, progressive, career-long, and relevant to a particular DoD department. On the other hand, the

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applicable technical skill set is not being maintained with as much structure, consistency, or resourcing.

Of particular concern to the acquisition community should be development of the technical skill sets needed to support complex roles requiring multisystem technical requirement apportioning, balancing system life-cycle needs during acquisition phases, and providing the capability to create affordable design engineering solutions to problems. Developing these specific technical skill sets involves lengthy and specific developmental experiences for government engineering personnel. Acquiring the necessary skills through random work experiences alone may take a substantial portion of a typical government engineering career. The barriers to developing these skill sets include outsourcing engineering work, resourcing long-term progressive training programs, lack of technical knowledge management, career transitions, and many other factors. The purpose of this effort is to identify some of the issues related to the technical side of this partnership and suggest a strategy for improving the engineering skill sets most relevant to supporting the acquisition community.

Engineers typically come into government service with a degree in a very general field of engineering (electrical, mechanical, civil, etc.). Upon entry into government service, they begin to learn how to apply these general engineering skills to the specific needs of their new employer. During the initial indoctrination period, there typically is either a formal or informal internship where new engineers learn the processes, practices, and procedures of their new jobs. In this same period, they start to become aware of their customer's needs, available resources, and working both as an individual and team member in projects. This period may last a year or two, it is very command-unique, and it is not the time of primary concern in this effort.

After the initial indoctrination, most engineers start to develop in what might be considered a mentored developmental training period, perhaps analogous to a medical residency. This will involve on-the-job training, completion of increasingly more complex assignments, and learning how to function independently as an engineer. Some will enter into specific government training programs, such a those under the Defense Acquisition Workforce Improvement Act (DAWIA). Some will just begin work as journeyman-level engineers. Some will go on to additional education with graduate academic work as they go down the technical specialist track. Others will go down a project management or engineering management track. The missing track from this list is a track providing structured long-term technical developmental programs for complex generalized roles, such as design engineer and systems engineer. These roles develop service-specific innovation and production heuristics that are the source for the sound engineering judgments and creative intuition for resolving acquisition program engineering issues. Collectively, personnel engaged in these roles are the backbone for DoD technical core competency.

The most essential element for engineers on a complex generalized track is the need to actually do the technical work under the supervision of an experienced engineering mentor. Like similar programs, substantial mentor involvement is needed initially, followed by a transitional period where mentoring is reduced and independent work becomes only occasionally reviewed. Gradually, the mentor becomes more of a colleague or consultant on a multilevel engineering team. A certain amount of actual core competency work also must be accomplished throughout a career just to stay in practice and capable of integrating new materials, technology, and systems into projects. For larger and more complex projects, you need to be able to readily immerse yourself in the technical design without spending too much time getting up to speed with the latest technological advances. Practice is in contrast to being the government technical point of contact (TPOC) controlling the work, where the engineer is the person responsible for technical oversight of a contractor's work. This is not to say controlling work should not also be part of the learning experience, but it is to say that enough work needs to be accomplished by the engineer to achieve initial proficiency in the role and then maintain proficiency in the role throughout their careers.

Engineering managers face balancing the challenges and technical problems of paying customers with training the workforce in a "working capital funding" environment. Often, training must take a back seat to product delivery.

As simple as this sounds, it becomes increasingly more difficult to get relevant and challenging engineering assignments that enable staying in practice as you become a more senior engineer, largely due to role shifts caused by the acquisition reform of the 1990s. In addition to these shifts, work that is difficult to contract out resulting from unusual circumstances, such as extreme schedule constraints, politically charged issues, or even availability of contracts, all tend to supersede the need for government engineers to work on core technical work. Reducing the opportunity further is the perception that contracting out such work is a cheaper way to accomplish a task and that one engineer can oversee much more than a single person can do alone. A working capital-funded program

is reluctant to assume any of the financial burden associated with maintaining technical core competency of engineering workers. The long-term effect of engineers not engaging in technically challenging work also is not captured by short-term price comparisons. Not accounting for this long-term resource loss leads to a diminished and dated command collective technical resource capability. The degradation is difficult to measure and often masked by inflated technical-sounding titles given to work assignments that are in reality more administrative than technical. There also is an employee-driven general shift from technical engineering to project engineering and engineering administration because it usually is the path to greater compensation for time.

If we want engineers to stay in these complex general role tracks, a structured development plan is needed for quantifying and achieving the expertise.

If we want engineers to stay in these complex general role tracks, a structured development plan is needed for quantifying and achieving the expertise, matched by a compensation plan that equates their importance to the acquisition program.

Senior engineers traditionally have been informally charged with mentoring the next generation, communicating the knowledge associated with specific past experiences, and providing life-cycle engineering support for past and present acquisitions. The new trend appears to be project engineering, where the oversight of many contracts or projects amplifies the influence of an engineer. However, such a work strategy precludes engineers from having the time to accomplish complex engineering developmental assignments that demand continuity of thought and focus on a specific complex set of issues. A sad byproduct of this strategy also is a diminished capacity to mentor. Loss of the opportunity to complete complex technical core competency engineering assignments equates to reduced engineering proficiency.

A loss in opportunity to transfer knowledge or mentor young engineers is a lost training opportunity. Engineering managers face balancing the challenges and technical problems of paying customers with training the workforce in a "working capital funding" environment. Often, training must take a back seat to product delivery. This creates a learning environment that is often sporadic, inconsistent, and fragmented. Engineering roles requiring long developmental training periods are particularly hurt by this type of learning environment. A structured development program for these roles would assist in managing these resources. A technical version of what DAU provides DAWIA workers would provide a means to manage the training of engineering resources to support the complex roles associated with large acquisition programs.

For example, one of the roles that requires a long development period and constant practice for proficiency is that of design engineer. Design engineers are the creators of the artifacts used to realize how mission requirements can be met in a safe and suitable manner. They are the front-line workers in technical risk decisions, integration of concepts, and determining a reasonable tradeoff strategy in production efforts. New engineers taking on the role of design engineer must find creative and affordable solutions to meet mission requirements using academic principles, industry products, and production practices. This involves a constant iterative comparison between product costs, most effective production process, material constraints, safety and environmental regulations, and many other factors. These solutions must be technically sound, communicated to the production workforce, tested, logistically supported, and properly archived. The time invested in this role includes learning and staying abreast of industry products, production techniques, performance of equipment in the field, and production costs. Most new designs also include the challenge of integrating them into the existing systems and operational procedures. Effective integration of new designs into existing products and systems is a skill that takes practice to learn. However, the dividends from this time investment include increased vision about the probability of success of new concepts, and understanding about the dominant design factors, knowledge of the controlling cost factors, and an ability to rapidly identify the impact of changes to operational or design requirements. These attributes are important technical support skills to be able to bring to an acquisition program. As a side note, acquisition reform and the trend to contract out the design engineering function have reduced the opportunities for design engineering development programs, particularly within the subset of acquisition workforce members.

A second role that requires a long development period is that of systems engineer for complex systems. The technical side of systems engineering involves at least a functional understanding of how systems work, how they interact with the environment, and how they interact with other systems. In the case of complex equipment, systems engineers need to understand the balance between individual system performance and the overarching performance of the total mission system. For example, typically desirable skill sets include understanding issues such as apportionment of power resources or weight allowance for different systems to optimize total performance of a vehicle.

Keeping abreast of the various systems, given the rate of change in many industries, can be a full-time job. However, systems engineers also need to know and understand the acquisition process and understand how to work through issues associated with the different steps in the process. Because each acquisition is different, this often involves learning how to apply and adapt procedures to situations at hand in addition to knowing the defined procedures. Frequently, systems engineers start in one discipline (such as mechanical, electrical, or structural), then learn how systems in their field interact with other systems in complex equipment. Consequently, in addition to keeping current with systems in their field and acquisition procedures, considerable time is spent learning and understanding the changes in system interaction as a result of changes to other systems. Systems engineers often can find their time constrained by involvement in many parallel projects, often at different phases of an acquisition, and must keep up with changes to acquisition procedures at all phases. For their investment of time in learning the breadth of systems and interrelationships, systems engineers become essential in providing acquisition programs guidance on how to handle changes during the life cycle of an asset. These may be subtle changes, such as cost changes or equipment performance characteristic variations, or massive changes involving replacement of one or more entire systems. Accurate and efficient determination of cost, logistics support, overall performance, and similar impacts of changes for the program manager can play a major role in overall success of a program.

Frequently, systems engineers start in one discipline (such as mechanical, electrical, or structural), then learn how systems in their field interact with other systems in complex equipment.

Despite their importance to the acquisition process and overall engineering health of DoD, the health and relevancy of the technical skill level of personnel in key roles such as design engineer and systems engineer is not collectively monitored. Both roles typically have no formal structured technical training within the government to capture the technical level of individual practitioners within the discipline. There are no formal metrics to provide managers a measure of the skill level of groups of practitioners within a branch, division, or command. There also is no means of technical knowledge management for either role that could compare to the knowledge management method provided by the online services of DAU. Knowledge in both systems engineering and design engineering is acquired through direct experience, individual investigation, and direct mentorship from more experienced personnel.

While these methods all have positive attributes, they also often lead to an inconsistent technical message going forward. There is enough commonality of information in both roles for there to be substantial benefit in an "online" technical knowledge management system for both roles within the government. Such a system would not only capture the information, but allow it to be maintained and monitored in a manner consistent with the individual technical authorities within DoD. Ideally, a technical knowledge management system also would permit capturing the "lessons learned" by the workforce as well as delivering the policies of technical authorities.

The DoD acquisition process is designed to provide a delicate balance between flexibility and risk that needs an effective technical leg with awareness of acquisition policies and products. Creation and implementation of these products by the acquisition workforce in an affordable and operationally effective manner depends on the existence and management of several key complex roles that require both substantial technical training and a working level knowledge of the acquisition process. There is sufficient risk in loss of these skill sets to warrant a structured in-house curriculum to add order to a currently chaotic experiential learning process associated with various on-the-job engineering assignments.

Management of the development and status of these roles needs to include a monitored and structured developmental process, have measurable milestones, and permit the command to capture the technical health of its personnel in key roles within the acquisition community at any time. The acquisition community needs engineers who offer a well-balanced technical perspective, do not allow the right process to drive them toward a bad technical decision, and who can offer acquisition guidance in a clear and succinct form. This requires more control of the development process.

Similarly, management of these roles must include capturing and managing the associated knowledge in a manner that permits easy access and a consistent technical message for delivery to developing engineers. One method of both controlling development and managing knowledge is to create a supportable and well-maintained online training and knowledge management system, similar to that used by DAU. This will enable the technical side of the partnership between the acquisition and technical communities to function consistently when supporting acquisition programs in meeting future DoD acquisition challenges. &

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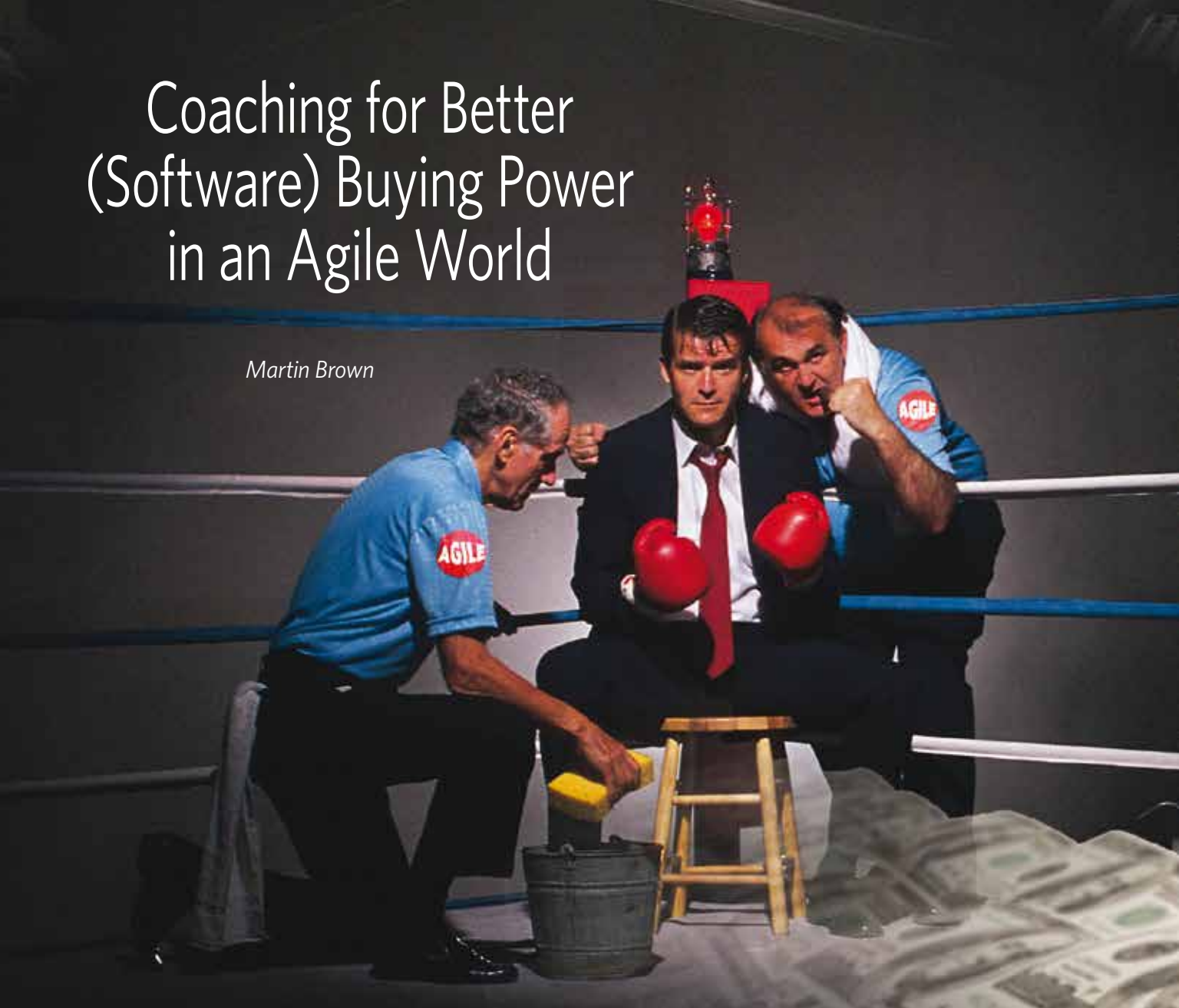
Coaching for Better (Software) Buying Power in an Agile World

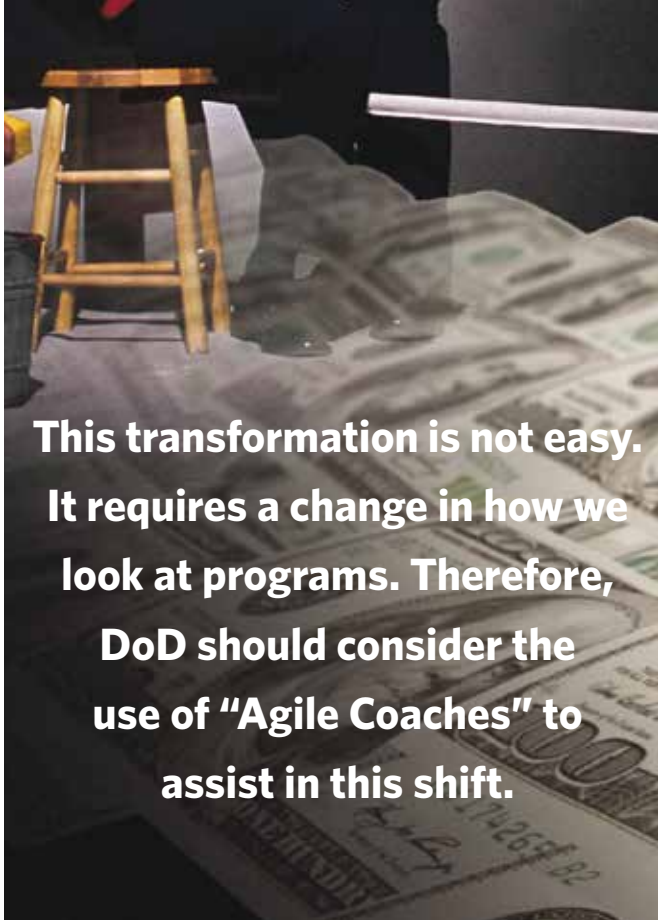
Martin Brown



On Nov. 13, 2012, Under Secretary of Defense for Acquisition, Technology and Logistics Frank Kendall unveiled his guidance for improving efficiency and productivity under the Better Buying Power initiative. Better Buying Power 2.0 (BBP 2.0) identifies 36 initiatives under seven focus areas with all being applicable to the acquisition of software and systems.

The extension of Better Buying Power, coupled with ongoing initiatives to improve the acquisition of information technology (for example, Defense Science Board 2009, Section 804 of the 2010 Defense Authorization Act), should lead acquisition professionals carefully to consider incorporation of agile methodologies into the set of acquisition tools at their disposal. This transformation is not easy. It requires a change in how we look at programs. Therefore, DoD should consider the use of "Agile Coaches" to assist in this shift. Ideally, the agile coaching corps should be internally grown and assigned to acquisition organizations with a cadre centrally located as DAU consultants available to support any and all acquisition programs.

Brown *has more than 20 years of defense acquisition experience and brings both the contractor and government perspective to his current role. He holds both Program Management Professional (PMP) and Agile Certified Practitioner (ACP) certifications from the Program Management Institute.*



The 12 agile principles supporting the "Agile Manifesto" are closely aligned to six of the seven focus areas of BBP 2.0 as shown in the following paragraphs.

Achieve Affordable Programs

Agile places the highest priority on satisfying the customer through early and continuous delivery of valuable software. Unlike the traditional waterfall method that delivers at the end of a long process subject to schedule delays and cost overruns, the agile process focuses on delivering the customer's top priority functionality first and continuing to update development plans so that the customer continuously gets what he or she wants the most. From an affordability perspective, the agile process stays within cost and schedule constraints but varies the features delivered within those constraints. An agile program can be stopped as the planned funding limits or timeframes are reached, and the customer will have already received the most valuable set of capabilities.

Cost Controls Throughout the Product Life Cycle

In addition to the focus on satisfying the customer described above, three additional agile principles support this focus area. Agile methodologies call for continuous attention to technical excellence and good design to enhance agility. Agile understands that these factors cannot be completely designed up front. Instead, agile processes address technical excellence and good design throughout the design, development, test, and support phases of the product life cycle. Agile methods include the concept of technical debt, which, simply stated, is the increased cost of change due to poor, inefficient code or due to the backlog of unresolved defects allowed in the system. A good agile team will plan on regular refactoring efforts to ensure that the software conforms to high standards. Agile also focuses on frequent and regular delivery of functioning software reflecting top user priorities. Therefore, it is easy to equate costs to functionality and user value throughout the development process. A key principle of agile is simplicity, defined as the value of the work not done. The concept of timeboxing when coupled with the principle of simplicity focuses agile development on delivering functionality the user asks for—no more, no less.

Incentivize Productivity and Innovation in Industry and Government

Agile methodologies support the close alignment between profitability and DoD goals through the frequent delivery of working software that address top warfighter priorities. In an agile environment, incentives can be directly tied to the early and regular delivery of working software. Agile also focuses on harnessing change for the customer's advantage. This means that, as acquisition professionals, we need to assess how and when requirements are set in concrete. This also means we need to think about how we contract for capabilities. In an agile world, we can think in terms of fixed-price or fixed-price incentive contracts if we fix the price of a sprint (using an agile term for a short duration iteration) then buy a number of sprints as an option if the contractor meets promised velocity. This strategy allows both the government and the contractor to be responsive to changes in requirements or user priorities.

Eliminate Unproductive Processes and Bureaucracy

Agile has a principle called simplicity that is the art of maximizing the amount of work not done, that captures the essence of this focus area. Traditional information technology acquisition follows a sequential, stovepiped waterfall process that results in a large amount of "work in progress" throughout the development effort and delays delivery of functionality to the end user until the end of the effort. Agile believes that DevOps, the process of warfighters and developers working together throughout the project, is superior to volumes of detailed documentation subject to misinterpretation—or worse, nonuse—and results in early and frequent delivery of the capabilities the user needs. Simplicity also comes into play here in that developers, working closely with warfighters, can accurately identify when a capability is good enough. If 20 percent of the effort can deliver 80 percent of the functionality and the warfighter is happy, the Department is better served if the remaining funds are allocated where they can address the most pressing needs.

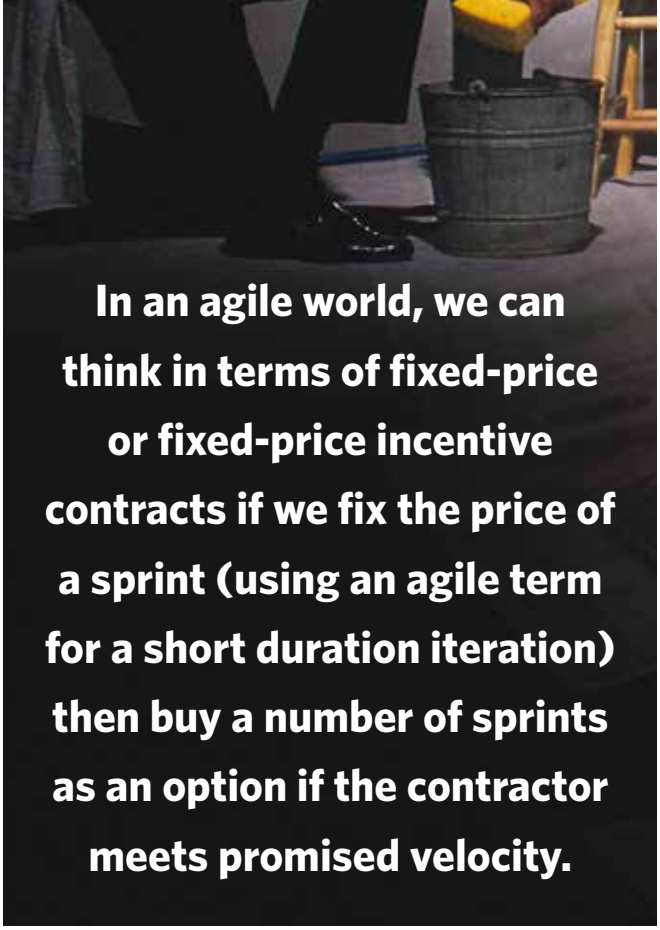
Promote Effective Competition

This starts with establishing the government as the product owner and ensuring that the government owns the functional and technical vision. For afloat forces in the Navy, we expect software capabilities to ride on the Consolidated Afloat Networks and Enterprise Services (CANES) infrastructure.

Contractors follow well-defined software development standards designed to promote interoperability and avoid proprietary code from creeping into deployed systems. It also means the government program offices need to clearly define the desired government technical data rights.

Improve the Professionalism of the Total Acquisition Workforce

The DoD needs to invest in training the acquisition workforce in agile methodologies to add tools that can be used effectively when appropriate. The Department also needs to look at organizational structures and relationships that promote the values identified in BBP 2.0. Operational commands need to understand their role in defining priorities and working with the acquisition agencies to ensure their voice is heard throughout the development process. One of the most fundamental changes is in how the Department manages requirements—or, as they are referred to in an agile environment, features. The incremental, iterative evolution of requirements throughout the life of a project calls for active participation instead of the frequent practice of throwing the requirements over the fence and waiting years for results. Acquisition professionals need to learn how to manage features (large blocks of functionality) and user stories (detailed requirements) instead of tasks. At senior levels, we need to think about how we manage and assess the effectiveness of investment strategies.



In the preceding paragraphs I discussed how agile principles support the BBP 2.0 focus areas. Now I want to focus on the transformation to agile.

The first question always is, "Why?" Version One, a leading provider of tools supporting agile development, conducts an annual State of Agile Survey. The results for 2011, based on more than 6,000 responses, indicated that the ability to manage changing customer priorities (cited on 84 percent of respondents) replaced improved productivity (75 percent) as the leading reason to be agile. Equally surprising was the fact that project visibility (77 percent) moved into the second position, indicating that senior decision makers are getting the information they need from agile projects.

A number of agile programs currently are being executed within the DoD environment. The DoD even has a draft Agile Handbook (Mitre Technical Report 100489) that identifies both the advantages and barriers a program faces as it tries to adopt agile methodologies. The Government Accountability Office (see GAO Report 12-681) was asked to "identify (1) effective practices in applying agile for software development solutions and, (2) federal challenges in implementing Agile development techniques." Both documents contain specific recommendations that address key reasons agile projects fail if the Department considers moving toward increased use of agile software development methodology. The 2011 State of Agile Survey reported that the leading causes of failure for agile projects were lack of experience in agile methodologies and failure to understand/address the broader organizational issues involved. These top two were followed closely by corporate culture issues and pressures for traditional waterfall methods.

Agile reflects a way of thinking about executing projects that cannot be learned in one or two classes. The Defense Acquisition University (DAU) is continuously improving the information technology curriculum. The challenge will be to continually raise the bar as agile approaches reach deeper and broader into the national defense system. DAU also offers coaching services but the number of agile certified coaches is currently limited. These are valuable resources. However, software development organizations should consider establishing an internal Agile Coach position within the acquisition and/or program management competency to provide the ongoing mentoring and advice to individual programs considering adopting agile. Both of the previously referenced documents recommend training and the involvement of an Agile Coach to help projects and organizations align processes and organizational structures to support agile methods. The Agile Coach also should help the organization address the transition from traditional waterfall processes toward increased agility. In BBP 2.0, Mr. Kendall challenged every acquisition professional to do "more with less." Agile methodologies may provide the means for us to meet that challenge.

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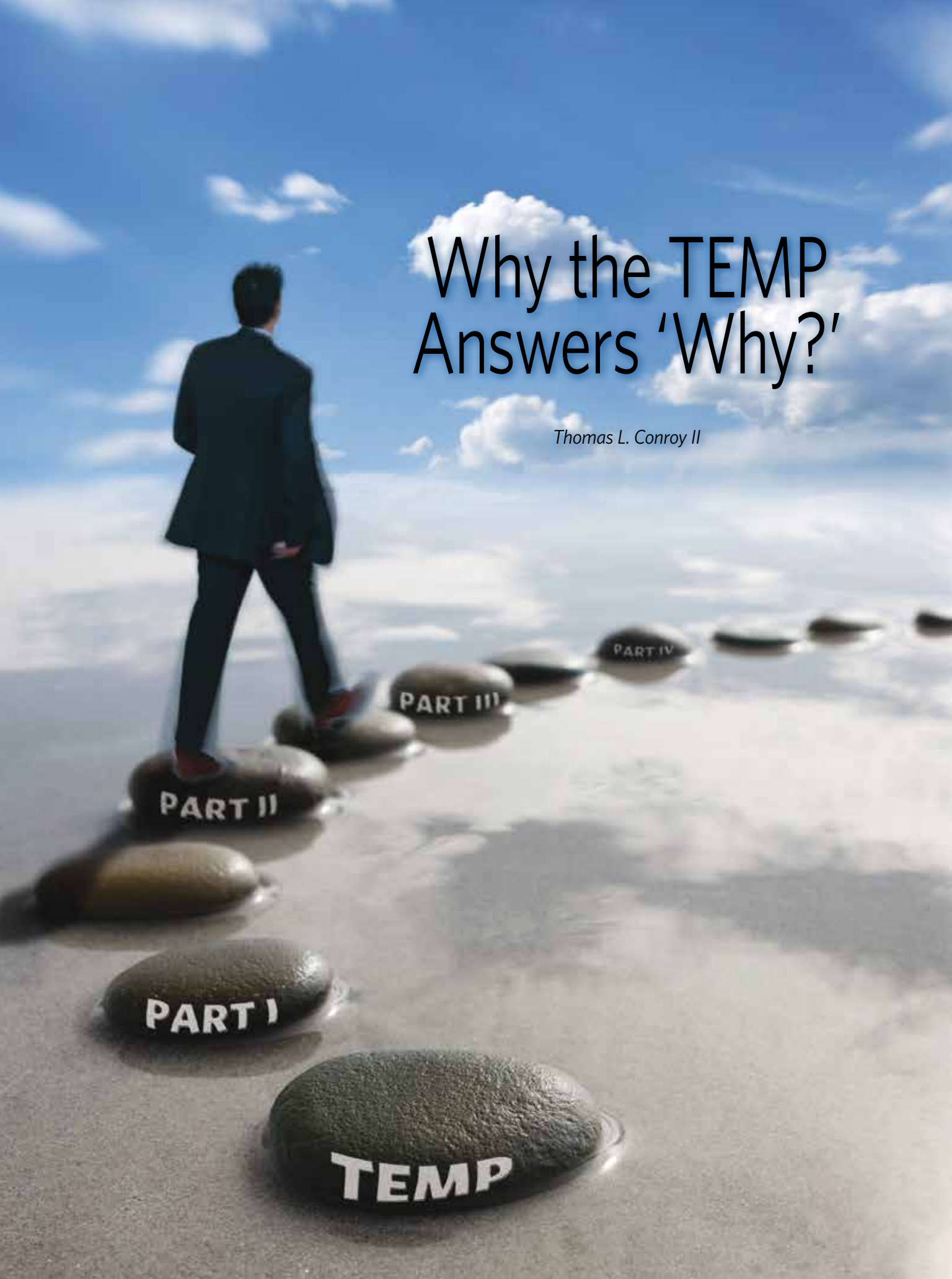
Why the TEMP Answers 'Why?'

Thomas L. Conroy II



The TEMP, or Test and Evaluation Master Plan, is the framework for an acquisition program's Test and Evaluation (T&E) program. The TEMP is a four-part critical program document that links directly to the Acquisition Strategy and the System Performance Specification. The TEMP shows how the program will verify and validate the system requirements, whereas the Acquisition Strategy speaks to the management of the acquisition

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of the requirements, and the System Performance Specification guides the development of those requirements. The TEMP has a crucial role in ensuring that the system meets the users' requirements and capabilities.

Each of the TEMP's four parts is integral to answering the "why" questions surrounding the programming and planning for the developmental test (DT) and operational test (OT) and evaluation methods and resources. If the TEMP is written correctly, the order of the four parts also tells a story and answers these "why" questions effectively. If these "why" questions are used when creating a TEMP, it will be a very useful document for managing the test program.

Part I

The TEMP has four main parts. Part I of the TEMP is called the Introduction, but in reality it is everything one needs to know about the system being developed, tested, and evaluated. The relevant question answered by the information in Part I is "Why is this system needed?" One can see that Part I answers this question with the background information about the system and what capabilities and requirements are necessary to achieve its mission. Part I also uses this information to explain the rationale behind the prioritization of the capabilities and requirements for the system by explaining the nature of the threat and how the system combats it.

Part II

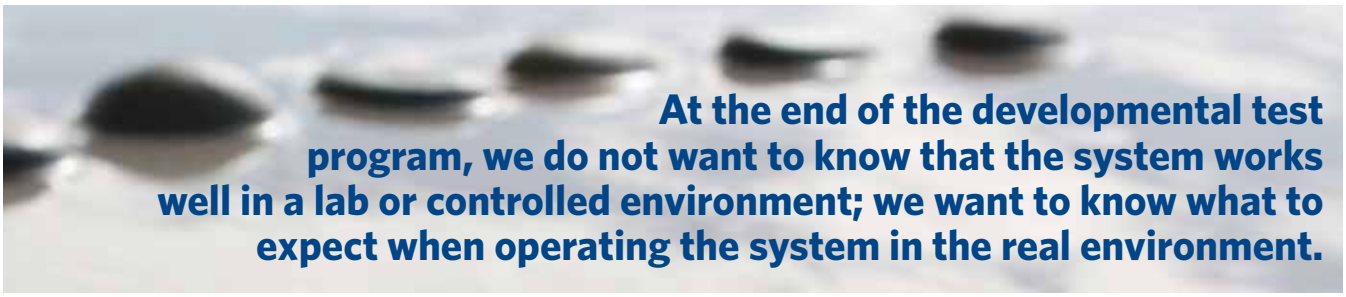
Part II of the TEMP is known as the Test Program Management and Schedule. This section is very straightforward and it answers the primary "why" question of "Why does this testing need to be done now and under this budget?" This is important because it will constrain the amount of testing and evaluation that can be done on the program to prove that the system is effective and suitable in meeting its objectives. We'll talk more about what it means to be effective and suitable in Part III. Part II sets the boundaries within which the test program needs to be accomplished successfully. This will be significant when trying to establish the best tradeoffs between how much testing is desired and how much testing is needed to evaluate what can be expected of the system's true performance when used in the field.

Part III

The next section is Part III, the Test and Evaluation Strategy. This section is the heart and soul of the TEMP. But before we delve into this part, let's talk a little bit about the two views of testing in terms of evaluated performance and the two views of testing in terms of evaluation focus.

When testing the performance of a system, the system is tested and evaluated for effectiveness and suitability. Effectiveness is the ability of the system to meet its mission and suitability is the ability of the system to be available to meet its mission. That is it in a nutshell. There are more detailed definitions, but those are the basics. An example would be that the effectiveness of a car is that it has the ability to get you to your destination within your timeframe, whereas the suitability of a car is that it is reliable and ready to drive and that it can be driven. If the car can get you to your destinations but you need to change the oil each trip, it may be effective but not very suitable.

Having said that, let's discuss the focus of test and evaluation. The two main views of evaluation are from the points of developmental testing and operational testing. These views used to be very diverse, so much so that what is now Part III once was two separate sections, one for developmental testing and one for operational testing. Both views are now integrated into Part III.



Developmental testing focuses on giving you what you asked for. It answers the question "Did I build it right?" Developmental testing is more to the point of meeting the requirement, or what was asked for, while trying to meet the needed capability. However, if the needed capability was not correctly translated into a specified requirement, then what was asked for may not meet that need. This second view, which answers the question "Did I build the right thing?" is called validation and is the focus of operational testing. It is easy to see how the two can diverge if the translated need is not fully resolved by the stated requirements. One example may be to state the need for a 200-square-foot room. If this is the only requirement, the requirement can be met, or pass verification and thereby developmental testing, by any combination of square footage in the room that totals 200. However a room that is 2 feet wide by 100 feet long may not suit your needs and would not meet validation or operational testing.

One can see how important it is that developmental testing and operational testing, or verification and validation, are given their due in supporting each other to gain the end user

a system that meets all the requirements and capabilities to be both effective and suitable in the field. To this end, the operational test community focuses heavily on integrated test and evaluation. Integrated test and evaluation involve the integration of developmental testing with operational testing. This is accomplished in many ways, but one of the best ways is to make developmental tests look and feel like operational tests as much as possible. At the end of the developmental test program, we do not want to know that the system works well in a lab or controlled environment; we want to know what to expect when operating the system in the real environment. To do this, developmental testing environments need to be instituted to the greatest extent possible to simulate increasing levels of the operational environment, thereby decreasing the risk over the test program on the way to a fielding decision.

This is ultimately why there is a single combined developmental and operational test focus in Part III to reach both effectiveness and suitability. Verification must work with validation, and effectiveness must be balanced with suitability. Part III brings all these together to explain the test and evaluation strategy as a whole to include how many tests it will take, what methods of test and evaluation are necessary for each requirement and capability, and how the complete program balances to meet the need. Ultimately, Part III answers the "why" question of "Why is this combination of tests necessary to evaluate the system's performance?"

Part IV

Part IV is the final part of the TEMP and it is called the Resource Summary. This is the point everything else was leading up to. This is what gets the plan done. Part IV is the description of the resources in terms of funding, test sites, and test assets that will be needed to meet the test and evaluation strategy described in Part III.

Part IV is the end of the document but also a beginning in terms of evaluating the TEMP to see if it is effective as a planning tool for the program once it has been written. If you ask "why" of each part, you should be able to find the answer in the previous part and be able to work your way back through the TEMP with all your questions answered. If you ask "Why are these resources in Part IV needed to accomplish this test program?," you should be able to find all the answers in terms of what tests depend on those resources in Part III. If you ask "Why are these tests constrained the way they are in Part III?," you should be able to find those answers in Part II. And if you ask "Why do these tests in Part III need to be conducted?," you should be able to find those answers in Part I. Finally, if you ask "Why is the program constrained the way it is in Part II?," you should be able to find those answers in Part I.

Summary

The four-part TEMP is an effective tool in planning the test and evaluation program for a system in development. The TEMP has a crucial role in ensuring that the system meets the users' requirements and capabilities that are documented in the System Performance Specification and acquired and managed through the Acquisition Strategy. It is a document that answers a number of questions about the nature of the test and evaluation program. In answering those questions while developing the TEMP, the TEMP becomes more effective as a management and planning tool supporting the entire system acquisition and management program. When it comes to the TEMP, it is OK to keep asking "why."

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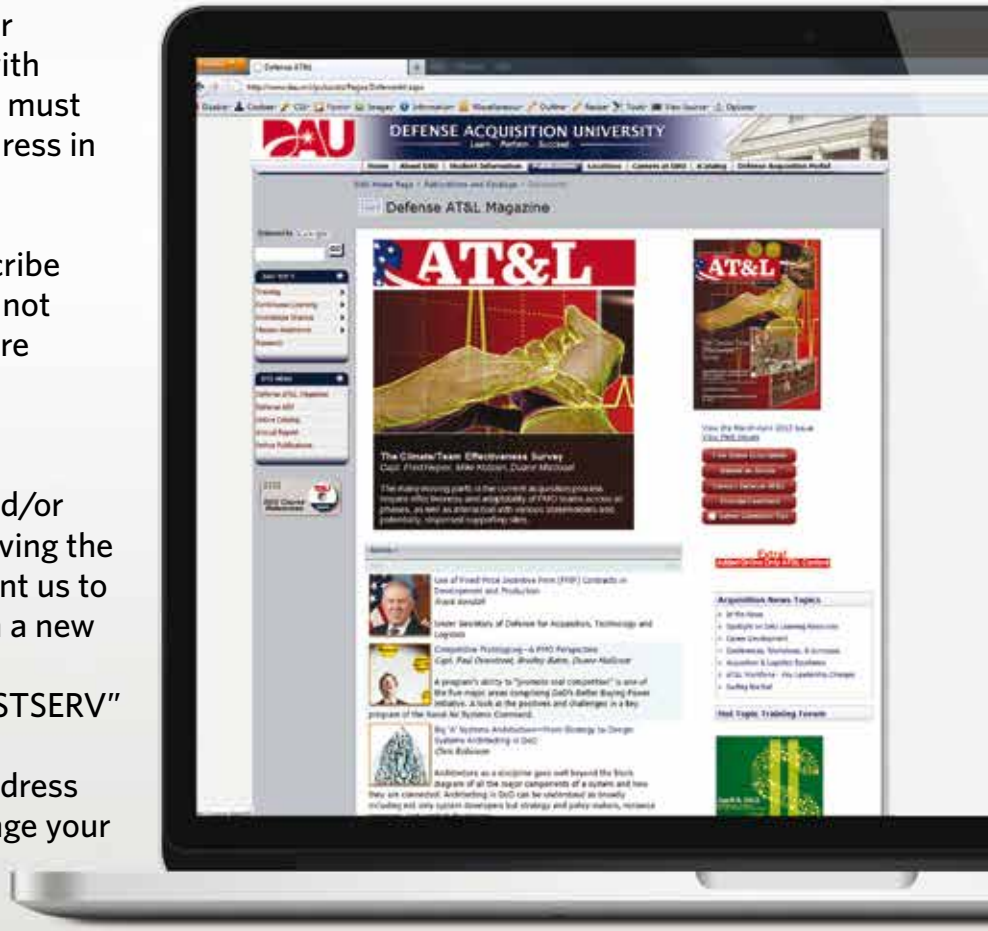
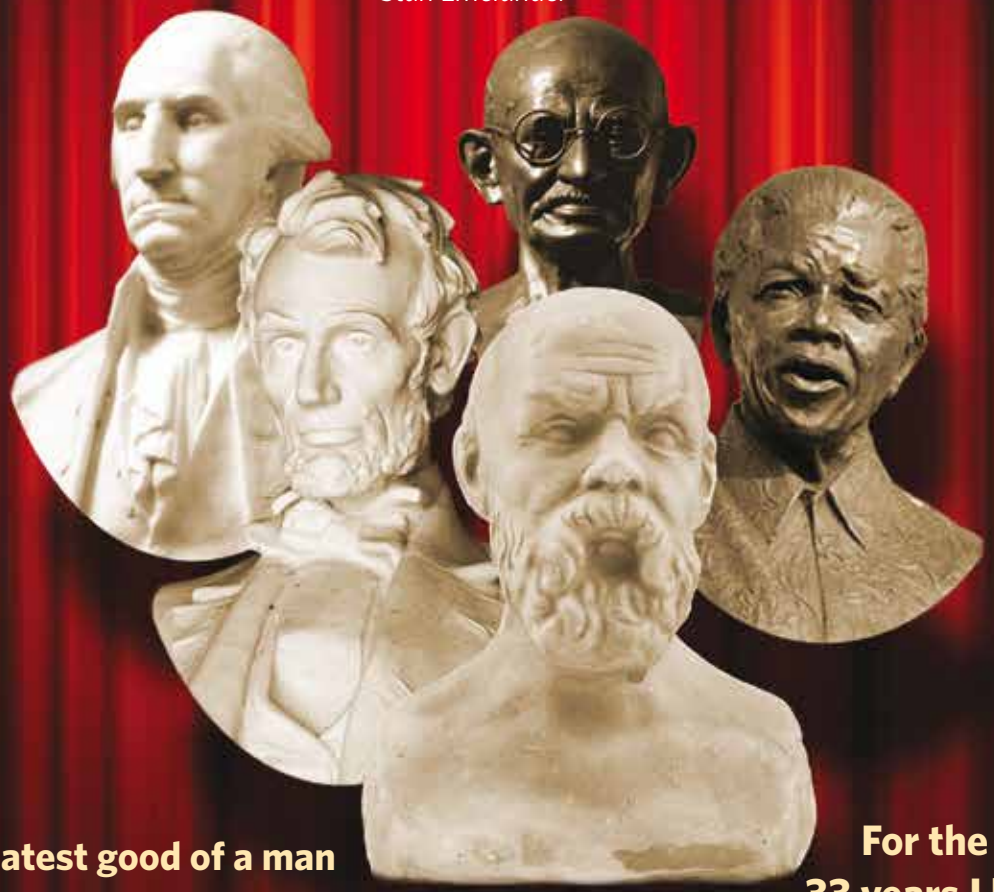


Values Take Center Stage

Stan Emelander



The greatest good of a man is daily to converse about virtue, and all that concerning which you hear me examining myself and others, and that the life which is unexamined is not worth living.

—Socrates, 399 BC

For the past 33 years I have looked in the mirror and asked myself, "If today were the last day of my life, would I want to do what I am about to do today?"

—Steve Jobs, 2005 AD

Values exert a powerful influence on our behavior, whether or not we deliberately choose which are most important. I think this is primarily what Socrates meant. Consider how you start your day. Let's say you are someone, like me, who sometimes has trouble getting going in the morning. As you hustle through your morning routine, you might feel pressed for time, a little pressured and hassled. What are your concerns when

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The ideal situation exists when there is congruence between individual and organizational values, often embodied by the firm's leaders.

you feel this way? Are you in control? Where are your values? Do you regularly start your day in a positive or negative frame of mind? Think about the many other circumstances where your mood, outlook, and effectiveness are influenced by values that may be unconscious and out of control.

In my experience, values are universally recognized as important, but also often weakly understood and acted upon. As a starting point, it helps to define the term clearly. Values can be defined as deeply held beliefs and needs that guide our decisions and behavior, the principles and standards that give meaning to life. Core values are those we will not violate, even when the stakes are high. The concept of values also extends to our personal likes, dislikes, and preferences. For instance, although a desire to exercise every day may seem unrelated to deeply held moral beliefs, it cannot be rejected as a value. If being fit contributes to your quality of life, and you deeply enjoy the activity, exercise also has a place among your values. Values, then, both constrain our behavior and compel us to take action.

Why Values Matter

Developing and acting on strong values is important for professional success and personal meaning. It's unsurprising that studies show people who recognize and regularly act on their core values experience greater fulfillment, satisfaction, and success. Personal values can become meaningful goals, and working to achieve substantial goals is the prime ingredient of a purposeful life. Studies show that those who prize intrinsic values, such as meaningful work, experience greater happiness than those who esteem extrinsic values like wealth, even when the differences in wealth are large. The integration of values with work is one way to answer this question: "Do you work to do something, or for something to do?"

The case for strong organizational values is just as convincing. Organizational values can point the way to behaviors that power the firm's strategy, such as creative risk-taking or putting customer's needs first. Trust, to take one value, has been identified as the key distinguishing feature of top-performing business. Research also supports the link between committed workers and business success, making the firm's support for workers' value fulfillment a top priority. The ideal situation exists when there is congruence between individual and organizational values, often embodied by the firm's leaders. Values also play an essential role in leadership development. In the field of leadership studies, values are strongly associated with the greatest role models. True leadership can be thought of as the art of persuading others to act when they can choose not to, and the strongest call to action often originates from a leader's values. Aspiring leaders everywhere identify role models, including Abraham Lincoln, Nelson Mandela, Mahatma Gandhi, George Washington, and others whose strongly held and effectively communicated values contributed to their profound impact. While there are many different leadership styles and behaviors, nothing is stronger than matching values in persuading followers to act. However, despite their appeal and importance, multiple challenges inhibit developing and acting upon values.

Barriers to Value Formation

If strong personal values are such a potent force for success and fulfillment, what blocks their development and implementation? We can identify several factors. Deciding upon a core set of values might be a daunting task, requiring considerable introspection, and finding time for self-reflection can be a challenge in our era of expanding job hours and constant information input. Analysis of one's own behaviors can be uncomfortable, especially if when we are asking unfamiliar questions. Also, the sheer number of values, and their interrelatedness, complicates the task. Trust, for example, can be thought of as consisting of reliability and competence, which are themselves values. So what does it really mean to hold trustworthiness as a value?

Additional inhibitors exist in teams and other organizations. At work, values may be considered a personal matter, something we are reluctant to discuss. When is the last time you asked your supervisors about their values? When have you explained your values to your constituents? Barriers to communication, including clarity, frequency, and information overload can hinder the distribution of leaders' intent concerning values. An effort to instill a new set of values can entail a change to organizational culture that may be resisted. Factors such as fear, a perceived threat to power and prestige, and fatigue from past change efforts must be overcome for new cultural values to take hold. There also is the potential problem of overexposure leading to cynicism and a "flavor of the moment" attitude on the part of workers. Another challenge is conflict between organizational and individual values, leading to confusion. Employees are quick to detect discrepancies between the organization's stated values and conflicting behaviors by leaders at any level.

Discovering Values

You may have to dive deep to retrieve your values. I was initially overwhelmed trying to sift through lists of possible values, but started making progress when I followed some of the guidelines available on the Internet and elsewhere. These included imagining one's own memorial service and what one would most want to be remembered for, and thinking about what made peak experiences so significant: First identify some peak experiences, then recall your feelings at that time and since. Another method is self-observation, reflecting on your regular behavior. Your repeated activities, encompassing all areas of life, signal where your values lie. Whatever the method used, record the values you identify and make a date with yourself to revisit them. I find that my most important values change, becoming clearer, when I consider them again.

Collective values may be developed for teams, departments, and the whole enterprise. Along with mission and vision statements, a statement of core values is a common method managers use to communicate organizational purpose and influence culture. Group values have multiple sources, including the parent enterprise, the top management team, and customers, but the most potent source of an organization's values is usually its employees. Effective leaders are in touch with followers and pay attention to their dreams and aspirations, fostering organizational values that share an organic relationship with employee values. These have the strongest resonance and are more likely to be adopted as part of the organization's culture. Transformational leadership, including effective communication of an empowering vision, especially seeks to address gaps or dissonance between individual and collective values.

There also is the potential problem of overexposure leading to cynicism and a "flavor of the moment" attitude on the part of workers.

Empowering Values

A first step to empowering your values is to analyze how well you are now enacting them. Ideally, your behavior should match your values, with the most time and intensity devoted to those most important. One straightforward means to weigh this alignment is to draw a line down the middle of a piece of paper. On the left side list your regular activities, on the right side your reasons for these behaviors. If one activity-reason pair (like servicing your car) is in support of another (like getting to work) cross it out, so only root activities and reasons remain. Look at the reasons for the remaining behaviors. How well do they match your ideal list of values? This exercise can be done for the various spheres of life, including your work life.

Another method focuses on enacting your values, thinking of ways you can put your values into action. Research the definition of each of your values and write an expanded personal definition, concentrating on how it could be enacted and what specific behaviors make it come to life. Select a value to enact and focus upon each day; if your day includes meetings or other trying activities, attempt to be specifically conscious of your value intent throughout the event. Yet another technique is to identify an icon that represents your values. It might be a person, an animal (lion, eagle), or something drawn from nature (ocean, mountain). Periodically touch bases with your icon, especially when you feel pressured.

In addition to their personal values, managers and leaders must consider how to empower organizational values. The organization's values (conscious or unconscious) are at the heart of what it does to survive (i.e., its strategy), and enacting those values also is at the heart of a leader's role. Two aspects of leadership enable this effort: effective communications and role modeling. Discussion of values is important and does not have to be an extraordinary event. It is reasonable, for instance, to emphasize trust, fairness, or honesty, as themes at the start of a meeting, or to explore what values set your team, department, or organization apart from others. This method, asking "what makes us special," offers leadership opportunities for employees at all levels and lowers the barrier to value infusion.

Role modeling is arguably the most powerful method at the leader's disposal to affect follower behavior and beliefs. Values such as customer service come alive when workers observe leaders helping customers themselves. For organizations, as for individuals, the greatest challenge lies in enacting values. To avoid the "hollow values" syndrome, managers must follow through and to see that behavior and rewards match the organization's values. Remember, "What get measured gets done." When values are consistent between leaders, followers, and customers, everyone benefits from their fulfillment.

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Defense AT&L

Writers' Guidelines in Brief

Purpose

Defense AT&L is a bimonthly magazine published by DAU Press, Defense Acquisition University, for senior military personnel, civilians, defense contractors, and defense industry professionals in program management and the acquisition, technology, and logistics workforce.

Submission Procedures

Submit articles by e-mail to datl@dau.mil. Submissions must include each author's name, mailing address, office phone number, e-mail address, and brief biographical statement. Each must also be accompanied by a copyright release.

Receipt of your submission will be acknowledged in 5 working days. You will be notified of our publication decision in 2 to 3 weeks. All decisions are final.

Deadlines

Note: If the magazine fills up before the author deadline, submissions are considered for the following issue.

Issue	Author Deadline
January–February	1 October
March–April	1 December
May–June	1 February
July–August	1 April
September–October	1 June
November–December	1 August

Audience

Defense AT&L readers are mainly acquisition professionals serving in career positions covered by the Defense Acquisition Workforce Improvement Act (DAWIA) or industry equivalent.

Style

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The magazine does not print academic papers; fact sheets; technical papers; white papers; or articles with footnotes, endnotes, or references. Manuscripts meeting any of those criteria are more suitable for DAU's journal, *Defense Acquisition Research Journal (ARJ).*

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