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have the authors assess the current status of contracting out procurement functions within DoD and federal agencies. This study determined that government agencies display considerable variety in their use of contractor support for procurement functions. This article summarizes the current status of contracting out procurement functions and recommends that contracting managers retain a limited capability to contract out to meet their mission requirements.

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Welcome to the *Defense Acquisition Review Journal* (ARJ) theme edition on contracting trends in acquisition. Our featured author for this edition is Professor John Krieger, the Director of the Contracting Center of the Defense Acquisition University's Curriculum Development Support Center. In his article, "Professionalism in the Acquisition Contracting Workforce: Have we gone too far?," Professor Krieger questions the basic required credentials of the acquisition contracting workforce. The Defense Acquisition Workforce Improvement Act (DAWIA) threshold requirements for this career field include a bachelor's degree and 24 semester hours of business-related courses. Since recruiting and retaining acquisition professionals in this career field have become increasingly difficult, it may be time to reconsider the basic eligibility criteria for hiring. The author asserts that experience may be equal in importance to education, and that a wider variety of educational and professional backgrounds for members of the acquisition contracting workforce would expand the pool of talented candidates. He argues that we should hire the best and brightest, no matter their degree areas, and then train them to the specific knowledge, skills, and abilities that they will need to do federal government contracting, which is not what they would have learned in most business degree programs.

The following article, "Contracting Out Procurement Functions: Current Status" by J. Scott Williams, Roland D. Kankey, Billy R. Harry, and Alan S. Gilbreth, summarizes a large research study sponsored by the Air Force Deputy Assistant Secretary (Contracting) to assess the current status of contracting out procurement functions within the Department of Defense (DoD) and federal agencies. For years, the DoD acquisition workforce has been decreasing, but the workload has not. This has created a dilemma for DoD procurement organizations, causing these organizations to contract out some of the work. The study determined that government agencies display considerable variety in their use of contractor support for procurement functions, and the article summarizes the current status of contracting out procurement functions and recommends that contracting managers retain a limited capability to contract out to meet their mission requirements.

The third article, "A Proposal for a New Approach to Performance-Based Services Acquisition," by Vernon J. Edwards and Ralph C. Nash, Jr., discusses the concept of Performance-Based Services Acquisition (PBSA). Since 1991, the Office of Federal Procurement Policy's specifies that PBSA is the government's preferred approach for service contracting. However, despite numerous efforts—publication of many guidebooks and significant investments in training and consultant services—PBSA remains difficult to implement. An analysis of services acquisition suggests that while PBSA may be useful for routine, common, and relatively simple services, it is not applicable for services that are too long-term and complex to permit complete specification of results and competitive pricing at the outset of contracting. A new approach for contracting these kinds of services is recommended.

The fourth article, "Customer Focus and Army Procurement: Is it Possible?," by Keith R. Shelton and Dr. Drumm McNaughton, examines the concept of customer focus from a DoD contractor's perspective. Current business scholars consider customer focus to be a critical factor in maintaining competitive advantage. The literature is full of research and recommendations considering the *what* and *how* of customer focus. Modern defense product developers, like all modern business enterprise, seek competitive advantage. Customer focus, and the promise of competitive advantage within that concept, is seen as a critical component of a modern defense company's strategy. This article explores the difficulty of true customer focus within the rather strict and regulated Army procurement system. Several common problems are discussed, such as defining the customer, the inherent rigidity of the procurement process, public relations, and product focus. The authors argue that by understanding the customer better, a contractor can create the necessary visions, strategies, and trust leading to a successful program. Finally, constant focus on the end user—the combat soldier—can build morale and enthusiasm within the firm and a positive brand name outside the firm.

In the next article, "Lessons Learned in Acquisition Management," Dennis K. Van Gemert and Martin Wartenberg analyze why many projects and programs fail to meet their initial intended goals. Managing project scope is essential to meeting all objectives. Changing scope (such as requirements creep or funding cuts) will almost certainly derail any original estimates of program performance. Several other lessons learned discussed in the article deal with the following areas: immature technologies, use of management reserves, risk analyses, effective communications, staffing and resource issues, frequent personnel turnover, overly optimistic contractor claims, and integrating sound systems engineering principles into program management decisions. The authors conclude that we have become very good at documenting lessons learned, but not so disciplined in the institutionalization of these lessons. Documenting lessons learned is just the beginning of knowledge management. These lessons must be socialized among program participants to the degree that they are transferred to upcoming generations.

The last article, "Test and Evaluation Lessons Learned from the Field," by Karen M. Stadler, summarizes lessons learned reported by Defense Acquisition University (DAU) students taking Advanced Test and Evaluation (TST-301) over a 4-year time-frame (FY02-FY05). As part of TST-301, all students prepare and present

briefings on test and evaluation (T&E) issues and lessons learned based on their actual T&E experiences in acquisition. These students typically have many years of T&E/acquisition field experience, and their presentations contain a wealth of valuable information, which could help others avoid common sources of error when designing and executing test events. Data from this article is taken from a sample of 393 TST-301 graduates, and lessons learned are grouped into 18 categories. The top five categories of lessons learned are Test Design and Execution, Test Planning, Teamwork and Communication, Funding/Budget/Cost, and Scheduling.

Contracting trends in acquisition and other *Defense ARJ* themes provide opportunities for dialog among members of the Acquisition, Technology, and Logistics (AT&L) community. Journal readers are encouraged to share their experiences in the field, any materials and methodologies that verify research conclusions, tutorials, and fresh viewpoints regarding subject areas relevant to the AT&L workforce by sending submissions to DefenseARJ@dau.mil.

Dr. Paul Alfieri
Executive Editor
Defense ARJ

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2007

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PROFESSIONALISM IN THE ACQUISITION CONTRACTING WORKFORCE: *HAVE WE GONE TOO FAR?*

John Krieger

To professionalize the acquisition contracting workforce, the Department of Defense (DoD) currently requires a bachelor's degree and 24 hours of business-related courses as a threshold requirement for the contracting occupational series. In recent years, recruiting and retaining needed personnel has become increasingly problematic. It may be time to reconsider the hiring criteria used to select candidates for the acquisition workforce. Considering experience to be of equal importance to education, as is done in the private sector, and considering candidates with a wider variety of educational and professional backgrounds may enhance the pool of talented candidates available for the acquisition contracting field.

Between 15 and 20 years ago, the Department of Defense (DoD), with the assistance of legislation, continued its efforts to professionalize the acquisition contracting workforce by requiring a bachelor's degree and 24 hours of business-related courses as a threshold requirement for the contracting occupational series. Over the last five years, there has been a bombardment of statistics concerning the "graying" of the acquisition workforce and the number of civil servants eligible for retirement.

Although the tidal wave of retirements that were forewarned in some of the more dire predictions have not appeared, many agencies are feeling the stresses associated with trying to recruit needed personnel, including positions going vacant for long periods of time and the need to contract for advisory and assistance services to meet

contracting requirements. These stresses may be due to decisions that were made long ago in an effort to professionalize the acquisition contracting workforce and to stem the practice in some organizations of selecting insufficiently qualified personnel for acquisition contracting positions (i.e., GS-1102 contract specialists).

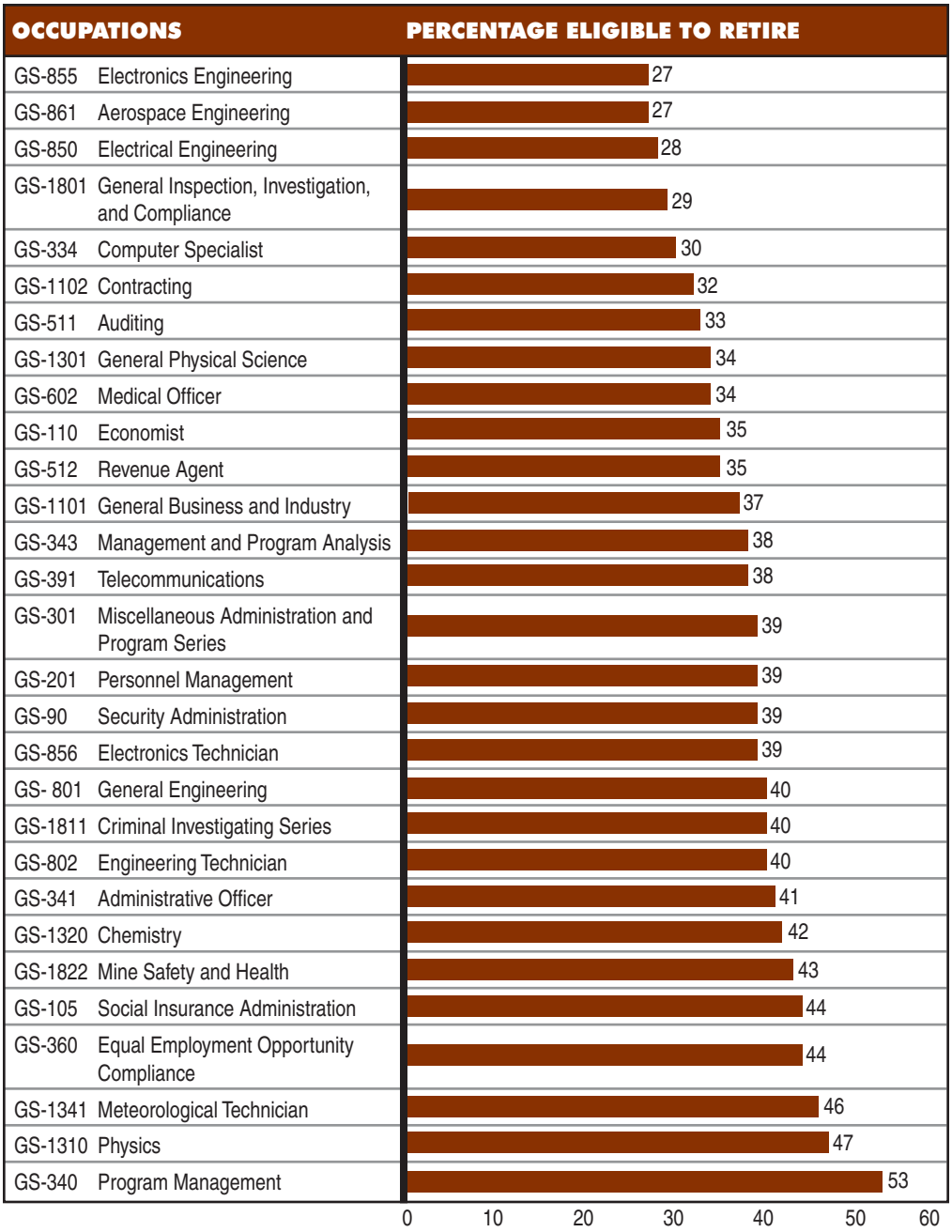
Although the motives may have been well-intentioned, we are now living with the result of unintended adverse consequences. It is now time to reassess these past decisions, specifically degree and course requirements, and determine whether a mistake in approach has been made. By selecting the wrong solution to solve a problem, has a more significant problem been created? The BLUF (bottom-line-up-front): I believe we have made a mistake.

My opinion is somewhat biased on this question. My father, my two brothers, and I have well over a century of combined federal government service. My two brothers and I have all been contracting officers for the federal government. One brother, while a member of the Senior Executive Service (SES), was the director of contracts for what is now called the National Reconnaissance Office (NRO). I am currently the director of the Contracting Center of the Defense Acquisition University's Curriculum Development Support Center. If my brothers and I were to graduate from college today with the same bachelor's degrees we obtained in the 1960s and 1970s, none of us could come to work for DoD in contracting. The ways we entered the contracting field (one through his secondary occupational code in the U.S. Air Force, one from the PACE [Professional and Administrative Career Examination], and one from his placement in the top ten percent of his class, not in business) are all unavailable under the current statutory and rule structure.

I do not want anyone to misunderstand anything written in this article; I am a strong believer in formal education, including education in business. My second and third master's degrees are in contract and acquisition management from the Florida Institute of Technology and national security management from the National Defense University's Industrial College of the Armed Forces, respectively. However, I believe even more strongly that we should hire the best and brightest, no matter their degree areas, and then train them to the specific knowledge, skills, and abilities that they need to do federal government contracting, which is not directly what they would have learned in most business degree programs.

CURRENT SITUATION: THE GRAYING WORKFORCE

There is little doubt that we have a graying acquisition workforce. I note that every morning when I look in the mirror. In point of fact, the entire federal workforce is aging. Although this paper will specifically address GS-1102 personnel, particularly those in the DoD, many other occupational series have larger percentages of retirement eligibles (e.g., GS-340 program management, GS-343 management and program analysis, GS-511 auditing). Figure 1, from GAO-01-509 (2001), provides more detailed information, albeit somewhat dated.



Source: GAO analysis of CPDF data

FIGURE 1. ESTIMATED PERCENTAGE OF SELECTED MISSION-CRITICAL OCCUPATION'S FISCAL YEAR 1998 WORKFORCE THAT WILL BE ELIGIBLE TO RETIRE AS OF THE END OF THE FISCAL YEAR 2006

In a recent article in the *Baltimore Sun* (2006), Melissa Harris updates this information. During his confirmation hearings to become the Administrator of the Office of Federal Procurement Policy, David Safavian also expressed his concerns about the aging acquisition workforce.

> The wave of federal workers originally hired to spy on the Soviet Union, launch the Great Society, and regulate everyone from polluters to drug makers in the 1960s and 1970s is beginning to age out of the work force; an exodus that some officials say could drain expertise and diminish the quality of service.
>
> The numbers point to what some call a *retirement tsunami*: 60 percent of federal workers are older than 45, and many could retire now if they wanted to, compared with 31 percent in the private sector, according to one think tank.
>
> Experts say that the next five years could see a mass exit of experienced—and loyal—employees at a time when some younger workers see public service as a steppingstone to lucrative private-sector jobs (Harris, 2006).

During his Senate confirmation hearing less than a year ago, federal procurement chief David Safavian said shaping a workforce of top-notch acquisition professionals was one of his top priorities. Recruitment is especially critical because roughly 40 percent of senior contracting officers are eligible to retire in less than five years. "We seem to be losing more folks than we are bringing in right now, and that's a grave concern," he said. (Gruber, 2005).

The Federal Acquisition Institute (FAI) provides us with data specific to the GS-1102 occupational series: "Retirement eligibility in the Contracting Series (GS-1102) rose from 10 percent in FY 2002 to 12 percent in 2004. However, retirement eligibility for full retirement climbs to 30 percent in 2009 and 51 percent in 2014" (2005, p. vii).

The potential problem may be much worse than just trying to backfill for retirees. In commenting on this kind of information, particularly that presented by Mr. Safavian, Professor Steven L. Schooner (2005), Co-Director of the Government Procurement Law Program at the George Washington University Law School, commented:

> Yet even that stark language undersold the extent of the problem. Safavian failed to acknowledge that (a) the acquisition workforce was insufficient before Sept. 11, 2001, and (b) although Government procurement spending has increased dramatically since then, neither the Office of Federal Procurement Policy (OFPP) nor Congress has expressed any interest in commencing a meaningful dialogue on

TABLE 1.
BACHELOR'S DEGREES EARNED BY FIELD: 1980 TO 2003
(The new Classification of Instructional Programs was introduced in 2002–2003. Data for previous years has been reclassified where necessary to conform to the new classifications. Based on survey.)

FIELD OF STUDY	1980	1990	2000	2001	2002	2003
Total	**929,427**	**1,051,344**	**1,237,875**	**1,244,171**	**1,291,900**	**1,348,503**
Agriculture and Natural Resources	22,802	12,900	24,238	23,370	23,331	23,294
Architecture and Related Services	9,132	9,364	8,462	8,480	8,808	9,054
Area, Ethnic, Cultural, and Gender Studies	2,840	4,447	6,212	6,160	6,390	6,629
Biological and Biomedical Sciences	46,190	37,204	63,005	59,865	59,415	60,072
Business	186,264	248,568	256,070	262,515	278,217	293,545
Communication, Journalism, and Related Programs[1]	28,616	51,572	57,058	59,191	64,036	69,792
Computer and Information Sciences	11,154	27,347	37,788	44,142	50,265	57,439
Education	118,038	105,112	108,034	105,458	106,295	105,790
Engineering and Engineering Technologies	69,387	82,480	73,419	72,975	74,679	77,267
English Language and Literature/Letters	32,187	46,803	50,106	50,569	52,375	53,670
Family and Consumer Sciences/Human Sciences	18,411	13,514	16,321	16,421	16,938	18,166
Foreign Languages, Literatures, and Linguistics	12,480	13,133	15,886	16,128	16,258	16,901
Health Professions and Related Clinical Sciences	63, 848	58, 983	80,863	75,933	72,887	71,223
Legal Professions and Studies	683	1,632	1,969	1,991	2,003	2,466
Liberal Arts and Sciences, General Studies, and Humanities	23,196	27,985	36,104	37,962	39,333	40,221
Mathematics and Statistics	11,378	14,276	11,418	11,171	11,950	12,493
Multi/Interdisciplinary Studies	11,457	16,557	28,561	27,189	28,943	28,757
Parks, Recreation, Leisure and Fitness Studies	5,753	4,582	17,571	17,948	18,885	21,428
Philosophy and Religious Studies	7,069	7,034	8,535	8,717	9,473	10,344
Physical Sciences and Science Technologies	23,407	16,056	18,331	17,919	17,799	17,940
Psychology	42,093	53,952	74,194	73,645	76,775	78,613
Public Administration and Social Services	16,644	13,908	20,185	19,447	19,392	19,878
Security and Protective Services	15,015	15,354	24,877	25,211	25,536	26,189
Social Sciences and History	103,662	118,083	127,101	128,036	132,874	143,218
Theology and Religious Vocations	6,170	5,185	6,789	6,945	7,762	7,926
Transportation and Materials Moving	213	2,387	3,395	3,748	4,020	4,567
Visual and Performing Arts	40,892	39,934	58,791	61,148	66,773	71,474
Other and Unclassified	436	2,992	2,592	887	388	147

[1] Includes technologies

Source: U.S. National Center for Education Statistics, *Digest of Educational Statistics*, annual; and unpublished data.

TABLE 2.
COLLEGE FRESHMEN—SUMMARY CHARACTERISTICS: 1970 TO 2004
(In percent, except as indicated [12.8 represents $12,800]. As of fall for first-time full-time freshmen in 4-year colleges and universities. Based on sample survey and subject to sampling error; see source.)

CHARACTERISTIC	1970	1980	1985	1990	1995	2000	2002	2003	2004
Probable field of study:									
Arts and Humanities	(n/a)	10.5	10.1	10.5	11.2	12.1	12.6	12.3	12.0
Biological Sciences	(n/a)	4.5	4.5	4.9	8.3	6.6	7.2	7.3	7.7
Business	(n/a)	21.2	24.6	21.1	15.4	16.7	16.2	15.9	16.0
Education	(n/a)	8.4	6.9	10.3	10.1	11.0	10.6	10.1	9.6
Engineering	(n/a)	11.2	11.0	9.7	8.1	8.7	9.5	9.3	9.6
Physical Science	(n/a)	3.2	3.2	2.8	3.1	2.6	2.7	2.7	3.0
Social Science	(n/a)	8.2	9.4	11.0	9.9	10.0	10.4	10.5	10.3
Professional	(n/a)	15.5	13.1	13.0	16.5	11.6	12.3	14.3	15.1
Technical	(n/a)	3.1	2.4	1.1	1.2	2.1	1.4	1.5	1.5
Data Processing/ Computer Programming	(n/a)	1.7	1.7	0.7	0.8	1.5	0.9	0.7	0.6
Other[1]	(n/a)	14.0	15.1	15.8	16.0	17.9	16.9	16.0	15.0
Communications	(n/a)	2.4	2.8	2.9	1.8	2.7	2.5	2.4	1.9
Computer Science	(n/a)	2.6	2.4	1.7	2.2	3.7	2.2	1.7	1.4

(n/a) – Not available

[1] Includes other fields, not shown separately

Source: The Higher Education Research Institute, University of California, Los Angeles, CA. *The American Freshman: National Norms*, annual.

this problem. Thus, despite a clear need for additional resources, Safavian, like many of his predecessors at OFPP, steadfastly refuses to call for increasing the size of the acquisition workforce.

ASSESSING THE CANDIDATE POOL

Given this huge potential for retirements and potential need for even more contracting personnel, we must now look at the sources for those candidates. This becomes particularly important if we assume that the federal government will want to continue to maintain an organic capability for performing acquisition contracting, notwithstanding that there will probably be a need to supplement that organic capability with contractor support. Because of the inherently governmental functions associated with the acquisition contracting process, this should be a safe assumption.

The FAI (2005) reports that in both 2003 and 2004, the last years for which statistics are available currently, about twice the number of contracting occupational

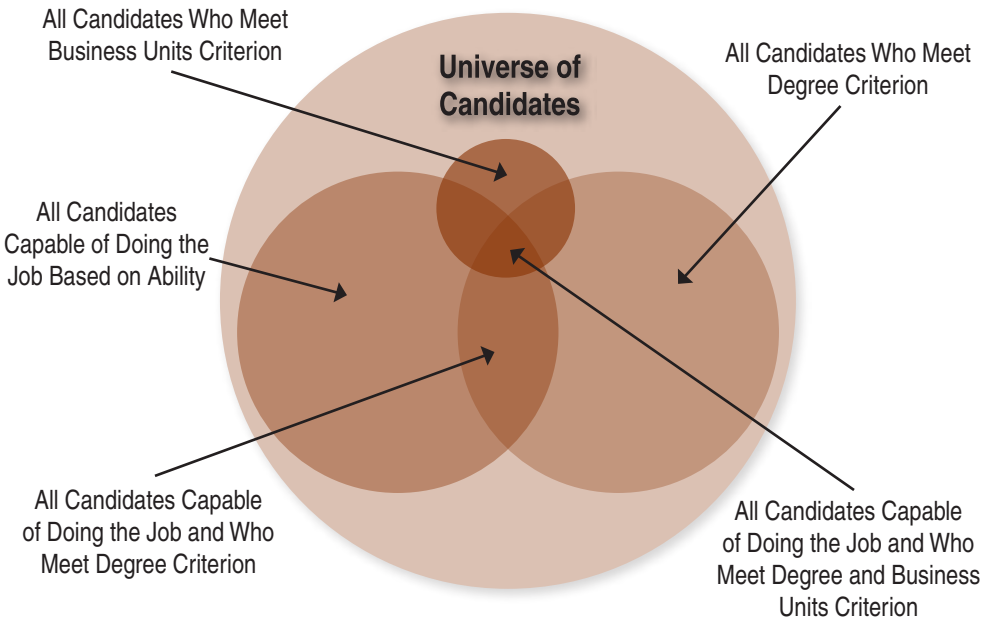


FIGURE 2. THE DIMINISHING POOL OF HIRABLE CANDIDATES

series hires came from internal hires and employees changing agencies than came from external hires. This "robbing Peter to pay Paul" approach to recruitment is not a long-term solution, and it may only exacerbate problems in the long run by obscuring the true significance of the problem. The only viable long-term solution to developing and maintaining an organic acquisition contracting workforce is through external hires.

Let's look at the potential pool of future candidates. For DoD, that means college graduates with a minimum of a bachelor's degree and at least 24 hours in business or business-related courses. The preceding two tables from the *Statistical Abstract of the United States* (2006) delineate that future pool. Recognize, however, that the DoD candidate pool (i.e., college graduates with a minimum of a bachelor's degree and at least 24 hours in business or business-related courses) is not necessarily reflective of those potential candidates that are actually capable of performing the job based on ability. Additionally, recognize that the DoD candidate pool contains people who meet the two criteria, but are not capable of performing the job based on ability.

Although Table 1 shows the absolute number of business graduates has been growing, in Table 2, it is important to note the decline of the percentage of college freshmen opting for business degrees, a decline of five percentage points over the last 25 years.

As a result of the narrow criteria used, the DoD has a limited pool of candidates from which to select. Figure 2 reflects a number of overlapping and intersecting

pools, representing the Universe of Candidates, All Candidates Capable of Doing the Job Based on Ability, All Candidates Who Meet Degree Criterion, All Candidates Who Meet Business Units Criterion, All Candidates Capable of Doing the Job and Who Meet Degree Criterion, and, finally, All Candidates Capable of Doing the Job and Who Meet Degree and Business Units Criteria. Although the size of the circles is notional and strictly arbitrary, the important fact to remember is that the pool of candidates from which DoD may select contracting personnel becomes very limited in comparison to the total number of candidates that may be able to do the job effectively and efficiently.

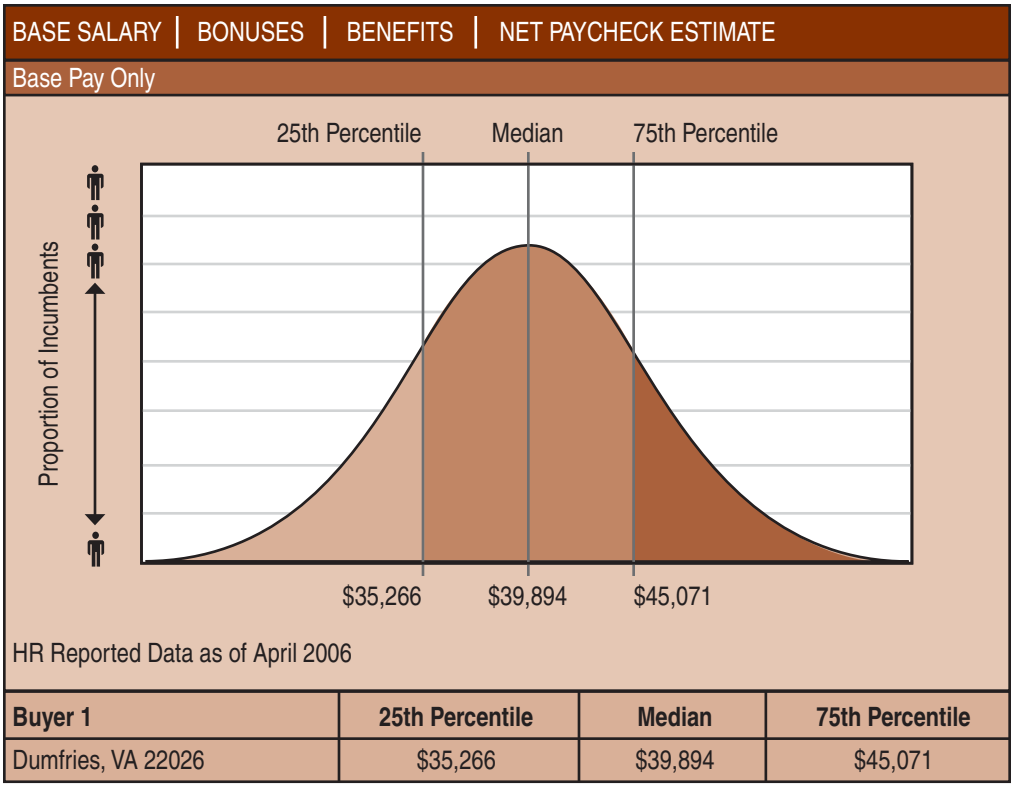
LIMITING DIVERSITY

Another unintended adverse consequence of limiting the pool by establishing degree and course requirements is the narrowing of diversity in the acquisition contracting workforce. Although we may have a tendency to think of diversity in terms such as age, disability, economics, gender, ethnicity, religion, or sexual orientation, diversity also includes other areas, such as education. In discussing diversity, R. McInnes (2006) writes:

> As we enter the 21st century, workforce diversity has become an essential business concern. In the so-called information age, the greatest assets of most companies are now on two feet (or a set of wheels). Undeniably, there is a talent war raging. No company can afford to unnecessarily restrict its ability to attract and retain the very best employees available.
>
> Generally speaking, the term *Workforce Diversity* refers to policies and practices that seek to include people within a workforce who are considered to be, in some way, different from those in the prevailing constituency.

McInnes (2000) continues:

> Tumultuous change is the norm in the business climate of the 21st century. Companies that prosper have the capacity to effectively solve problems, rapidly adapt to new situations, readily identify new opportunities and quickly capitalize on them. This capacity can be measured by the range of talent, experience, knowledge, insight, and imagination available in their workforces. In recruiting employees, successful companies recognize conformity to the status quo as a distinct disadvantage. In addition to their job-specific abilities, employees are increasingly valued for the unique qualities and perspectives that they can also bring to the table.



Buyer 1	25th Percentile	Median	75th Percentile
Dumfries, VA 22026	$35,266	$39,894	$45,071

FIGURE 3. AVERAGE INCOME INFORMATION FOR A NORTHERN VIRGINIA RESIDENT

What does this mean for DoD? McInnes's description echoes the needs that we have in DoD's acquisition contracting workforce. Psychologist Abraham Maslow (1966) wrote, "If the only tool you have is a hammer, it is tempting to treat everything as if it were a nail." Over time, we are reducing and limiting the intellectual diversity of the DoD acquisition contracting workforce. This is of critical concern at a time when we are asking our workforce to be more flexible, innovative, and creative. In years past, we would have leveraged the diverse thinking and analytical skills and tools of people with various backgrounds (e.g., business, history, communication, political science, chemistry, and theology[1]). In the future, we will bring the thinking and analytical skills and tools of a less diverse group: business, business, business, and business.

LAGGING COMPENSATION

Yet another unintended adverse consequence is that it is more difficult to compete for qualified candidates. In addition to fishing in a smaller pool for candidates,

some of the bait being used by the federal government does not compare well to the lures being used in the private sector. We will discuss one, salary, although there are certainly other inducements for joining federal service (e.g., public service).

The ability of the federal government to compete with the private sector is hampered by the low initial salaries offered. Unfortunately, no additional money for salaries, bonuses, or pay differential came with the higher entry requirements into the contracting occupational series. Figure 3, from *Salary.com* (2006), provides salary information for a Buyer I in the Northern Virginia area. According to the *Statistical Abstract of the United States* (2004),

> The average beginning salaries for accounting and business administration/management graduates in 2003 were $36,012 and $40,647, respectively. By comparison, the 2005 Federal General Schedule salaries for entry level personnel at the GS-5 and GS-7 levels are $24,677 and $30,567, respectively.

CRITICALITY OF DEGREE AND BUSINESS UNITS

This article has said a good deal about the unintended adverse impacts of requiring a bachelor's degree and 24 units of business-related courses. However, an assessment is necessary to see whether there may be a critical importance to these requirements that outweighs the unintended adverse impacts. In his testimony before the Acquisition Advisory Panel, Robert M. Cooper (2005) stated:

> Career Entry Standards should be reviewed. The loss of the Federal Service Entrance Examination (FSEE) and subsequent PACE exams is a handicap in the hiring process. Intern Programs should be examined for adequacy, currency, and potential expansion. Most importantly, the 24 hours of business course requirements should be revisited. Although a background in business education is helpful, in itself it is not a strong indicator of the full range of capacities required to meet the challenges of risk management and decision making called for in the expanded acquisition role of Business Manager imposed by recent Reform.
>
> Analytical skill and ability to clearly articulate and execute resulting weighed risks must be developed, identified, and verified before the complex and demanding responsibilities of acquisition personnel against the scope and pace of their environment will be reliably, efficiently, and effectively performed. Demonstrated education/training/performance in case study, logical analysis, and English composition are equally as important as finance, accounting, and logistics for professional level performance of acquisition duties.

Interestingly enough, his words echo both the theme of this article and the results of the U.S. Merit Systems Protection Board's (MSPB) 1992 report to the President and the Congress, *Workforce Quality and Federal Procurement: An Assessment*. The report dealt with many issues, including trying to determine whether there were indicators that could be used to determine success on the job as a contract specialist. During the MSPB study, senior procurement officials provided the researchers with suggestions for improving the quality of the contracting workforce, including limiting hiring for entry-level positions in the GS-1102 series to college graduates or persons who have completed at least 24 hours of college courses in related subjects (p. 18). This reflects the current situation in DoD.

The MSPB researchers attempted to isolate the relative importance of a college degree and business-related courses. In relation to the business courses, the MSPB found (1992):

> An analysis of the relationship between the completion of these courses and work performance revealed that there is only a minimal relationship between the number of these courses the person has completed and the various assessments of his or her performance. In a way this finding is not surprising. According to supervisors responding to our survey, the performance of contract specialists often depends upon *their ability to think analytically and write clearly*. Competence in these abilities may be demonstrated in a variety of courses, from science to English, and not just in those that would appear to be directly related to procurement work (pp. 18–19).

In point of fact, the MSPB researchers found that the correlation to contracting training courses indicated a stronger relationship to job success:

> Presumably, the more training completed the better prepared employees should be to perform their jobs well. In fact, analysis using the various ratings of performance that were discussed earlier in this study showed that there was indeed a statistically significant relationship between the number of training courses completed and each of the ratings of performance (pp. 19–20).

In relation to the college degree, the MSPB researchers did find a correlation. However, they noted a significant caveat regarding whether a college degree requirement should be established:

> The single best [quality] indicator is the education level of the workforce. In general, the more education completed by a worker the higher the quality of his or her work. This is not to say, however, that a person must possess a college degree in order to be a high-

TABLE 3.
AVERAGE PERFORMANCE RATINGS AND SOURCE OF ENTRY INTO THE GS-1102 SERIES

SOURCE	Supervisory Rating (Abilities)	Supervisory Rating (Tasks)	Annual Performance Rating	Research Rating	Self-Rating (Abilities)	Self-Rating (Tasks)
Intern Program	3.19	3.76	4.11	3.88	3.37	3.98
PACE/FSEE	3.22	3.85	4.14	3.90	3.38	3.99
Cooperative Program	3.16	3.69	4.06	3.88	3.36	3.89
Schedule B	3.14	3.68	4.10	3.76	3.32	3.86
Work Study	2.96	3.35	4.16	3.8	3.10	3.70
Other Special Program	3.09	3.60	4.03	3.75	3.26	3.76
No Special Program	3.08	3.65	4.09	3.81	3.27	3.80
AVERAGE	**3.12**	**3.69**	**4.10**	**3.82**	**3.30**	**3.85**

> quality contract specialist. The relationship between education and performance is not large enough to indicate that possession of a college degree should be a minimum qualification for admission to the field (p. 49).

Consistent with Mr. Cooper's testimony to the Acquisition Advisory Panel, the MSPB research would appear to indicate that the loss of the PACE and FSEE exams eliminated a good indicator of job performance. As shown in Table 3, PACE/FSEE was the leading source for career field entrants across five of the six indicators used, and it was the second highest in the only category it was not first (MSPB, 1992, p. 28).

PRIVATE SECTOR APPROACH

The DoD and the civilian agencies are constantly being told they should run our acquisition business more like the private sector. So, what does private industry do? Are bachelor's degrees and 24 hours of business-related courses the threshold requirement for business?

A look at *Salary.com* is helpful. The hiring criteria results of three searches for contractor-type jobs in the private sector were: Buyer I—May require a bachelor's degree; Buyer II—May require a bachelor's degree; and, Buyer III—May require a bachelor's degree. Additional searches for positions in contracts, contract administration, subcontracts, and price analysis sometimes contained a degree requirement, but in many cases this was only listed as a preference.

Anecdotally, this author discussed hiring criteria with a number of sources for background purposes off-the-record, including a source from one of DoD's top 10

contractors. Generally, experience, including diversity of experience, appeared to be the most significant criteria, with a degree being a *want*, not a *must*. All things being equal, a degree would be preferred. However, even when there was a desire for a degree, that desire would be trumped by experience. Rarely were a degree and 24 hours of business-related courses required.

Robert C. Marshall, Chairman, Department of Economics, Pennsylvania State University, in his testimony before the Acquisition Advisory Panel (2005), echoed the above when he was asked a follow-up question by one of the panelists. The following interchange occurred:

> MR. SCHWARTZ: And I have the greatest respect for our wonderful Federal procurement work force, but I feel that they're overmatched. We're taking folks in some cases with high school degrees and some on the job training, many other cases with college degrees, and they're trying to do what the MacKenzie guys are doing, and it seems to me that that's not a formula for success. I wonder if you have any thoughts about that.
>
> MR. MARSHALL: Well, some of the most impressive people I've talked to in private industry, just to add another category to the list you've mentioned are people who—running top level procurement people in private companies came up through a community college system and have just, you know, ground out their expertise through running procurements and understanding procurements and understanding the vendor community in that market. I mean, they have just made deep investments to understand what's going on to deliver best surplus to their company.

The other idea to keep in mind is that the private sector emphasizes "Hire for Attitude, Train for Skill." DoD should do the same. This is important, as the time spent in formal and on-the-job training of a member of the acquisition contracting workforce is significantly more that in 24 units of business courses.

CONCLUSION

The BLUF discussed previously is the conclusion of this article. Although it may go against conventional wisdom, the data and analysis indicate that we need to reassess past decisions associated with professionalizing the acquisition contracting workforce. Those decisions were well motivated, but required additional analysis. Standards have been established that have not achieved what they were intended to do and have created unintentional adverse consequences. There are many examples general and flag officers and SESs, and of men and women in the ranks of leadership

and senior management, who would not meet the current criteria to believe that they are just exceptions to the rule. The rules must be revisited.

Specifically, DoD should seek to, at a minimum, eliminate the business-related course requirements, and possibly eliminate the bachelor's degree requirement as thresholds for entry into the GS-1102 occupational series. The DoD approach should become that in addition to the training currently provided, there is also an emphasis on seeking a business degree in addition to the education that a candidate has already received as part of the early development of the new contract specialist or contract administrator.

Additionally, an examination conceptually similar to the PACE must be developed. Although the PACE was eliminated because of biases that effected diversity in the workforce, the MSPB study demonstrated that it was the best indicator of job performance of any of the entry sources studied.

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ENDNOTE

1. For those who may be mentally scoffing at the inclusion of theology, don't forget that the scientific method used for complex problem solving came from a Franciscan friar.

Image designed by TSgt James Smith, USAF

CONTRACTING OUT PROCUREMENT FUNCTIONS: *CURRENT STATUS*

By J. Scott Williams, Roland D. Kankey, Billy R. Harry, and Alan S. Gilbreth

For years, the Department of Defense (DoD) acquisition workforce has been decreasing, yet workload often has not kept pace. This has created a dilemma for DoD procurement organizations that many have addressed by contracting out some of the work. The Air Force Deputy Assistant Secretary (Contracting), Mr. Charlie Williams, sponsored a study to assess the current status of contracting out procurement functions within DoD and federal agencies. Our study determined that government agencies display considerable variety in their use of contractor support for procurement functions. This article summarizes the current status of contracting out procurement functions and recommends that contracting managers retain a limited capability to contract out to meet their mission requirements.

This article examines the use of contractor support to supplement government contracting personnel in the completion of procurement functions/activities using an advisory and assistance services (AAS) contract. When we address the issue of "contracting out," many automatically think we are concerned with contracting out the entire function. That is not the case. According to the Federal Acquisition Regulation (FAR), many procurement functions/activities are inherently governmental (IG). In other words IG functions must be performed by government personnel, which include participating as a voting member on any source selection boards; approving any contractual documents; and awarding, administering, and terminating contracts (FAR 7.503). The FAR succinctly precludes contracting out these activities: "Contracts shall not be used for the performance of inherently governmental functions" (FAR 7.503).

POLICY REVIEW

It has been a long-term policy of the Executive Branch to rely on contractors in the private sector to provide the goods and services needed to act on the public's behalf (General Accounting Office [GAO], 1981). Previously, the Office of Federal Procurement Policy (OFPP) Policy Letter 92-1 stated, "inherently governmental functions necessarily involve the exercise of substantial discretion," which "must have the effect of committing the Federal Government to a course of action when two or more alternative courses of action exist." Alternately, the FAR 2.101 describes an IG function as follows:

> Inherently governmental function means, as a matter of policy, a function that is so intimately related to the public interest as to mandate performance by Government employees. This definition is a policy determination, not a legal determination…. (FAR, 2005)

Guidance on IG functions was reiterated in the Office of Management and Budget (OMB) Circular A-76 when it was revised in 2003, officially superseding OFPP 92-1. The circular tightened the description of substantial discretion. It stressed that not every exercise of discretion is substantial. To quote OMB:

> The use of discretion shall be deemed inherently governmental [substantial discretion] if it commits the government to a course of action when two or more alternative courses of action exist and decision making is not already limited or guided by existing policies, procedures, directions, orders, and other guidance that (1) identify specified ranges of acceptable decisions or conduct and (2) subject the discretionary authority to final approval or regular oversight by agency officials. (OMB C A-76, 2003)

If a function is determined to be IG (e.g., the procurement function), but some parts of the work (activities) are noninherently governmental, then these activities could be contracted out as AAS in accordance with FAR 37.2 and Defense FAR Supplement (DFARS) 237.2. The definition of AAS is found in FAR 2.101(b), which states in part:

> Advisory and assistance services means those services provided under contract by nongovernmental sources to support or improve: organizational policy development; decision-making; management and administration; program and/or project management and administration; or research and development activities. (FAR, 2005)

A great deal of information is available on IG and the contracting-out decision. See the referenced Defense Acquisition University (DAU) Research Report for more historical detail and discussion. With respect to current policy, the FAR defines IG in FAR 2.1, lists functions normally and not normally considered IG and normally considered IG in FAR 7.5, and prescribes policies and procedures to ensure that IG functions are not performed by contractors in FAR 7.5. The DoD has chosen to supplement FAR 7.503 with some additional guidance in DFARS 207.503 with respect to those functions close to IG.

Another factor in the decision as to whether government personnel or contractors should perform specific activities deals with breadth of vision. The GAO (1991) indicated that government decision-making power means more than just being the final authority or signing the document. Government officials should be active throughout the decision-making process. The GAO related that the question often presented to courts was not whether the contractor can be involved, but to what extent can the contractor be involved. Per the GAO, a key criterion was whether the government maintains sufficient in-house capability to be thoroughly in control of the policy and management functions. It can be noted that OMB (2003) now calls for agencies to consider the ability of senior management to develop and consider options before contracting out activities. If contracting out is judged to inappropriately restrict this ability, then one may be transferring IG authority to a contractor.

To conclude this section, it should be noted that the FAR echoes OFPP Policy Letter 92-1 and specifically calls out several procurement activities as IG. This clearly establishes that the entire contracting function cannot be contracted out. On the other hand, the government policy of dependence on the commercial sector to the maximum extent for services has been in place for decades. Activities within procurement that are considered to be noninherently governmental are legitimate candidates for contracting out under AAS, consistent with the guidance in FAR 37.203 and DFARS 207.503.

RESEARCH METHODOLOGY

The research involved personal and telephone interviews with numerous contracting personnel from the military services, federal, and DoD agencies. These interviews, along with an extensive literature review, allowed development of a survey using a Microsoft Word form. The survey specifically applied to contracting-out duties performed by the Office of Personnel Management (OPM) 1102 job series/and equivalent military occupational codes and was not associated with support roles—i.e., administrative or statistical support. The sponsor (Air Force Deputy Assistant Secretary [Contracting]) helped establish links to knowledgeable focal points throughout the military services who could properly respond to the survey for their organization. Building on this start, the research team used personal contacts, the Internet, published directories, and other sources to contact other DoD and

federal agencies, soliciting them to likewise identify knowledgeable focal points and ultimately knowledgeable personnel who could provide meaningful responses with respect to contracting out procurement functions in their organization. This approach can be called "purposeful" or "snowball" sampling (McMillan, 1989; Trochim, 2001). While this approach results in a smaller sample than random sampling and reduces the statistical analysis of results, it was the only practical and efficient sampling approach for the research question, because we needed knowledgeable experts from each organization, but we did not want multiple responses from an organization.

Once the focal point for an organization had been identified, a two-stage process was utilized. The first contact tried to ensure that the representative was knowledgeable and willing to participate in the research. It is very important to note that those who received the survey had already been identified as knowledgeable about contracting activity in their organization. The intent was for each survey to address the status in a separate organization. In some cases, one representative possessed the requisite knowledge and experience to answer for a large organization such as the Department of State. In other cases, such as the National Aeronautics and Space Administration and the Department of the Navy, the organizational representatives were located at the regions and major commands respectively. Following a positive first contact, the survey was forwarded as an e-mail attachment. While the purpose was to get equal representation and responses from each military service, the interest from the Air Force and Navy is reflected in the responses received when compared to the lower Army response. Emphasis was not placed on any one particular service or agency, because the intent was to represent the extent of participation in contracting out of procurement functions. The number of surveys received reflected the responsiveness of the services and agencies contacted. Once completed, the form was returned to the research team, where it was sorted into an appropriate grouping for the organization (service, DoD agency, etc.). Discrete responses were tabulated, and comments were grouped by question and analyzed.

RESULTS

A. RESPONDENTS

The survey phase started in December 2004 and was terminated on May 5, 2005. As of that date, 57 completed surveys had been received from organizations within the agencies in Table 1.

B. ORGANIZATIONS CONTRACTING OUT PROCUREMENT SERVICES

Of the 57 respondents, 26 indicated that their organizations were contracting out for procurement services, 25 said their organizations were not contracting out for procurement services, 5 said not currently—but they had plans to do so in the future, while one indicated not currently—but they had in the past. The distribution of those

TABLE 1.
DISTRIBUTION OF RESPONDENTS AMONG MAJOR GROUPINGS

AGENCY	RESPONSES	PERCENTAGE
Air Force	23	40
Army	4	7
Navy	16	28
Other DoD Agencies	8	14
Non-DoD Federal Agencies	6	11

TABLE 2.
DISTRIBUTION OF RESPONDENTS WHOSE ORGANIZATIONS WERE CONTRACTING OUT PROCUREMENT FUNCTIONS

AGENCY	RESPONSES	PERCENTAGE
Air Force	12 of 23	52
Army	1 of 4	25
Navy	1 of 16	6
Other DoD Agencies	8 of 8	100
Non-DoD Federal Agencies	4 of 6	67

respondents who said they were contracting out procurement services is shown in Table 2.

Based on our process and our sampling procedure, it would be unfair to impute these percentages across all these agencies, but it is interesting to note that the dominant Navy response was, "we have not done, nor do we plan to do any contracting out of procurement functions," and the Army responses send a similar message. It is also interesting that other DoD agencies, other federal respondents, and the Air Force indicated they were contracting out at a higher rate than the Army and Navy.

C. REASONS FOR NOT CONTRACTING OUT

For those who indicated their organization was not and had no plans to contract out any procurement functions, it was important to know why. Some options that had been identified through the literature search and interviews were provided. There were 26 respondents for this question. The results are in Table 3.

It is interesting to note that while the highest response was "contracting is an inherently governmental function," running a close second was "current manpower resources are sufficient and qualified." We solicited comments from our respondents on each question. These comments were to elaborate on their selected response(s)

TABLE 3.
WHAT ARE THE MAJOR REASONS YOU ARE NOT CONTRACTING OUT PROCUREMENT SERVICES? (N=26) (MULTIPLE RESPONSES ALLOWED)

Contracting is an inherently governmental function	15
Current manpower resources are sufficient and qualified	13
Concern with handling proprietary information	8
Could negatively impact competition	7
It is not cost efficient	4
Unsatisfactory contractor performance	2
Other	6

and/or to raise other concerns. Several respondents on this question stated that they would contract out some procurement functions if government resources became inadequate. The reservation some units have with contracting out procurement services seems to weaken when faced with the task of performing procurement services in understaffed conditions. Other concerns identified by our respondents were varied. One indicated that any organization that contracts out loses control of itself and its future. The wisdom of contracting out was questioned, along with the legality. Another specified that when contracting by negotiation (FAR 15), the procurement function becomes inherently governmental due to the managerial and business decisions that must be made. Others indicated that purely administrative functions could be contracted out, and that contracting out might be acceptable in a surge situation. Another related that contracting out procurement functions puts additional responsibilities on the contracting officer. Along with the usual responsibilities, the contracting officer would need to ensure that decisions supported by the work of a contractor were free from conflicts of interest. One was concerned with the need to maintain a pipeline of well-trained and qualified 1102s to assure a viable cadre for movement to contracting officer positions in the future.

D. PROCUREMENT SERVICES CONTRACTED OUT (PRESENT AND PROJECTED)

The next question on the survey (Table 4) attempted to ascertain which procurement functions were most commonly being contracted out. Thirty-one individuals indicated their organization either was contracting out procurement functions or planned to do so in the future. The nine responses coded "other" involved three dealing with the administration of construction contracts, one involved procurement training, and the others were clarifications or qualifications of the listed responses. It is important to see where contractor support occurs in the general flow of the procurement process.

The data show that contractors perform duties across the spectrum of procurement functions, both pre-award and post-award. It should be noted that contract closeout is

TABLE 4.
WHAT PROCUREMENT SERVICES ARE YOU OR WILL YOU BE CONTRACTING OUT? RANKED (N=31) (MULTIPLE RESPONSES ALLOWED)

Preparing contracts for closeout	24
Performing price and cost analysis	18
Providing assistance in developing a statement of work	17
Market research	15
Drafting/developing price negotiation memorandum	15
Receiving/assessing offers and preparing packages for negotiation	14
Procurement planning	14
Recommending a procurement strategy (contract type)	14
Drafting solicitation document	14
Issuing solicitation package	12
Processing award decision and distributing contract	11
Reviewing performance and advising the exercise of options	10
Investigating reports of discrepancy	10
Identifying orders for expedited delivery	8
Negotiating contract modifications	8
Negotiating price, terms, and conditions	4
Other	9

the function most heavily performed by contractors. Traditionally, this is a function that offices seek to contract out due to backlogs and attention placed on other higher-priority procurement functions. In contrast, very few are using contractor support in negotiating price, terms, and conditions. Negotiation is a function viewed by most as IG in nature. Respondents' comments lead to the conclusion that in those organizations where contractors perform some tasks related to the negotiation function, government contracting officers perform the IG tasks. The responses and comments reflect that contractors are tasked to perform functions across the procurement spectrum.

E. REASONS FOR CONTRACTING OUT

The spectrum of possible answers was developed based on interviews with Headquarters, Air Force Materiel Command; Headquarters, Defense Logistics Agency; Defense Supply Center–Columbus; Defense Supply Center-Richmond; and the literature review. Results are shown in Table 5.

The dominant reasons for contracting out are centered on the organization's workload. Two situations apparently drive the decision to contract out portions of

TABLE 5.
WHY ARE PROCUREMENT SERVICES BEING CONTRACTED OUT? (N=31) (MULTIPLE RESPONSES ALLOWED)

To meet workload surge requirements	19
Inability to hire adequate resources to meet workload	18
Contracting out is faster than hiring to meet workload	11
Ability to select specific expertise required	11
Bridge to hiring permanent employees	7
More cost effective	4
Other	6

the procurement function—a temporary workload surge or a permanent increase in workload where contractor employees are needed to fill the gap until permanent government employees can be hired. The respondents indicate that contracting out is both faster than hiring government employees and that contractors offer the added ability of being able to provide the specific expertise required. The literature and interviews with government managers point out the increased flexibility contractors provide versus government personnel systems. The speed in hiring enjoyed by the contractor and the ability of the contractor to provide specific expertise were noted by government procurement managers.

F. PERCENT OF PROCUREMENT WORKFORCE PROVIDED BY THE CONTRACTOR

The proportion of the workforce provided by the contractor was also of interest for this research. The percentages from the respondent organizations are shown in Table 6.

TABLE 6.
WHAT PERCENT OF YOUR CURRENT PROCUREMENT WORKFORCE (1102 OR EQUIVALENT) CONSISTS OF CONTRACTOR EMPLOYEES? (N=31)

Less than 1%	9
At least 1%, but less than 5%	3
At least 5%, but less than 10%	4
At least 10%, but less than 20%	5
At least 20%, but less than 40%	4
At least 40%, but less than 60%	2
No response	4

The mode was 1% or less, while the median response was at least 5% but less than 10%. The results show that more than 50% of the respondents had less than 10% contractor employees in their contracting workforce. Six respondents reported 20 to 60% contractor employees in their workforce. Those organizations having contractor employees as a large percent of their total workforce were contracting organizations in Iraq and several smaller DoD agencies in the Washington, DC, area.

G. PROCUREMENT FUNCTIONS CONSIDERED INHERENTLY GOVERNMENTAL

While the items cited in the policy review section provide some detail on what GAO and OFPP felt were IG functions, the perspective of the respondents regarding IG functions was also important. A list of activities that spanned the types of work identified as either IG or of a type that could cause concern if performed by a contractor was developed and respondents were allowed to select. Responses are shown in Table 7.

The 31 respondents for this question are those who indicated their organization was either contracting out procurement functions or planned to do so in the future. From

TABLE 7.
WHAT PROCUREMENT ACTIVITIES DOES YOUR ORGANIZATION CONSIDER INHERENTLY GOVERNMENTAL? (N=31) (MULTIPLE RESPONSES ALLOWED)

Committing the government to take some course of action	30
Approving evaluation criteria	30
Terminating contracts	30
Approving incentive plans	29
Awarding contracts	29
Obligating funds	29
Voting member of the Source Selection Evaluation Board	28
Ordering changes/taking action based on contractor performance	28
Determining if costs are reasonable, allocable, or allowable	25
Negotiating price, terms, and conditions	24
Accepting or rejecting services or products	24
Determining what supplies or services are to be acquired	23
Use and disposition of government property	23

TABLE 8.
WHERE DID YOU LOOK FOR GUIDANCE REGARDING POLICY/ GUIDELINES ON CONTRACTING OUT PROCUREMENT? (N=31) (MULTIPLE RESPONSES ALLOWED)

Federal Acquisition Regulation and Supplement	25
Organizational Legal Office	24
Office of Federal Procurement Policy (OFPP)	17
OMB Circular A-76	16
Headquarters Legal Office	8
Other	8

their responses, it appears all have a common opinion with respect to committing the government to a course of action, approving evaluation criteria, and terminating contracts. The majority of respondents indicated their organizations considered all the listed items to be IG. Clearly, items that require a contracting officer's signature were considered IG. The reduced count for some of the items may have been impacted by the organization's mission. Some organizations may not perform certain functions, which could prompt the respondent to not select that response. In addition, based on overall survey results, analysis and staff activities were less clearly IG and more subject to a contracting out decision.

H. SOURCES OF GUIDANCE

As one would expect, organizations relied most heavily on the FAR, their specific agency FAR Supplement, and their own legal office. However, they also substantially used the OFPP and the OMB A-76 Circular, which both provide a good description and examples of what is/is not IG. Several organizations checked the "other" box and spoke to evaluating precedents in contracting out procurement. Sources of guidance for contracting out are shown in Table 8.

I. LEGAL LIMITS/CONCERNS

Nineteen of 31 respondents indicated they did not receive any legal limits or concerns in their guidance. However, a few specific concerns were brought to the forefront. The first of these was the need for contractor personnel to stay clear of any organizational conflicts of interest. The second was to ensure the contracts do not entail personal services. Many respondents pointed out that contracting out was only done for augmentation purposes. In no way was contracting out intended to displace current federal civil service employees. Many organizations' Federal Activities Inventory Reform (FAIR) Act submissions identified contracting professionals as criterion "G," which identifies IG positions. Organizations felt that these positions, though primarily governmental in nature, did include some functions that were not

IG. Those noninherently governmental functions were those that could be contracted out.

J. EXPECTED FUTURE INVOLVEMENT

Although no one can foresee the future, respondents with knowledge of contracting out procurement functions should have an understanding that would allow them to reasonably forecast future involvement by their organization. Their projections are shown in Table 9.

Of those responding to the question, 47 percent said they would be increasing the contracting out of their procurement services in the future, 20 percent said they would be decreasing contracting out of their procurement services in the future, and 33 percent said they did not expect their level of contracting out to change.

TABLE 9.
HOW DO YOU FORESEE YOUR FUTURE INVOLVEMENT IN CONTRACTING OUT PROCUREMENT SERVICES? (N=32)

Increasing	14
Decreasing	6
About the same	10
No response	2

Those organizations foreseeing increasing involvement in contracting out procurement services attributed the anticipated increase largely to the result of more workload being placed on the organization with limited resources available to meet the workload. Conversely, those organizations foreseeing a decrease in contracting out procurement services attributed those decreases to reductions in short-term surge requirements.

CONCLUSIONS

Respondents utilizing contractor support for traditional contract specialist duties most frequently reported a positive impact on the mission. To a lesser degree, they also cited increased flexibility and generally highly qualified contractors. While some reported negative experience with contracting out (Gilbreth, et al., 2005), it is reasonable to conclude that AAS contracts for support of contracting organizations will likely increase in the future. The following specific conclusions can be drawn:

- It is reasonable to contract out noninherently governmental functions or tasks when an increased workload suddenly appears, when a requirement for extra workload is only temporary, or when special expertise is required.

- The services, the DoD, and other federal agencies seem to be contracting out similar procurement functions, but the DoD and other federal agencies report more widespread use of this alternative.

- Most organizations use contractor support when mission accomplishment drives them to make this decision.

- Most feel that development of future contracting officers should not be a problem if contracted-out procurement support is at a reasonable level.

- Contracting out procurement functions violates no laws so long as no IG functions are contracted out, unauthorized personal services contracts are avoided, core procurement capability is retained, and consistency is maintained with FAIR Act submissions.

- Many organizations' ability to perform its mission would be severely impacted if it were suddenly unable to contract out.

- The reservation some units have with contracting out procurement functions seems to weaken when faced with an understaffed condition.

- The current definition of IG and the examples provided in the OMB Circular A-76 and the FAR are well constructed and provide appropriate guidance while allowing the application of the business judgment that is necessary to accomplish the mission in today's changing environment.

RECOMMENDATIONS

While the survey results reflected that contractors are primarily used to accomplish the more administrative tasks, a few of the respondents used contractors to accomplish some of the more sensitive procurement tasks—negotiation of price, terms, and conditions—while the contracting officer (CO) made the final decision. In this type of arrangement, there must be substantial discussion between the CO and the contractor typical of the discussion that occurs between the CO and the government buyer. In essence, an atmosphere bordering closely on personal services could be created. If one believes negotiating price, terms, and conditions is inappropriate for contractors to perform, one could issue guidance precluding such, but interpretation and enforcement of this type of policy is always problematic in its implementation. Instead of a restrictive list of do's and don'ts of contracting out procurement functions, a better approach is available.

The research team recommends that each procurement activity be limited in the percentage of its workforce that may be contracted out. The appropriate limitation

can certainly be debated, but the research team recommends that in nonexceptional situations, contractor employees should not exceed 25 percent of an activity's total 1102 workforce. This approach achieves several objectives.

First, it provides each activity the flexibility to use contractors to accomplish the mission by quickly reacting to surge workload situations within its organization's funding constraints. Most respondents stated they preferred the use of a government workforce to accomplish the procurement function and only used contractors when necessary to meet the mission. While recognizing this preference, the respondents also found it necessary, at times, to use contractors to meet the mission. In fact, the findings indicate that many of the respondents who were not currently contracting out any of their procurement functions because "procurement is inherently governmental" might feel otherwise if they were confronted with a surge requirement that exceeded their capabilities and resulted in a negative mission impact. So allowing the procurement activities some authority to contract out when necessary seems prudent.

Recommend that each procurement activity be limited in the percentage of its workforce that may be contracted out.

Secondly, this approach addresses another concern when contracting out the procurement workforce. By limiting contractors to 25 percent of the total procurement workforce, a manager would typically assign the contractors to the lower priority and less sensitive tasks. This is logical because these tasks would be the ones that could not be accomplished by the government workforce, thus providing a need to contract out. By limiting the total contractor workforce to 25 percent, the assumption is that they would be less involved in the more sensitive procurement tasks. Obviously there could be exceptions, but management would make these decisions only when appropriate. For instance, a contractor employee who has extensive government contracting experience and is trusted by the contracting officer (CO) could be used to negotiate price, terms, and conditions.

Finally, this policy would also help address the concern of growing future COs. Some have expressed concern that extensive contracting out would have the long-term effect of reducing the opportunity to develop adequate government personnel who have the full range of contracting experience necessary to meet the CO needs of the future. A 25 percent limit on the contractor workforce should provide management the opportunity to develop prospective COs in all aspects of procurement.

It is also recommended that a process be established for situations when it becomes necessary to exceed the suggested contractor percentage limits. The process should

not be overly onerous, but should have an approval level outside the procurement activity with a specific time limit for the waiver. These short-term situations should be accommodated and should not have a negative impact if well managed. The CO function can still remain governmental, and a short-term situation should not impact the development of future COs.

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A PROPOSAL FOR A NEW APPROACH TO PERFORMANCE-BASED SERVICES ACQUISITION

Vernon J. Edwards and Ralph C. Nash, Jr.

Performance-Based Services Acquisition (PBSA) is the government's preferred approach for service contracting, but despite great efforts and training, PBSA remains difficult to implement. An analysis of services acquisition suggests that while PBSA may be useful for routine, common, and relatively simple services, it is not as applicable for services that are too long-term and complex to permit complete specification of results and competitive pricing at the outset of contracting. A new approach for contracting these kinds of services is recommended.

Since the publication of the Office of Federal Procurement Policy's (OFPP) policy letter 91-2, *Service Contracting*, on April 15, 1991, Performance-Based Services Acquisition (PBSA, formerly called "Performance-Based Contracting") has been the government's preferred approach to service contracting. It requires specification of the results that contractors must produce instead of the processes that they must use.

Agency acquisition managers and working-level agency acquisition personnel have devoted a lot of energy to PBSA since 1991. But despite goal-setting, the publication of numerous guidebooks, the development of an informational Web site, and significant investments in training and in the services of consultants, PBSA has not been as successful as hoped, and agencies still struggle to apply it. Even when agencies claim to have adopted PBSA, close examination of their contracts often shows that those documents do not entirely satisfy the criteria in the Federal Acquisition Regulation (FAR) (GAO, 2002). Moreover, despite occasional agency "success stories," the policy has not produced verified quality improvements or cost savings.[1]

This article proposes that there are two categories of services, and that PBSA as it is known at the beginning of 2007 works for one, but not the other. The first category includes many common, routine, and relatively simple services that can be acquired through PBSA as it is currently defined, including many housekeeping services, simple equipment maintenance and repair services, and the like. The second category includes services that are too long-term and complex to permit complete specification of results and competitive pricing at the outset of contracting. These include many long-term information technology services, services to operate government-owned facilities, and long-term and multifunction or multitask professional, administrative, and management support services. These are the services for which the government spends the most money. This article proposes a new approach to contracting for this second category of services.

DESCRIPTION AND HISTORY OF PBSA

The FAR provides that when using PBSA, agencies must specify the service results (outputs, outcomes) they want in "clear, specific, and objective terms with measurable outcomes." They must prepare performance work statements and quality assurance surveillance plans, use performance incentives when appropriate, and inspect and compensate contractors on the basis of their work products rather than their work processes.

The PBSA, in various manifestations, has a long history. During 1969–1971, the Office of Economic Opportunity (OEO) in the Department of Health, Education, and Welfare experimented with an outcomes-based approach to contracting for educational services. The results were mixed and the program was dropped.[2] In September 1979, the U.S. Air Force adopted a comprehensive performance-based approach to contracting for base support services, which OFPP adopted for government-wide use in October 1980. The efforts of the Air Force and OFPP produced few, if any positive results.[3]

The 1991 OFPP policy letter was a response to growing concerns about the amounts that agencies were spending to buy services and the quality of the services they were receiving.[4] However, agencies were slow to respond to the policy letter, and although the letter called for FAR implementation before the end of 1991, it was not until 1997 that the FAR was amended to include rules for PBSA.[5] Since then, agencies have tried to use the technique, but with disappointing results. Implementation goals were established, but not achieved. Government acquisition officials and industry representatives have expressed doubts about the success of PBSA, independent reviews have not validated predictions and anecdotal claims of improvements in quality and reductions in cost, and people at the working level are frustrated. In 2001 and 2002, the Honorable Angela Styles, then-Administrator of OFPP, told Congress that Performance-Based Services Acquisition had not been more successful because the concept had not been adequately defined.[6] In July 2003,

an interagency team assembled by OFPP recommended minor changes to the FAR, which were published in December 2005.[7]

WHY HAS PBSA NOT BEEN MORE SUCCESSFUL?

The main reason that PBSA has not been more successful is that it is not a practical approach to buying long-term and complex services. Agencies have been unable to implement PBSA as hoped because it requires them to do something that is too often impracticable.

It is unrealistic to ask agencies to specify services at the time of contract award in clear, specific, objective, and measurable terms when future needs are not fully known or understood, requirements and priorities are expected to change during performance, and the circumstances and conditions of performance are not reliably foreseeable. Yet those are the difficulties faced by agencies and their contractors when they negotiate long-term and complex service contracts.

The main reason that PBSA has not been more successful is that it is not a practical approach to buying long-term and complex services.

In real life, parties to long-term and complex service contracts do not specify all requirements at the time of contract award in clear, specific, objective, and measurable terms. Instead, they engage in *ad hoc* decision making in response to emerging and changing requirements, shifting priorities, and unexpected circumstances. They make it up as they go along, developing and adjusting expectations and agreements accordingly. Reality is never the same as expectations and projections, and plans and agreements go awry. No matter how long and hard future needs are considered, contracts will include things that will not be needed and leave out things that will be. Specifications and expectations must be adjusted over the course of time.[8]

Thus, in requiring that agencies fully specify results at the outset of contracting, PBSA often requires them to do something that is too hard to do and sets them up to fail. More training will not make PBSA appropriate for long-term and complex service acquisitions.

THE CHALLENGES OF SERVICE CONTRACTING

When contracting for services, agencies must follow regulations and use practices that were developed for the procurement of supplies. Supplies are always specified based on known design or performance requirements. The PBSA is an attempt to buy services like we buy supplies. But this attempt ignores key differences between supplies and services.

SERVICE QUALITY

Unlike most supply purchases, long-term service contracts entail close human relationships that enable the parties to deal with dynamic complexity and respond to emerging and changing needs and circumstances. Relationships are crucial, and it is well established in service marketing literature that subjective *customer satisfaction* is as important, and sometimes more important, than technical success.[9] The importance of subjective factors in government service contracting is confirmed by the fact that subjective incentives—award fee and award term—are the most popular of all incentives used in performance-based contracts.[10]

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Services confront agencies with quality specification problems, unlike those associated with contracts for supplies. Services are always rendered in response to actual circumstances and conditions. It is often impossible and even unwise to try to fix specifications of service quality at the outset of contract performance, because quality often "depends." What is good service in one set of circumstances might be poor service in another, and the standard contract modification process is not nimble enough for the realities and demands of a high-speed, electronic world.

The PBSA requirement for beforehand specification and objective and measurable standards ignores the nature of long-term and complex service relationships.[11]

CONTRACTOR SELECTION AND CONTRACT PRICING

A lynchpin of PBSA is competitive contractor selection based on price and other factors in compliance with the Competition in Contracting Act (CICA) and FAR Part 15. In theory, PBSA allows competing firms to devise their own ways to produce

the results sought by the government, which supposedly lets the government enjoy the benefits of vigorous price competition. But when an agency cannot describe its requirements and the circumstances and conditions of performance, competing firms cannot do so either. So when an agency evaluates a proposal for a service contract, it evaluates the product of the marketing imagination, which describes something that does not yet exist and cannot be examined or tested before purchase.

An agency proposal evaluation team cannot be sure whether the firm selected for contract award will truly be the best value or that it just produced the best proposal document. In the absence of specific knowledge about future needs, firms cannot propose specific solutions, and strict enforcement of vague commitments is an unlikely prospect. In the absence of clear and binding promises, prices or estimated costs are not very meaningful. Comparative evaluation of competing proposals of service quality and prices is thus a dubious undertaking, because an agency cannot be sure about what it will actually get or be entitled to get from a contractor for its price.

Contractor selection under FAR Part 15 procedures does not readily permit a full and frank airing of issues and resolution of concerns between the government and its contractor before contract award. Industry responses to draft solicitations and participation in preproposal conferences are constrained by competitive strategy and tactics and government reticence. After proposal submission, agencies either award contracts without discussions or conduct discussions that are constrained by issues of fairness and procedure and fear of protests. The result is that the parties to a new contract are often virtual strangers to one another, who learn of gaps and disconnects in their understanding of the work and their expectations only after contract award.

The CICA price competition and FAR Part 15 source selection are ill-fitted to the procurement of long-term and complex services.

CONTRACT ENFORCEMENT: PRICE REDUCTIONS, DAMAGES, AND TERMINATIONS

The FAR tells contracting officers to inspect service results and make price or fee reductions when services are not acceptable. However, long-term and complex services confront agencies with unique quality assurance problems. Inspection can be difficult because many service results are intangible, and many tangible results are ephemeral. One hundred percent inspection is usually impracticable, but acceptance sampling is not always appropriate. The quality of some results, like the results of observational or analytical work, may depend on the quality of unobservable mental processes. It is easy enough to verify that a floor is "clean" in the morning, that wastebaskets have been emptied, that grass has been cut to a prescribed length, and that an item of equipment has been repaired. But the results produced by security guards who must check the identities and possessions of the hundreds of persons seeking entry to a federal office building on a daily basis are not easily inspected or verified.

Reviews of decisions by boards of contract appeals and by courts about price reductions under long-term and complex performance-based contracts show that price

reductions generally are not a satisfactory remedy for poor performance. Under long-term and complex contracts, such reductions are administrative nuisances to both the agency and to its contractor, and reductions for minor technical flaws in performance sour a business relationship. Moreover, price reductions and money damages cannot adequately compensate the government for poor performance of critical operations.

Termination is truly a last resort when a contract is for long-term and complex services because it takes a lot of time and effort to award a replacement contract, and award might be delayed by a protest. So an agency might choose to live with marginal performance, or be forced to exercise an option to extend a contractor that is performing marginally so it can buy time to find a replacement. In sum, contract law and court enforcement cannot ensure satisfactory service and cannot remedy poor performance. The only way for the government to get the service results it needs is by choosing good contractors and by establishing and maintaining effective working relationships with them. Relationship management, not contract administration, is the key to success.

Contract law and court enforcement cannot guarantee satisfactory service or adequate remedies for poor performance.

HOW THE GOVERNMENT SHOULD BUY LONG-TERM AND COMPLEX SERVICES: AN EMPHASIS ON RELATIONSHIPS

While the government should usually focus on service results instead of processes, the realities of long-term and complex service contracting require a new approach to PBSA. The following paragraphs describe a *relational* approach to PBSA, an approach that emphasizes the need to establish a solid working relationship between the government and its contractor that will allow the two of them to engage in ad hoc specification and adjustment of expectations throughout the life of the contract.

This proposed approach to PBSA is called *Relational Contracting* or *Relational PBSA*. The key features of this approach are:

- competency-based contractor selection;
- in-depth, one-on-one negotiations with the contractor selectee before contract award to jointly develop a contract work statement;
- joint management to budget instead of to a fixed-price or estimated costs;
- advanced agreement on specified direct and indirect cost limitations;
- ad hoc specification of results and adjustment of expectations during performance;
- fair and reasonable fee arrangements; and

- mandatory use of alternative dispute resolution procedures.

An agency would use the relational approach to PBSA only when:

1. the contract will be of at least two years duration, including options;
2. the contract will have a total value of at least $10 million, including options;
3. the agency cannot fully specify key requirements or describe key performance circumstances at the time of contract award;
4. the head of the contracting activity approves its use; and
5. the head of the contracting activity makes provision for periodic independent review of the management of the contract by neutral officials.

This article will now address each of the elements of relational PBSA in greater detail.

COMPETENCY-BASED CONTRACTOR SELECTION

The approach to contractor selection would be similar to the architect-engineer selection approach described in FAR Subpart 36.6. Price would not be a factor in contractor selection. The main factors would be experience, past performance, and key personnel qualifications. An evaluation board would consider candidate firms and recommend two or three highly qualified firms to the selection official, who would then select one for contract negotiations.

The contracting officer would solicit an offer from the selectee, disclosing the agency's budget and objectives and providing for joint fact-finding about known and anticipated requirements and anticipated performance circumstances and conditions. The parties would then conduct in-depth negotiations to jointly develop a work statement, an advance agreement on small business subcontracting, an advance agreement on cost limitations, and a fee agreement. The contracting officer would award a contract following approval of the negotiations in accordance with agency procedures.

This approach to contractor selection and contract pricing will permit a fuller and franker airing of issues and cooperative problem solving before contract award. It will enable the parties to reach a common understanding of what they can and cannot specify at the outset and what they must set aside for ad hoc resolution during performance. This approach will lay a better foundation for a successful working relationship than source selection under CICA and FAR Part 15.

ADVANCED COST LIMITATION AGREEMENTS/JOINT MANAGEMENT TO BUDGET

The resultant contract would be a modified cost-reimbursement type, with government risk mitigated by advance cost limitation agreements. The contract would provide for the parties to jointly manage performance within the government's operation or project budget, but with the government having the final say on all requirements. The parties would work together to prioritize and schedule activities, set standards, establish work package budgets, and monitor performance. They would use earned value management techniques when appropriate.

AD HOC SPECIFICATION OF REQUIREMENTS DURING PERFORMANCE

A key feature of relational PBSA would be ad hoc specification of service requirements as they emerge or become more fully understood in the course of performance. The parties would specify requirements in terms of results whenever possible, unless they agree that specification of process would be better. In order to remain within budget, the parties would make tradeoffs, adjusting expectations, reordering priorities, and modifying performance standards as necessary. If requirements change, the parties would bargain to make adjustments to stay within the budget.

A key feature of relational PBSA would be ad hoc specification of service requirements as they emerge or become more fully understood in the course of performance.

Adjustments within budget would not require formal contract modifications and equitable adjustments and would be within the authority of the government's program manager as long as they do not require fund obligations or de-obligations. But all transactions would be documented to reflect the agreement and expectations of the parties.

FAIR AND REASONABLE FEE ARRANGEMENTS

The contract would provide for payment of fee in accordance with the agreement negotiated prior to contract award. The maximum available fee would be fixed and would not change during the course of performance unless the government increases or decreases its budget due to the addition or deletion of requirements. Changes in budget due to cost overruns would not entitle the contractor to additional fees. The contractor would be guaranteed a fair and reasonable fee for acceptable performance

within budget and could earn additional fees for excellent performance, based on objective and subjective considerations to which the parties agreed in advance.

MANDATORY USE OF ALTERNATIVE DISPUTE RESOLUTION

The contract would require the parties to engage in alternative dispute resolution before resorting to the FAR disputes procedures. Each party would name one senior official outside the immediate program organization as its principal, and they would jointly hear the dispute and work to resolve it with the assistance of a neutral. Only if the two principals cannot agree on a resolution within a reasonable period of time would the parties be permitted to resort to the dispute procedures described in FAR Subpart 33.2.

PREREQUISITES TO USE

Because relational PBSA would permit the award of contracts without price competition, and because it would grant very broad discretion to government program managers and contractor personnel, it is essential that it be used only when appropriate and only as approved by higher level agency officials. It is also essential that relational contracts be subjected to periodic independent review in order to maintain the integrity of the acquisition system and public confidence. Relational PBSA should be approved for use only for complex contracts of two years duration or longer and with a total value of $10 million or more, including options. It is also recommended that the use of relational PBSA require approval of the head of the contracting activity, subject to arrangements for periodic independent review of each relational contract by neutral agency officials.

CONCLUSION

The time has come to try something new. We propose that OFPP obtain statutory approval for a pilot program to conduct a number of controlled experiments in relational contracting by selected agencies. The OFPP should set criteria for evaluating the effectiveness of relational contracting, establish a preparatory training program for participants, and appoint a panel which includes executive branch officials; representatives of the Government Accountability Office; working-level acquisition personnel; members of academia; members of the Bar; industry representatives; and a support staff to monitor, evaluate and report the results, and make recommendations for further action.

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END NOTES

1. "There is little current data to support monetary savings, and if such data did exist, it would be extremely difficult to isolate the exact reasons the savings occurred." In Interagency Task Force On Performance-Based Service Acquisition. (2003, July). *Performance-based service acquisition: Contracting for the future*. Washington, DC: Office of Federal Procurement Policy, p. 10. "The effect of PBSA practices on contract prices is hard to assess for the contracts we studied because (a) the work scopes relevant to the contracts we examined changed with the new contracts, and (b) the Air Force has no simple way to adjust costs for the changes observed in work scopes. In most cases, we could not clearly attribute price changes to a move toward PBSA." In Ausink, J., Camm, F., & Cannon, C. (2001). *Performance-based contracting in the Air Force: A report on experiences in the field.* Santa Monica, CA: Rand, p. 34.

2. See Levine, D. M., ed. (1971). *Performance contracting in education—An appraisal*. Englewood Cliffs, NJ: Educational Technology Publications; and Stucker, J. P. & Hall, G. R. (1971). *The performance contracting concept in education* (R-699/1-HEW). Santa Monica, CA: Rand. Performance contracting in education was controversial. Some state and foreign governments still use the technique in secondary and higher education and, although the results are unclear, the technique still has supporters. Performance contracting in education should not be confused with energy performance contracting.

3. The approach was described in Air Force Regulation (AFR) 400-28, *Base Level Service Contracts*, a detailed, multi-volume guide to the preparation of performance work statements and quality assurance surveillance plans. Supplementary Air Force publications, such as AFR 70-9, *Base Level Service Contract Administration*, provided instructions to quality assurance evaluators (inspectors). OFPP adopted the first volume of that regulation for government-wide use in October 1980, dubbing it OFPP Pamphlet No. 4, *A Guide for Writing and Administering Performance Statements of Work for Service Contracts*. The Air Force withdrew AFR 400-28 in 1994, replacing it and other guidance with Air Force Manual (AFMAN) 64-108, *Service Contracts*, a 63-page document which still included fairly detailed guidance for the preparation of performance work statements and quality assurance surveillance plans. But in 1999, the Air Force replaced AFMAN 64-108 with Air Force Instruction 63-124, *Performance-Based Service Contracts* (PBSC), an 11-page document that contains a statement of policy but virtually no practical guidance, and it remains in effect today. OFPP withdrew Pamphlet No. 4 in the mid-1990s, but in October 1998, it issued *A Guide To Best Practices For Performance-Based Service Contracting*, a severely edited version of Pamphlet No. 4, containing less detailed guidance. In December 2000, the Department of Defense issued its current *Guidebook for Performance-Based Services Acquisition (PBSA) in the Department of Defense*, a 54-page

document that contains sparse practical guidance. Several other agencies have issued similar guidance of their own. Much of this guidance can be accessed through the Web site, *Seven Steps to Performance-Based Services Acquisition*, available at http://www.arnet.gov/Library/OFPP/BestPractices/pbsc/home.html. For a fascinating first-hand account of an attempt to develop a performance work statement in accordance with OFPP Pamphlet No. 4, see Paddock, C. D. (1987, June). *Performance work statements: Significant problems in the preparation process.* (Master's thesis) Defense Technical Information Center (DTIC No. AD-A184 897).

4. "Each year the Government contracts for a significant amount of services. Such services range from the routine maintenance of facilities or equipment to highly sophisticated technical and management assistance such as the design, development and furnishing of systems, or expert assistance for management and program activities. Attempts to apply contracting methods which are inappropriate to the services being acquired have often resulted in unsatisfactory performance and contract administration problems, as reflected in several internal agency investigations and evaluations, General Accounting Office Reports, and OFPP studies. These reports criticized unnecessarily vague statements of work, insufficient use of firmer pricing arrangements, the lack of quantifiable performance standards, and the inadequacy of quality assurance surveillance. In addition, there is concern that the Government underemphasizes quality versus price in the acquisition of services." In Office of Federal Procurement Policy. (1991, April 15). *Policy letter on service contracting* (56 FR 15110, 15113). Washington, DC: Author.

5. Federal Acquisition Circular 97-01, 62 FR 44802, August 27, 1997.

6. "In part, I believe the problem centers on a lack of clarity regarding the definition of what constitutes a performance-based service contract. Based on my experience, there is considerable disagreement among agencies regarding the requirements to qualify a contract as performance-based. Previous attempts by OFPP to clarify the definition, including a 'checklist' of minimum required elements for an acquisition to be considered performance-based, have been unsuccessful." Styles, A. B. (2001, November 1). *Statement of Angela B. Styles, Administrator for Federal Procurement Policy, before the Subcommittee on Technology and Procurement Policy, Committee on Government Reform, United States House of Representatives.* Retrieved from http://www.acqnet.gov/Notes/sarafinal.doc, p. 11. See also Styles, A. B. (2002, March 7). *Statement of Angela B. Styles, Administrator for Federal Procurement Policy, before the Subcommittee on Technology and Procurement Policy, Committee on Government Reform, United States House of Representatives*, retrieved from http://www.acqnet.gov/Notes/saratestimony37.doc

7. Published results can be seen in: Interagency Task Force On Performance-Based Service Acquisition. (2003, July). *Performance-based service acquisition: Contracting for the future.* Washington, DC: Office of Federal Procurement Policy; and Federal Acquisition Circular (2005-07, 71 FR 198, 211), published January 3, 2006.

8. This has long been recognized in economic and legal scholarship. See Coase, R. H. (1988). The nature of the firm. In *The Firm, the Market, and the Law.* Chicago: The University of Chicago Press, pp. 33-56; Knight, F. (1971). *Risk, uncertainty and profit.* Chicago: University of Chicago Press; MacNeil, I. R. (1978). Contracts: Adjustment of long-term economic relations under classical, neoclassical, and relational contract law. *Northwestern University Law Review 72*(6), p. 854; and Williamson, O. E. (1988). *The economic institutions of capitalism.* New York: The Free Press.

9. "Of course, it is possible to measure service quality with more objective criteria, such as in the technical approach to quality. Services could be compared to a checklist of quality indicators, such as whether calls are answered in three rings or whether employees remember to smile and say "thank you" to customers at least 99 percent of the time. However, setting specific goals for particular aspects of service might narrow the vision of employees so that they will achieve these goals by lowering quality in areas for which no goals have been set. For example, service representatives might start answering all customer calls within three rings by terminating other customer calls or placing people on hold. This situation would not be an overall improvement in service quality, even though the objective, technical approach to quality might indicate that it was. Thus a user-based approach, rather than an objective checklist approach, has been found to be superior for evaluation the quality of intangible services." In Schneider, B., & White, S.S. (2004). *Service quality: Research perspectives*. Thousand Oaks, CA: Sage Publications, p.11. See, too, discussions of service quality in several articles in Rust, R. T., & Oliver, R. L., eds. (1994). *Service quality: New directions in theory and practice*. Thousand Oaks, CA: Sage Publications.

10. FAR 16.404(a) and 16.405-2(b) say that award fee incentives are to be used only when it is not possible develop objective incentive criteria. Their use in performance-based contracts is inconsistent with the PBSA requirement for objective, measurable performance standards.

11. "The feasibility requirement in contracting for results is that the product must lend itself to clear definition. Whether he is contemplating a fixed (price) or a performance contract (a contract with incentives), the buyer must be able to specify the desired results in simple, straightforward terms to a prospective seller. These terms must also be meaningful to a knowledgeable third party so that, if a dispute arises, he can determine whether the contract terms have been fulfilled

or not. In purchasing books or equipment or even buildings, the school is usually able to describe exactly the product it is after. Such procurements as the purchase of administrative services is not so easy." In Stucker, J., & Hall, G. (1971). *The performance contracting concept in education.* Santa Monica, CA: Rand, p. 6.

Image designed by TSgt James Smith, USAF

CUSTOMER FOCUS AND ARMY PROCUREMENT: *IS IT POSSIBLE?*

Keith R. Shelton and Dr. Drumm McNaughton

Current business scholars consider customer focus critical to competitive advantage. The literature is full of research and recommendations considering the *what* and *how* of customer focus. Modern defense product developers, like all modern business enterprise, seek competitive advantage. Customer focus, and the promise of competitive advantage within that concept, is seen as a critical component of a modern defense company's strategy. This article explores the difficulty of developing true customer focus within the rather strict and regulated Army procurement system.

Over the past few years, customer focus research has occupied much space in the business literature. Research into the *hows* and *whys* of customer focus is conducted and reported and metadata studies pulling research together are completed. Customer focus, we are told, holds the key to modern competitive advantage.

Of course, customer focus is not altogether new. Strong and Harris (2004) point out that since the 1950s, marketers have "advocated the pursuit, development, and maintenance of a customer-oriented company" (p. 1). Boulding, Staelin, Ehret, and Johnson (2005) point out that as far back as 1960, Levitt counseled focusing on filling customer needs rather than simply selling products. This idea that customer focus is central to competitive advantage has almost become the "leitmotif for all organizations" (Strong & Harris, p. 1).

While we accept customer focus as important to corporate success, figuring out how to be customer focused is not altogether clear, especially for a procurement system as complex as that of the defense industry. The defense industry, long a product-based industry, is attempting to capture the power of customer focus. This is problematic not only because of its bias toward the push/pull marketing inherit in

product-based companies, but also because of the complexity of the whole defense procurement process. Within this process, even the definition of *customer* is difficult, and maximizing customer needs, wants, and desires is more difficult still. This article documents the difficulty defense contractors face in developing and executing customer focus and puts forward a plan for making such a change.

CUSTOMER FOCUS: WHAT IS IT?

The first step in setting up a customer focus in defense contracting is to define what we mean by customer focus. The definition is not altogether clear and runs the gamut from simple data collection to a rather complicated and amorphous idea of shaping customer experiences.

CUSTOMER FOCUS: WHY IT IS IMPORTANT

Before customer focus is defined, perhaps an explanation of why customer focus came to be so important is in order. Urban (2005) shows how customer power has developed over the past few years. This market power has developed as a result of the abundance of easily obtained information available to consumers. Urban points out that the Internet provides huge amounts of data that customers mine to:

- compare products,
- find competing products,
- buy from suppliers all over the world, and
- collaborate with each other concerning how one company compares to others in customer service.

This increase in customer knowledge has led, as Urban notes, to considerable power shifting from the producer to the customer. Those familiar with defense procurement understand that this power, only now moving to the customer in the commercial world, has long resided with the customer in the defense procurement world.

CUSTOMER FOCUS: A DEFINITION

Perhaps the simplest definition of customer focus can be deduced from the Customer Relationship Management (CRM) movement. The CRM advocates believe that the key to customer focus is for the firm to form a "relationship" with the customer (Boulding et al., 2005; Jayachandran, Shurma, Kaufman, and Raman, 2005; Urban, 2005). Amin (2005) puts the idea of CRM most succinctly: "the only way for a business to prosper in today's highly competitive marketplaces is through

concentrating passionately and devotedly on customers and their needs" (p. 1). The point of this concentration is the formation of a *relationship* between customer and supplier that will hopefully lead to gaining new customers and retaining old customers, thus positively influencing (in the company's direction) customer buying habits. Once that relationship is formed, it must be managed (Boulding, et al., 2005).

At its foundation, CRM demands the accumulation of a tremendous amount of data. According to CRM, a relationship with the customer cannot be established unless the firm knows and understands the customer. This knowledge and understanding begins with the accumulation of data.

CUSTOMER FOCUS: ITS INTENTION

But what is the intention of customer focus? It is well and good to speak of the customer-firm relationship and the information that can be obtained from the mountain of data that is generated each year by modern companies, but there must be a point to the whole process more than just getting to know one's customers. Johnson and Selnes (2004) articulate this purpose when they talk about building "value for a firm across an entire portfolio of customer relationships" (p. 2). Payne and Frow (2005) talk about "improved shareholder value through the development of appropriate relationships (p. 2). Johnson and Selnes (2004) mention a host of studies that show a strong correlation between "the customer relation orientation and its financial and marketing performance." Boulding, et al. (2005) soften the idea of increased shareholder value a bit when they speak of creating value for both the firm *and* the customer, but the point of customer focus is and has always been the creation of value for the firm. While in a market system *value creation* (read profit) is not bad, profit within the context of defense procurement is somewhat problematic.

Customer focus insists that data collection eventually leads to relationship. But what does relationship mean? Almost universally, relationship means understanding the customer based on knowledge of the customer (Gulati & Oldroyd, 2005; Jayachandran, et al., 2005; Boulding, et al., 2005). The important thing is what the firm does with this understanding. Authors report many different uses for this understanding. Gulati and Oldroyd note that some companies use this information simply to predict future customer behavior for the purpose of more efficient marketing activities (doing what companies have always done, only being more efficient at it). Jayachandran, et al. find many companies who simply wish to distinguish profitable from unprofitable (or less profitable) customers. Others desire developing new and/or different products to fill customer needs (Boulding, et al.; Johnson & Selnes, 2004) or the ability to match customers to existing products (Johnson & Selnes). Some companies use this understanding as a way of developing customer loyalty (Gulati & Oldroyd) and developing long-term relationships (Boulding, et al.).

Others see a less concrete, almost ethereal purpose for this understanding. Prahalad and Ramaswamy (2000) believe that this understanding can allow the firm and the customer to "co-create personalized experiences" (p. 4), Urban (2005) sees the firm

becoming the customers' "advocate," and Johnson and Selnes (2004) want customers to become "partners" with the firm. But whatever the intent of the relationship, the end result is always seen as building value for the firm.

CUSTOMER FOCUS: HOW TO OBTAIN IT

Once the company defines customer focus, the question becomes, "How do I get it?" Generally writers see this as a process moving from an internal focus to a customer focus. Gulati and Oldroyd (2005) see four stages as companies move toward customer focus. These four stages include:

1. gathering information,
2. gaining insight from past customer behavior,
3. understanding of possible future behavior, and
4. real-time response to customer need.

Johnson and Selnes (2004, p. 2) suggest that the firm move from "strangers to acquaintances," then from "acquaintances to friends," and from "friends to partners." Prahalad and Ramaswamy (2000) state that the firm must "engage their customers in an active, explicit, and ongoing dialogue; mobilize communities of customers; manage customer diversity; and co-create personalized experiences with customers" (p. 1). Strong and Harris (2004) insist the firm must create relational tactics, procedural tactics, and human resources (HR) tactics to create effective customer focus. Urban (2005) insists customer focus cannot be developed until a deep level of trust exists between the customer and the firm.

While each consultant might have a different approach to gaining customer focus, one thing is sure: Customer focus is not business as usual. It involves some type of special relationship between the firm and the customer that is systematically developed by the firm.

CUSTOMER FOCUS AND PROBLEMS IN THE ARMY PROCUREMENT SYSTEM

Anyone working in the Army procurement system understands that DoD rules, regulations, and legislation introduce certain problems that are not faced in non-defense markets, which certainly inhibit realization of the full promise of customer focus. Many of these problems cannot be overcome by anything less that an overhaul of the legal and regulatory foundation of the process. However, there are problems that currently inhibit the realization of a strong customer focus that can be overcome.

THE PROBLEM: WHO IS THE CUSTOMER?

The first problem encountered with the Army procurement system is determining who the customer really is. A quick answer to this question is always *the user*: the combat soldier. This is the emotionally satisfying answer. All defense contractors want to provide products and services to the combat soldier that will allow them to accomplish the mission and return home safely. Public relations demand this sort of "user as customer" focus.

Unfortunately, this cannot be the only answer. If the ultimate impact of customer focus is to influence the procurement of particular products and enhance corporate profitability, the user cannot be the customer. In the Army system, the users (the combat soldiers) do not control any of the actual procurement processes. Combat soldiers do not control needs assessment and capability determination, concept refinement, contract award, product procurement, product development, or product testing. While developing a relationship with the combat soldier is emotionally satisfying, it does not produce the required influence within the development and procurement communities that is the ultimate goal of a customer-focused strategy.

All defense contractors want to provide products and services to the combat soldier that will allow them to accomplish the mission and return home safely.

If the combat soldiers are not the customers, then who is? This answer depends on where a particular product is in the product life cycle. Early in the development cycle, the Joint Capability Integration Development System (JCIDS) community is the customer (Chairman of the Joint Chiefs of Staff, 2005). Later, the combat developer (CBTDEV) community is seen as the customer (PM-2001-ISE, 2003). Later still, the material developer (MATDEV) community is the customer (PM-2001-DL, 2005). Throughout the whole process, the various proponent schools are customers. Relationships must be formed with each of these communities if any influence is to be gained.

For an effective customer focus and its resultant procurement influence, a military contractor must forge relationships with all relevant military stakeholders. That might mean relationships with the JCIDS community as they uncover capability gaps; relationships with relevant CBTDEVs as they develop requirements to fill those capability gaps; and relationships with MATDEVs, proponent schools, and the test community as they develop, procure, and support various products. This obviously makes for a bewildering mix of relationships, because each of these customers has a different set of needs and concerns.

THE PROBLEM: A RIGID PROCESS

Added to the difficulty of determining the actual customer is the inherent rigidity of the procurement process. Central to the idea of customer focus is the notion that a company can determine a need and rapidly fill that need (Gualati & Oldroyd, 2005). However, the Army procurement process is painfully slow. Each stage in this process is tightly controlled by statute and regulation, such that a defense contractor cannot quickly capitalize on an innovation or a technological breakthrough by marketing and selling a new product to combat soldiers.

Every piece of Army hardware developed and fielded to soldiers goes through a very structured process. The process has seven stages, beginning with a needs and capability assessment phase and a concept refinement phase. Once through the concept refinement phase, the future product enters a technology development phase and a system development and demonstration phase in which a product is designed and developed. After successfully completing its product demonstration phase, an Army product enters the production and deployment phase where the product is manufactured and fielded to tactical units. The longest phase for Army products is the operations and support phase. This phase can run in excess of 20 years. Finally, the product is removed from service in the disposal phase. The Army tightly controls each of these stages.

THE PROBLEM: PUBLIC RELATIONS

Additionally, there is the basic public relations problem of a corporation making a profit at the expense of combat soldiers who desperately need reliable and effective products to do their jobs. While everyone acknowledges the right of defense contractors to make a fair profit, the definition of *fair* is continually discussed, and the MATDEVs go to great lengths to monitor the profit made by contractors. Furthermore, the Army insists that there be competition in all areas of hardware procurement. The Army actively supports multiple suppliers for each product type or technology and goes to great lengths to maintain this competition among contractors (Department of the Army, 1989). Within the Army procurement process, gaining competitive advantage is difficult, and maintaining that advantage is more difficult still.

THE PROBLEM: PRODUCT FOCUS

Complicating things further is the fact that most major military contractors are organized with a product-focused structure. The military products industry has four major players: Boeing, Lockheed Martin, Northrop Grumman, and Raytheon. Of these, only Boeing has attempted any sort of customer focus (Boeing, 2005), but closer examination reveals that even Boeing, within its "customer faced" business units, reverts to product focus. Such a product focus tends to force a company to look inward rather than outward toward the customer. Consequently, the tendency is to make really high-tech, reliable new products and force those products to fit existing Army needs.

This tendency to look inward can be seen in the vision statements of the big four defense contractors as found in their Web sites. In each of the vision statements, the focus is internal. The vision has to do with corporate success. It is telling that in each of the corporate Web sites detailing the company vision, customer satisfaction typically shows up as a strategic thrust or value statement (Boeing, 2005; Lockheed Martin, 2005; Northrop Grumman, 2005; Raytheon, 2005), but the vision statement and the strategies created tend to revolve around products, not customers. This internally focused, product-related structure serves as a strong barrier to developing an outward-looking customer focus.

The product focus is a natural outgrowth of technology-based companies. Companies like Boeing, Lockheed Martin, Northrop Grumman, and Raytheon employ engineers, technologists, and scientists whose education and training tends to be focused on using technology to invent *things*: products. Their operations and manufacturing organizations are focused on producing *things*: products. It is natural that a product focus emerges.

WHAT IS POSSIBLE

Thus far this article has explored what customer focus is and the difficulties of influencing Army procurement. Now the focus looks at what is possible within the Army procurement system. There are several avenues that could be explored. First, if defense contractors focus on the dominant customer at each stage in the procurement process, they can use their vast technological knowledge and experience to influence how capability gaps are defined and how they can best be filled. Additionally, they can influence how spiral and technology upgrades are inserted into systems already fielded. If a contractor can forge relationships with all procurement customers and establish a sense of trust with those customers, competitive advantage through procurement influencing could be achieved, at least at some level. The key is for the customer to develop a sense of trust in the company (Boulding, et al., 2005; Johnson & Selnes, 2004; Urban, 2005) that leads to customer commitment (Johnson & Selnes, 2004).

Second and less obvious, a defense contractor can use a customer-focused strategy to leverage productivity and enthusiasm within the firm itself. Defense contractors tend to be very patriotic. They tend to respond to soldiers, especially combat soldiers. When contractors hear good words from soldiers about their products, they feel great pride. When they hear that soldiers are having problems with the hardware, they tend to be depressed. Defense contractors want to be a positive force in the nation's defense. Companies can use this patriotism by focusing on the customer to build morale, productivity, and great enthusiasm.

A third area where customer focus might provide some benefit is in the area of branding and brand recognition. It is extremely difficult to build brand identity with defense products. Corporate names do not typically appear on warfighter products, and everything the Army uses is painted olive drab, white, or black. But if a company

can build a strong customer focus, build strong trust among the various customer groups, and build solid relationships, positive branding can be achieved, at least within a particular customer community.

HOW TO PROCEED

If procurement influence is possible, at least at some level, through customer focus, we must now turn our attention to how that influence can be attained. There are three avenues that shall be explored: getting to know the customer, aligning the firm, and developing trust.

HOW TO PROCEED: KNOW YOUR CUSTOMER

Virtually all writers on customer focus understand that the beginning place for developing an adequate customer focus is to know and understand the customer. This knowledge and understanding starts with the accumulation of information about the customer. This information gathering isn't a one-time activity. It is a continuous enterprise that can take years (Gulati & Oldroyd, 2005). Jayachadran, et al. (2005) emphasizes the importance of the proper processing of the mountain of data accumulated. Without adequate information processing, the customer focus effort can be "rendered ineffective by poor communication, information loss and overload and inappropriate information use" (Jayachadran, et al., p. 128).

This information processing starts with focusing on and understanding the customers' agenda (Amin, 2005) and treating customers as equals (Prahalad & Ramaswamy, 2000). It means learning everything there is to know about the customer at the lowest possible level, gathering and pooling this information from all possible sources, and then using that information to construct a comprehensive picture of the customer—past, present, and future (Gulati & Oldroyd, 2005). Once this information is accumulated, Prahalad and Ramaswamy suggest that the company engage the customer in an active dialogue. This dialogue allows the firm to properly process all the information. It also serves to keep the customer interested, involved, and active in the process.

HOW TO PROCEED: ALIGN THE COMPANY

The next thing the company must do to create a vibrant and effective customer focus is to ensure the company is properly aligned. Proper alignment assures the whole company is pulling in the right direction.

Proper corporate alignment begins with corporate vision. Collins and Porras (1996) point out that in a dynamic business environment where truly great companies are able to renew themselves, "vision provides guidance about what core to preserve and what future to stimulate progress toward." The vision must face outward toward the customer and call the entire enterprise to focus on the needs of the customer.

For modern American business, the power of the vision comes from the excitement generated when people feel they are part of something greater than themselves (Hamel & Prahalad, 1989) and taps into values people hold and believe to be important (Bruhn, 2001). A corporate vision that focuses on the customer can supply this excitement.

After the vision is developed, strategies that support that vision must be developed. Yukl (2002) defines strategy as "a plan or blueprint for carrying out the mission and attaining strategic objectives" (p. 360). Without a blueprint, the organization cannot build toward the vision. The strategies that are developed describe the method by which the vision will be achieved. It is beyond the scope of this article to suggest specific strategies for defense contractors; however, it is imperative for defense contractors to ensure that there is proper alignment of vision and strategy (Yukl, 2002; Kaplan & Norton, 2005) and that the strategy be communicated effectively throughout the organization. Kaplan and Norton believe that upwards of 95 percent of the employees of any firm do not know or do not understand the company's strategy. They believe that management spends too little time in "strategy management" (p. 2). The result is a misaligned company: strategy pointing one way with employees heading another.

Defense contractors must develop dynamic customer-focused visions and dynamic customer-focused strategies.

Finally, the strategies employed by the firm must be continuously evaluated and, when necessary, modified. Kaplan and Norton (2005) estimate that 85 percent of executive leadership teams spend less than one hour per month reviewing the firm's strategy. Without effective reviews, modifications, and corrections, ineffective strategies are not replaced.

Defense contractors must develop dynamic customer-focused visions and dynamic customer-focused strategies. Then they must drive those strategies down to the lowest levels of the organization and make subtle corrections whenever necessary as the vision takes hold.

It is not being suggested here that the whole product-focused structure of the organization should be scrapped and a brand new customer-focused structure be developed. Technology companies tend to have, as discussed above, product biases for some very good reasons. Attempting to eliminate these product biases would be very difficult and would probably be detrimental to the firm. What is being suggested is that changes could be made that would keep the strengths of the product focus and yet allow for a strong customer focus.

Govindarajan (2005) examines the problems of developing new organizational structures in response to technological innovation. He states that there are things the new structure should bring forward from the old structure and things that should be left behind. The trick, obviously, is determining what to bring forward and what to leave behind. Dean (2000) suggests that a front/back structure is the best way to provide for customer needs. Dean believes that a front end that concentrates on serving customers (determining needs and developing often complex solutions to meet those needs) and a back end that concentrates on products is the best organization for meeting customer needs. This front/back structure would allow for retaining the best of what Govindarajan calls *organizational DNA*.

HOW TO PROCEED: DEVELOP TRUST

Finally, a look at the last step in the process: using the information and the customer-focused, properly aligned firm to build a relationship with the customer. This relationship is most often described in terms of trust (Boulding, et al., 2005; Urban, 2005; Johnson & Selnes, 2004). The idea of trust seems to revolve around the idea of confidence customers feel when they believe their suppliers will treat them fairly (Boulding, et al.). Boulding, et al. (p. 8) notes that the collection of data does allow for the "differential treatment of customers."

Customers evaluate the treatment received from their suppliers and respond based on the sense of trust they have in the firm.

Customers evaluate the treatment received from their suppliers and respond based on the sense of trust they have in the firm. That is why Strong and Harris (2004) stress the importance of making and keeping promises. They emphasize the development of adequate measures to ensure that all commitments are met. In this regard, Urban (2005) suggests that all communications remain open and honest. This means giving the customer information that might actually lead the customer to a competitor's product. Urban believes this type of open communication develops the trust required to build lasting relationships.

But what is the purpose of this *trust* once it is built? Writers are united on the intended result of this developed trust. Johnson and Selnes (2004) believe that the "creation of trust leads to the creation of commitment—trust breeds trust, which ultimately increases commitment and results in a shift from short-term exchanges to long-term relationships" (p. 3). They point out that long-term relationships reduce the customer's need to solve problems in the traditional sense of "finding a better

alternative." Urban (2005) assumes that if the company becomes an advocate for the customer, those customers will reciprocate with trust, purchases, and enduring loyalty. In other words, "a company advocates for the customer interests and customers advocate for the company by buying its products" (Urban, p. 5).

CONCLUSION

This article has looked at customer focus within the Army procurement system. Certainly there is sufficient theoretical data to show that customer focus is a valuable strategy for modern business, but there are many reasons why a customer focus would be difficult within the Army procurement process. However, there are sufficient potential benefits to developing a customer focus to make it worthwhile. American defense contractors will never, short of a radical overhaul of defense procurement rules, regulations, and legislation, be able to deliver Prahalad and Ramaswamy's (2000) "personalized experiences" or Urban's (2005) "real time solution to identified problems" as a result of a change to customer focus. But by developing a deep understanding of the customer; creating visions, strategies, and structures that allow the firm to focus on customers wherever they are found in the procurement process; and working hard to develop a bond of trust between contractor and customer, some level of influence can be gained. And constant focus on the end user—the combat soldier—can build morale and enthusiasm within the firm and a positive brand name outside the firm.

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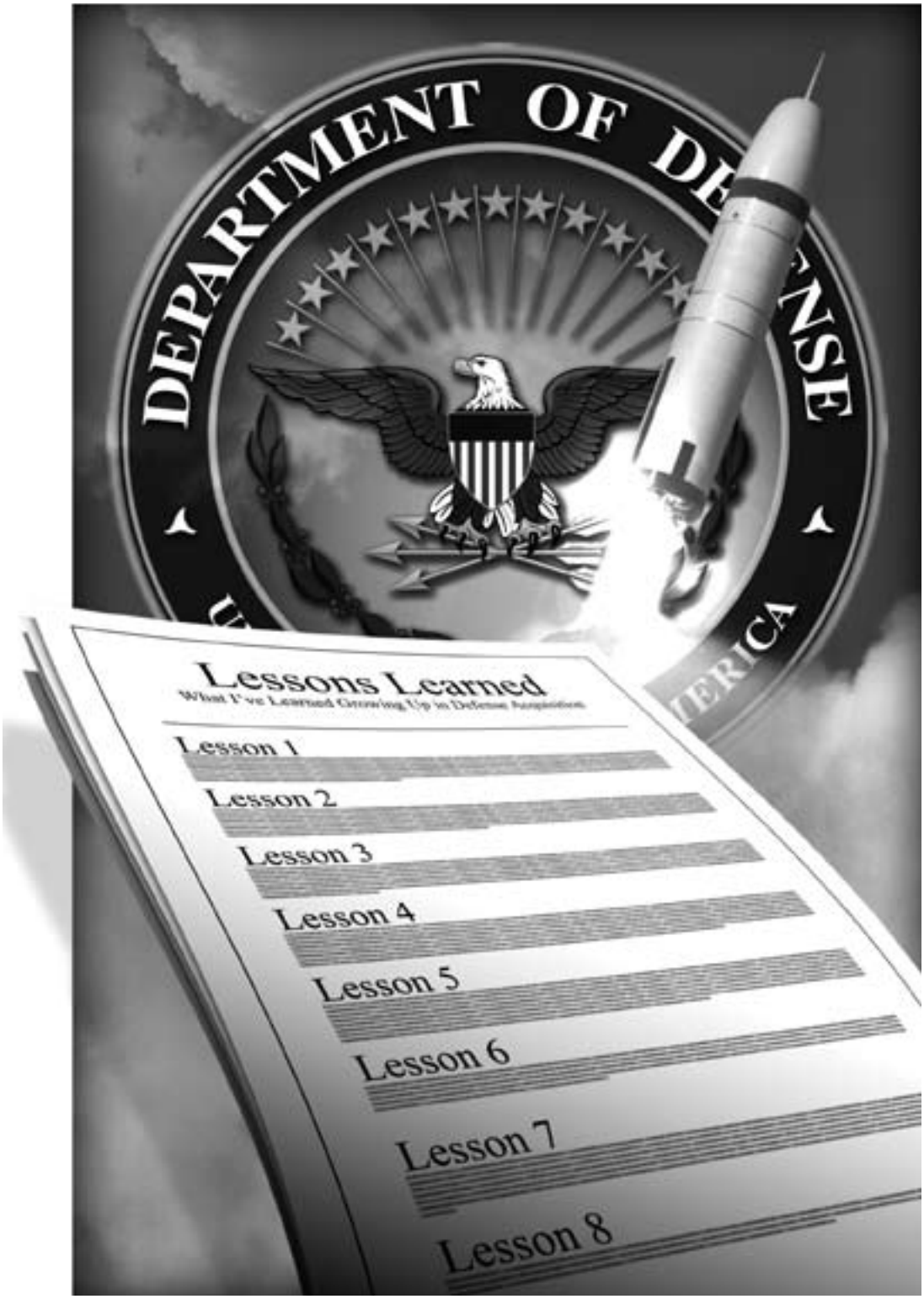

Image designed by TSgt James Smith, USAF

LESSONS LEARNED IN ACQUISITION MANAGEMENT

Dennis K. Van Gemert and Martin Wartenberg

Many projects and programs fall short of meeting their initial intended goals. Tracing these shortfalls to their common set of root causes and analyzing these root causes to find common threads illustrates opportunities for lessons learned. The authors of this article examined these common threads and referred to their professional experience in defense acquisition and academic backgrounds in project management and systems engineering to address these issues and propose strategies for countering their ill effects on program performance.

Programs succumb to the same pitfalls, regardless of lessons learned documentation. Lessons learned must be institutionalized into the acquisition learning curve. Documentation does not ensure institutionalization. Why do we not learn from the past and continue to make the same mistakes on weapon system after weapon system? Doing what has not worked before, but doing it harder or with more process, usually produces the same poor results. As aptly put in this anonymous quote:

> If you always do what you always did, you always get what you always got. If you do not want what you got, do not do what you did. If you like what you got, do it again.

INSTITUTE SCOPE MANAGEMENT TO AVOID SCOPE/ REQUIREMENTS CREEP

Managing the project scope is essential to maintaining cost and schedule target dates. Increasing the scope will almost assuredly increase cost and delay the schedule (see Figure 1). It is good practice to follow the old adage, "It is not a requirement until someone is willing to pay for it."

The incorporation of unfunded or under-funded requirements leads to uncontrollable scope growth. A detailed analysis of the impacts to the cost, schedule, and technical baselines should be performed prior to implementing a change proposal. Any potential adverse impacts must be documented in the risk registry and managed until either realized or successfully dispositioned via mitigation, transference, avoidance, or acceptance (active or passive). A signed change proposal does not relieve the contractor from meeting cost and schedule constraints.

Never use management reserve to cover the cost of additional product features and functions. Incorporating features and functions into a product that are not part of the contractual statement of work results in resources being applied to noncontractual work, effectively putting the project schedule and cost at risk. Even if the project comes in ahead of schedule and under budget, it should be at the discretion of senior acquisition officials, not the rank-and-file acquisition workforce, to determine whether the cost and budget reserve should be used to add functionality to the product or applied to another acquisition that may require additional funding.

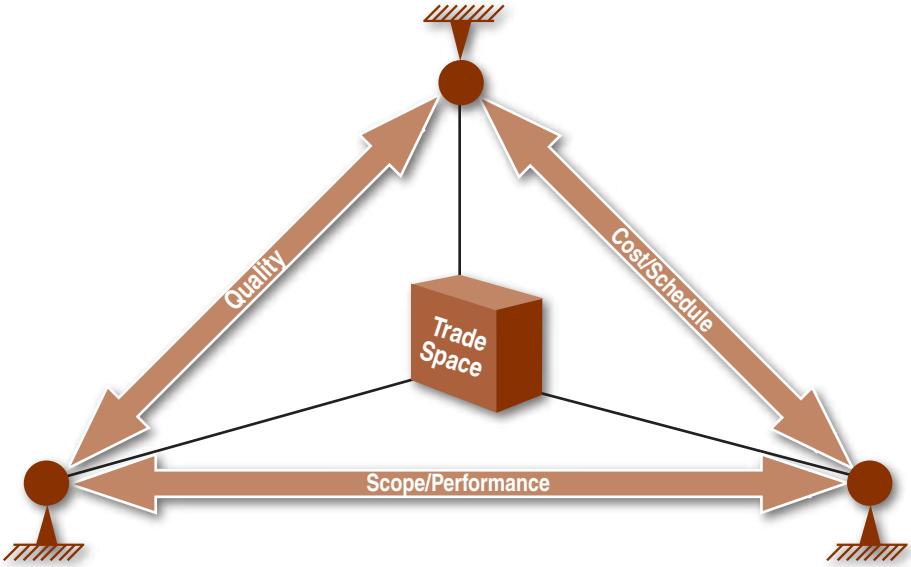

FIGURE 1. THE TRIPLE CONSTRAINT DIAGRAM

The *Guide to the Project Management Body of Knowledge* (PMBOK®) states: "Project Scope Management includes the processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully" (Turner, 1992). Create a scope management plan, perform scope verification, and actively exercise scope control, as described in Chapter 5 of the PMBOK® Guide. During initial scope planning, prioritize the triple constraint variables. For example, quality tends to be an inflexible variable, whereas availability, maintainability, and reliability are components of quality. Determining relative sensitivities among triple constraint variables will facilitate system requirements trades performed during critical points in the program.

Not all requirements are equal. Another area requiring detailed discussion and documentation in requirements specifications is the relative priority of sets of requirements. This allows the systems engineer and the project engineer to make concessions, changes, and alternative approaches based on the current design reality.

RECOGNIZE IMMATURE TECHNOLOGY

Immature technology can bring a program to its knees. Schedule elongation on a research and development (R&D) project that is composed almost entirely of the technology development core team is relatively inexpensive compared to holding up a large program, burdened with sizable overhead and product teams unrelated to the emerging technology. When technology fails to mature at the rate estimated during initial planning, the costs of overhead and labor grow. Considerations to keep in mind:

- A key technology should always be thoroughly evaluated prior to formal program kick-off to ensure adequate confidence in the technical maturation process. A small team of scientists, engineers, and technicians is less expensive than a large management infrastructure and the associated inefficiencies.

- Where feasible, allow for technological advances to be spiraled into a product, thereby allowing the product technical maturity to grow with the state-of-the-art, or state-of-the-industry, whichever is the desired goal.

- The buyer must do due diligence in determining the technical risk associated with product technical maturity and avoid being blinded by the *wow factor*. If the seller is advertising technical capability for a price that is out of line with the other bidders, raise the flag and investigate.

- Contracts should be customized to dissuade the seller from over-promising capability to the buyer for the sole purpose of winning the contract. A stepped procurement may be the answer, with upgrades or more capable systems to follow as technology evolves to the point of acceptable risk.

AVOID IMPROPER USE OF MANAGEMENT RESERVE

Management reserve is a budget reserve set aside to address the unknown-unknowns (unk-unks) on a project or program. The probability and impact of these risks are not only unknown, even the presence of the potential risks may be unknown. Management reserve is money set aside to address such unexpected emergencies.

Often, this money is used to add scope to the program in order to keep the customer happy. It is easy to fall into the trap of conceding to unfunded scope modifications. The danger lies in the realization of these unk-unks, and not having sufficient reserve remaining to address them without increasing project completion costs.

Another purpose of the management reserve is to guard against the statistical likelihood that some people overestimate while others underestimate the budget. A key input to building selected reserves is the individual uncertainty and risks associated with specific project tasks. The management reserve should be used strictly for the purpose of addressing unforeseen obstacles to program success, never to add additional scope.

ENSURE ADEQUATE SCHEDULE RISK ANALYSIS

The Critical Path Method (CPM) is a useful tool and, when combined with Program Evaluation and Review Technique (PERT) analysis, can give good results for planning purposes. However, as the schedule matures, one should always go back and run a Monte Carlo simulation against the schedule to avoid being overly optimistic—a documented side-effect of CPM. David Hulett (1996) characterized the optimistic bias of CPM in his paper, *Critical Path Method Scheduling: Some Important Reservations*.

Ignore the assertion that completion dates are best represented as single points in time. They are best represented as a finite probability distribution with corresponding confidence intervals. When a date is stated, it should be accompanied by a confidence level (e.g., the task will be completed on February 5, 2007, with a confidence of 70 percent, or 2/5/07 [70%]). Most scheduling tools offer the ability to perform Monte Carlo simulation analysis to determine schedule confidence and risk. In addition, Dr. Hulett recommends that the project or program manager (PM) analyze the network and look for nodes that represent a high risk due to excessive implosion or explosion, and consider adjusting the schedule to make the network less sensitive to the effect of statistical variances of parallel activities. *Merge bias* is the term used to refer to the elevated risk levels experienced at schedule nodes where multiple paths converge into a single path.

Though relatively new to project management, the concept of Critical Chain Project Management (CCPM) addresses the risk of multitasking on schedule visibility and viability based on sharing critical path resources.

IMPLEMENT EFFECTIVE COMMUNICATIONS

Communication is the most important responsibility of the PM. Ninety percent of a PM's time will be spent communicating, which facilitates collaboration and reduces inefficiencies. Concurrent engineering, collaborative design, systems integration, systems engineering, and high performance work teams depend on fluid communication between teams, individuals, contractors, and customers/clients. It is not merely enough that communication take place, but that the communication be effective. Be aware of the barriers and facilitators of communication. Use clear and concise communication, as well as active listening.

Those in management must take care not to lose touch with the information grapevine: peer-to-peer information flow at the design- and user-working level.

Management must actively engage the engineering workforce and the user community and seek their input and advice. Those in management must take care not to lose touch with the *information grapevine:* peer-to-peer information flow at the design- and user-working level. Even those with the best of intentions to stay connected to their former colleagues must take note that a managerial position elevates an individual above the day-to-day, word-of-mouth conversation about what is working and what is not. Those actively engaged in solving the design issues have first-hand information about what is and is not working, so it is advisable to pay attention to their concerns. Often, this communication flow is hindered by a belief that management knows better then those in the trenches what is and is not working. And often, when input is sought from management, the response is not taken to task.

Do not be afraid of bad news, and never shoot the messenger, lest the free flow of communication be inhibited. Better to learn of bad news while there is still time to correct or mitigate it than when it is too late to react. Never conceal unfavorable information about project or program progress. Analyze the threat and probability levels, and search for solutions. By doing so, when the sponsor is briefed, you have shown that there is a negative issue or risk, but that it is being actively addressed. Always give the sponsor an opportunity to participate in the solution. It is, after all, the sponsor's product. While industry has become diligent in documenting lessons learned, communicating that information has not been as successful. Fear of reprisal is the leading cause of bad news not flowing up the chain of command.

REDUCE PROGRAM OFFICE ROTATIONS

Continuity of leadership is essential to effective and efficient program execution. When program officers are rotated out every few years, the learning curve recycles before utility of the previous learning cycle can be harnessed. In effect, once an officer gains the background understanding of the program, keep the individual in place long enough to realize their talent in that position. Turning over leadership every few years keeps the program office in a state of constant redirection, shifting priorities and expectations, and confusion. It generally takes several years on a particular program or project to reach peak performance.

Plans should be in place for an orderly transfer of responsibility and knowledge. Only a small part of project activities and communications are in some form explicit. Much, including off-the-table agreements, are tacit and need to be transferred or acknowledged by new folks coming into the project. Succession planning is essential to program or project success.

The success of the U.S. Navy Strategic Systems Project Office in the management of the Polaris, Poseidon, and Trident Programs is due at least in part to the fact that key PMs stayed on the job and, when rotated, moved into other parts of the program, so that key tacit knowledge remained available. Aside from the Navy's Fleet Ballistic Missile (FBM) program and, to a lesser extent, the F-18 E/F, rapid turnover and a punch-your-ticket mentality is prevalent in defense acquisition. Despite the laudable results achieved on the FBM and F-18 E/F programs, the rest of the acquisition/procurement world did not follow the model the Systems Projects Office and the Strategic Systems Project Office developed regarding time in place and rotating within the program. There have been studies and the subject has been extensively discussed at the Naval Postgraduate School in Monterey as well as at the Defense Systems Management College (DSMC).

RECOGNIZE OVERLY AGGRESSIVE BIDDING

Be cautious of over-aggressive bidding, and protect against bids that are unrealistic. Ensure that all scope has been accounted for, and review the scope against cost for any inconsistencies. Use the change clause for protection, and incentivize the bidding contractors to be reasonably accurate in their estimated costs. Share the budget savings, as well as the losses, with the contractors, if possible.

Past experience should serve as a reality check on what is achievable and what is overly optimistic. If greater capability of a previous, similar system is being proposed at a cost that is not proportional to that capability, seek justification for this discontinuity. The contractor may be bidding aggressively under competitive pressures, with the intent to make up any losses during the production and/or operations and maintenance phases. The buyer usually ends up paying for cost growth, regardless of the contract agreement.

One vehicle for the seller (contractor) to recoup lost income is to buffer the engineering change proposals, or contract change proposals. If the seller is not meeting their fair profit goals, expect to pay more for design changes than if they are meeting goals. This does not mean that the seller is trying to take advantage of the buyer. The seller is interested in making a fair and reasonable profit, while the buyer is interested in receiving the most capability for their expenditure.

Keep procurement dialogue open and honest on both sides of the contract. Mistrust of the other side is not in either side's best interest. A realistic *should cost* model must be used to examine bids for reasonableness. Bids that are too low should be questioned in detail regarding how the organization plans to meet the low-cost targets.

> *"In nature, the optimum is almost always in the middle somewhere. Distrust assertions that the optimum is at an extreme point."*
>
> — Professor David Akin, University of Maryland

ESTABLISH STAFFING AND RESOURCE PLANNING

It is not uncommon for new employees to wait months for proper security clearances to move through the process. It is important not only to account for this delay in the staffing plan, but also to use the time to prepare for productive integration of the new team member. Plan for the individual's arrival by ensuring a computer and other needed work equipment and items are on his/her desk and in working order. Nothing is more frustrating and unproductive than waiting several months for a security clearance to come through, only to find out that it will take a few more days to get a working computer set-up, and a few weeks to order more licenses for the software tool required to perform primary job responsibilities (e.g., computer-aided design and analysis software). If you have several months' notice of an individual's start date, take advantage of this time to set up the workspace and determine if more software licenses are required. This is an easy money saver, but often overlooked, thus costing a fortune in lost productivity.

LEVERAGE SYSTEMS ENGINEERING WITH PROJECT MANAGEMENT

The ability of a project team to successfully complete a project, and the follow-on work associated with it, is tied to the team's ability to leverage the capabilities of systems engineering and project management, enabling collaborative teaming among various engineering disciplines. Leveraging the synergies between the two disciplines (as shown in Figure 2) is a critical aspect of collaboration.

The two disciplines overlap in some respects and complement each other in others. Where they overlap, systems engineering and project management are motivated by different objectives resulting from their unique perspectives. The PM is concerned with maintaining cost and schedule commitments, whereas the systems engineering

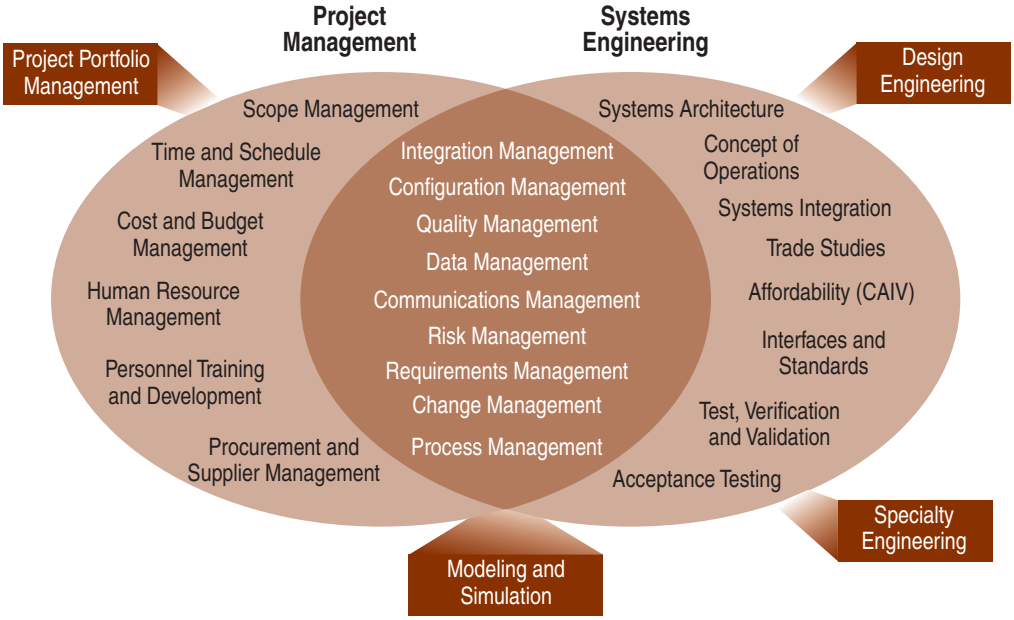

FIGURE 2.
PROJECT MANAGEMENT AND SYSTEMS ENGINEERING RESPONSIBILITIES

emphasis is on requirements management and verification. Today's technology often results in a family-of-systems or system-of-systems environment where various technologies are connected through an information grid in which systems interoperability is a leading success criterion for project success. Methodical systems engineering is essential to a well-integrated system. The PM and systems engineer must work together to achieve optimal results.

It is helpful to review the formal definitions of project management and systems engineering, as used by their industry governing bodies. The Project Management Institute defines *project management* as:

> The application of knowledge, skills, tools, and techniques to a broad range of activities in order to meet the requirements of a particular project. Project management is comprised of five processes—initiating, planning, executing, controlling, and closing—as well as nine knowledge areas. These nine areas center on management expertise in project integration, project scope, project time, project cost, project quality, project human resources, project communications, project risk management, and project procurement. (PMI, n.d.)

The International Council on Systems Engineering defines *systems engineering* as:

> An interdisciplinary approach and means to enable the realization of successful systems. It focuses on defining customer needs and required functionality early in the development cycle, documenting requirements, then proceeding with design synthesis and system validation while considering the complete problem: operations, performance, test, manufacturing, cost and schedule, training and support, and disposal. Systems engineering integrates all the disciplines and specialty groups into a team effort forming a structured development process that proceeds from concept to production to operation. Systems engineering considers both the business and the technical needs of all customers with the goal of providing a quality product that meets the user needs. (INCDSE, n.d.)

In the complex world of system-of-systems, project managers have their hands full just managing the job. It is the role of the systems engineer to provide the management of the technical issues including quality, conformance with requirements, and other targets of the specific procurement (flexibility, adaptability, reliability, etc.).

ENSURE FOR ADEQUATE PLANNING

Under pressure to perform, many PMs proceed to the product development and execution phase prematurely, without sufficient attention to the planning phase. It is important to note that upfront, advance planning becomes more critical as budgets become more constrained. Proper planning dramatically reduces scrap, rework, and redesign. A good rule-of-thumb for planning is to spend approximately 15 to 25 percent of the overall budget on planning: *planning for success*.

However, it is equally important to ensure that the budget spent on planning is value-added. Structure must be enforced on the planning phase to make certain that the planning is disciplined and documented. The PMs and systems engineers are essential disciplines to the planning process. Working together, they can efficiently produce an integrated set of project management (e.g., scope management plan, risk management plan, quality management plan) and technical management (e.g., systems engineering plan, systems engineering management plan, etc.) plans.

RECOGNIZE SHOULD COST VS. WOULD COST

If one builds in a *should cost* clause in the contract or includes it as part of a value engineering section, one has the ability to propose alternative approaches to

the sponsor in order to save both time and money. It is one of the least-used tools of systems engineering in that once the contract is signed, alternative approaches tend to cease. Negotiate a percentage sharing basis with the sponsor; a 50/50 sharing arrangement is a good initial objective.

UTILIZE SYSTEM ARCHITECTURE STUDIES

Another area that causes failure is an upfront lack of, or non-use of, system architecture studies related to topics like functionality, modularization, placement of risk, determination of design margins, etc. Often, this may be done by the systems engineering team and included as a deliverable, but may never get into the project planning activity.

CONCLUSION

A root cause of a failure is often not sufficient in and of itself to cause a catastrophic failure. It is when secondary variables are present, in a specific sequence, that all the factors align to cause the worst-case scenario to become reality. For example, the common thread between the two shuttle tragedies is the prior observation and documentation, during multiple flights, of a technical design flaw that had the potential for causing a catastrophic failure. If repeated O-ring failures on the Challenger led to disaster, then why, within 20 years, was repeated tile damage to a shuttle's heat shield from break-away insulation allowed to continue, until eventually a piece struck in such a manner as to cause catastrophic damage to the integrity of Columbia's heat shield?

The answer lies in the knowledge management of lessons learned of not only the root cause itself, but also the associated factors and circumstances. We have become very good at documenting lessons learned, but not so disciplined in the institutionalization of those lessons. Documenting lessons learned is only the beginning of knowledge management. Those lessons must be socialized among colleagues to the degree that they are transferred to upcoming generations. How do lessons learned become generally accepted best practices? Some lessons should change the foundations of our organizational culture permanently. We have mastered the archiving of lessons learned. Now we must master their retrieval, and give them life, not just a life cycle.

A final quote, attributed to Andy Grove, chairman emeritus of Intel: "Individuals, processes and organizations are perfectly designed to achieve whatever results they are currently getting, so if you're not happy with what you are achieving, its time to reconsider your assumptions and approaches to your process and product design methods."

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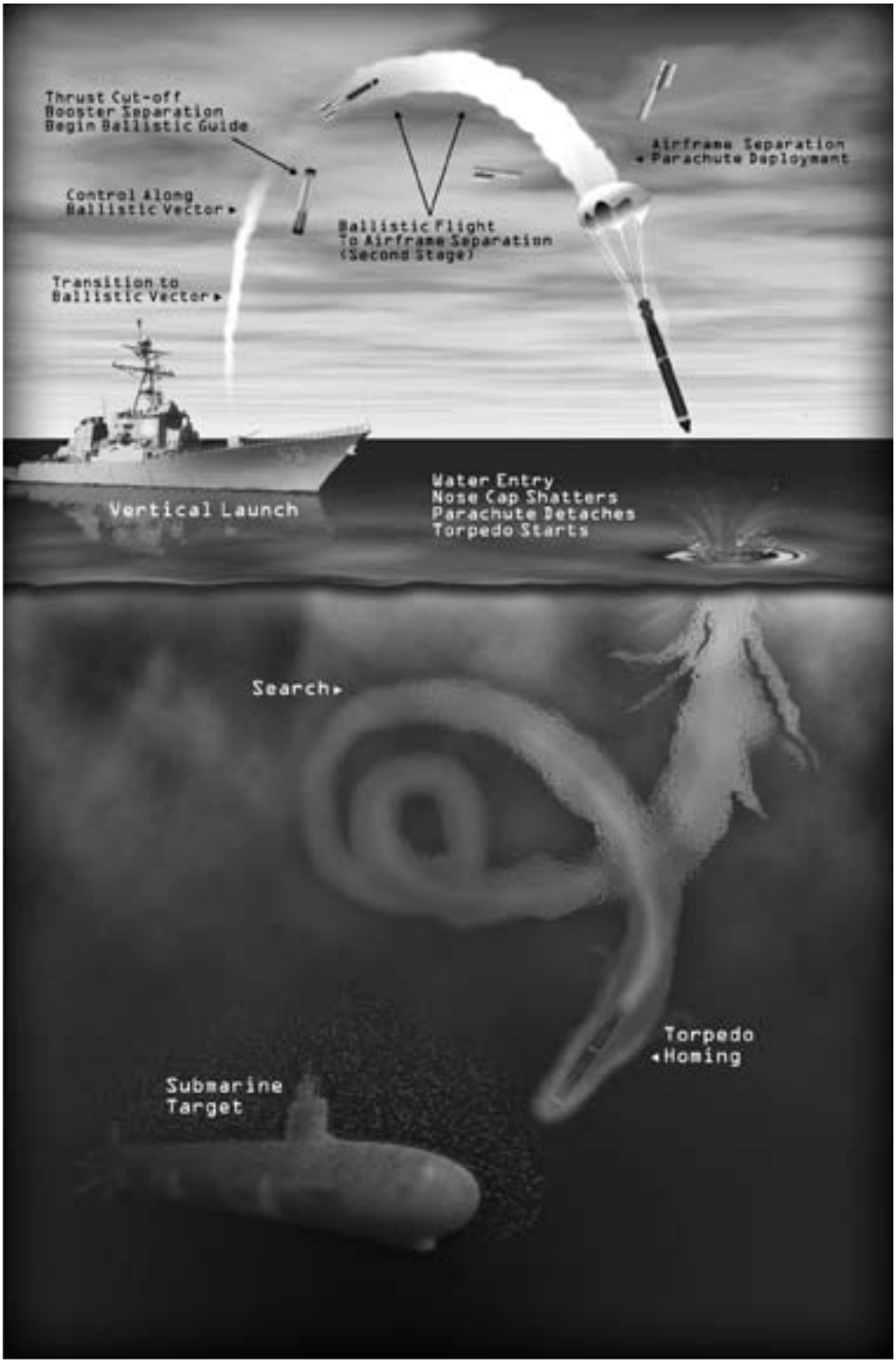

Image designed by TSgt James Smith, USAF

TEST AND EVALUATION LESSONS LEARNED FROM THE FIELD

Karen M. Stadler

This article examines test and evaluation (T&E) lessons learned from more than 300 students with extensive T&E field experience who attended the Defense Acquisition University (DAU) test and evaluation classes during FY02–FY05. The T&E lessons learned in 18 categories were researched and correlated, and findings in the top five categories are presented. In particular, this article focuses on detailed lessons learned in the areas of test design and execution, test planning, teamwork and communication, funding, and scheduling. A compilation of student (field practitioner) comments and recommendations is presented, and overall results are compared with results from other similar studies and documents.

As part of the DAU Advanced Test and Evaluation (TST 301) class, students prepare and present PowerPoint slideshows on various T&E-related topics. Many students prepare and present detailed briefings on their T&E lessons learned. The lessons-learned presentations are typically based on actual experiences in planning, conducting, analyzing, and reporting test results. Students typically have many years of T&E/acquisition field experience, and their presentations contain a wealth of valuable information, which could help others avoid common sources of error when designing and executing test events. The purpose of this article is to identify and discuss common T&E best practices and lessons learned, thereby enabling possible cost and schedule savings and improved test results from future T&E efforts. Decision makers and acquisition/program leadership can benefit from this article by better understanding the top T&E related issues, as reported by field practitioners.

The T&E lessons-learned data was obtained from students who attended this author's TST 301 classes during FY02-FY05. Of the 393 students, 301 students

TABLE 1.
NUMBER OF STUDENTS BY ORGANIZATION/SERVICE

ORGANIZATION/SERVICE	NUMBER OF STUDENTS	PERCENT OF STUDENTS
U.S. Army	141	46.8
U.S. Air Force	89	29.6
U.S. Navy	35	11.6
Missile Defense Agency (MDA)	24	8.0
Special Operations	6	2.0
Department of Defense (DoD)	4	1.3
U.S. Marine Corps	2	0.7
Industry/Contractor	0	0.0
Total Number of Students	**301**	**100.0**

presented significant T&E lessons-learned information. The students came from all four services and DoD agencies, as summarized in Table 1. The lessons-learned data consists solely of student comments and opinions and is based on student knowledge and experience in the T&E area, along with any research conducted by individual students.

The student data was analyzed for common trends, and 18 different categories, covering all common trends, were selected. The student briefings were then tabulated, to determine the number of student briefings with lessons learned for each of the 18 categories. For example, 192 of the 301 total students (63.8% of the total) had significant lessons learned in the area of test design and test execution. Note that each student briefing contained lessons learned from one or more of the 18 categories. The student lessons learned data is presented in Table 2.

MAJOR FINDINGS

Of the 18 categories of T&E lessons learned in Table 2, this article will further discuss the top five categories (test design and execution, test planning, teamwork and communication, funding, and schedule). Note that far more students (41%–64%) had lessons learned in the top five categories than in the bottom 13 categories (5%–30% of students). This article contains a summary and detailed student comments and recommendations for each of the top five areas. This information can benefit the T&E community by providing detailed lessons learned, which might assist future T&E efforts and help acquisition leadership better understand the major T&E issues and concerns.

TABLE 2.
NUMBER OF STUDENTS WITH LESSONS LEARNED, IN EACH CATEGORY

LESSONS LEARNED CATEGORY	NUMBER OF STUDENTS	PERCENT OF STUDENTS
1. Test design, test methods, test execution, and analysis methods	192	63.8
2. Test planning	162	53.8
3. Teamwork and communication	141	46.8
4. Funding, budget, and cost	141	46.8
5. Schedule	122	40.5
6. Test infrastructure, test tools, test articles, and instrumentation	91	30.2
7. Test requirements	91	30.2
8. Safety and risk management	85	28.2
9. Government leadership and management issues and organizational politics	66	21.9
10. Contractor issues, including contractor leadership and management issues	55	18.3
11. Training issues	35	11.6
12. Modeling and simulation (used in conjunction with testing)	34	11.3
13. Interfaces, interoperability, and integration issues	33	11.0
14. "Stuff happens" (Murphy's law, weather)	32	10.6
15. Manpower issues	27	9.0
16. Immature technology and/or immature system	15	5.0
17. Commercial-off-the-shelf (COTS) and Non-development Item (NDI) issues	15	5.0
18. Poor judgment	15	5.0
Total Number of Students	**301**	**100.0**

THE TOP FIVE STUDENT CATEGORIES

TEST DESIGN, TEST METHODS, TEST EXECUTION, AND ANALYSIS METHODS (63.8 PERCENT)

Test design, methods, execution, and analysis methods are unquestionably among the largest factors that determine the success or failure of test events. Students offered the following advice in this area:

- Take the time to develop a robust T&E strategy and to determine the best (anticipated) test design and methods for your situation. Consult experts where necessary. Examine all facets of T&E such as instrumentation, data collection, analysis methods, test validity, test procedures, etc. For example, one might consider a side-by-side comparison of the existing and the new system. The new system may not meet all the requirements, but may be significantly better than the existing system. Without the comparison, the true conclusion may be missed.

- The devil is in the details. Student after student indicated that the little details (as well as the overall test design and execution) greatly affected the success or failure of their test events. For example, one detail of test planning might be to consider collecting diagnostic data, as well as test data. In case of equipment failure, the data can assist in determining the problem(s).

- Understand the test objectives, including how and why the test requirements were generated. Know the *what* and *why* behind limits and guidelines. Look at the system requirements, don't just accept them. Spend the time upfront with users and requirements developers to get the requirements well defined, especially where the requirements don't make sense. Often, the user may not know what he/she wants and why. Is the test relevant? Are the requirements realistic? The user will sometimes change the requirements, if the need is explained to them. Systems engineers and testers need to work together.

- Include tests at realistic operating conditions and at all corners of the envelope. These tests should occur prior to production or as early as possible. Measure all critical parameters and verify all requirements. Review the Test and Evaluation Management Plan (TEMP) and test plans versus requirements (e.g., was essential data collected and nonessential data not collected?).

TEST PLANNING (53.8 PERCENT)

Numerous students stressed the importance of thorough test planning. There are things one cannot or will not anticipate; stuff happens, people make mistakes. But proper anticipation and thorough planning will result in fewer problems in the long run, including a better chance of success and remaining within cost and on schedule. Good planning allows proper resource allocation and makes test execution far easier. Additional student comments concerning the importance of test planning and not cutting corners are as follows:

- Any test plan should have more than one person to review it. Make use of available expertise.

- Do analysis prior to testing to try to predict and anticipate results. This analysis will assist in identifying potential problems and developing contingency plans. It also helps identify needed changes to test plans.

- Plan for contingencies, especially weather. Have an alternate test plan/alternate test points available for each day of testing.

- When planning a test with others, start early. They were already busy before you came. Attempt to keep things simple. Questions should be clear and to the point. Follow their processes, if possible.

- Become an expert on systems you are testing. Tap into subject matter expert (SME) knowledge. Spend time with the user. Find out the user's priorities, concerns, and the reasons for these. Consider traveling to the factory or contractor facility. Obtain and study system documentation. Discuss design criteria with contractors, SMEs, users, maintainers, etc. The smarter you are about the system, the better decisions you will make, and others will not be able to hide issues that need to be brought out into the open.

- Early operational test agency (OTA) involvement is critical to reducing OT risk. The OTA should/could assist in requirements and concepts of operations (CONOPS) development, in early identification of T&E related systems concerns, in providing input aimed at conducting selected developmental test (DT) events in a more operational environment, etc.

- Plan for proper training, and make the case for extra training time, if needed. Training usually results in a better and safer test, better information, and better decisions. It almost always pays off in the long run.

TEAMWORK, COMMUNICATION (46.8 PERCENT)

Many students cited the importance of teamwork and communication as critical to minimizing and/or preventing T&E problems. Frequent, open, and timely communication (integrated product team [IPT] meetings or otherwise), along with consulting with SMEs when needed, undoubtedly increases the chance of program success. Students had a number of recommendations concerning the importance of teamwork and communication:

- Get support from and educate all involved commands and customers. Early involvement of all key parties (developmental and operational testers, evaluators, user representatives, program office personnel, range and safety personnel, specialty area experts, contractors, etc.) is critical. Resolve conflicts early, if possible. Understand the decision cycles and decision criteria of all involved organizations.

- Consult experts for any important matter, when lacking the necessary expertise. Ask for help when needed!

- Do not punish subordinates for finding errors or performing necessary rework. Establish a healthy team environment where discussions are open and candid and where people do not hide mistakes and problems.

- The IPTs work well when used correctly. They should consist of qualified and empowered team members from all key organizations and stakeholders, plus any needed SMEs. Get the best experts from each organization. Ensure expectations are well understood. If more organizations have input and more points-of-view are considered, more creative options may be generated, which lead to better decisions with better buy-in. There should be consistent, success-oriented, proactive participation: open discussions with no secrets. Issues and concerns should be raised and resolved early through critical dialogue, not just "group think." Reasoned disagreement should occur, with decisions based on reaching consensus, if possible. Ethical decision making is important, with action items worked quickly. Properly functioning IPTs can reduce confusion in an already complex process.

- The T&E effort on joint programs is much tougher to coordinate. Establish a joint T&E working integrated process team (WIPT), with the best experts from each service and continuous "up the line" communications. Joint programs are more challenged by rice bowls and politics, so communication is even more critical. Leadership and joint processes need to be established early. Goals, schedules, performance levels, logistics issues, and CONOPS are unique and different for each service. All these issues need to be worked out early.

- Test reports need to clearly communicate the facts. Write reports for all audience levels (executive summary in lay terms for executives, common technical terms for managers, attachments with appropriate technical jargon for engineers and analysts). Not all deficiencies are equal; prioritize and sort boulders from gravel, based on mission impact. Whenever a deficiency is mentioned, address impact and ease of correction. Include charts and tables that are easy to understand. Put the test methodology in an appendix. Report all results, good and bad, and document the value-added of this testing. Report test results with respect to conditions and mechanisms. Report bottom line results—what worked and what did not—and what decision makers need to know concerning the system's mission capabilities and limitations. Bad news does not get better with age; consider a quick-look report or interim results if decision makers need to quickly know the results.

FUNDING, BUDGET, AND COST (46.8 PERCENT)

This group of lessons dealt with the importance of adequate funding and the negative effects of inadequate funding on T&E programs. Student comments are as follows:

- With the current DoD budget situation, one of the hardest hit areas is T&E. But money and time saved by cutting corners up front is invariably spent in fixing problems later. Customers are unhappy, and it leads to increased cost in the long-run.

- Because of funding limitations, testers commonly execute only a small subset of the test events that should be required. Lack of funding results in delayed testing, test events that are limited in scope, data or reports that are not delivered, cancelled test events, and/or a nonrobust test program that fails to find the critical problems or issues. Unforeseen test requirements sometimes arise for which funding is unavailable.

- Seek to document and educate management and leadership that cost savings obtained by reduced testing may compromise or jeopardize final system quality or operation. And reduced testing, which allows systems to be fielded with undetected problems, could potentially endanger lives.

- To mitigate the risk of inadequate funding, seek to determine realistic cost estimates early in program development. Conduct thorough budget planning and review, consult with experts as needed, and include adequate management reserve for unanticipated problems. If there are cost and schedule constraints, fully document the impact. Include risk analysis and cost/benefit analysis to prioritize limited resources.

Testing is often hindered because of inadequate time available for testing.

SCHEDULE (40.5 PERCENT)

This group of findings dealt with the importance of an adequate schedule and the negative effects of inadequate schedule on T&E programs. Testing is often hindered because of inadequate time available for testing. Overly optimistic schedule estimates commonly lead to this problem as well as unforeseen problems, which decrease the time available or increase the time needed for testing. Program managers sometimes curtail testing in order to make up for lost schedule time. Students said the following:

- Take the time to understand and develop a realistic plan and schedule, including consulting with experts as necessary. Plan for realistic test and program schedules,

with time allowed for things such as maintenance, bad weather, and crew rest. Add cost and schedule contingency to each activity, not just at the end.

- Communicate the need for adequate scheduling, including probable effects if needed or planned testing is delayed or cancelled. A limited test program often results in higher overall program costs and longer overall schedule because discovery of problems is delayed. If there are schedule constraints, fully document the impact. Include risk analysis and cost/benefit analysis to prioritize limited resources.

COMPARISON WITH OTHER STUDIES

A literature search was conducted, and the results from this study were compared with the results from five other similar studies and documents. These studies and documents all examined and/or presented T&E best practices and lessons learned. A short description of each study and document follows:

DEFENSE ACQUISITION GUIDEBOOK SECTION 9.8, BEST PRACTICES (DAG, 2004)

This list of T&E best practices was prepared by developmental test and evaluation (DT&E), operational test and evaluation (OT&E), and live fire test and evaluation (LFT&E) experts at the Office of the Secretary of Defense (OSD). Best practices are offered to increase the likelihood of a successful T&E program. Some commercial industry T&E best practices are included in the list. However, other than that, the methodology for developing the DAG list of best practices is not stated. Since the OSD experts (who developed DAG Section 9.8) have extensive knowledge and experience in T&E oversight of DoD acquisition programs, presumably the list of best practices is (at least partially) based on this extensive T&E knowledge, experience, and expertise.

A MORE CONSTRUCTIVE TEST APPROACH IS KEY TO BETTER WEAPON SYSTEM OUTCOMES (GAO, 2000)

In this report, the General Accounting Office (GAO) examines (a) how the conduct of T&E affects commercial and DoD program outcomes, (b) how best commercial T&E practices compare with DoD's, and (c) what factors account for the differences in these practices. The report includes detailed discussion of DoD and commercial T&E best practices and lessons learned, along with recommendations for improving the conduct of T&E within DoD. The GAO conducted literature searches, interviewed numerous T&E experts, examined four DoD weapon programs, and analyzed T&E best practices of five leading commercial firms, including site visits with structured interview questions sent in advance of each visit.

RECURRING LESSONS IN WEAPON T&E PROGRAMS (HOIVIK, 2000)

This article summarizes and discusses significant issues and problem areas in conducting DoD T&E programs. More detailed analyses and findings may be found in two Naval Postgraduate School Master of Science theses, which are referenced in the article. Sources for the research efforts included studies of T&E in various major system acquisition programs, including information from program office personnel, testers, analysts, user representatives, and contractor T&E personnel. Literature searches and reviews were also conducted.

A STUDY OF COMMERCIAL INDUSTRY BEST PRACTICES IN TEST & EVALUATION WHICH ARE POTENTIALLY APPLICABLE TO DOD DEVELOPMENTAL TEST AND EVALUATION (SAIC, 2002)

This study presents a detailed discussion of commercial industry best practices, including how and why these T&E best practices have led to industry success. The study team made site visits to 12 leading commercial firms and asked them to identify T&E best practices that make them successful (structured interview questions were sent in advance of each visit). The team met with senior corporate managers, engineers, and technicians. The four focus areas for gathering information were: philosophy, policy, and approach; test investment; test execution; and test evaluation.

FLOYD AND WALLY'S OPERATIONAL TEST AND EVALUATION TOP 10 LESSONS LEARNED (SMITH & TUBELL, 2001)

Using knowledge acquired from their direct and indirect experience in Army OT&E, the authors share and discuss their hard-won lessons learned. Their top 10 lessons learned are presented, along with advice and recommendations.

COMPARISON WITH OTHER STUDIES: FINDINGS

Table 3 compares the results discussed in this article with results from the above five studies and documents. To develop Table 3, it was determined which of the 18 lessons learned/best practice categories were listed and/or discussed in each of the five documents. The 18 categories, ranked by frequency, represent only the results of the study discussed in this article. The author did not attempt to rank the findings from the other five documents. The author also did not address information contained in the other five documents that was outside the scope of the 18 categories.

The research methodology and/or population studied were different in each of the above studies. But the findings were similar in that this article's top findings were discussed in all of the studies, whereas the lower categories showed up in less of the studies (or in this article's study only). It is significant that the top six areas were discussed in all of the studies, as this shows that the same sorts of issues have repeatedly surfaced over the past five to ten years.

TABLE 3.
TEST AND EVALUATION BEST PRACTICES/LESSONS LEARNED STUDIES AND DOCUMENTS

LESSONS LEARNED/ BEST PRACTICE CATEGORY	MY FINDINGS	DAG	GAO	HOIVIK	SAIC	SMITH AND TUBELL
1. Test design, test methods, test execution, and analysis methods	X	X	X	X	X	X
2. Test planning	X	X	X	X	X	X
3. Teamwork and communication	X	X	X	X	X	X
4. Funding, budget, and cost	X	X	X	X	X	X
5. Schedule	X	X	X	X	X	X
6. Test infrastructure, test tools, test articles, and instrumentation	X	X	X	X	X	X
7. Test requirements	X			X	X	X
8. Safety and risk management	X		X	X	X	
9. Government leadership/ management issues, and organizational politics	X	X	X	X		
10. Contractor issues, including contractor leadership and management issues	X				X	
11. Training issues	X	X			X	
12. Modeling and simulation (used in conjunction with testing)	X	X			X	
13. Interfaces, interoperability, and integration issues	X	X			X	
14. "Stuff happens" (Murphy's law, weather)	X					
15. Manpower issues	X			X	X	
16. Immature technology and/or immature system	X		X			
17. COTS and Non-Development Item (NDI) issues	X			X		
18. Poor judgment	X					

CONCLUSIONS

Despite good intentions and some DoD progress, weapon system programs still suffer from persistent problems associated with late or incomplete testing (GAO, 2000). Several common lessons learned have surfaced over the years, as evidenced by the similar findings from this study and the five other studies and documents.

The purpose of this article is to identify and discuss common T&E best practices and lessons learned, thereby enabling possible cost and schedule savings and improved test results from future T&E efforts. Testers, evaluators, and program office personnel can certainly benefit from applying these lessons where they are not already doing so. Decision makers and acquisition/program leadership can benefit by better understanding the top T&E related issues, as reported by field-level T&E personnel.

Karen M. Stadler has 17 years of engineering/acquisition experience in the T&E; systems planning, research development, and engineering (SPRDE); and production, quality, and manufacturing (PQM) career fields. She is currently a professor of T&E with the Defense Acquisition University (DAU), and teaches all DAU T&E classes and several DAU systems engineering classes. She has a B.S. in chemical engineering from Purdue University, and is a former U.S. Naval officer.

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