Information Technology Acquisition

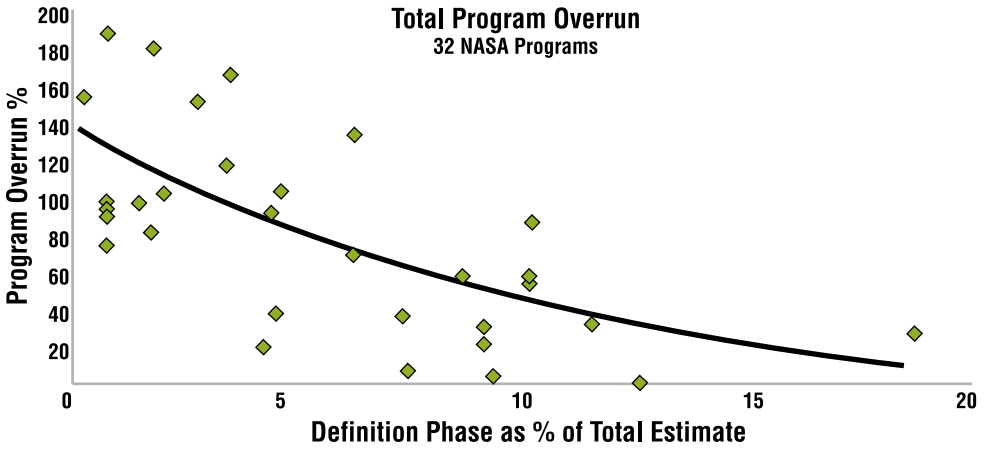
A Common-Sense Approach

Alfred Grasso

Federal information technology programs operate in an environment of rapid technology evolution in which some system components become obsolete while the program is still in development. This pace of technology change requires agile decision making and challenges program teams to keep their technical skill base current to inform these

Grasso *is president and CEO of The MITRE Corporation. He has nearly 30 years of industry experience supporting IT and communications programs for DoD.*

Figure 1: **The Value of Initial Requirements and Concept Definition**



decision-making processes. IT systems and business processes are increasingly interconnected within and across agencies, making it hard to achieve consensus on vision, operational concept, and requirements. The federal government's stretched fiscal and human resources further complicate the situation. The net effect is the widespread failure of many programs to deliver on time and on budget. In 2008, the Government Accountability Office, in Publication No. GAO-08-1051T, reported that "OMB [the Office of Management and Budget] and federal agencies have identified approximately 413 IT projects—totaling at least $25.2 billion in expenditures for fiscal year 2008—as being poorly planned, poorly performing, or both."

In this article, I'd like to reflect on three critical challenges facing IT acquisition: governance, requirements management, and program management practices. I will also outline four steps for improvement: focus oversight on best practices, take a portfolio approach to IT program management, attract and retain critical government professionals, and strengthen program management offices.

Challenge #1: Improve Governance

Effective governance is essential to success. Governance relates to decisions that define expectations, grant power, assign accountability, or verify performance. Effective governance comprises consistent management, cohesive policies and processes, and decision rights for a given area of responsibility. Governance becomes increasingly complicated as programs and processes cross organizational boundaries and intersect multiple governing bodies. Authorities and responsibilities become ambiguous, and program managers are disenfranchised. It is often said that the debate begins in government once the decision is made.

Successful programs must have unambiguous governance. Decision-making authority and accountability that address the implications of intersecting organizations must be clearly defined at the onset. Those authorities must encompass the areas of budget and finance, investment portfolio management, business processes, and program and project management. The Clinger-Cohen Act of 1996 and Title 40 provide the chief information officer with the responsibility and accountability necessary for effective governance. However, it is often the case that CIOs are not fully resourced to perform accordingly, and in other cases, CIOs are not fully empowered across boundaries and choose to avoid organizational conflict. The successful collaborative efforts of the DoD CIO and intelligence community CIO on security certification and net-centricity have illustrated that community-wide enterprise governance can increase timeliness, save money, and improve mission capability.

Challenge #2: Actively Manage Requirements

An equally important consideration is active management of requirements. Lack of realism and stability of requirements is often recognized as the root cause of program re-baselining, which, in itself, is not a dirty word but a necessary part of delivering capabilities that meet the user's needs in a dynamic and complex environment. The initial requirements definition and tradeoff phase is rarely performed with sufficient rigor. In many agencies, responsibility for requirements definition, resource allocation, and acquisition are spread across multiple organizations without a process for making explicit tradeoffs among cost, schedule, and performance. The importance of spending sufficient time and resources in this initial phase cannot be overemphasized. Figure 1 (from the 1992 *Lessons Learned, Cost/Schedule Assessment Guide*, National Aeronautics and Space Administration, by W. Gruhl) shows acquisition program cost performance as a function of the amount spent on initial requirements and concept definition. Performance improves dramatically when a significant proportion (up to 15 percent) of the total program cost is for requirements and concept definition.

Requirements are too often determined in the absence of cost, schedule, and technology risk considerations; and once determined, they are very difficult to change. The biggest difference between successful commercial IT developments and troubled government IT acquisitions is how requirements are managed. Successful commercial IT developers handle requirements with great caution. If a certain requirement adversely drives cost, performance, or schedule, it is quickly modified or eliminated. This does not necessarily happen in a typical government IT acquisition. Time-to-market is a competitive driver in the commercial marketplace, and I would submit it is as important, if not more so, in a world in which adversary capabilities change as quickly as the technology cycle. System requirements must be considered "liv-

ing" but managed, with a controlled process using regular tradeoff analyses to determine the value of change.

One concept, put forth by a key executive at a U.S. leading IT firm, drives this point home. He suggests that if one were to have a competition between a program conducted the traditional way (tight control over requirements process) and a program with the same objectives but where the developer has full control over requirements and is provided only one-tenth of the funding, the non-traditional program would produce a better product in a shorter time frame. The many prototypes and "proof of concept" developments that transition directly to operation ahead of programs of record, as well as the experience of many commercial developments, seem to substantiate this theory.

Another key element to rapid fielding of capability is the notion of a pipeline that consists of concurrent processes for capability planning, incremental development, integration and test, and architecture and standards. Throughout this process, there is close interaction among users, developers, the test community, and decision makers. This is analogous to the successful approach taken by the Missile Defense Agency in the rapid development and deployment of the Ground-based Missile Defense capability. A notable GMD process that informed, and continues to inform, evolving capability planning and system development is the annual large-scale simulation exercise held at the Missile Defense Integration and Operations Center in Colorado Springs. The week-long exercise involves the real users of the system, ranging from operators at fire control consoles to the National Command Authority. The purpose is to develop and refine operational concepts and rules of engagement using representations of the "current" system capabilities, as well as to determine what changes to system design could make sense to improve overall capabilities.

Challenge #3: Build and Sustain a Strong Program Management Office

Successful programs have a strong government program management office capable of a peer relationship with the contractor(s) on systems engineering and program management issues. With a strong and capable PMO, the government can make informed tradeoffs of requirements, cost, and schedule and manage the risk in acquisition programs. A key function within a strong PMO is well described by the metaphor of an architect's relationship with the user and the builder of a building. The architect is the user's agent and is independent of the builder.

The architect works to understand the user's operational needs and translate them into the technical requirements that guide development. The architect evaluates development feasibility and performs independent conceptual designs and cost estimates. Those architect functions enable the user to make informed cost and capability tradeoffs and prioritize requirements. The architect is accountable to the user to ensure that the delivered capability meets the user's highest-priority needs within the constraints imposed by available technology, funding, and time.

The architect also supports other critical decision-making processes. For example, one of the most important decisions a PMO makes is selection of a prime contractor. Many studies have concluded that the contractor's past performance should be a prominent factor in the source selection decision. An effective architect is instrumental in helping the PMO structure the source selection to effectively incorporate past performance into the decision process.

There are many successful programs that exhibit the characteristics I just described. One is the Distributed Common Ground Station–Army. With its version 3 release, DCGS-A leveraged the successful Joint Information Operations Center–Iraq proof-of-concept effort, bringing operational intelligence information and alerts to field units and individual soldiers today in Iraq. By retaining the architect function within the government PMO, the program was able to establish a technical framework that enabled the integration of products from multiple contractors. It also worked interactively with the user community and industry partners to determine what would be the most valuable capabilities that could be delivered within the program's tight cost and schedule constraints.

As a result, they were able to field a system that, for the first time, allowed seamless information flow with Army Battle

Command systems, and provided a collaboration framework that allowed users to work with and visualize data from multiple intelligence sources in a single, unified application, all within a robust security architecture leveraging commercial off-the-shelf-/government off-the-shelf-based tools.

While many studies have revealed similar issues and far-reaching recommendations have been offered, we can make progress now within the constraints of current policy and regulations. Based on MITRE's experience with these issues, I propose four critical strategies to move forward.

Strategy #1: Focus Oversight on Success

We must first change the tone and tenor of oversight to focus equally on programs that have gone from bad to good or good to great to reveal best practices, which then can be applied more broadly. No program is without risk. We should all be more interested in the programs that have managed risk well and harvest those results for the betterment of a larger set of programs. In our experience, we have seen the impact that oversight has on decision making through program and enterprise governance and program operations.

Specific recommendations include, but are not limited to:

- Convene OMB-chaired, facilitated workshops on a variety of program-delivery topics, attended by a cross-section of program leaders and government technical professionals, highlighting program cases as examples, and held in low-key, private venues that encourage discussion of issues and successes.
- Assemble a cross-government "PMO council," following the concept of the chief financial officer and CIO councils, constituted as a forum for program leaders to work together to establish government standards, to help advance the state of the practice in government IT acquisition, and to leverage successes across the government.

Strategy #2: Take a Portfolio Approach

DoD has recently begun to manage portfolios of programs grouped by capability, enabling the capability portfolio managers to allocate resources across programs and to synchronize program deliveries. The elements of these portfolios are of a granularity that is good for making adjustments in resources, but not for managing the programs themselves.

To navigate the dynamics and uncertainty of today's environment, the IT programs themselves need to be structured as a portfolio, with internal planning and management flexibility. Oversight should focus on the long-term funding envelope and the overall capabilities to be delivered, which allows flexibility at the program level to make informed tradeoff decisions and to concentrate on manageably sized increments that deliver capabilities in shorter time frames. This approach makes it easier for programs to demonstrate success or to fail early, which is valuable if the program has put in place and funded contingencies. It also puts capabilities in the hands of the users more quickly. This incremental approach is the norm in commercial practice.

Strategy #3: Attract and Retain Talent

According to the 2006 *Defense Acquisition Performance Assessment Report* (<www.acq.osd.mil/dapaproject/documents/dapa-report-web.pdf>), the department needs to retain and immediately increase the number of employees focused on "critical skill areas, such as program management, system engineering and contracting." The report highlights the concerted effort since 1990 to reduce the government acquisition workforce as well as delays in filling both political and senior executive service appointments. It also underscores the lack of systems engineering experience: "System engineering capability within the Department is not sufficient to develop joint architectures and interfaces, to clearly define the interdependencies of program activities, and to manage large scale integration efforts." Exacerbating this situation is an aging science and engineering workforce and a decrease in supply of qualified engineering graduates combined with an increase in engineering talent in other developed nations.

In order to support programs with qualified staff and execute informed tradeoffs within the portfolio management system, several successful federal programs should continue to be supported, refined, and broadened. Examples of such programs are the DoD's Highly Qualified Experts Program and the Internal Revenue Service's Critical Pay Authority, which help attract and retain critical government professionals. Additionally, the IRS' pay-for-performance program has helped motivate performance aligned to outcomes. These are valuable tools that address the capacity, capabilities, and incentives needed to manage effective programs.

The government should also consider strengthening the role of government laboratories, both as a means for performing relevant research and development and as a source of systems engineers and program managers. Government laboratories can also be funded to sponsor university research to create a new generation of engineers and scientists to feed both industry and government.

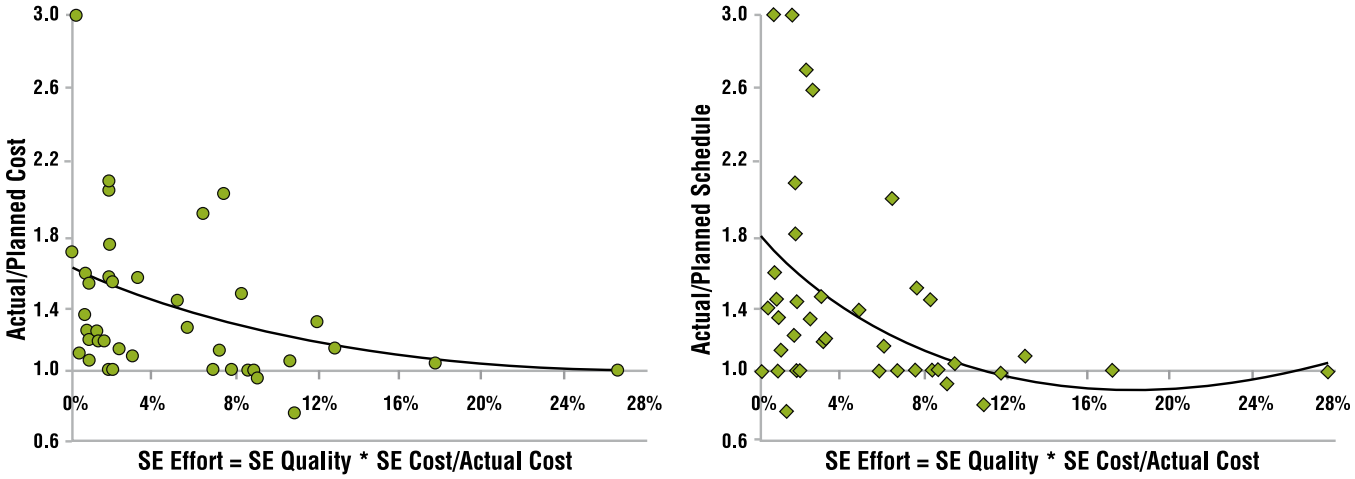
Strategy #4: Strengthen the Program Management Office

As I pointed out earlier, a technically strong PMO can improve the probability of program success by executing the disciplined systems engineering and program management processes necessary to manage risk effectively. To manage acquisition program execution successfully, the PMO must have strong technical and management capabilities. The PMO must also ensure that acquisitions are structured to deliver capabilities within budget and that program execution is managed to minimize risk while adapting to changing requirements and priorities. Acquisition processes must ensure that qualified suppliers are selected and that agreements are negotiated with terms

that, if fulfilled, ensure that the cost, schedule, and performance expectations will be met.

The PMO's systems architecture and engineering processes must ensure that systems are engineered to provide the desired capabilities within the constraints imposed by technology, available resources, schedule, external interfaces, operating environment, and regulatory requirements. Experience has shown that up-front systems engineering directly affects affordability and timeliness. As evidence, Figure 2 (from a presentation given by E.C. Honour at the 2004 INCOSE International Symposium) shows acquisition program cost and schedule performance as a function of the percent of actual program cost spent on systems engineering weighted by expert assessment of the quality of the systems engineering effort. Performance improves dramatically when a

Figure 2: **The Cost and Schedule Impact of Systems Engineering**



significant fraction (up to 12 percent) of the program cost is for effective systems engineering. Today's government IT acquisition programs rarely devote this percentage of program resources to systems engineering.

Again using the metaphor of an architect's relationships with the user and the builder of a building, the architect works with the user to understand operational capability needs and performs cost/schedule/capability tradeoffs to establish system requirements that define the system sufficiently to enable one or more "builders" to develop the capability. The architect also will perform analyses supporting PMO decisions throughout the program life cycle, including cost and performance estimates, cost/schedule/performance tradeoffs, and evaluations of competing architectural and technical approaches. Investing in people and establishing clear measures of success at the macro (program) level in addition to the micro (project) level have had positive effects in every case where we have seen this occur. For example, the IRS was able to streamline the return processing for millions of taxpayers through modernization of the Customer Account Data Engine. It did so by choosing a third party as architect, who then worked closely in a peer relationship with the contractor to conduct weekly assessment meetings that produced the first-ever on-time Customer Account Data Engine software upgrade.

Righting the Ship

Today's government IT acquisition programs are executed in a complex, uncertain environment. Rapidly evolving roles and missions create requirements volatility, and growing operational interdependence of organizations increases the number of program stakeholders and dependencies. An aging workforce, difficulty in attracting new talent, and an explicit strategy to reduce the size (and expense) of PMOs are the root causes of the erosion of the government's organic ability to perform the functions of a strong PMO, and will be difficult to reverse. In many failed programs, the government PMO's inability to manage this uncertainty and risk resulted in a failure to meet cost, schedule, and performance expectations. As articulated above, success in this challenging environment requires oversight focused on success, a portfolio approach that enables truly agile acquisition, methods of attracting and retaining the best talent, and a strengthened program management office. A technically strong PMO provides an "architect" function that enables the government to make informed decisions and manage the increased risks in today's environment of uncertainty, improving the likelihood of success in complex IT acquisitions.

Major IT programs are increasingly complex and volatile, and require intensive endeavors; and no matter how well organized, challenges will arise. The key is how one "rights the ship" when problems develop. Experienced and empowered leadership and oversight focused on best practices and problem solving rather than placing blame are essential for success. In the end, this is hard work.

The author welcomes comments and questions and can be contacted at **ag@mitre.org**.