Earned Value Management — Reconciling Government and Commercial Practices

For People Involved in Earned Value — Government, Industry, Academia, Or Consulting — These Are Exciting Times!

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The United States Department of Defense (DoD) pioneered many of today's project management techniques. The Department's vital national defense mission requires rapid responses to changing threats, often requiring that its contractors and program managers develop new technology. Because it is difficult if not impossible to establish a firm price for such risky work, government assumes or shares the risk through the use of flexibly priced (cost type or fixed price incentive type) contracts. The resulting large, risky contracts not only push the technical state of the art, they also challenge accepted management techniques — while being scrutinized constantly by the public and its elected representatives.

Searching, Reexamining, Eliminating

Commercial management practices simply do not have much to offer in these circumstances. Many years of searching has failed to find an industrial business arrangement like that between DoD and its contractors. Commercial enterprises rarely enter into cost-based contracts and when they do, the contracts do not approach the scale seen in Defense — hundreds of millions (even billions) of dollars over a development and production period spanning several years.

Among the techniques used extensively in Defense work, work breakdown structures and network schedules have long been accepted as valuable and fundamental management tools. However, earned value management was not embraced as widely, for several reasons.[1] Earned value originated in government three decades ago, was perceived by many as a mere financial reporting requirement, and was over-implemented by a specialist subculture. As a result, DoD began to correct many of those problems in the 1980s.

With the advent of acquisition reform initiatives in the mid-1990s, DoD once again thoroughly reexamined all its management practices. Many were discarded, such as over-reliance on military specifications and standards. Commercial practices were substituted where feasible. But for risky, cost-based contracts, DoD in 1995 reaffirmed earned value management as the "tool of choice."[2]

Also, DoD regulations reissued in 1996[3] require contractors having either flexibly priced research and development contracts valued at $70 million or more or procurement contracts valued at $300 million or more (fiscal year 1996 constant dollars) to meet DoD cost and schedule management control system criteria. The criteria are essentially unchanged from those introduced by DoD in the 1960s. Below the mandatory thresholds, project
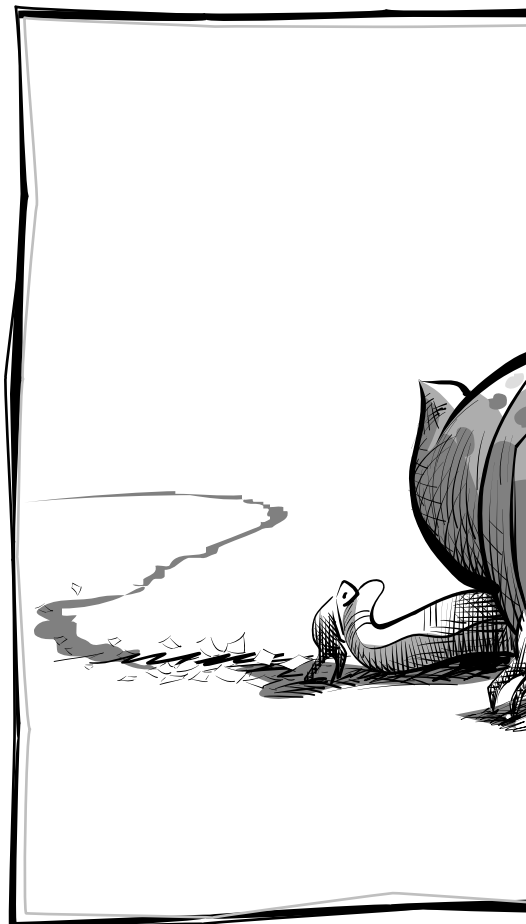
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managers may use less formal techniques consistent with expected cost risk.

This article suggests it is time to recognize the "value of earned value" in its proper project management context. As commercial industry increasingly implements earned value on large projects, DoD is seeking to identify and eliminate any practices used on government work that are found to be unnecessary.
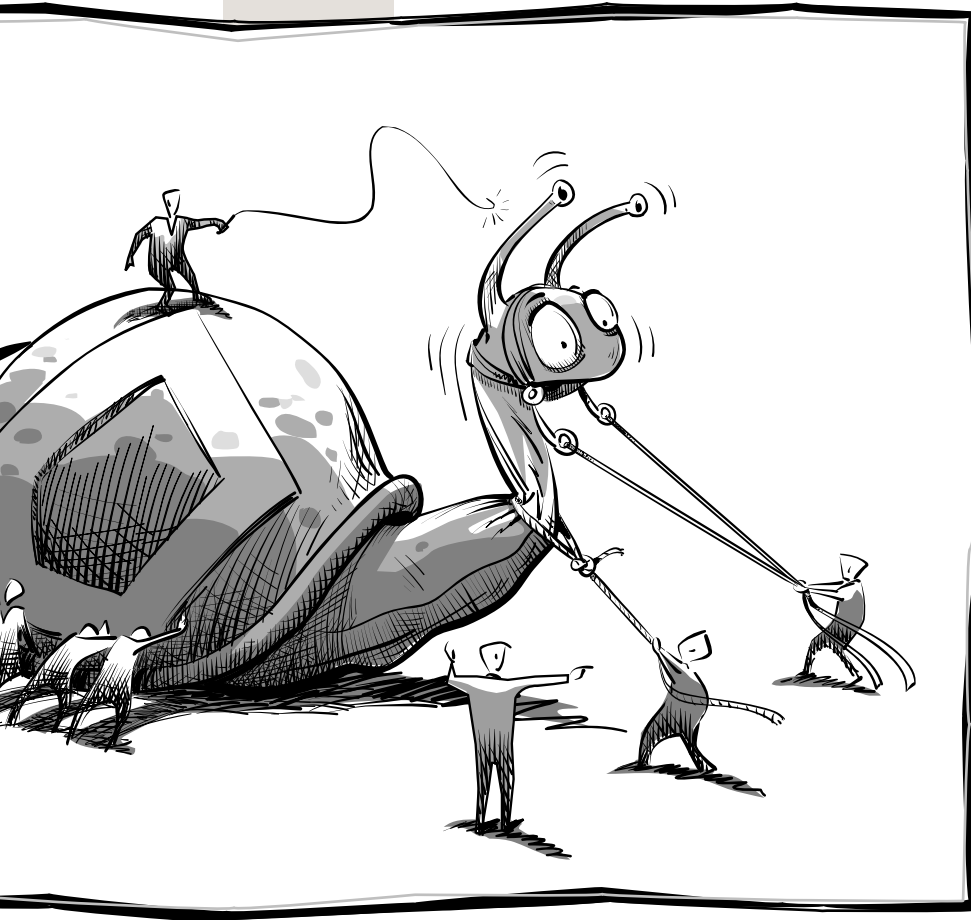
The "Revolutionary" 1960s

Increasing program complexity led in the early part of the decade to recognition that management control systems used on large Defense programs needed to be improved. The typical "spend plan" approach, whereby contractors reported actual expenditures against planned expenditures, proved to have no objective relationship to the work that was accomplished. Although DoD pointed out the fallacy of spend plan management three decades ago,

international consultants working in this field today observe that " . . . most of the projects of the world likely relate their planned costs to the actual costs and attempt to ascertain their cost status."[4]

The Navy attempted to improve cost management in 1960 by linking resources to the PERT network then being used on Navy Polaris program[5] contracts. This resource-loaded network system was called PERT COST. It worked after a fashion, but was misunderstood by other programs that attempted to apply it. More than 10 PERT COST variations existed by 1964, each a unique "how-to-manage" requirement imposed by a DoD or National Aeronautics and Space Administration (NASA) program. Industry viewed with alarm the complex, proliferating management systems required by their various government customers.

In 1963, building on the PERT COST efforts, Air Force implemented the first earned value management approach on the Minuteman Program based on *criteria* – brief statements of attributes that a contractor's management system must meet – that were derived from best practices used by American industry. That Air Force innovation left it to each contractor to tailor its individual system requirements. For example, any scheduling system could be used, provided that it described not only the sequence of the work, but also significant task interdependencies required to meet contract objectives.

The Navy and Air Force experience was captured in the Air Force Cost/Schedule Planning and Control Specification or "C/SPEC." In turn, C/SPEC was the basis for the DoD Cost/Schedule Control Systems Criteria (C/SCSC), issued in 1967 as a DoD Instruction.[6] The instruction introduced DoD-wide both the earned value concept and the criterion-based approach to management. The 35 criteria, essentially unchanged today, describe the minimum standards that a contractor cost and schedule management con-

trol system must meet. They are organized in five parts comprising widely recognized basic management principles:

- Organization and Integration of People and Work
- Planning and Budgeting
- Accounting
- Analysis
- Revisions

Although C/SCSC may seem to have emerged fully fledged in 1967, the criterion-based approach to management and earned value actually evolved over a decade. And while earned value was a revolutionary idea, the management principles captured by the criteria remain as fundamental in 1996 as they were in the 1960s.

What is Earned Value?

Earned value is a management technique that relates resource planning to schedules and to technical performance requirements. All work is planned, budgeted, and scheduled in time-phased "planned value" increments, constituting a performance measurement baseline. As work is performed, it is "earned" on the same basis it was planned, in dollars or other quantifiable units such as labor hours. Planned value compared with earned value thus measures the dollar volume of work planned vs. the equivalent dollar volume of work accomplished. Any difference is called a "schedule" or "accomplishment" variance. Earned value compared with the actual cost incurred for the work performed provides an objective measure of cost performance. Any difference is called a cost variance.

Earned value – the objective measurement of completed work and work in process for comparison with planned and actual values for the same work – distinguishes this technique from any other. Its simplicity and value for managers concerned about cost control begs the question, "Why has earned value remained virtually isolated in the government sector?" Its origins probably provide the answer. Invented by

DoD financial managers (though rooted in industry), C/SCSC evolved outside project management mainstream activities that were more concerned with technical and schedule performance considerations than with cost.

Earned Value Evolution — the 1970s and 1980s

As DoD gained experience with the criterion-based approach to management, the 35 criteria were interpreted differently by the three Military Departments. In 1972, the first *C/SCSC Joint Implementation Guide* was issued to increase uniformity and to insure the broadly worded criteria would be interpreted consistently. The first Guide contained 76 pages, with 12 devoted to criteria discussion, the essence of the Guide. By 1987, the Guide had grown to 102 pages, with 20 – a two-thirds increase – now in the criteria discussion chapter. The increase is significant because the "discussions," intended to clarify the criteria, instead became de facto requirements.

For example, one criterion states, "Establish and maintain a time-phased budget baseline at the cost account level against which contract performance can be measured." (A cost account is the management control point – unique to each contractor – at which a substantial amount of work is integrated with the organization responsible for performing it.) The extent of detailed planning within the cost account was not defined by the criterion, the idea being that all work would be planned in detail to the extent it is practical to do so.

The criteria discussion in the 1972 Guide addressed the planning horizon as follows:

Detailed planning approximately six months in the future should provide for adequate planning and control. The extent of the detailed planning is determined by the nature of the work. Production effort is normally planned considerably longer than six months in the future. However, some development projects are

less readily defined and consequently detailed planning may be less than six months in advance.

This "discussion" quickly devolved into an unwritten rule. Despite the repeated cautions that detailed planning should relate to the nature of the work, arbitrary six-month "rolling wave" planning horizons became a norm because:

- contractors who used a six-month rolling wave planning horizon successfully passed the review process;
- government review teams came to expect six-month planning; and
- consultants recommended six-month planning to their contractor clients, who could then pass the review process.

In this circular fashion, the judgment inherent in the criterion-based approach often was replaced by rules, both written and unwritten. Such regulatory creep is by no means unusual in large organizations, and was furthered by cost and schedule management specialists from the government/industry/consultant triad. Specialists were needed because C/SCSC was not embraced by technically oriented managers, who may have been put off by the esoteric C/SCSC jargon.

There can be little doubt that as C/SCSC was implemented during the 1970s, many contractors substantially improved their cost and schedule management control systems. But it is also true that many contractors simply did what they had to do to pass the government review, then produced monthly cost and schedule performance reports that were analyzed in detail by C/SCSC specialists, but ignored by project managers in government and industry. Unpleasant contract overrun surprises that should have been foreseen were one result.

Predictably, C/SCSC specialists responded by tightening the rules. Management failures were answered by increasingly stringent C/SCSC reviews

and by contractual requirements for more detailed cost reporting. Relationships between government and industry grew more acrimonious and frustrating because each side had persuasive reasons to believe it alone had the correct view. The situation was expressed well by Osborne and Gaebler:

We embrace our rules and red tape to prevent bad things from happening, of course. But those same rules prevent good things from happening. They slow government to a snail's pace. They make it impossible to respond to rapidly changing environments. They build wasted time and effort into the very fabric of the organization.[7]

The environment was ripe for reform. Although government reform usually occurs as a result of external influences, for example, a law, a commission, or a new Administration, earned value reform began from within. The Office of the Secretary of Defense (OSD) traditionally had issued broad policy guidelines for the Services to implement. However, OSD became convinced that industry complaints about implementation practices were valid after an OSD-sponsored research study in 1984 found that industry strongly supported the criterion-based approach.[8]

The study concluded, "The most important overall conclusion of the study is that **C/SCSC is a valid concept and approach** to controlling contract performance. We did find some problems. While these problems have not been debilitating and the 'sky is not falling,' there is room for improvement in C/SCSC implementation." Accordingly, OSD began to assume a more active role with the Services and with industry. Some improvements were made in the late 1980s, mainly in training, but were limited as C/SCSC continued to be identified closely with financial reporting. In 1989, the OSD C/SCSC organization was transferred from the DoD Comptroller's office to Acquisition, setting the stage for significant top-down improvement with a

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clear departure from the DoD "Finance" organization.

The organizational transfer was followed in 1989-91 by a joint DoD-industry Total Quality Management or "TQM" survey that was designed to identify DoD and industry customer needs for effective cost/schedule management.[9] The TQM team concluded that both DoD and industry place high importance on the need for effective control systems and made 18 recommendations for improvement. Led by OSD, DoD worked closely with industry to address the recommendations. The TQM bottom-up study was a watershed in government/industry cooperation that led to mutual efforts to improve the process rather than engaging in mutual fault-finding.

Earned Value — the 1990s Project Solution

Having demonstrated its inherent value to DoD, the earned value requirement was reaffirmed in acquisition regulations in 1991.[10] Given this new

mandate, OSD became the driving force in reform initiatives. The pace of change quickened in 1993 when DoD formed an office dedicated to acquisition reform at the Deputy Under Secretary level. The new office examined the earned value initiatives that were underway and lent its strong support.

In December 1994, Coopers & Lybrand/TASC reported the results of an OSD-sponsored study titled, "The DoD Regulatory Cost Premium: A Quantitative Assessment." It found that the value added cost to industry of doing business with DoD was 18 percent, of which 0.9 percent was attributed to C/SCSC. However, most of the 0.9 percent was attributed to non-value added practices that are not required by C/SCSC, and that OSD for several years had encouraged contractors to remove from their management systems. The study served a useful purpose by confirming that desirable reforms were not being implemented.

Nearly 30 years after being introduced as DoD policy, earned value management is seen by DoD as a significant reform activity. For people involved in earned value, whether in government, industry, academia, or consulting, these are exciting times. A good idea from three decades ago has been reinvented as a valuable and fundamental management tool. Of course, this means that old attitudes and practices also must change. To that end, DoD leadership is apparent in a wide variety of initiatives.

Earned Value Ownership

The Service Acquisition Executives, responding to an OSD initiative, accepted ownership of earned value management for their Departments. This "Integrated Program Management Initiative" marks the shift in earned value from its identification with financial management to mainstream project management. An executive steering group was formed to improve each Service's processes while providing reasonable DoD consistency. Chaired by OSD, the steering group oversees the activities necessary to accomplish the following objectives:

- Reduce the review burden by changing emphasis from government review to contractor responsibility for their own systems.
- Obtain only necessary reports, electronically.
- Ensure comprehensive planning and mutual understanding of contract requirements.
- Integrate cost, schedule, technical performance and risk management.

C/SCSC Reorganization

In 1995, DoD abolished the governing committee for C/SCSC implementation, the Performance Measurement Joint Executive Group. With most DoD contractors accepted as meeting the criteria and with earned value management widely understood, a committee for C/SCSC implementation and coordination was no longer required. Its responsibilities were reassigned to the Defense Contract Management Command as executive agent for C/SCSC. The change will streamline the review and acceptance process while encouraging responsible, timely innovation.

Integrated Baseline Reviews (IBR)

In January 1994, the Principal Deputy Under Secretary of Defense (Acquisition & Technology) signed a policy memorandum formalizing the shift in earned value ownership. Program managers were requested to conduct an IBR soon after award to assure that the contract performance measurement baselines capture the entire technical scope of work consistent with schedule requirements and have adequate resources assigned.

The IBR differs from traditional C/SCSC reviews in that IBRs are led by program managers and their technical staffs, supported by earned value specialists, and emphasize comprehensive planning and integration. Two objectives are to reduce the number of C/SCSC reviews required while improving use of cost performance data by contractor and government managers. All the Services strongly endorse the IBR as a significant management improvement.

International Cooperation

A trilateral Memorandum of Understanding (MOU) was signed in 1995 by Australia, Canada, and the United States. The MOU pledges participants to the following types of cooperative and collaborative activities:

- Cooperation with industry to minimize and eliminate where feasible, differences between management practices used for government and commercial activities.
  - Mutual recognition of contractors accepted as compliant with each participant's requirements.
  - Advocacy of improved project management in both government and industry based on effective risk assessment and integrated management of cost, schedule, and technical performance objectives, using earned value as the integrating tool.
  - Outreach to industry, academia, and professional associations.

The United Kingdom, New Zealand, and Sweden also have expressed interest in cooperating on project management principles.

Industry/International Standards

Currently, DoD is cooperating with the National Security Industrial Association, Aerospace Industries Association, and Electronic Industries Association to develop a U.S. industry standard for integrated project management using earned value. Parallel national standards being developed in other countries hold out the prospect for an eventual international standard.

Other Government Agencies

In cooperation with the Executive Office of the President, Office of Management and Budget, OSD is working to develop performance management requirements based on earned value for non-Defense agencies. We are being careful to model the requirements on best practices used by government and industry while avoiding excesses often associated with DoD C/SCSC experience.

Office of Management and Budget Circular A-11, Part 3, "Planning, Budgeting, and Acquisition of Fixed Assets," issued on July 16, 1996, requires earned value as an integral part of fixed asset planning for all proposed and ongoing acquisitions in all Federal Government agencies. Previously, NASA, the National Oceanic and Atmospheric Administration (Department of Commerce), the Federal Aviation Administration and Coast Guard (Department of Transportation), the Internal Revenue Service, and the Federal Bureau of Investigation adopted DoD requirements for their large, risky contracts.

Project Manager Certification

Cooperating with the Project Management Institute, the Performance Management Association, the National Contract Management Association, the Office of Federal Procurement Policy, Defense Acquisition University, and other government agencies, DoD is exploring using the Project Management Body of Knowledge as the basis for project manager certification. This initiative is intended to bring the public and private sectors into closer alignment.

New Management Tools

When earned value emerged in the 1960s, it was years ahead of its time not only in terms of management philosophy, but also in terms of computer hardware and software capability. The Department led in developing analysis tools. The most widely used earned value analysis software, *Performance Analyzer*, was developed by DoD and provided free of charge to some 2,000 users. As commercial tools emerged that duplicated and expanded on *Performance Analyzer* capabilities, DoD stopped enhancing it and instead encouraged the marketplace to meet future DoD needs.

Other DoD tool development activities include electronic data interchange, improved risk management techniques, and new ways of integrating technical performance measures with earned value metrics.

Defense Acquisition Workforce Education and Training

Earned value management content in the Advanced Program Management Course curriculum at the Defense Systems Management College was doubled even as the course length was reduced from 20 to 14 weeks. Other courses benefiting from improved earned value content included those required in the Business, Cost Estimating, and Financial Management areas.

Reconciling Government and Commercial Practices

A recurring theme in the ongoing DoD initiatives is a desire to reconcile management practices used on DoD contracts with practices used on commercial work. Having deflated the notion that a mythical "best commercial practice" could replace disciplined earned value management on cost-based public sector contracts, OSD is cooperating with industry at home and abroad to optimize its management approach. The ideal solution would minimize, and eliminate where feasible, differences between military and commercial practices.

Government and industry have nothing to lose and much to gain from this cooperation. And we have much to learn from one another. The Department invites like-minded enterprises to join in reaching those goals, modeled on initiatives by several major DoD contractors:

• The President, Boeing Defense and Space Group, directed that all contracts would be managed using earned value, regardless of contractual requirements. The Group is well along in implementing a common management system at all locations and is applying it to commercial work also.
• The Under Secretary of Defense (Acquisition and Technology) presented the first Acquisition Excellence Award to the F/A-18E/F government/industry team. A key element in its success was the Integrated Management Information and Control System, developed by McDonnell Douglas Aerospace and used by the Integrated Product Teams.
• The President, Lockheed Martin Missiles and Space, issued a policy directive making earned value the basis for management of all efforts across all lines of business. A task force is benchmarking earned value practices used on the commercial IRIDIUM(program and will apply lessons learned to the Air Force MILSTAR program. Any unique government requirements that are shown to be unnecessary will be candidates for elimination.

Summary

The Department has reestablished its position as a world leader in risky project management by reaching out to reconcile the best practices pioneered in DoD with those developed in the private sector and internationally. Through cooperative efforts with industry, such as at Lockheed Martin Missiles and Space, OSD is committed to define the attributes of integrated management control systems that meet all needs. Any unique government requirements that are shown to be unnecessary will be eliminated. On the other hand, any that are necessary will be identified and implemented with the least possible burden.

As acceptance of integrated project management using earned value continues to grow in government and industry, professional associations such as the Project Management Institute are appropriate bodies to define its proper place in the global project management community. Accordingly, OSD's outreach to industry and to professional associations opens doors to a wealth of experience and best management practices.

Editor's Note: For information on integrated program management using earned value, visit the Earned Value Home Page:

http://www.acq.osd.mil/pm

REFERENCES

1. Abba, W. F., "Beyond Communicating with Earned Value: Managing Integrated Cost, Schedule, and Technical Performance," Proceedings, Project Management Institute Conference, New Orleans, Louisiana, October 1995, pp. 2-6.
2. Kaminski, Paul G., Under Secretary of Defense (Acquisition and Technology), Keynote address to International Cost Schedule Performance Management Conference, Tysons Corner, Virginia, October 23, 1995.
3. DODR 5000.2-R, "Mandatory Procedures for Major Defense Acquisition Programs and Major Automated Information System Acquisition Programs," Part 3.3.4.3, March 15, 1996.
4. Fleming, Q. W. and J. M. Koppelman, "Reengineering the Earned Value Process: From Government into the Private Sector," Proceedings, Project Management Institute Conference, New Orleans, Louisiana, October 1995, pp. 7-12.
5. Fox, J. R., "Roots of Earned Value System," *The Measurable News*, published by the Performance Management Association, March 1996, pp. 9-12.
6. DoDI 7000.2, "Performance Measurement for Selected Acquisitions," December 22, 1967 (canceled; replaced by ref. 10).
7. Osborne, D. E. and T. A. Gaebler, "Reinventing Government: How the Entrepreneurial Spirit is Transforming the Public Sector." Reading, Massachusetts: Addison-Wesley, 1992.
8. Arthur D. Little Program Systems Management Co., "Survey Relating to the Implementation of Cost/Schedule Control Systems Criteria Within the Department of Defense and Industry," Phase II, August 15, 1984.
9. Department of Defense/National Security Industrial Association, "Joint DoD/Industry Total Quality Management Team report for Program Management on the Cost/Schedule Management Process," May 17, 1991.
10. DoDI 5000.2, "Defense Acquisition Management Policies and Procedures," February 23, 1991 (canceled; replaced by ref. 3).