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SPECIAL 50TH EDITION

DAUAA 2009 Research Paper Competition:
WINNING THE WAR FOR TALENT

COMPETITION WINNER
What Ever Happened to Certification?
COL William R. Fast, USA (Ret.)

COMPETITION WINNER
Keeping the Talent: Understanding the Needs of Engineers and Scientists in the Defense Acquisition Workforce
Alan K. Jenkins

COMPETITION WINNER
Leadership and Cultural Change: The Challenge to Acquisition Workforce Retention
Mike Kotzian

The Benefits and Limitations of Telecommuting
Jerome H. Collins
Joseph "Joe" Moschler

Acquisition Workforce Challenge—Motivation for Government vs. Industry Employment
John Dobriansky

Shaping the Life Cycle Logistics Workforce to Achieve Desired Sustainment Outcomes
Bill Kobren

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COL William R. Fast, USA (Ret.)

If the Department of Defense (DoD) is to *win the war for talent*, it must be concerned about the professionalism and competence of its acquisition workforce. To that end, the training, education, and experience requirements of the Defense Acquisition Workforce Improvement Act (DAWIA) were signed into law in November 1990. This research investigates how well the DoD is implementing DAWIA. A historical analogy is presented first, followed by the course of workforce certification, tracing its inception in the DAWIA through today's Human Capital Strategic Plan. Recent best practices in acquisition workforce development are also highlighted. Finally, current thinking in academia and the private sector is discussed to shed light on how to better motivate the acquisition workforce toward certification.

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(1960) Theories X and Y, and a three-part organizational commitment model of Meyer and Allen (1991), recent data on engineers and scientists in the acquisition community were examined. Findings include the motivating factors for organizational commitment were meaning obtained from one's job and growth and development opportunities. Retention efforts should focus on these areas rather than on areas where the government is less capable.

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Robert L. Tremaine

Since 1990 when Congress first passed the Defense Acquisition Workforce Improvement Act (DAWIA), the Department of Defense has provided ample guidance to "improve the effectiveness of the personnel who manage and implement defense acquisition programs." Eighteen years later, and after

an evolutionary training transformation intended to strengthen each functional area of expertise, the defense acquisition workforce is poised to meet even greater acquisition challenges. However, programs are becoming more technically complex. Acquisition challenges continue to dominate. Fortunately, the inherent synergy that already exists between Systems Engineering and Lean Six Sigma can help unravel the more difficult technical hurdles associated with many complex defense acquisition programs. This article addresses the common attributes that make their union the next logical step.

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DEFENSE ARJ EXECUTIVE EDITOR

Welcome to this very special issue of the *Defense Acquisition Review Journal (ARJ)*. In 2008, the DAU Alumni Association (DAUAA), along with the DAU Research Department, initiated the annual Hirsch Research Paper Competition for the DoD acquisition community (including all members of the Defense Acquisition Workforce, the DAU faculty, and the entire commercial defense industry). In 2009, the Hirsch Research Paper competition was conducted for the second time, and winners will be recognized at the DAU Acquisition Community Symposium on Tuesday, April 14, 2009. The theme for research papers in the 2009 competition is, "The Acquisition Workforce Challenge: Winning the War for Talent." The top three papers will receive the Hirsch Award and cash prizes of $1000, $500, and $250 respectively. A panel of subject matter experts reviewed all submitted research papers and selected the top three winners. This research paper competition results from a special relationship between the DAU Alumni Association, the DAU Research Department, and the *Defense Acquisition Review Journal*. I am extremely pleased and proud to publish the three winning papers for the second annual Hirsch Research Paper Competition in this issue of the *Defense ARJ*. The theme for the 2009 competition was very broad, and you will see many diverse topics in this issue. A total of seven papers were selected for publication in this issue.

The 1st-place winning research paper for the 2009 Hirsch Research Paper Competition is: "What Ever Happened to Certification?" by COL William R. Fast, USA (Ret.). The author uses an interesting historical analogy of the Civil War to explain some of the acquisition certification issues facing the acquisition workforce today.

The 2nd-place winning research paper is: "Keeping the Talent: Understanding the Needs of Engineers and Scientists in the Defense Acquisition Workforce" by Alan K. Jenkins. The author emphasizes that DoD should focus on mission and service instead of monetary benefits. Specifically, organizations should concentrate

on improving the connection between the individual worker and his/her role in accomplishing the organizational mission.

The 3rd-place winning research paper is: "Leadership and Cultural Change: The Challenge to Acquisition Workforce Retention" by Mike Kotzian. The author asserts that too often the approaches selected to increase workforce retention are associated with short-term practices such as pay increases, physical environment improvements, and teleworking. The retention problem, according to the author, can only be permanently resolved by using organizational change initiatives to better align culture types and leadership styles to those sought by workforce members.

Four additional research papers were accepted for publication from this research paper competition. The fourth research paper in this issue is: "Benefits and Limitations of Telecommuting: A Case Study for the DoD" by Jerome H. Collins and Joseph "Joe" Moshler. This paper analyzes the benefits and limitations of telecommuting on individuals and organizations within the DoD and society as a whole. The authors provide methodology for rational decision-making on this controversial subject.

The fifth research paper selected for publication was: "Acquisition Workforce Challenge—Motivation for Government Employment vs. Commercial Employment" by John Dobriansky. The author makes the case that government and its commercial contractors compete for acquisition and contracting talent, and that there are inherent commonalities and differences in government and commercial employees. These commonalities and differences were addressed: Professional Development, Promotions/Advancement, Pay Incentives, Employment Stability, Organizational Influence, and Retention.

The sixth research paper in this issue is: "Shaping the Life Cycle Logistics Workforce to Achieve Desired Sustainment Outcomes" by Bill Kobren. The author characterizes our current situation as a "perfect storm" of aging weapon systems in the inventory, high operational tempo rates in harsh environments, and reduced sustainment funding due to global economic slowdown. He articulates the challenges to a well-trained DoD life cycle logistics workforce, and offers solution sets for the future.

The final research paper in this commemorative issue is: "A New Acquisition Brew: Systems Engineering and Lean Six Sigma Disciplines Make a Great Mix" by Robert L. Tremaine. The author examines key similarities between professionals in these two functional areas. He thoroughly explains the commonalities in these important job skills: problem solving, process management, proper use of analysis/control tools, technical competence, and professional experience.

One final personal note from the Executive Editor: This issue of the *Defense Acquisition Review Journal* commemorates the second year of the Annual Hirsh Research Paper Competition. We received 11 research papers for the competition. Three were prize winners and seven were published. Thanks to all the authors who

dedicated their research time to this cause. Special thanks go to Jerome H. Collins and Joseph "Joe" Moshler, who also participated in last year's competition and were selected for publication in the *Defense ARJ* April 2008 edition. This is the kind of dedication that makes the acquisition workforce a special group, indeed. I want to also express my personal thanks to Professor Collins and Professor Moschler for their initiative and continued involvement.

Dr. Paul Alfieri
Executive Editor
Defense ARJ

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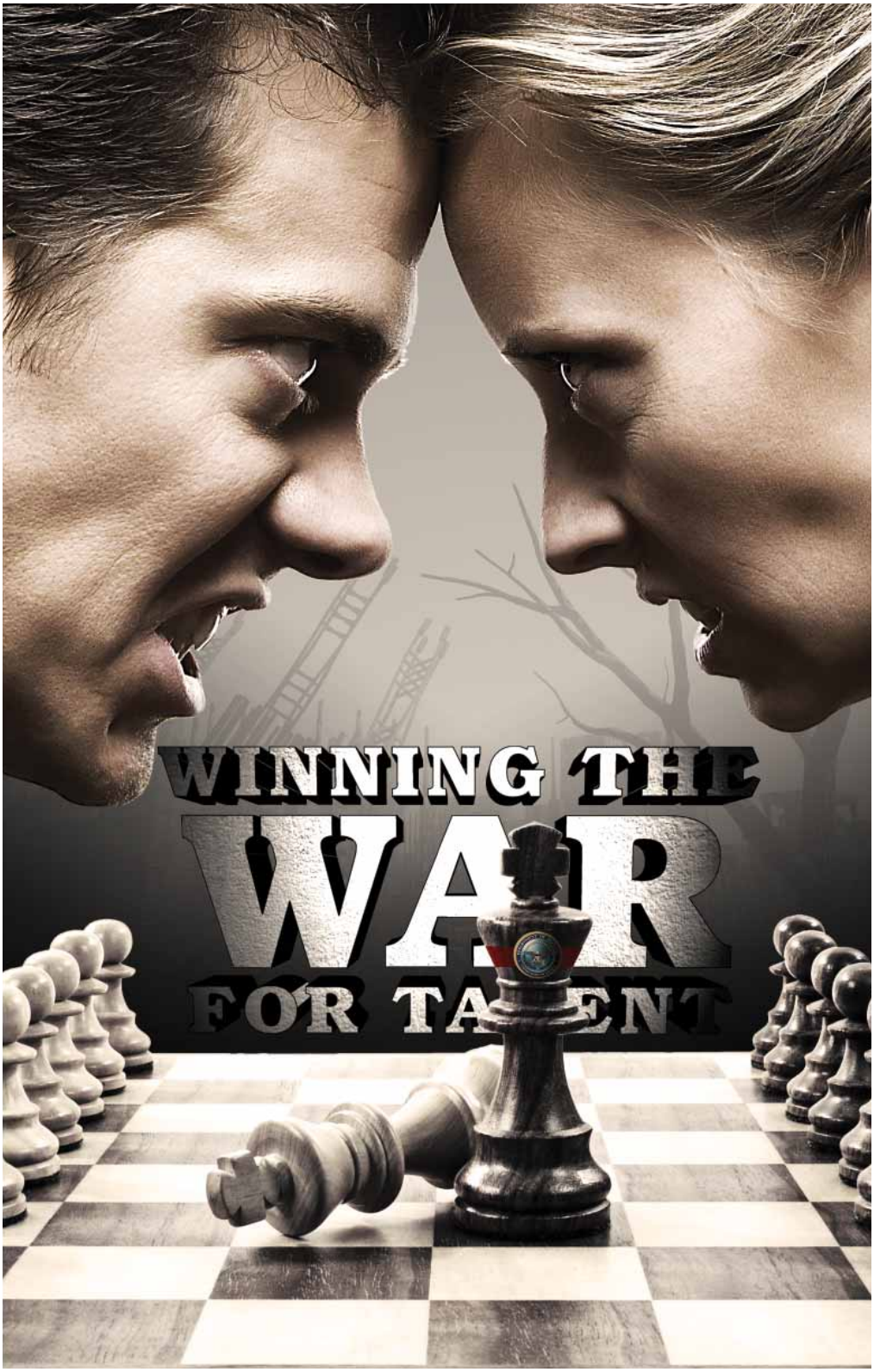

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WHAT EVER HAPPENED TO CERTIFICATION?

COL William R. Fast, USA (Ret.)

If the Department of Defense (DoD) is to *win the war for talent*, it must be concerned about the professionalism and competence of its acquisition workforce. To that end, the training, education, and experience requirements of the Defense Acquisition Workforce Improvement Act (DAWIA) were signed into law in November 1990. This research investigates how well the DoD is implementing DAWIA. A historical analogy is presented first, followed by the course of workforce certification, tracing its inception in the DAWIA through today's Human Capital Strategic Plan. Recent best practices in acquisition workforce development are also highlighted. Finally, current thinking in academia and the private sector is discussed to shed light on how to better motivate the acquisition workforce toward certification.

The primary purpose of this research was to investigate how well the training, education, and experience requirements of the *Defense Acquisition Workforce Improvement Act (DAWIA)* have been implemented by the Department of Defense (DoD). If the DoD is to *win the war for talent*, it must be concerned about the professionalism and competence of its *acquisition workforce*. First, a historical analogy was considered. Next, the course of workforce certification was traced from its inception in the DAWIA through today. Recent *best practices* in acquisition *workforce development* were also studied. Finally, current thinking in academia and the private sector was sampled to shed light on how to better motivate the acquisition workforce toward certification.

A HISTORICAL ANALOGY—TALENT WARS DURING THE CIVIL WAR

In 1861, on the eve of the American Civil War, the active officer corps of the Regular army numbered 1,080. When Confederate President Jefferson Davis (West Point class of 1828 and a veteran of the Mexican War) called for a 100,000-man volunteer force, 286 of these officers entered the Confederate army. Of the 824 West Point graduates on the active rolls at the time, 184 went with the Confederacy, including the likes of Generals Robert E. Lee and Thomas "Stonewall" Jackson. In addition,

the pre-war South had an established military tradition and several military institutions that produced two dozen general officers and even more talented regimental and staff officers (Matloff, 1996, p. 188).

On the federal side, President Abraham Lincoln (whose military experience consisted of three months with the Illinois militia during the Black Hawk War) was initially left with two types of officers (Millet and Maslowski, 1984, p. 173). The first type preferred to exaggerate their difficulties and not fight battles. Even though he was a West Point graduate, General George B. McClellan epitomized this type of general officer as he failed to commit his reserve during the battle of Antietam (1862). Lincoln also selected some of his generals from among leading politicians in order to generate broader support for the war. The Union Army also had to live within an existing military department structure that promoted officers based upon their years of service (seniority) over their abilities. On the Confederate side, Davis promoted based upon ability and rarely let politics dictate the selection of military commanders. Thus, in the first two years of the war, the Confederate officers generally out-performed their federal counterparts.

Methods of developing and promoting the acquisition workforce should recognize capability.

The other type of officer found in the Union army could be characterized by General Ulysses S. Grant. After rising to General in Chief of the Union army in March 1864, Grant was relentless in his attacks on Lee's army of Northern Virginia. And, by April 1865, as Grant pursued Lee to Appomatox, a new generation of Union officer—officers who would take the fight to the enemy—had advanced through the ranks and replaced the politician-generals. By then, however, the South was exhausted and the Civil War was rapidly coming to an end.

From the many lessons that can be gleaned from this historical analogy, three are particularly applicable to today's war for talent. First, the sudden nature of the coming Civil War gave little time for recruitment, training, development, and testing of officers on either side of the Mason-Dixon line. Unprepared as either side was for the conflict, the initial advantage went to the South based not solely on the number of West Point-trained and experienced officers, but on other pools of talent—the Southern military institutions. Today, defense acquisition stands on the brink of entering the war for talent. Experienced acquisition workforce employees from the baby boomer (born 1946–1964) and veteran (born before 1946) generations are poised to retire in great numbers and today represent 76 percent of the civilian acquisition workforce. The generations in training and development, those behind the boomers and veterans, represent only 24 percent of the civilian workforce and cannot replace them on a one-for-one basis (USD[AT&L] *Human Capital Strategic Plan*, 2007). Defense acquisition leaders must seek other pools of talent as quickly as possible.

Second, the selection procedures and military experience of President Davis quickly elevated his most capable officers to key leadership positions. As a result, the Confederate army had a decided advantage over the Union army in the first two years of the war. And so it is today. Methods of developing and promoting the acquisition workforce should recognize capability. Recruiters need to clearly articulate defense acquisition workforce education, training, and experience requirements so as not to mislead potential workers. And, development policies and procedures must be reviewed to ensure that they do not inadvertently cause the most capable and experienced acquisition workers to depart for greener pastures.

Third, out of necessity, the army of the Potomac rid itself of the incompetent and political general officers, replacing them with younger men who were trained to take the fight to the enemy. At war's end (April 1865), these general officers were only in their mid-twenties, meaning that their training and experience had come on the fields of battle (Woodhead, 1991, p. 19). Not to insinuate that the baby boomer and veteran generation workers are incompetent or political, but it may only be four to five years before those that will replace them have to perform on the defense acquisition *field of battle*. Now is the time to get the next generation certified. Now is the time to let them participate as team players in key acquisition and contract actions. Now is the time to mentor and coach them in the finer points of defense acquisition and let them try their hand at managing the most challenging programs.

CERTIFICATION—A GOOD IDEA YET TO BE FULLY IMPLEMENTED

The DAWIA was born out of 40 years of frustration (1949-1989) with programs that failed to meet cost, schedule, and performance goals. In June of 1990, legislation was introduced by Congressman Mavroules (D-MA) to require that all acquisition workforce members meet education, training, and experience requirements appropriate to their position. For the taxpayer, a competent workforce would mean fewer cost overruns, schedule slips, and weapon systems that worked. With an overwhelming vote of 413 to 1 in the House, DAWIA (H.R. 5211; P.L. 101-510; and now, 10 U.S.C., Chapter 87) was enacted on November 5, 1990. DAWIA was a mandate to the Pentagon to get the acquisition workforce certified (Edgar, 2001). So, how did defense acquisition leaders comply with this certification mandate over the next 18 years?

Unfortunately, the Department of Defense was left to come up with the certification standards and reporting requirements. First, the DoD established four acquisition corps—one in each military department and one for the defense agencies (also termed the *4th Estate*). Each of the components was to maintain their own certification records and report management information on a regular basis to the Defense Manpower Data Center (see DoD Instruction 5000.55, 1991, *Reporting Management Information on DoD Military and Civilian Acquisition Personnel and Positions*). Membership in the four acquisition corps was based on holding a critical acquisition position (CAP). It was assumed that the person holding the CAP would meet certification requirements.

Second, after forming numerous acquisition career field committees, the training, education, and experience standards were announced in January 1993 (see DoD 5000.58-R, 1993, *Acquisition Career Management Program*)—over 2 years after

DAWIA was enacted. However, there was one fatal flaw to the implementing regulation: no time limit was given for compliance with the certification standards. In fact, members of the acquisition workforce could encumber a CAP for up to 18 months without meeting the education, training, and experience requirements for the position. Components reported their total number of CAPs by career field, and it was assumed that the incumbents in those positions were certified, whether or not they really were (e.g., see Defense Acquisition Workforce Improvement Reports in the 1995–1999 *Annual Reports to the President and Congress*). So, not only was the recording of certifications decentralized, but no goals were established for attainment of certifications by the acquisition workforce.

Seeking to harvest the *peace dividend* after the fall of the Berlin Wall and the demise of the Soviet Union, Congress began legislating reduction to the size of the acquisition workforce. From 1993 to 1998, the quality of the workforce seemed to take a back seat to reductions in workforce size and associated cost savings. Some Services and components were tracking progress toward certification of the

For the taxpayer, a competent workforce would mean fewer cost overruns, schedule slips, and weapon systems that worked.

workforce, others were not. No one at the Office of the Secretary of Defense was collecting or reviewing certification data. As the adage goes, "you can't improve what you don't measure." And, when asked why certification was not complete, the components could always point to a lack of classroom seats and student throughput at DoD's corporate university, Defense Acquisition University.

Also during this time, defense leaders became concerned about the retirement of the baby boomer generation (born 1946–1964). By 1998, the first boomers were just 10 years from retirement eligibility (age 62 in the year 2008). There was fear that boomers would exit the acquisition workforce in great numbers, taking with them years of experience and knowledge. This "brain-drain" had to be stopped. Internships, succession planning, and mentoring were just a few of the many programs established to ease the impending loss of talent. The private sector was also concerned about the loss of boomers and the effect that would have on the pool of knowledge workers for the emerging information-based economy. First introduced in 1997, McKinsey and Company coined the term *the war for talent* based on their research into how the best companies attract, develop, and retain the people needed to build a strong managerial talent pool (Michaels, Handfield-Jones & Axelrod, 2001).

The new millennium brought new emphasis on the acquisition workforce. This time, the issue was performance, and *pay for performance* seemed to be the answer. Under an acquisition workforce demonstration project, the army led the way in show-

ing that the general schedule for civilians could be replaced by pay bands, thereby rewarding the "high performers" for their performance. Perhaps this incentive would be the answer to persistent problems with the acquisition system. However, lost in the all of the revelry of the time was the enforcement of certification standards. Any emphasis on compliance with the intent of DAWIA had been lost.

No wonder the Congress had to step in again in 2003 with DAWIA II (Public Law 108-106) to attempt to put some teeth into the certification process. The law required that the four acquisition corps be rolled into a single defense acquisition corps. Whereas the previous acquisition corps had been defined by position (i.e., military O–4 and above; civilian GS-14 and above), DoD now required that prospective members of the defense acquisition corps first meet Level II education, training, and experience requirements in an acquisition career field. Now, critical acquisition positions could only be filled by acquisition corps members. In addition, there were to be no waivers of certification requirements to join the acquisition corps. Moreover, a management structure was put in place to provide oversight and to hold the components responsible for certification results.

Unfortunately, DoD implementation of DAWIA II extended the timeframe for compliance with certification from 18 to 24 months, and members who can not achieve certification can obtain a waiver. In addition, it introduced a new management category—*Key Leadership Positions* (KLPs)—to be targeted for intensive management (DoD Directive 5000.52, 2005). In the past, management attention was directed toward CAPs. By 2004, there were about 21,000 CAPs. Defense acquisition leaders felt that this number was too large, so they invented the term *Key Leadership Position* to help focus their management attention. The objective was to hold the number of KLPs to 1,500 positions so that acquisition leaders could provide better management of these positions, enhancing program stability and accountability (DoDI 5000.66, 2005).

By 2005, concern over "brain-drain" from the retiring baby boomers, pending experience gaps, and emerging shortages of labor pools in the technical, engineering, and scientist skill areas led defense acquisition leaders to embrace human capital strategic planning. Supported by an analysis of acquisition workforce trends (RAND, 2008), the Acquisition, Technology, and Logistics Human Capital Strategic Plan was first issued in 2006 (and updated in June 2007). Unfortunately, by 2006 only 50 percent of acquisition workers met or exceeded the education, training, and experience required for their positions. That number rose to 56 percent in 2007. To address the certification problem, the plan identified two tasks. First, the components were to develop and implement strategies to meet target certification levels (even though these targets were not defined in the plan); and second, the oversight process was to ensure workforce competency (USD[AT&L] Human Capital Strategic Plan, 2007, Tasks 1.4.1 and 6.2.2.).

Since 2004, defense acquisition leaders have also encouraged the components in workforce competency through an annual workforce development awards program. The components submit best practices in workforce development that are judged by a panel of experts. All best practices, including those that did not win the top awards, are included in the awards brochure. A review of these best practices over the past 5

years reveals that 59 of 319 best practices (18.5 percent) were in the areas of certification management and innovations for achieving the education, training, and experience standards required by DAWIA.[1] The review also noted that 11 best practices were from acquisition commands that had established acquisition training operations of their own. Eight of these operations used the term *academy* or *university* in naming their new training organization. In all cases, these new organizations appear to have supplemented the required DAWIA training courses in various career fields to more fully enable their acquisition workforces (USD[AT&L] Workforce Development Award, 2004–2008).

It has now been about 10 years since McKinsey and Company performed their study that led them to proclaim that a war for talent had broken out. Back in 1997, they identified five imperatives that companies needed to be successful in this war: 1) embrace a talent mindset; 2) craft a winning employee value proposition; 3) rebuild your recruiting strategy; 4) weave development into your organization; and, 5) differentiate and affirm your people. While the first four imperatives are relatively easy to understand, the fifth needs a bit more explanation. Essentially, McKinsey and Company proposed that employees be identified as A, B, or C players based upon rigorous talent reviews. Once differentiated, the A players should be affirmed differently from the B and C players through such tools as fast-track development opportunities and significantly higher compensation (Michaels, 2001).

As a management and human resources advisor, McKinsey and Company helped turn Enron into the ultimate talent company. Talented employees were "differentiated and affirmed" through a performance review process called "rank and yank" (Gladwell, 2002). Rising stars were promoted without regard for experience. Seemingly "smart" people were paid much more than they were worth. Some accelerated employees moved up so quickly that there was not time for performance evaluations—yet, they kept rising based upon their ability to take risks. Even if these rising stars failed, they were promoted. That kind of aggressive, risk-taking behavior was thought to be the most important engine driving Enron's performance. The failure of Enron was that it believed in stars more than it believed in systems. While it had plenty of stars, it had ignored the checks and balances that only an organization and systems can provide. Gladwell (2002, p. 33) concludes that Enron was "looking for people who had the talent to think outside the box. It never occurred to them that, if everyone had to think outside the box, maybe it was the box that needed fixing."

Today, McKinsey and Company are singing a different tune. They are advising managers to not focus solely on the top performers, but to target talent at all levels, regardless of gender, age, nationality, or academic achievements (Guthridge, 2008) (see also Guarino, 2007, in *Smart is not enough!* for the importance of recruiting and developing ambitious academic underachievers). Perhaps this shift away from imperative No. 5—"differentiate and affirm"—was a lesson learned in the Enron scandal.

Has defense acquisition fallen into the same trap? Have defense acquisition leaders opted for the latest out-of-the-box thinking like pay for performance, rising star development programs, and human capital management plans without regard for developing and certifying talent at all levels? Or, have acquisition leaders simply

not followed up on, or enforced the requirement for workforce certification? Is the acquisition workforce certification box broken and in need of repairs? Can academia or the private sector offer any advice or best practices?

CURRENT CONCEPTS—THE WAR FOR TALENT REVISITED

A review of recent literature indicates that the way in which talent has been managed in the past will not be sufficient in the future. In 1997, the McKinsey and Company research identified three forces fueling the war for talent: 1) an irreversible shift from the Industrial Age to the Information Age; 2) an intensifying demand for high-caliber managerial talent; and, 3) a growing propensity to switch companies (Michaels, Handfield-Jones, & Axelrod, 2001). These three forces can be used to categorize current thinking on talent management.

IRREVERSIBLE SHIFT FROM INDUSTRIAL AGE TO INFORMATION AGE

In their book, *The Minding Organization*, Moshe Rubinstein and Iris Firstenberg reframe the organizational paradigm. In the industrial age, organizations operated like railroads on fixed rails, with fixed plans and rigid time schedules. Back then, a customer needing transportation from point A to point B had to get to the station in time to catch the scheduled train. Today, enabled by ubiquitous information, the organizational metaphor has changed to one of a taxicab service, moving freely about the city streets, with only partial plans for the day that can be changed in order to meet customer needs as the future unfolds. The customers get better service because decisions on where and when to travel are made at the time needs arise. However, this way of doing business requires that the organization be able to deal with change and uncertainty because it is operating in a very chaotic environment (Rubenstein & Firstenberg, 1999, p. 19).

To thrive in chaos, companies must be able to reframe their thinking and bring the future to the present. They do this by creating chaos up front (deliberate chaos) and framing their processes to manage this chaos early, rather than at the end when failure and loss of customer confidence would be fatal. They set the conditions for the success of their employees. They empower their employees by embracing concepts such as self-organization to spark creativity. They also create an environment that permits honest mistakes and errors so the organization can learn from them. Finally, the leadership brings the future to the present by envisioning the desired end result or end state for their employees. Leadership describes what the future looks like but lets the employees take them there (Rubenstein & Firstenberg, 1999).

Futurist Jim Carroll in the forward to *The Rise of the Project Workforce: Managing People and Projects in a Flat World* declares that members of today's "snowboard generation" are "fiercely collaborative and extremely competitive" making them uniquely suited to project management (Melik, 2007, preface). Carroll posits that generational changes in the workforce necessitate a change of attitudes toward work, organizational structure, and careers. Specifically, there is an entire generation of talent (e.g., snowboarders) that would prefer short-term, project-oriented assignments rather than long-term career paths. The majority of engineering students today believe

that a full-time career is about 2 to 5 years long. So, the baby boomer generation idea of long-term project teams needs to change to fit the snowboarder mentality. Baby boomers are also the last generation to define themselves by their careers.

INTENSIFYING DEMAND FOR HIGH-CALIBER MANAGERIAL TALENT

Human capital plans must target talent at all levels. With a workforce composed of multiple generations (i.e., veteran, baby boomer, X/Y, and millennium generations), talent management models must address value propositions appropriate to the generation (Guthridge, 2008). For example, baby boomers are attracted to employers who value experience and who tell them that they will have the chance to change things for the better. On the other hand, generation X (born 1965 to 1976) wants to know that they will have a life outside of work and that their talent, not their experience, is most important (Ahlrichs, 2007; SkillSoft, 2006).

Human capital plans must address both the uncertainly of supply of talent and the risk in estimating demand for talent. On the supply side, Cappelli (2008) says that employers need to move away from the "organization-man" philosophy where the firm decided when the employee was ready for advancement and defined the next position. Today, employees want to take control of their own career development and should be empowered to do so. Internal job boards can promote job change within the company rather than outside the company, thereby preserving the investment made in employee development.

On the demand side, Cappelli (2008) says that employers should assess the trade-offs between "making" and "buying" talented employees. By shortening the time horizon for talent forecasts, just-in-time training and coaching of selected employees might close the talent gaps (Hargrove, 2007). Kram and Higgins (2008) say that the world has gotten too complicated for one-on-one mentoring. A better approach is to create a developmental network of people, both inside and outside the organization, that possesses a variety of skills and can identify all the opportunities needed to prepare for the future.

In a study of the performance portability of National Football League punters and wide receivers, Groysberg (2008) found that punters are easily imported to a new football team because their performance is almost completely dependent on their own strength and skills. However, when traded to another team, the performance of wide receivers initially dropped and recovered only after they adjusted to, and built cohesion with, their new teammates. These results suggest that managers who hire rising stars from the outside for positions that require teamwork should expect that it will take them some time to connect with their new team before achieving top performance.

GROWING PROPENSITY TO SWITCH COMPANIES

Employee mobility is a fact of life in the war for talent. Typically, employers take defensive actions like increasing salaries and benefits or changing the work environment when employees threaten to quit. Then, when employees with a non-compete clause actually jump ship to work for a competitor, lawsuits are filed as a retaliatory

measure. Both of these approaches are costly and embrace a win-or-lose attitude toward employee turnover. Somaya and Williamson (2008) propose that employers consider the social capital of their relationship with departing employees.

When positive relationships are maintained and nurtured, there is potential for access to new talent pools and future "boomerang" hires (i.e., hiring a former employee). Such was recently the case at the Defense Acquisition University, which maintains relationships with some of its former students and faculty via an alumni association. When one of the university's deans sought to fill several new faculty positions, he sent e-mails to members of the alumni association. In so doing, he leveraged the positive relationship that these alumni had with the university to garner candidates for the job openings. More importantly, he understood the skills of this talent pool and knew they could be brought on board quickly, saving time and money.

Research has shown that effective coaching and mentoring pays off not only in performance, but also increases job satisfaction and decreases turnover.

Managing social capital does one other thing; it goes a long way in telling people that they are valued—that people are the greatest asset of the employer. People-centered employers understand this and, taking the concept one step further, they win talent wars because their "employer brand" delivers as advertised. In other words, employers that claim to be innovative do in fact listen to their employees and take action on their creative ideas. Employers that claim to be socially responsible do in fact demonstrate socially responsible behaviors in the marketplace. People-centered employers build enduring relationships that serve to retain current employees and attract new ones (Thorne & Pellant, 2007; Ahlrichs, 2000). They advocate, like Covey (1991) in *Principle-Centered Leadership*, that people-centered employers "walk the talk" thereby unleashing the creativity, talent, and energy inherent in their employees.

Research has shown that effective coaching and mentoring pays off not only in performance, but also increases job satisfaction and decreases turnover. Leaders who understand and use their "emotional intelligence" to sense how to give effective feedback demonstrate empathy, which is key to the retention of knowledge workers in today's information economy (Goleman, 1998). Moreover, smart people are more often motivated by awards rather than money. Employers that recognize the accomplishment of employees in front of their peers make it harder for them to leave and keep them much more engaged in their work. In addition, key talent who are allowed to self-organize to solve problems, working both inside and outside the management hierarchy, more often feel that they are contributing (Fryer, 2001).

CONCLUSION

The American Civil War Battle of Gettysburg (July, 1863) is considered the "high water mark of the Confederacy." It was during this historic battle that momentum shifted from the Confederate army to the Union army. This shift was due, at least in part, to the attitudes of the Union general officers who moved from the defense to the offense, taking the battle to the enemy, just as the Confederate army had done from the beginning of the war. In every sense, the Union army got back to the basics of Napoleonic warfare—the operations and tactics that the Union's West Point graduates had learned so well but had been slow to implement.

Like the general officers of the Union army, this research has shown that defense acquisition leaders of this era have been slow to implement DAWIA certification. In 2007, only 56 percent of acquisition workers met or exceeded the education, training, and experience required for their positions. Undoubtedly, this lack of professionalism and competency has affected the execution of defense acquisition programs. Just read the selected acquisition reports sent to Congress. In 1997, 7 years after DAWIA was enacted, 38 percent of the Major Defense Acquisition Programs (MDAPs) breached established cost, schedule, and performance goals. Last year, 36 percent of the MDAPs breached these goals.[2]

In a politely worded indictment of the defense acquisition workforce, Section 852 of the Fiscal Year 2008 National Defense Authorization Act called for the Secretary of Defense to establish a fund to be known as the *Department of Defense Acquisition Workforce Fund* to provide funds, in addition to funds already available, for the recruitment, training, and retention of defense acquisition personnel. In addition to providing incentives for attracting new workers to defense acquisition and for retaining experienced workers, *funds are to be used to make changes to the types of skills needed in the future workforce*. The question that begs an answer is this: Why, after 17 years since DAWIA mandated education, training, and experience standards, is defense acquisition in the predicament that future workforce skills remain undefined?

Acquisition leaders and the acquisition workforce need to get serious about certification standards. Current thinking from the private sector and academia reveals that acquisition leaders must describe the future and motivate the workforce to achieve that future. To motivate acquisition workers to achieve education, training, and experience standards, leaders have to understand motivational differences between the different generations of the workforce.

Human capital plans must include defined strategies as to how the acquisition workforce will become certified and then remain current in their respective career paths. These plans must target all levels of the workforce. "Rank and yank" methods of identifying and promoting rising stars without the requisite experience should be questioned. All workers should be empowered to manage their own careers and reach their maximum potential. And, because of the importance of teamwork and trust, leaders should be careful when bringing in outsiders to work in the defense acquisition environment.

Finally, the defense acquisition workforce will be mobile. Workers will move freely in and out of defense acquisition positions, and that fact must be taken into ac-

count when developing workforce certification programs. However, winning the war for talent will not be a challenge if the acquisition workforce is seen, both inside and outside of government, as a model of professionalism and competence based upon full compliance with clearly stated education, training, and experience requirements.

Keywords:
Acquisition Workforce, Best Practices, Defense Acquisition Workforce Improvement Act (DAWIA), Human Capital Strategic Plan (HCSP), Workforce Development

COL William R. Fast, USA (Ret.), facilitates financial and program management courses at the Defense Acquisition University. He also writes and speaks on various management topics and provides consultation services to defense acquisition programs. From 1996–1998, he served as the Career Development Manager for Army Acquisition Corps Officers and participated in the Congressionally mandated Section 912 (1998 National Defense Authorization Act) study of the future acquisition workforce.

(E-mail address: william.fast@dau.mil)

AUTHOR **BIOGRAPHY**

ENDNOTES

1. The 2004 through 2008 USD(AT&L) Workforce Development Awards yielded a total of 120 acquisition organizational submissions. All best practices were placed into one or more of these six categories: 1) DAWIA education enhancement; 2) DAWIA training enhancement; 3) DAWIA experience enhancement; 4) recruitment practices (including co-op hiring, intern programs, and student career exchange program); 5) development practices (including leader development, team development, executive coaching, mentoring, human capital planning, and succession planning); and 6) retention practices (including award programs, telework, and student loan repayment). A best practice pertaining to two or more categories was credited to each of those categories. The 59 best practices cited are the sum of the best practices categorized in the DAWIA education, training, and experience enhancement categories.

2. Data for these statistics were derived from two sources. A query of Defense Acquisition Information Retrieval (DAMIR) provided the number of calculated breaches by major defense acquisition program as reported in Selected Acquisition Reports to the Congress in 1997 and 2007. Included were cost, schedule, and performance breaches of the acquisition program baseline, and both current and original breaches of program acquisition unit cost and average procurement unit cost, per Nunn-McCurdy. The number of major defense acquisition programs was taken from December 1997 and December 2007 Selected Acquisition Reports summary tables retrieved from http://www.acq.osd.mil/ara/am/sar/index.html. Percentages were determined by dividing the number of breaches in the year by the number of major defense acquisition programs in the year. Programs with multiple breaches in a particular year were only counted as having one breach in that year.

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KEEPING THE TALENT: UNDERSTANDING THE NEEDS OF ENGINEERS AND SCIENTISTS IN THE DEFENSE ACQUISITION WORKFORCE

Alan K. Jenkins

The need to focus on retention efforts for acquisition professionals, specifically engineers and scientists, is becoming more evident with the aging of the general civil service population, decline in domestic engineer and scientist production, and increase in worldwide demand for those professional groups. Using a framework that integrates Maslow's (1954) hierarchy of needs, McGregor's (1960) Theories X and Y, and a three-part organizational commitment model of Meyer and Allen (1991), recent data on engineers and scientists in the acquisition community were examined. Findings include the motivating factors for organizational commitment were meaning obtained from one's job and growth and development opportunities. Retention efforts should focus on these areas rather than on areas where the government is less capable.

The United States federal government is like most organizations with respect to the need for talented personnel. The ability to attract and retain talent along with increased competition for talented personnel is also common to most organizations. However, the government has a particular issue not faced by other large organizations in that the majority of the federal workforce can retire within the next decade (Thompson, 2008; Zeller, 2004). To compound the issue, part of the federal workforce, *engineers and scientists*, will face an increasing demand for their talents in the coming years. Clearly, those leading and managing this professional group must understand the factors that retain engineers and scientists within their respective organizations. This article addresses the background of the potential shortage of engineers and scientists, a framework for *workplace satisfac-*

tion and *organizational commitment*, factors affecting workplace satisfaction and organizational commitment, findings from a recent research effort on engineers and scientists in the acquisition community, and implications and recommendations for an organization's leadership with respect to retaining its engineering and science professionals.

BACKGROUND

Albano and Leaver (2004), Wilson (2003), Thompson (2004), and Zeller (2004) among others have noted the potential crisis of massive departures by the federal workforce. However, Shoop (2005) noted that the government would not suffer from an organization-wide crisis but from hundreds of smaller crises from the loss of personnel. These crises include departures to pursue careers with other public or private industry organizations, and retirement from the workforce completely.

Within the acquisition community, engineers and scientists can be found throughout most disciplines. Doyle and Colvard (2006) highlighted the need for engineers and scientists within the U.S. Navy. Like many of the armed services, the civilian engineers and scientists working for the Navy bridge the gap between the Services' mission and technology. With respect to external competitors, the federal government will have difficulty in keeping and replacing its engineering and science workforce (Gropp, 2004).

When a person departs a team or organization, there are indirect and direct costs associated with the loss. Specifically for technical and knowledge workers like engineers and scientists, a departure signifies a loss of expertise and capability (Stovel & Bontis, 2002) because the knowledge worker keeps the means of production rather than leaving it at the former workplace. Other indirect costs include the lower morale and lower customer satisfaction (Kaye & Jordan-Evans, 2003).

Direct costs are more easily calculated. To replace an employee, the organization must spend, in terms of work-year costs, between ½ work-years (Earle, 2003; Hillmer, Hillmer, & McRoberts, 2004; Ramlall, 2004) to 3 work-years (Earle, 2003; O'Leary, 2003). Recruiting, training, certification, and recapturing productivity are a few of the areas where the organization incurs costs. If the replacement requires specialized training, warrants, or security clearances, the costs could increase beyond 3 work-years.

The loss of engineering and science personnel within the acquisition community poses a difficult problem for its management. Supply of engineers is lagging demand (Doig & Beck, 2005). In addition, the United States is producing fewer domestic engineers and scientists each year (Butz et al., 2003; Lavigna & Hays, 2004). To compound the difficulty of a decreasing supply, demand for engineers and scientists is increasing worldwide (Brown, 2004; Manning, Masini, & Lewin, 2008). How the organization will address increased demand and decreased supply will determine whether its personnel remain with the organization or depart. Understanding what keeps personnel with an organization may be the first step to finding viable options for *retention* efforts.

FRAMEWORK FOR WORKPLACE SATISFACTION AND ORGANIZATIONAL COMMITMENT

Two theories of workplace satisfaction and motivation that continue to be relevant for the acquisition community are Maslow's hierarchy of needs and McGregor's Theory X and Theory Y (Jenkins, 2008). Meyer and Allen's (1991) three-part organizational commitment connects the workplace factors such as pay and benefits to the level and type of commitment an employee has for his or her organization. The framework for understanding workplace satisfaction and organizational commitment integrates McGregor's Theories X and Y, Maslow's hierarchy of needs, and Meyer and Allen's three-part organizational commitment theory.

MASLOW

In 1954, Maslow developed a hierarchy of needs to explain a person's motivation. The base level related to physiological needs. Once the physiological needs were met, the next level of security needs could then be pursued. Two subsequent levels of community and esteem needs had to be sequentially met before the top level of self-actualization needs could be met (Maslow, 1954). People have a need to continue moving up to higher levels of motivation (Maslow, 1998).

In the workplace, Maslow's hierarchy can be translated into job-related factors. Table 1 details the workplace needs and motivational order. The higher order needs cannot be met until the lower order needs have been satisfied. If the employee is operating at the community needs level and a perceived threat to his or her income emerges, the employee moves down to the security needs level, meets it, and then works on satisfying the next higher level.

TABLE 1. WORKPLACE INTERPRETATION OF MASLOW'S HIERARCHY OF NEEDS*

Motivational Order	Maslow's Hierarchy of Needs	Workplace Interpretation of Maslow's Hierarchy of Needs
Highest	Self-Actualization Needs	Meaning, Innovation
	Esteem Needs	Position, Rank, Respect
	Community Needs	Teams, Co-Workers, Professional Organizations
	Security Needs	Income Security, Freedom from Fear, Safe Working Conditions
Lowest	Physiological Needs	Wages, Benefits

**Jenkins, 2008; see also Winder, 2003.*

MCGREGOR

McGregor (1960) used Maslow as a foundation for understanding how managers view their employees. Theory X states that employees do not want to work and

must be forced into performing; they prefer direction as a way to avoid responsibility (McGregor). Theory Y states that employees like to work and do not have to be forced in order to perform; they will take responsibility when the work environment permits (McGregor). Theory X factors are related to physiological and security needs,

Increasing motivation increases productivity.

and Theory Y factors are related to community, esteem, and self-actualization needs. Of note is that a manager must meet the needs of the employees at the lower levels before being able to improve the performance of his or her employees, regardless to which of McGregor's theories he or she may subscribe. Increasing motivation increases productivity (Halepota, 2005) and the likelihood that an employee will remain with his or her organization (O'Leary, 2003; Ramlall, 2004).

ORGANIZATIONAL COMMITMENT

How an employee feels toward his or her organization and continuing in that organization is organizational commitment (Meyer & Allen, 1991). Meyer and Allen separated organizational commitment into three parts, which describe three distinct aspects of commitment: affective, normative, and continuance commitment. The first is affective commitment and is perhaps the most common interpretation of organizational commitment.

Affective commitment refers to the desire of an employee to continue working with his or her specific organization (Meyer & Allen, 1991) and operates at the highest order of an individual's needs. An employee fulfills self-actualization and esteem needs through belonging to a specific organization. Belonging to a community or identification with a community operates on needs that are more normative.

Normative commitment refers to the desire or perceived obligation of an employee to remain with an organization (Meyer & Allen, 1991). For example, a summer-hire student may have a sense of obligation to work for his or her employer after graduation based upon the opportunities provided to him or her as a student. The sense of obligation can extend to a type of organization. For example, a person may feel the need to support national defense and choose that industry through public or private service. Loyalty to a particular team or effort also is a part of normative commitment.

Continuance commitment refers primarily to weighing the monetary cost of remaining with the organization (Meyer & Allen, 1991). Options to pursue employment with other organizations and economic stability affect this type of commitment. For employees whose skills are in demand outside the boundaries of the organization, continuance commitment would be low. The figure shown here depicts a conceptual relationship of Maslow's hierarchy of needs, McGregor's Theories X and Y, and the three-part organizational commitment theory of Meyer and Allen.

FIGURE. CONCEPTUAL RELATIONSHIP OF MASLOW'S HIERARCHY, MCGREGOR'S THEORY X AND Y, AND MEYER & ALLEN'S ORGANIZATIONAL COMMITMENT COMPONENTS*

**From Satisfaction and Organizational Commitment of Civilian Engineers and Scientists in United States Naval Acquisition (p. 37), by A.K. Jenkins. Unpublished doctoral dissertation (publication in work), University of Phoenix, Phoenix, AZ (© 2008). Reprinted with permission.*

FACTORS AFFECTING WORKPLACE SATISFACTION AND ORGANIZATIONAL COMMITMENT

A search of recent literature was conducted to determine which factors were important to engineers and scientists. Literature from previous research efforts was also reviewed. The findings from this search and reviews provided factors correlating to workplace satisfaction and organizational commitment.

Relevance and meaning of job refers to the intrinsic value one places on his or her tasks with respect to contribution to the organization or its mission.

The factors were gathered from research efforts published in numerous scholarly publications and dissertations. Consequently, the exact description of the factors used varied in the research. The factors were grouped into like categories. For example, pay and wages were grouped into a single factor—pay. The six factors significant to civilian engineers and scientists were: 1) pay and benefits, 2) growth and development opportunities, 3) relevance or meaning of job, 4) supervision, 5) feelings towards co-workers, and 6) job security.

Most of the significant factors are self-explanatory and are listed in Table 2 with several of the originating sources. The growth and development opportunities factor refers to an organization's culture towards training, training opportunities, work roles and tasks that increase in complexity, increased responsibility, and advancement in rank. Relevance and meaning of job refers to the intrinsic value one places on his or her tasks with respect to contribution to the organization or its mission. This factor is the one that is in most control of the employee and the manager. It is also the factor that relates most closely to self-actualization.

TABLE 2. FACTORS CORRELATING TO WORKPLACE SATISFACTION AND ORGANIZATIONAL COMMITMENT WITH THE CORRESPONDING SOURCE CITATIONS

Factors	Source Citations
Pay and Benefits	Brown & Yoshioka, 2003; DeYoung, 2003; Doig & Beck, 2005; Forbes & Domm, 2004; Magee, 2005; O'Leary, 2003; United States Office of Personnel Management (OPM), 2005
Growth and Development Opportunities	Beck, 2002; Brown, 2004; Brown & Yoshioka, 2003; Egan, Yang, & Bartlett, 2004; Forbes & Domm, 2004; Gould-Williams, 2004; Kanfer & Ackerman, 2004; Kaye & Jordan-Evans, 2003; Magee, 2005; O'Leary, 2003; OPM, 2005
Relevance or Meaning of Job	Brown & Yoshioka, 2003; Doig & Beck, 2005; Forbes & Domm, 2004; O'Leary, 2003; Sousa-Poza & Henneberger, 2004; Wilson, 2003
Supervision	Beck, 2002; Gould-Williams, 2004; Ito & Brotheridge, 2005; Joiner, Bartram, & Garreffa, 2004; Kaye & Jordan-Evans, 2003; Poon, 2004; Sutton & Griffin, 2004
Feelings Towards Co-Workers	Doig & Beck, 2002; Morrison, 2004; O'Leary, 2003; Sousa-Poza & Henneberger, 2004
Job Security	Beck, 2002: Doig & Beck, 2005; O'Leary, 2003; Sousa-Poza & Henneberger, 2004

RECENT RESEARCH FINDINGS

In October 2007, engineers and scientists employed in naval acquisition at a single facility in the southeastern United States were surveyed using the framework depicted in the figure on factors affecting workplace satisfaction and organizational commitment. The purpose was in part to determine which factors correlated to workplace satisfaction and organizational commitment for naval acquisition professionals. Two instruments were used to collect quantitative data on the factors listed in Table 2: the Job Diagnostic Survey (Hackman & Oldham, 1980) and the Organizational Commitment Survey (Meyer & Allen, 2004). Each instrument has been proven valid through previous research. The reliability of the data collected was tested by measuring the Cronbach alpha coefficient. The closer the coefficient is to 1.0, the more reli-

able the study. Coefficients for workplace satisfaction, affective commitment, normative commitment, continuance commitment, and the factors listed in Table 2 ranged from 0.80 to 0.93, indicating an acceptable level of reliability to perform correlational analyses (Jenkins, 2008).

A multivariate analysis was performed on the data to determine if the correlations noted in the univariate analyses existed when considering the entire set of factors. If the absolute value of the correlation coefficient ranged between 0.0 and 0.2, then no statistically relevant relationship exists; from 0.21 to 0.35, then a weak relationship exists; from 0.36 to 0.65, a moderate relationship exists; from 0.66 to 0.8, a strong relationship exists; and from 0.81 to 1.0, a very strong relationship exists (Creswell, 2002). Table 3 lists the factors and the relative correlation.

TABLE 3. FACTORS AND CORRELATION TO WORKPLACE SATISFACTION AND ORGANIZATIONAL COMMITMENT*

Factors	Correlation
Pay and Benefits	Normative Commitment—weak positive
Growth and Development Opportunities	Workplace Satisfaction—weak positive, Continuance Commitment—moderate negative
Relevance or Meaning of Job	Workplace Satisfaction—moderate positive, Affective Commitment—moderate positive, Normative Commitment—very strong positive
Supervision	None
Feelings Towards Co-Workers	Affective Commitment—moderate positive, Normative Commitment—moderate positive
Job Security	None
Workplace Satisfaction	Affective Commitment—moderate positive, Normative Commitment—moderate positive, Continuance Commitment—weak negative

**Jenkins, 2008*

A positive correlation indicates a direct relationship, and a negative correlation indicates an inverse relationship. The correlations listed are significant at least at the 0.05 level of confidence. Note that supervision had a correlation smaller than 0.20 and job security was not significant at the 0.05 level of confidence.

IMPLICATIONS AND RECOMMENDATIONS FOR MANAGEMENT

The most significant implication for management is evidenced by the positive correlations of affective commitment and normative commitment combined with the negative correlation of continuance commitment. The combination of correlations indicates that the workforce wants to work for the organization and derives meaning from their jobs. Factors of meaning and growth are more important to the engineering and science workforce than that of pay—assuming that pay needs continue to be adequately met.

Meaning had the highest correlation while pay had the lowest level of correlation. Engineers and scientists placed a greater importance on value derived from their jobs rather than the monetary rewards. While pay was a factor, the level of correlation combined with the levels of the remaining factors indicates the amount of pay is adequate to the meet the needs of the workforce. The low importance of pay to engineers and scientists has been noted in other research (O'Leary, 2003; Pfeffer, 2005; Rynes, Gerhart, & Minette, 2004; Takada, 2003), and less tangible factors may have a greater level of importance on workplace satisfaction and organizational commitment (see also Beck, 2002; O'Leary, 2003; Ready, Hill, & Conger, 2008).

The lack of statistically significant correlations to job security indicates it is not a relevant factor with the workforce. Either the perceived job security is high enough to not be in question or job security is not considered important to the workforce. Regardless of the reason, basing retention efforts on job security considerations may provide little if any return on the investment.

Each time management implements an initiative or change, it must be careful of unintended consequences (Grant, Christianson, & Price, 2007). Focusing retention efforts on pay and monetary rewards will tend to push employees into the lower and less motivating levels of Maslow's hierarchy. A monetary focus also operates on areas that have less value to engineers and scientists than other areas such as meaning and growth opportunities. If the organization attracts an employee solely through continuance commitment, it must continue to provide the monetary incentive in order to retain the employee. However, the government is not competitive in the pay arena when compared to private industry organizations (Trahant, 2008). Unless this can be overcome, the government will be perpetually competing in an area where it will repeatedly lose.

Where the government has an edge is in the missions it performs. The greatest gains with respect to workplace satisfaction and organizational commitment can be made by increasing the ability and understanding of the employee's effect in accomplishing the organization's mission. The closer the employee is to the mission, the greater the personal difference can be attributed to mission success. When an employee can understand how his or her efforts have a direct influence on the mission and realizes that influence, he or she has a better opportunity to create value from their work.

Some organizations have a certain cache upon which to capitalize. For example, the U.S. Navy can project power to any point on the globe, and the Department of Homeland Security is charged with protecting the United States respectively. Each organization can use its mission and stature as a selling point to attract and retain talent by connecting the employee's actions to being able to project power or protect the United States. Management's responsibility then is to make and keep the connections. As the mission or tasks evolve, management must make the necessary changes to ensure that the links between the employee's actions and mission success are kept strong. In other words, the organization should build upon its strengths when seeking to retain its personnel.

Encouraging growth in the workforce is another area where organizations can make gains on its investments. Rather than generic growth opportunities that tend to

lower workplace satisfaction, the organization should provide options that are aligned with the individual employee and the organization's mission. Caution must be extended to an organization wanting to limit the skill set of an individual to prevent him or her from easily transferring to another organization. While such limiting will hamper the ability to move within or between organizations, it also lowers job satisfaction. Increasing growth opportunities also increases workplace satisfaction. Employees that are more satisfied tend to be more committed to the organization and remain with the organization.

Future research efforts on retention include performing similar research on other professional communities. The acquisition workforce contains a number of professions, and potential concerns may exist that are similar to the ones with engineers and scientists. When other professions comprise the core group of an organization, the need to assess the risk of talent loss is vital. An additional area for future research is to determine if new factors are emerging that are important to the workforce with respect to workplace satisfaction and organizational commitment.

CONCLUSION

Thompson (2008) noted the importance of addressing a single issue before moving on to the next. Retaining talent should be taken in such a series of steps. Rather than vying for talent from a point of weakness, the acquisition community should focus its efforts in those areas in which it is strong. Instead of highlighting monetary benefits, mission and meaning should be the basis for competition. Specifically, organizations should concentrate on improving the connection between the individual worker and the accomplishment of its mission. Organizations should also provide growth and development opportunities tailored to the individual and ones that align with its mission. The acquisition community can be a strong competitor in the war for talent—as long as it understands on which battlefield it must compete.

Keywords:
Federal Government hiring, retention; workplace satisfaction; organizational commitment; government scientists and engineers

Dr. Alan K. Jenkins is the deputy program manager for test and evaluation for PMA226 and the lead test engineer for the H-46 aircraft at HX-21 at the Naval Air Warfare Center in Patuxent River Naval Air Station, Maryland. He holds a Bachelor's in Electrical Engineering from Auburn University, a Master's of Science in Applied Science from the Naval Postgraduate School, and a Doctor of Management from the University of Phoenix.

(E-mail address: al@claymore-flats.com)

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LEADERSHIP AND CULTURAL CHANGE: THE CHALLENGE TO ACQUISITION WORKFORCE RETENTION

Mike Kotzian

Too often the approaches selected to increase workforce retention are associated with short-term, tangible practices such as pay increases, physical environment improvements, and teleworking. Unfortunately, the benefits associated with these practices are fleeting. Rather, it should be long-term, intangible strategies that are pursued if changes are to last. This article posits that two such strategies capable of increasing the probability of higher Defense Acquisition Workforce retention rates are associated with organizational culture type and leadership style. Data from a survey of 1,284 Department of Defense military and civilian employees are extrapolated to show Defense Acquisition Workforce retention will permanently benefit if efforts are targeted to strengthen a "clan" and "adhocracy" culture type and leadership style.

As our case is new, so must we think anew, and act anew.
President Abraham Lincoln, 1862

As the 21st century begins to close in on its first decade, a management topic that is prominently discussed within all organizations trying to survive in today's global environment is that of human capital. Despite the best efforts of innumerable organizations employing a multitude of different approaches, the ability of organizations to retain human capital talent remains elusive. According to a recent survey, companies lost nearly 30 percent of their human capital from the beginning of 2005 to the end of 2006 (Somaya & Williamson, 2008). In February 2004, a survey of senior executives reported that their "most pressing concern...was...hiring and re-

taining talent" (Branham, 2005, p. 57). A 2002 study concluded that a 33 percent rise in the demand for talent is expected over the next 15 years while, at the same time, there is expected to be a 15 percent drop in the talent supply (Earle, 2003).

Organizational success as evidenced by measured results depends more than ever on retaining the best talent (Reid & Crisp, 2007). In light of these trends, many organizational leaders "are focusing their organizations on attracting, motivating, and retaining top talent to remain competitive and innovative" (Rosemond, 2002).

The Federal Government is certainly not immune from this challenge. In February 2006, the director of the U.S. Office of Personnel Management told a gathering of government executives that "60 percent of the government's 1.6 million white-collar employees and 90 percent of some 6,000 federal executives will be eligible for retirement in the next decade" (Trahant, 2006, p. 52). To think that these same trends do not apply within the Department of Defense (DoD) would be naive.

Within the DoD, the acquisition *workforce* has an especially daunting challenge that speaks to both national defense and taxpayer trust. According to Pursch and Garrett (2008, pp. 10–11):

> [This workforce] is composed of more than 100,000 government and military business professionals, including program managers, contract specialists, contracting officers, system engineers, cost/price analysts, logistics managers, property managers, and others. Collectively, the men and women of the federal acquisition workforce are responsible for acquiring the government's $400 billion worth of products and services to support the needs of the American public. Unfortunately, there are far too few of these talented acquisition professionals who are essential in supporting the growing requirements of our nation.

PURPOSE

The current statistics regarding workforce *retention* rates clearly indicate a problem among private and public organizations in their ability to retain talented workforce members. This problem has not gone unrecognized and, as a result, an entire branch within the human resources discipline has matured to address the issue of workforce retention.

Most organizations recognize this problem from a survivalist perspective in that a continued workforce talent drain is not viewed as an advantageous strategic business position. To exacerbate the retention problem, the battle for talent is "not a short-term phenomenon but the beginning of a long-term *change* in the labor force" (Jamrog, 2004, p. 26). Unfortunately, most organizations will initially seek to determine what 'best practices' are being implemented by organizations viewed as successful, and then have their own human resources department try to mimic what these supposedly successful companies are doing. The problem with this approach is that the practices that fit the business strategies of one organization do not necessarily fit the business strategies of another (Branham, 2005).

The common theme to resolving this problem of workforce retention is one of organizational change; that is, organizations can no longer operate in a "business as usual" manner. A virtually unanimous observation is that today's fast-paced global environment requires organizations to strategically change as a result of analyzing their external and internal environments (Kanter, Stein, & Jick, 1992; Porter, 1980; Rainey, 2003; Senge, 1990a). There is no disagreement that organizational change is a difficult process (Sims, 2000) and one prone to failure (Beer & Nohria, 2000). Unfortunately, many attempts at organizational change either fail or do not fully meet stated goals, resulting in a variety of negative outcomes (Kotter, 1996).

Today's fast-paced global environment requires organizations to strategically change as a result of analyzing their external and internal environments.

Some would argue that what is required is akin to a paradigm shift requiring the reconstruction of prior assumptions and re-evaluation of prior facts in order to create cataclysmic changes with past processes (Kuhn, 1996). Within the sphere of management, a "second-order change" is sought, which requires basic shifts in attitudes, beliefs, and cultural values (Bartunek & Moch, 1987, p. 484). A focus upon second-order change enables an organization to eliminate the "status quo," a consequence that first-order change is unable to accomplish (Bartunek & Moch, 1987, p. 487).

In terms of this article, one needs to think beyond the more sterile aspects of describing organizational change from a process perspective to a world view that considers the human factor. According to Linstone and Mitroff (1994), three factors should be considered when implementing change: technical, organization, and personal perspectives. Research dealing with organizational change "has mainly focused on organizational factors" while "neglecting the person-oriented issues" (Vakola, Tsaousis, & Nikolaou, 2004, p. 88). While people are the most important factor when it comes to implementing change, they are also the most difficult factor with which to deal (Linstone & Mitroff, 1994). For any organizational change to be effective, challenging people's beliefs, assumptions, and attitudes is critical, as the most influential leverage point for meaningful change resides within the human system (Juechter, Fisher, & Alford, 1998).

Academic literature is rife with changes that an organization can undertake to increase workforce retention. Such change approaches include salary, benefits package, job flexibility, vacation time, physical workspace, opportunities for career advancement, major work challenges and intellectual stimulation, teleworking, and job satisfaction (Branham, 2005; Cohen, 2006; Earle, 2003; Jamrog, 2004; Jenkins, 2008; Nelson, 2006; Reid & Crisp, 2007; Rosemond, 2002; Rosenberg, 2008; Rowan, 2000; Somaya & Williamson, 2008; Trahant, 2006).

Unfortunately, these traditional approaches reflect a short-term, tangible solution that fails to address the root cause. The shortfalls of such approaches are addressed within the concept of systems thinking (Senge, 1990a), which includes the key aspect of avoiding symptomatic solutions typified by the "shifting the burden" archetype where the "quick fix" solution is sought to a problem—"well-intentioned, easy fixes which seem efficient" but actually leave the underlying problem unaffected to only get worse" (Senge, 1990a, pp. 106–107). Approaches taken to provide symptomatic solutions address only the symptoms and not the foundational issues associated with the problem, thereby offering short-term solutions at best. Avoiding symptomatic solutions is especially difficult for organizational *leadership* who tend to intervene with popular quick fixes when, in fact, they should "keep the pressure on everyone to identify more enduring solutions" (Senge, 1990b, p. 15).

The usual solutions used to increase workforce retention rates are symptomatic in nature addressing short-term tangible (base pay, yearly incentives, health insurance) and long-term intangible (work-life benefits, hiring practices, and new hire engagement) practices. The problem is that "it is more tempting to select short-term, tangible practices over long-term, intangible ones" since human nature is to gravitate towards the short-term, instant gratification solution (Branham, 2005, p. 58). What is required is implementation of long-term intangible strategies dominated by cultural or leadership practices that have a much bigger impact (Branham, 2005; Reid & Crisp, 2007). There is mounting evidence "to support the conclusion that the greatest drivers of employee engagement and retention are intangible" (Branham, 2005, p. 58).

Therefore, the purpose of this article is to examine the following research question: since leadership and *culture* are posited by human capital managers as key organizational change tenets necessary to create an improved retention rate among the Defense Acquisition Workforce, are leadership and culture attributes seen as important factors when viewed through an organizational change prism?

METHOD

This article relies upon a mix of quantitative and qualitative research methodologies based on the notion that "qualitative and quantitative methods should be viewed as complementary rather than rival camps" (Jick, 1979, p. 602).

QUANTITATIVE APPROACH

This article's research question involves the exploration of individual value orientation, which "is more appropriate for social analysis because it provides information that is more central to the individual" (Meglino & Ravlin, 1998, p. 353). Researchers in human behavior generally believe that individual behavior data required for collection are best collected using a survey instrument methodology (Denzin, 1989) as it provides the advantage of "identifying attributes of a large population from a small group of individuals" (Creswell, 2003, p. 154).

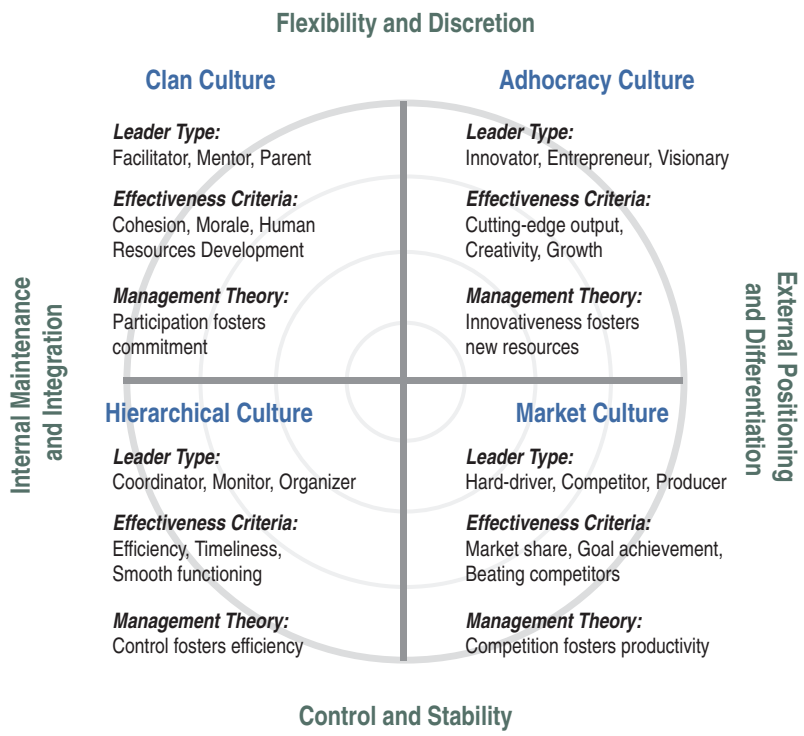
The survey population is military and civilian senior leaders, managers, or professionals associated with the DoD—not limited to the Defense Acquisition Workforce

but thought to be a representative cross-section applicable, in general, to the Defense Acquisition Workforce. Senior leaders are defined as rank structure O-6 and above for military members, and GS-15 (or equivalent) and above for civilian members. Managers are defined as rank structure O-4 and O-5 for military members, and GS-14 and GS-13 (or equivalent) for the civilian members. Professionals are defined as rank structure O-1 through O-3 and noncommissioned officers for military members, and GS-11 and GS-12 for civilian members.

The survey's sampling frame is comprised of individuals attending one of DoD's professional military education (PME) academic institutions, which is meant to provide a representative cross-section of the three population hierarchies (i.e., senior leaders, management, and professional) from which DoD identifies future leaders, managers, and professionals.

The chosen survey instrument is the Organizational Culture Assessment Instrument (OCAI), which is based on the Competing Values Framework (CVF). The CVF was developed by Quinn and Rohrbaugh (1983), which graphically categorized organizational effectiveness into four quadrants (Figure 1). Each of the four quadrants is labeled to distinguish its most notable characteristics—clan, adhocracy, market,

FIGURE 1. COMPETING VALUES FRAMEWORK*



**The competing values framework lists the leadership roles, the effectiveness criteria, and the core management theories most closely associated with each of the four culture quadrants. Source: Cameron & Quinn, 1999, p. 41. Used by permission.*

and hierarchy. The clan culture is named because of its similarity to a family-type organization. The adhocracy culture places a great deal of emphasis on flexibility and external focus. The market culture refers to the type of organization that is mainly focused on external constituencies such as suppliers, customers, contractors, regulators, etc. The hierarchy culture can be viewed as the traditional bureaucracy (Quinn & Rohrbaugh, 1983). Each quadrant within Figure 1 notes the leader type, effectiveness criteria, and management theory governing each culture type.

The survey instrument has been academically reviewed and proven for reliability and validity. A pre-test of the survey was conducted with some faculty and students at a prominent PME academic institution. Slight word changes were made to some of the survey questions based on pre-test feedback in order to make the survey more "DoD-centric." The formal survey instrument was distributed via electronic mail.

The OCAI uses a response scale in which respondents divide 100 possible points among four options across six initial questions. The compilation of "A" options correlates to the clan culture; the compilation of "B" options correlates to the adhocracy culture; the compilation of "C" options correlates to the market culture; and the compilation of "D" options correlates to the hierarchy culture (Cameron & Quinn, 1999). The summation of points within each quadrant is then plotted to form a four-sided profile that graphically illustrates the strength of each culture. Respondents answer the six questions two times: initially to provide responses regarding how respondents perceive the organization as it currently is "now" followed by responses as to how they would like to see the organization in 5 years "preferred."

Each question must sum to exactly 100 points across the four options. This approach is known as an ipsative ranking scale, which results in a "fixed choice" where measures are perfectly correlated to one another (Quinn & Spreitzer, 1991. p. 117). While the ipsative rating scale provides differentiation, it also forces respondents to conduct trade-offs among the four options by forcing respondents to make trade-offs, just as individuals within societal situations where "several values rather than one value may come in competition with one another, requiring a weighing of one value against another" (Rokeach, 1973, p. 6).

QUALITATIVE APPROACH

Attempting to interpret the actions of humans is very much a non-linear endeavor. Qualitative research is best used to understand the complexities associated with social phenomena (Tucker, Powell, & Meyer, 1995) as it ensures "a commitment to seeing the social world from the point of view of the actor" (Bryman, 1984, p. 77).

To obtain qualitative responses to supplement each respondent's required quantitative responses (i.e., the 12 questions), researchers placed an open-ended question at the end of the OCAI survey tool. Any qualitative responses were completely voluntary on the part of each respondent and could address any aspect that the respondent wished to discuss.

Open-ended questions allow researchers to obtain answers that were unanticipated, may better describe the real views of the respondents, and allow for a response that is phrased in the respondent's own words (Fowler, 2002). While self-administered open-ended questions may not be comparable across all respondents, the re-

sponses can be evaluated for patterns that may repeat over many different respondents in order to make generalized observations (Salkind, 2003).

RESULTS

QUANTITATIVE ANALYSIS

This article's quantitative data analysis was derived from received OCAI survey responses to the 12 questions, each with four options. The overall response rate is not available due to the inaccuracy of information provided by the various DoD PME institutions participating in the distribution of the OCAI survey tool. The majority of responses was collected from one specific DoD PME. The only distribution numbers provided by this institution were that approximately 5,000 students would be eligible to participate in the voluntary survey request. Therefore, this researcher would estimate an overall response rate of 24 percent based on information from all of the participating DoD PME institutions. Of the 1,550 OCAI surveys received, 312 (19.5 percent) were unusable due to incomplete data fields. This meant that 1,284 (80.5 percent) OCAI survey results were used as the quantitative basis of this article. Table 1 provides an overview of selected demographic respondent data.

TABLE 1. SELECTED DEMOGRAPHICS FOR THE 1,284 USABLE OCAI SURVEY RESPONSES

		Military		Civilian		Total	
		Number	Percent	Number	Percent	Number	Percent
Gender	**Total**	**1,048**	**81%**	**236**	**19%**	**1,284**	**100%**
	Male	891	85%	165	70%	1,056	82%
	Female	157	15%	71	30%	228	18%
Position	Senior Leader	29	3%	51	22%	80	6%
	Manager	891	85%	174	74%	1,065	83%
	Professional	128	12%	11	5%	139	11%
Years in Service	0 to 5	64	6%	28	12%	92	7%
	6 to 10	12	1%	20	9%	32	3%
	11 to 15	264	25%	24	10%	288	22%
	16 to 20	425	41%	33	14%	458	36%
	21 to 25	201	19%	71	30%	272	21%
	25+	82	8%	60	25%	142	11%
Level of Education	High School	48	5%	2	1%	50	4%
	Associate	24	2%	1	1%	25	2%
	Bachelor's	172	16%	39	17%	211	16%
	Master's	704	67%	153	65%	857	67%
	Doctorate	100	10%	41	17%	141	11%

TABLE 2. MEAN AVERAGE SCORES & STANDARD DEVIATIONS—TOTAL SAMPLE POPULATION BY CULTURE QUADRANT*

Total Sample Population (n = 1,284)	Culture Dimension			
	Clan	Adhocracy	Market	Hierarchy
Military - Now				
Mean	29.0	19.7	26.1	25.2
(Standard Deviation)	*(21.1)*	*(13.8)*	*(20.6)*	*(21.4)*
Civilian - Now				
Mean	33.6	21.0	21.2	23.6
(Standard Deviation)	*(21.0)*	*(16.5)*	*(19.0)*	*(23.2)*
Military - Preferred				
Mean	36.4	22.7	23.0	17.8
(Standard Deviation)	*(19.5)*	*(14.0)*	*(16.1)*	*(14.4)*
Civilian - Preferred				
Mean	39.3	26.1	20.1	14.4
(Standard Deviation)	*(19.8)*	*(15.3)*	*(14.9)*	*(13.3)*

**Shown in terms of "now" culture and "preferred" culture.*

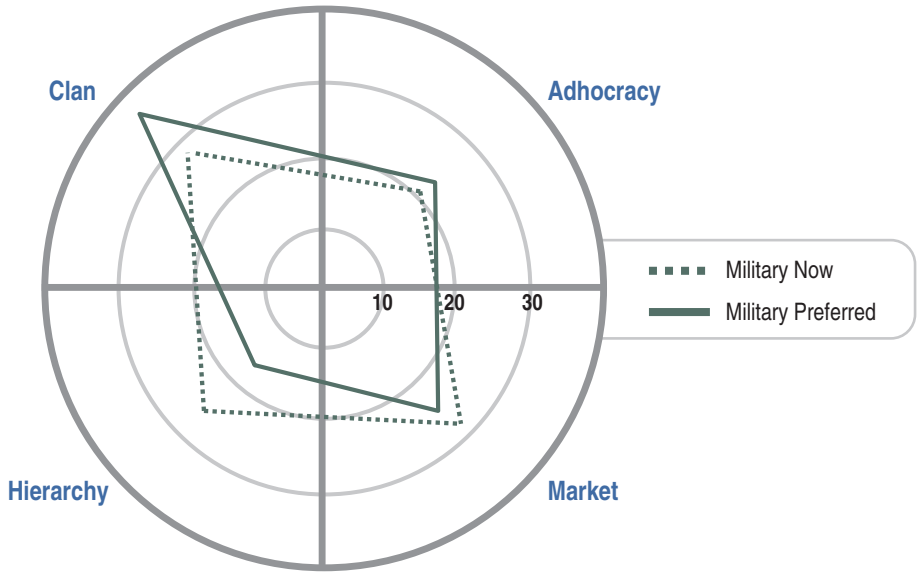
Two sets of organizational profiles are derived from the respondent's data. The first data set examines the difference in cultural values as compared between the overall military and civilian cultures. Table 2 provides a summary of all 1,284 usable OCAI surveys for mean average and standard deviation based on a comparison between the military and civilian sample populations across the four culture quadrants.

In terms of the "now" organizational profile data, both the military and civilian sample populations view the clan cultural type as dominant (29.0 and 33.6, respectively). Thereafter, the military sample population interprets the current organizational profile as a cluster of market (26.1) and hierarchy (25.2) cultural types followed by adhocracy (19.7). In contrast, the civilian sample population views the remaining three cultural types as an equal distribution between hierarchy (23.6), market (21.2), and adhocracy (21.0).

In terms of the "preferred" organizational profile, both the military and civilian sample populations continue to view the clan cultural type as dominant (36.4 and 39.3, respectively). In addition, both the military and civilian sample populations view the hierarchical cultural type as the least desirable by a large margin (17.8 and 14.4, respectively). The military sample population equated the market (23.0) and adhocracy (22.7) cultural types while the civilian sample population favored the adhocracy culture type (26.1) over the market culture type (20.1).

Figure 2 provides a four-sided plot of the overall military sample population mean averages across the four cultural quadrants. Figure 3 provides a four-sided

FIGURE 2. CULTURE PROFILE—OVERALL MILITARY SAMPLE POPULATION*



**Shown in terms of "now" culture (dotted line) and "preferred" culture (solid line).*

plot of the overall civilian sample population mean averages across the four cultural quadrants. Figure 4 provides a comparison overlay of Figures 2 and 3 to illustrate commonalities and differences between the overall military and civilian sample populations in terms of overall culture types.

The second data set examines the difference in cultural values as compared between the overall military and civilian culture quadrants in terms of leadership. Table 3 provides a summary of all 1,284 usable OCAI surveys for mean average and standard deviation based on a comparison between the military and civilian sample populations across the four culture quadrants.

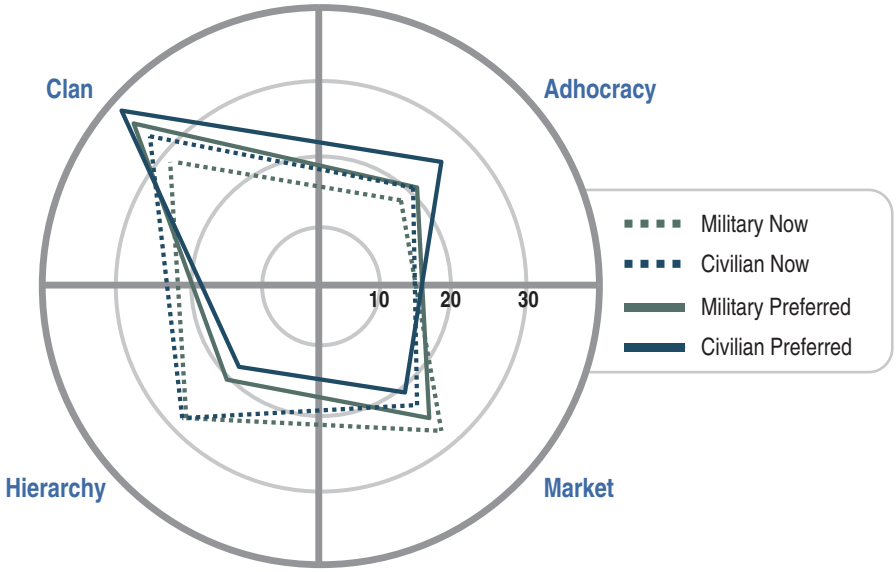
In terms of the "now" organizational profile data for the leadership dimension, both the military and civilian sample populations view the market leadership style as dominant (28.5 and 27.7, respectively). In addition, both the military and civilian sample populations view the remaining leadership styles in the same order: hierarchy leadership style (25.2 and 26.0, respectively), followed by the clan leadership style (25.1 and 24.1, respectively), and concluding with the adhocracy leadership style (21.2 and 22.3, respectively).

In terms of the "preferred" organizational profile for the leadership dimension, both the military and civilian sample populations preferred the clan leadership style as dominant (32.7 and 32.4, respectively). In addition, both the military and civilian sample populations view the adhocracy leadership style as the next most desirable (27.3 and 31.1, respectively). The military sample population concludes with the hierarchy (20.4) and market (19.6) leadership styles, respectively. Meanwhile, the

FIGURE 3. CULTURE PROFILE—OVERALL CIVILIAN SAMPLE POPULATION*

Shown in terms of "now" culture (dotted line) and "preferred" culture (solid line).

FIGURE 4. OVERLAY OF CULTURE PROFILES—OVERALL MILITARY & CIVILIAN SAMPLE POPULATIONS*



Shown in terms of the overall military "now" culture (green dotted line) and "preferred" culture (green solid line) compared to the overall civilian "now" culture (blue dotted line) and "preferred" culture (blue solid line).

TABLE 3. MEAN AVERAGE SCORES & STANDARD DEVIATIONS—TOTAL SAMPLE POPULATION BY CULTURE QUADRANT*

Total Sample Population (n = 1,284)	Leadership Dimension			
	Clan	Adhocracy	Market	Hierarchy
Military - Now				
Mean	25.1	21.2	28.5	25.2
(Standard Deviation)	*(17.7)*	*(13.6)*	*(21.0)*	*(17.5)*
Civilian - Now				
Mean	24.1	22.3	27.7	26.0
(Standard Deviation)	*(19.0)*	*(14.8)*	*(20.5)*	*(19.7)*
Military - Preferred				
Mean	32.7	27.3	19.6	20.4
(Standard Deviation)	*(17.7)*	*(13.9)*	*(13.7)*	*(14.0)*
Civilian - Preferred				
Mean	32.4	31.1	19.1	17.3
(Standard Deviation)	*(18.3)*	*(15.3)*	*(14.2)*	*(12.4)*

**Shown in terms of "now" culture and "preferred" leadership dimension.*

civilian sample population reverses that order by preferring the market (19.1) and then hierarchy (17.3) leadership styles, respectively.

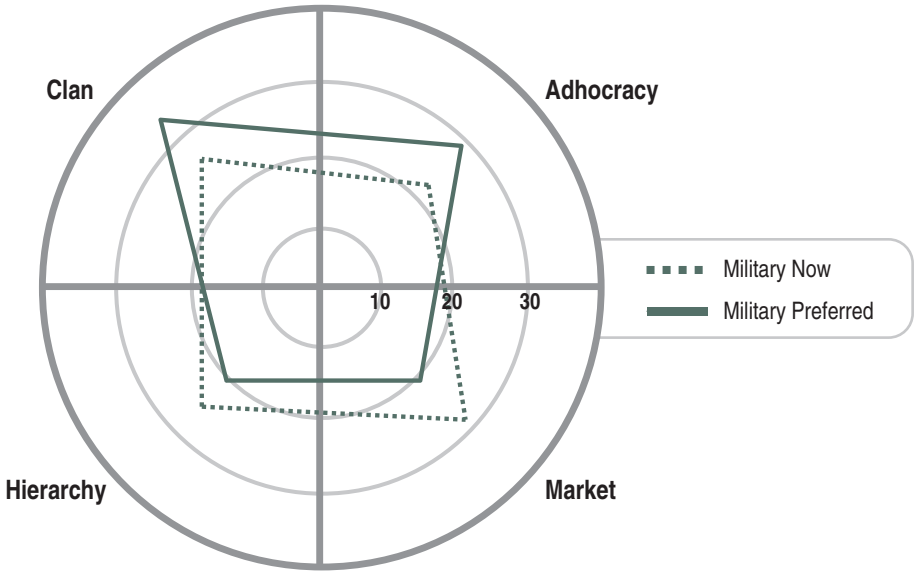
Figure 5 provides a four-sided plot of the overall military sample population mean averages across the leadership dimension. Figure 6 provides a four-sided plot of the overall civilian sample population mean averages across the leadership dimension. Figure 7 provides a comparison overlay of Figures 5 and 6 to illustrate commonalities and differences between the overall military and civilian sample populations across the leadership dimension.

QUALITATIVE OBSERVATIONS

Of the 1,284 usable OCAI surveys received, 292 respondents (23 percent) provided usable comments. Overall, the basic tone of the comments was more negative than positive, which may be a function of respondents being given the opportunity to vent their viewpoints without fear of reprisal. Whether a qualitative comment was positive or negative, the comment's gist remained steady: leadership and culture are intertwined and critical to the success of any organization. The frequency and fervor of qualitative comments regarding these two topics left no doubt regarding their relative importance.

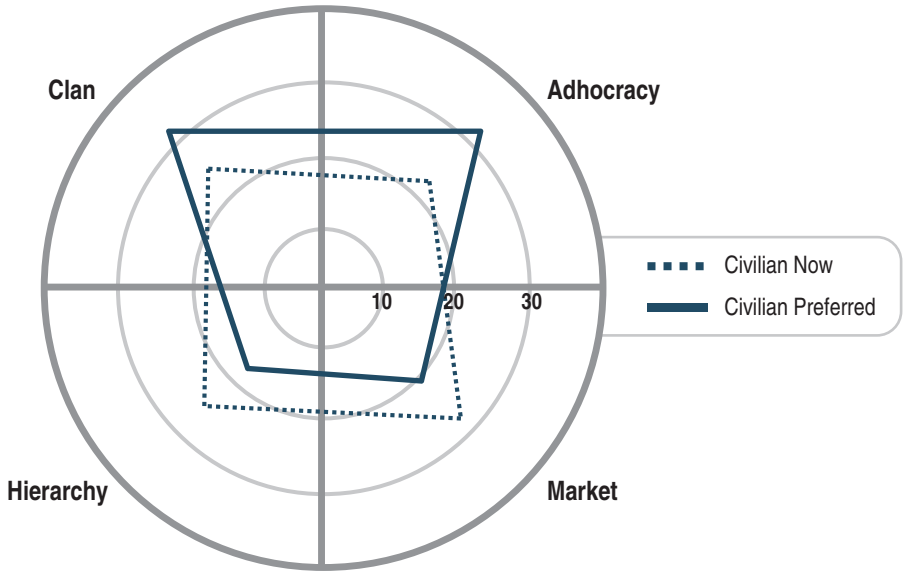
One of the more direct leadership definitions came from a military manager: "piles of paperwork and layers of bureaucracy do not equate to leadership. Smart people do not always make good generals! I would rather have someone that knows leadership

FIGURE 5. OVERALL MILITARY SAMPLE POPULATION—MEAN AVERAGES ACROSS LEADERSHIP DIMENSION*



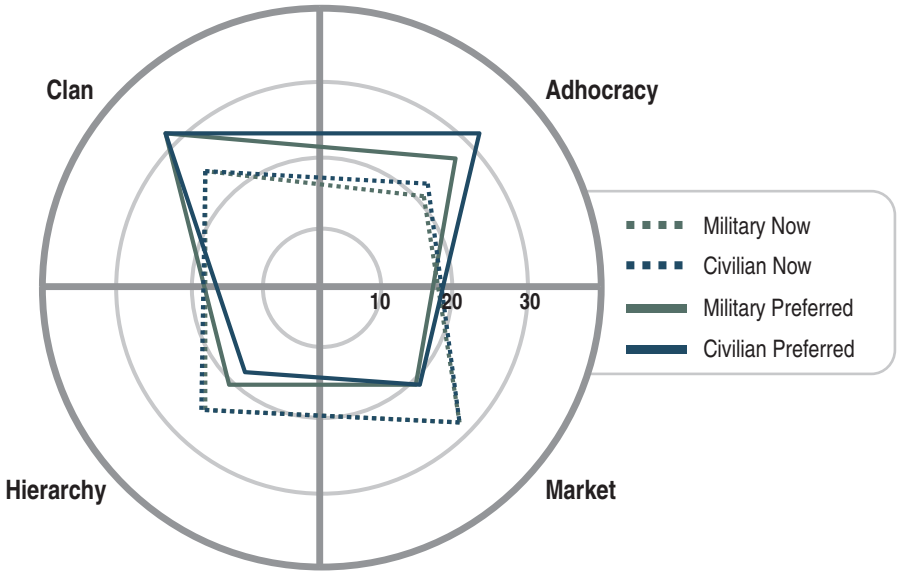
Shown in terms of "now" leadership dimension (dotted line) and "preferred" leadership dimension (solid line).

FIGURE 6. OVERALL CIVILIAN SAMPLE POPULATION—MEAN AVERAGES ACROSS LEADERSHIP DIMENSION*



Shown in terms of "now" leadership dimension (dotted line) and "preferred" leadership dimension (solid line).

FIGURE 7. OVERLAY OF CULTURE PROFILES—OVERALL MILITARY & CIVILIAN SAMPLE POPULATIONS ACROSS LEADERSHIP DIMENSION*



**Overall military sample population shown in terms of "now" leadership dimension (green dotted line) and "preferred" leadership dimension (green solid line) compared to the overall civilian sample population shown in terms of "now" leadership dimension (blue dotted line) and "preferred" leadership dimension (blue solid line).*

than [someone who] scored 1600 on his/her SATs!" [respondent's exclamations]

Another military manager remarked about leadership: "I believe that growing and developing people ... removing road blocks to let them without fear suggest or take risks to improve our organization, is what leadership is about." A common observation was summed up by a military manager who said that "... leadership MUST [respondent's emphasis] lead by example. Credibility is critical."

There was consensus across both the military and civilian cultures regarding a deep concern with how leadership is failing members and their entrusted organizations. One military manager wondered "... are these the best leaders we have to do the job?" while another military manager observed that "senior leadership needs to abandon stovepipe thinking." One civilian manager coined a new term to describe his organizational leadership:

> BYOL – bring your own leadership. Our formal leadership has been routinely bad. In the absence of effective formal leadership, actual leadership has become pretty egalitarian. We are successful because enough reasonable men and women decide that they will somehow succeed—often despite rather than because of—the formal organization. It isn't that we don't respond to effective formal leadership—we do. It just isn't required.

This consensus was very dramatic in how leadership was viewed in terms of risk taking. Comments such as the following from two military managers illustrate skepticism on how far the concept of risk taking has been accepted by senior leadership:

> WOW, you really missed on the normal ... environment. Leadership is so busy NOT making a decision and ensuring that they are covered for any mistakes that they or their subordinates may make that nothing really gets accomplished, no innovation is EVER taken—risk taking is frowned upon as it is getting away from the 'mediocre at best' pack. Rank and position is attained through interpersonal relationships and rarely through capabilities. [respondent's capitalization]

> We need to develop cultures that allow innovation and risk taking in areas that are not specifically 'life and death' battle decisions. As senior leaders, we must accept and promote risk taking or we will continue to grow 'yes people' and our innovativeness and ability to improve quickly will suffer.

An additional thread within the leadership and culture pairing was the seemingly unfairness of how leadership got promoted or progressed through the ranks. There were several direct comments that made it clear both military and civilian managers and professionals were disillusioned in how individuals ascended to their promoted leadership heights. One civilian manager remarked, "leadership ... seems to involve a considerable degree of politics—leaders are chosen by who they know, how they dress, and sometimes who they 'are' rather than by actual technical skills, accomplishments, and expected contribution." A military manager remarked, "I have been with leadership whose main concern is [his] own career and making only himself look important. I think the plan is quite effective."

There were also more direct remarks about the importance of developing future leaders. One civilian manager stated, "the development of future leaders through a systematic, not flow-as-you-go method of mentoring middle-level managers is the MOST [respondent's emphasis] important task an organization can do for its future." However, a more common remark was a lack of future leader development such as the military manager who commented, "... investing in senior leader development way too late. If you want to build better senior leadership ... then begin educating them sooner and younger."

Culture was typically addressed in conjunction with leadership, but culture was also addressed as a single entity and typically in a negative connotation. A common theme was that the existing DoD culture prevented the initiation of any substantive risk taking or innovation as evidenced by a military manager's following comment:

> We have a culture that stifles change and innovation and uses employees like cattle. Once their usefulness is over ... push them out the door. ... Typically, any individual that strays from the status quo and

> identifies problems or attempts to make change is generally affected negatively in the long term, either from direct confrontation or more often passed over and ignored. The culture has made subordinates [who] have no faith that leadership will come to their aid. Morale is generally low but people remain because they want to serve in the military, not because of the organization. ... Leaders and subordinates have no defined criteria or expectations on how to act.

One civilian manager blamed the Department of Defense's unswerving culture as a reason for initiative failures:

> Initiatives are failing because they are left to staffs who are stuck in old paradigms or have no understanding of uniqueness within the organization. Transformations that are intended to revolutionize thus become more convoluted and hinder real improvement. Real leadership must bridge the gap between vision and implementation more effectively.

DISCUSSION

To create a meaningful increase to an organization's workforce retention rate, this research posits that long-term, intangible strategies are required. Otherwise, organizations will be in a continuous do-loop attempting to solve their workforce retention problem by using short-term tangible practices that do not provide lasting improvements.

This article posits that leadership and culture are *the* key organizational change tenets necessary to create a lasting improved retention rate among a typical workforce—including the Defense Acquisition Workforce. Since these two key tenets are so critical, this research leveraged the OCAI survey tool to capture the DoD's workforce alignment in terms of what they perceive as the current DoD organizational culture and leadership as well as how they would prefer to see the DoD organizational culture and leadership tenets within the next 5 years. This research posits that any disconnects between the "now" and "preferred" timeframe for either of these key tenets must be addressed if an improved workforce retention strategy has any chance of lasting success.

Since the OCAI survey responses were generated from a representative cross-sectional population from within the DoD, a reasonable assumption was that the resultant analysis would be applicable to the overall Defense Acquisition Workforce as well.

The OCAI overlays in Figure 4 and Figure 7 provide an organizational profile indicating that the military and civilian sample populations strongly favor an increase in the upper portions of the Competing Values Framework for culture type and leadership style—the clan and adhocracy quadrants. From a clan culture perspective, both the military and civilian sample populations are seeking a humane environment best managed through teamwork and employee development; and the major task of management is to empower the workforce and facilitate their participation, commit-

ment, and loyalty. The organization places a premium on teamwork, participation, and consensus. From an adhocracy culture perspective, innovation and pioneering initiatives are what lead to success, and that the major task of management is to foster entrepreneurship, creativity, and activity on the cutting edge. The emphasis is on being at the leading edge of new knowledge and being ready for change. The respondents' qualitative responses tended to support these quantitative results.

DoD's acquisition leadership needs to better embrace organizational change initiatives that emphasize those attributes associated with the clan and adhocracy quadrants.

From a leadership perspective, the favored clan quadrant indicates a people-oriented approach whereby influence is based on getting people involved in the decision-making and problem-solving process. Participation and openness are actively pursued. When considering the adhocracy quadrant, the leadership style is based on the premise of change influenced by the anticipation of a better future and generating hope. Innovation and adaptation are actively pursued. As with the culture quadrants, the respondent's qualitative responses tended to support these leadership quantitative results—especially in terms of innovation and risk taking.

So what do these findings mean to the issue of workforce retention from the perspective of the Defense Acquisition Workforce? Simply that DoD's acquisition leadership needs to better embrace organizational change initiatives that emphasize those attributes associated with the clan and adhocracy quadrants. Attempting to head off or resolve a Defense Acquisition Workforce retention issue without paying attention to what is deemed important by this uniquely talented membership essentially equates to attacking a problem with no real idea on how to make meaningful changes. Ignoring these two key tenets of organizational change equates to a strategy of hope versus meaningful change. Paying attention to what truly matters from the perspective of the Defense Acquisition Workforce—in this case, those attributes associated with the clan and adhocracy quadrants—represents a strategy that at least has some chance of meaningful and lasting success.

CONCLUSION

Any real or potential acquisition workforce retention problems can not be solved by what this article has identified as short-term, tangible incentives such as pay, benefits, physical workspace, teleworking, etc. Contrary to popular opinion, a Defense Acquisition Workforce potential retention problem can only be permanently

resolved by using organizational change initiatives to better align culture types and leadership styles to those sought by workforce members. Without such an alignment, the acquisition community will continue a never-ending cycle of wasting resources by advocating short-term solutions that will never fully resolve the serious issue of finding a meaningful way to improve the Defense Acquisition Workforce retention rate—before it's too late.

Keywords:
leadership, culture, change, workforce, retention

Dr. Mike Kotzian is a Professor of Program Management, Defense Acquisition University Mid-Atlantic Region. His 25-year DoD career encompasses uniformed military and civilian service, including previous assignments in various program manager positions within the Office of the Secretary of Defense, U.S. Air Force, and U.S. Navy. He has two Bachelor of Science degrees (Secondary Education and Electrical Engineering), a Master of Science degree in Electrical Engineering, and a Doctor of Management degree. He is Level III certified in program management.

(E-mail address: mike.kotzian@dau.mil)

AUTHOR **BIOGRAPHY**

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THE BENEFITS AND LIMITATIONS OF TELECOMMUTING

Jerome H. Collins and Joseph "Joe" Moschler

This article explores the benefits and limitations of telecommuting on individuals and organizations within the Department of Defense. Telecommuting is linked to increased employee satisfaction with the employer, reduced employee turnover, and increased employee productivity. However, the authors also identify the limitations of telecommuting, such as employees feeling isolated from their co-workers and managers' concern about decreased productivity among telecommuting employees versus those in the traditional office setting. The authors present findings from a review of the research on the benefits and limitations of telecommuting. Additionally, a case study of telecommuting in a Department of Defense organization is presented to show a tangible cost-benefit analysis of telecommuting to an organization.

Telecommuting has gained considerable attention in recent years. This is due in part to organizations, both in the private sector as well as the public sector, using telecommuting to accomplish organizational goals and to affect the organization's "bottom-line" results. This can be seen in such organizations as AT&T, IBM, and Sun Microsystems. Within AT&T, one-third of the company's managers are not bound to a particular worksite (Conlin, 2006). Similarly, 40 percent of IBM's workforce has no official office (Conlin, 2006). The tangible benefits of telecommuting are enormous. Sun Microsystems allows half its employees to work anywhere they want, and by so doing, estimates that it saves $300 million a year on real estate costs (Conlin, 2006).

The federal government has also made some significant progress in implementing telecommuting. Some agencies have fully embraced telecommuting with positive results. For instance, the United States Patent and Trademark Office (USPTO) is recognized as a pioneer in the area of telecommuting. It has established two very successful telecommuting programs. The "Trademark Work-at-Home" program has 86 percent of the total number of trademark attorneys working from their homes

the majority of the week, and going into the office one day a week where they share office space. Similarly, the "Patent Hoteling" program has 1,000 patent examiners participating in the telecommuting program. In total, the USPTO has 40.7 percent of its workforce in telecommuting arrangements (Byrne, 2007).

The United States Congress has been actively involved in promoting telecommuting throughout the government. Starting as far back as the year 2000, Congress mandated that agencies should "establish a policy under which eligible employees of the agency may participate in telecommuting to the maximum extent possible" (Office of Personnel Management, n.d.). For instance, the Telework Improvement Act of 2007 (H.R. 4106), co-sponsored by Representatives Danny Davis (D-IL) and John Sarbanes (D-MD), is intended to encourage federal agencies and employees to utilize telecommuting, especially in the area of Continuity-of-Operations, commonly known as COOP (Walker, 2008). The bill was passed by the House in June 2008, but has yet to be voted on by the Senate. Similarly, Senate Bill S.1000, The Telework Enhancement Act, was introduced in 2007 and requires agencies to create a telework policy for their specific agency and provide training to their employees—including managers—on utilizing telework (Holmes, 2008).

The terms *telework* and *telecommute* are at times used interchangeably, and there are definitions for both. Telework has been defined as any form of substitution of information technologies (telecommunications and computers) for work-related travel (JALA International, n.d.). Telecommute is defined as that portion of teleworking that applies to the daily commute to and from work (JALA International, n.d.). For instance, a person who participates in a meeting using video teleconferencing equipment would be considered a teleworker since he or she did not have to travel to the meeting. A person who performs some portion of their work either from home or another worksite without having to travel into work would be considered a telecommuter. Therefore, all telecommuters are teleworkers, but not all teleworkers are telecommuters. From a federal government standpoint, the Office of Personnel Management (OPM) uses the term telework for reporting purposes and for all other activities related to policy and legislation. OPM defines telework as work arrangements in which an employee regularly performs officially assigned duties at home or other worksites geographically convenient to the residence of the employee (Office of Personnel Management, n.d.).

The underlying issue is not what telework or telecommute are, but what they are trying to accomplish. From an academic level, Tietze and Musson (2003) state, "Paid work has become 'flexible' and is no longer exclusively associated with particular geographical settings." In other words, work is not a place to go but an "activity" that can be done anywhere and anytime. From a practitioner level, a manager from a Seattle, Washington, public relations firm summed it up succinctly: "As long as you get your work done, it doesn't matter too much where you do it" (Gardner, 2006). Throughout the rest of this article, telecommuting will be used to describe this activity.

Telecommuting is becoming more of a topic for discussion for two reasons: a) more jobs and managers are amenable to allowing telecommuting, and b) more individuals are requesting the option of telecommuting. As Potter (2003) states, "Employees are requesting the option of working at home to avoid potential workplace

threats, to reduce anxiety, and to get the job done." This moving of the work to where the worker is does have limitations (Igbaria & Guimaraes, 1999). The main one cited is that managers often believe they have reduced insight into what their employees are doing unless they can physically see them at work.

Based upon a review of recent research done in the area of telecommuting, the rest of this article will present the benefits and limitations of telecommuting; and based upon this research, as well as the author's professional experiences, a case study of a notional Department of Defense organization will be developed for discussion.

THE POWER AND PRICE OF TELECOMMUTING

The growth, power, and sophistication of technology have made remote work a viable option. If technology has enabled the growth of telecommuting, then the demands of three constituencies (i.e., employees, organizations, and society) have fueled that growth (Igbaria & Guimaraes, 1999). Each of these constituents has both tangible and intangible benefits and limitations associated with telecommuting. The remainder of this article explores these benefits and limitations.

BENEFITS

EMPLOYEES

One of the most significant tangible benefits associated with telecommuting is the reduction of travel time and expenses (Crandall & Gao, 2005; Schettler, 2002). Using data from the 2000 American Community Survey, Potter (2003) proposes that employees on average spend 28.8 minutes commuting to work each day. This is an increase of 7 minutes over the commute time 10 years prior. As urban sprawl continues in the years to come, the commute time will continue to increase. This total commute time equates into 57.6 minutes per day that could be reutilized elsewhere, such as for personal priorities, if employees telecommuted. This number is an average and could be higher or lower depending on the geographical area in which an individual lives. Overall, federal workers nationwide spent $19 million a day commuting to and from work (Holmes, 2008). Since fuel prices have increased since the year 2005, the cost of commuting has increased as well.

Another tangible benefit is the ability for individuals to better balance work and family life (Baruch, 2001; Igbaria & Guimaraes, 1999). Although this could be viewed as only an intangible benefit, when telecommuting results in a reduction in the amount of daycare children require before and after school, the tangible benefits are obvious.

An intangible benefit for individuals who telecommute is that telecommuters, as has been demonstrated by numerous surveys and studies, have an increased satisfaction with their employment and employer (Igbaria & Guimaraes, 1999; Manoochehri & Pinkerton, 2003; Tremblay, 2002). Telecommuters are also not as involved in office politics, which can affect an employee's level of on-the-job satisfaction and disrupt the traditional work setting (Manoochehri & Pinkerton, 2003).

ORGANIZATIONS

As discussed under the employee tangible benefits section, an employee who commutes less will have more time for other priorities in his or her life. Crandall and Gao (2005) proposed that the reduction in commute time could be reprioritized by the employee for work that would help improve the employee's *productivity* and thereby benefit the organization. The next tangible benefit—and one most focused on by leadership within an organization—is the increased productivity by telecommuters. The International Telework Association and Council reported in its Telework America 2000 research that self-reported productivity gains for those working from home were on average 15 percent; and for those working at a telework center, gains reported were on average 30 percent. Manoochehri and Pinkerton (2003) have suggested that one reason for the increase in productivity is the distraction-free environment allowed by telecommuting. Further, Nilles (1998) found that telecommuters average 2 less days of sick leave per year than traditional employees. The explanation for this could be that employees are more willing to work at home when they are sick versus going into the office sick.

Manoochehri and Pinkerton (2003) cited cost reductions experienced by organizations that have implemented full-time telework programs. Some examples are a reduced amount of office space, parking, clerical and support staff, to name just a few. AT&T reported that $550 million in cash flow has been made available since 1991 due to telecommuting employees (Apgar, 1998).

Yet another of the benefits of telecommuting for an organization is the ability to attract and retain qualified employees (Manoochehri & Pinkerton, 2003). From an employee incentive viewpoint, telecommuting opens up new possibilities for some organizations to hire individuals who may not be able to work in a traditional environment, such as disabled workers and workers in other regions of the country or world. Looking at employee *retention* statistics, Nilles (1998) noted that the search, hiring, and training of an individual has been shown to cost an organization 25 percent of the employee's annual salary. Therefore, if telecommuting is a tool to retain employees, the cost of doing so is justified. Finally, telecommuting can also be a valuable tool for an organization's continued operation in the event of an emergency. Continuity of Operations, known as COOP, is a plan detailing work arrangements to be implemented in an emergency such as acts of nature, accidents, and/or terrorist-related incidents. Telecommuting can play a vital role in helping agencies preserve their functionality in this environment. The terrorists attacks of September 11, 2001, exemplify the need for options like telecommuting. Companies like American Express increased their use of telecommuting to maintain operations despite damage to their offices in New York City (World Resources Institute, 2004).

The key to the successful use of telecommuting in the event of an emergency is an effective telecommuting program in place to ensure the capability is operational and thoroughly tested. This means that as many employees as possible have the proper connectivity, equipment, and current arrangements in place to ensure a viable distributed workforce. This also implies the agency's telecommuting expectations have been communicated to all employees such that in the event its COOP plan must be activated due to an emergency situation, there will be a smooth transition to this

mode of operation. Many federal agencies already require their essential personnel to have telecommuting agreements in place. More extensive adoption of telecommuting will enhance an organization's ability to be effective in a COOP environment. The Telework Improvement Act mentioned previously would require agencies to incorporate telecommuting into their COOP plans (Walker, 2008).

SOCIETY

The tangible benefits to society include such things as the reduction in the number of vehicles on the road, which in turn reduces the number of road expansion projects that need to occur (Manoochehri & Pinkerton, 2003). A study done in Japan showed that telecommuting would lead to a 6.9 percent to 10.9 percent reduction in congestion in Tokyo (Mitomo & Jitsuzumi, 1999). Also, with less commuting, there will be a natural decrease in fuel consumption and resultant decrease in pollution. More specifically, telecommuting reduces pollution, resulting in fewer emissions from commuter vehicles; less business travel, such as air travel and rental cars; and less energy consumption for heating, cooling, and lighting office space (World Resources Institute, 2004).

The intangible benefits of telecommuting to society include the opportunity for organizations to support local, in particular rural, communities by allowing more people to work from home and contribute to the economies of their local communities (Baruch, 2000; Baruch, 2001).

LIMITATIONS

INDIVIDUALS

One of the prevalent challenges that individuals report when telecommuting is the feeling of isolation that occurs (Baruch, 2001; Manoochehri & Pinkerton, 2003). If the telecommuter is truly isolated from the organization, then this could lead to the person being passed over for promotions or not getting a choice assignment (Baruch, 2000; Baruch, 2001). Another concern of telecommuters is that their personal life will more often conflict with their work life (Crandall & Gao, 2005).

ORGANIZATIONS

The limitations, as seen by the organization, of telecommuting include the lack of control over telecommuters versus traditional employees, loss of teamwork benefits, and concerns with health and safety of the employees outside of the office environment (Baruch, 2000; Baruch, 2001). However, the more tangible cost of providing the telecommuting employee with the right tools to perform their tasks is probably of most concern to the employer. The U.S. General Services Administration (2006) reported that total annual spending by government agencies on telecommuting information technology ranges from $310 to $5,420 per user, with an average per user cost of $1,920.

Another major telecommuting concern of many agencies is information security (Holmes, 2008). Workers are often prohibited from taking home information that is considered sensitive, thus limiting their ability to work at home (Holmes, 2008). Some security measures may be implemented, such as encrypting data on laptops, but this increases expense and the workload for information technology managers (Holmes, 2008). Until the information security issue can be satisfactorily addressed, government agencies will be reluctant to more widely implement telecommuting.

SOCIETY

The final discussion in the limitations of telecommuting is that of the limitations on society. As individuals start to telecommute, they become isolated from social institutions (Baruch, 2000; Baruch, 2001). This could lead to individuals becoming socially isolated from each other and having fewer face-to-face relationships (Crandall & Gao, 2005). This could also be viewed as an organizational limitation, since a considerable amount of work effort takes place utilizing teams. Isolation by team members could have a considerable impact on the productivity of those teams

APPLICATION TO THE DEPARTMENT OF DEFENSE

This article has examined the benefits and limitations of telecommuting; now is the time to apply these findings as well as the professional experiences of the authors to a notional case study of a Department of Defense organization. For the purposes of this case, the authors assume a small department (~350 employees) within a larger organization will begin to implement a telecommuting program with its employees. Currently, an established telecommuting program already exists within the larger organization, so no new policy will need to be established to implement the telecommuting program in the department. For the purpose of this notional case study, the authors will assume that even though the benefits to individuals and society are very important, only the benefits to the organization will be important enough to *motivate* management to allow telecommuting arrangements for their employees. The vast majority of the employees within the department have positions that are amenable to telecommuting arrangements. Based upon the U.S. General Services Administration's Telework Technology Cost Study recommendation that from 25 percent to 50 percent of the workforce should telecommute, an assumption will be made for this analysis that 25 percent of the department's personnel should telecommute to determine the costs and benefits for the organization. This could be viewed as 25 percent of the employees are in a full-time telecommuting program or that 25 percent of the overall work-hours for the entire organization are accounted for as telecommuting hours.

The table shown here shows the cost-benefit analysis performed on the notional Department of Defense organization. As is seen in the analysis, the increased benefit to the organization per person per year would be $90,335 due to telecommuting implementation. If 25 percent of the workforce, or the equivalent of 87 work-year hours, were to take part in the telecommuting program, this would have a net benefit to the organization of $7,859,225 per year. With this in mind, one of the limitations of this

Benefits (per employee):	Value per Employee ($) per year					Assumptions
	Year 1	Year 2	Year 3	Year 4	Year 5	Analysis will only be done for 5 years since that is the length of time the department typically retains employees.
Productivity Increase	$ 16,875.00	$ 17,381.25	$ 17,902.69	$ 18,439.77	$ 18,992.96	This is based on the worst-case productivity increase of 15% reported by the International Telework Association and Council in their Telework America 2000 research report. Assuming a 2,000 hour year. The beginning hours of productivity will be assumed to be 5 hours out of 8 hours. Therefore the increase will be 0.75 hours per day or 187.5 hours per year. A department rate of $90.00/hour will be used.
Reduced Facilities Space	$ 28,571.00	$ -	$ -	$ -	$ -	This is based upon the authors' professional experience concerning the cost of 35 additional office spaces; infrastructure to support those individuals would be approximately $1.0M. This will only be assumed for one year since a building is sunk costs.
Reduced Absenteeism	$ 1,440.00	$ 1,483.20	$ 1,527.70	$ 1,573.53	$ 1,620.73	This is based upon the Nilles (1998) report that individuals who telecommute take two less sick days per year than those who don't. Assuming 8-hour days, that equates to 16 hours. Based upon a department hourly rate of $90.00/hour.
Subtotal:	$ 46,886.00	$ 18,864.45	$ 19,430.38	$ 20,013.30	$ 20,613.69	
Net Present Value (Benefits):	$ 116,646.60					
Costs (per employee):	**Value per Employee ($) per year**					
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**	
Information Technology	$ 5,420.00	$ 5,582.60	$ 5,750.08	$ 5,922.58	$ 6,100.26	This is based upon the worst-case numbers given by the U.S. General Services Administration in their report titled Telework Technology Cost Study of between $310.00 to $5,420.00 per telecommuter for IT equipment and support.
Net Present Value (Costs):	$ 26,310.68					
Net Present Value (Cost-Benefits Analysis)	$ 90,335.92					
Entire telecommute population (25% solution)	$ 7,859,225.24					Total department workforce of 350 people. 25% will telecommute or 87 people.

Note: Inflation rate and rate of return were set at 3%.

TABLE. TELEWORK COST-BENEFIT ANALYSIS FOR GOVERNMENT ORGANIZATION

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analysis is that all assumptions remained stable throughout the 5-year period. This is a broad assumption since nothing in a public sector organization is stable. Therefore, a more thorough analysis of the instabilities in the workforce and the tasking should be performed during future research into the cost-benefit of telecommuting programs.

CONCLUSIONS

In summary, the benefits of telecommuting are numerous and multi-faceted. Primarily, it serves as a powerful tool to increase certain workers' productivity, morale, and overall job satisfaction. This translates to cost benefits for the organization, both from increased worker productivity and from reduced operating costs. As indicated by the analysis of the notional organization, these benefits are significant. Another benefit of telecommuting is the ability of an organization to continue operations in the event of an emergency. Events such as Hurricane Katrina have highlighted the need for having tools in place like telecommuting to ensure functionality. However, limitations of telecommuting still exist for all three of the constituents and should be recognized prior to implementing any telecommuting plan. The cost of providing telecommuting employees the proper tools is a concern for organizations as is maintaining proper information security. Perhaps the most significant of these limitations seems to be the reluctance of managers to allow telecommuting because of the perception they will not have control over their employees (or to the degree that they would if the employees worked at the office). However, as Daniel A. Green, deputy associate director of the Office of Personnel Management states, "Managers should measure employee performance by results, not physical presence" (Rosenberg, 2008). To conclude, telecommuting can be a valuable tool to entice individuals to work for *the Department of Defense* and, if managed properly, can be used not only to attract and retain employees, but also to help them become more productive in their chosen career fields.

Keywords:
Telecommute, Telework, Recruit, Retention, Motivate, Productivity, The Department of Defense

Mr. Jerome Collins is a professor of Acquisition Management at the Defense Acquisition University Mid-Atlantic Region. He teaches Systems Engineering and Program Management courses. Prior to arriving at the Defense Acquisition University, Mr. Collins was an engineering manager for the Naval Air Systems Command. He holds a BS in Electrical Engineering from the West Virginia Institute of Technology and an MBA from Florida Institute of Technology.

(E-mail address: Jerome.collins@dau.mil)

Mr. Joseph "Joe" Moschler is a professor of Systems Acquisition at the Defense Acquisition University Mid-Atlantic Region. He teaches Systems Engineering and Program Management courses. Prior to joining the Defense Acquisition University faculty, Mr. Moschler worked for the U.S. Navy as both an aerospace and systems engineer. He served in the U.S. Air Force for 22 years in operational and acquisition assignments.

(E-mail address: joe.moschler@dau.mil)

AUTHOR **BIOGRAPHY**

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ACQUISITION WORKFORCE CHALLENGE—MOTIVATION FOR GOVERNMENT VS. INDUSTRY EMPLOYMENT

John Dobriansky

Highly qualified acquisition and contracting personnel are in short supply and high demand in today's acquisition and procurement environment and into the foreseeable future. More than ever, complex federal government programs will require management by seasoned acquisition and contracting professionals. The focus of this research is on General Schedule (GS) 1102 series contracting professionals and their industry counterparts—in particular, their commonalities and differences in a number of critical areas. Seasoned acquisition and contracting professionals are and will continue to be an integral part of the *leadership team* of major complex, multi-million dollar, multi-year government programs. The federal government and its commercial contractors must remain competitive in competing for the nation's best acquisition and contracting talent.

The federal government does not have the manpower or resources to staff and execute major multi-million dollar, multi-year, complex systems and services programs. Because of this shortfall, the government contracts with qualified prime and subcontractors to augment the government workforce and provide the quality systems engineering, analysis, and systems implementation services to successfully support the nation's warfighters. This effectively places the federal government and its commercial contractors in the unenviable position of competing for acquisition and contracting talent.

The composition of the *acquisition workforce* is defined in Office of Federal Procurement Policy (OFPP) Policy Letter 05-01, Developing and Managing the Acquisition Workforce (Office of Management and Budget, 2005). The focus of this research article is on General Schedule (GS) 1102-series *contracting professionals* and their industry counterparts. The essential commonalities for motivating government (Department of Defense and civilian agency) and industry (commercial)

contracting and acquisition professionals are identified in this research. Likewise, the major differences in the motivation of government contracting and commercial contracting professional employment are also examined. This research addresses both the commonalities and the differences in a number of critical areas:

- Professional development
- Promotions and advancement
- Pay Incentives
- Stability of employment
- Influence in the organization
- Retention of Personnel

INITIAL RESEARCH FINDINGS

MAJOR ISSUES: THE ACQUISITION WORKFORCE

The federal government and its commercial contractors compete for acquisition and contracting talent that is increasingly in short supply. Cutbacks in the acquisition workforce during the 1990s and the aging of the general civil service population who remained have created worldwide demand for those employees skilled in the acquisition and contracting disciplines. What employee incentives can government and its contractors offer this finite, skilled workforce to retain them in federal and defense industry employment? This research will examine who they are, what their jobs entail, and what motivates them to continue in their chosen career fields.

WHO IS THE ACQUISITION WORKFORCE?

An important question that is critical in addressing the needs and motivations of the acquisition workforce is who is the acquisition workforce? With the OFPP Policy Letter 05-01 and the Department of Defense (DoD) Acquisition, Technology and Logistics (AT&L) Human Capital Strategic Plan 2007, v. 3.0, the acquisition workforce is defined, particularly within DoD AT&L, as those professional personnel who work in the acquisition process in the following seven out of 13 career fields which make up 87 percent of the AT&L workforce: "Systems Planning, Research, Development, and Engineering (SPRDE); Contracting; Program Management (PM); Life Cycle Logistics; Production Quality and Manufacturing (PQM); Business, Cost Estimating, and Financial Management (BCEFM); and Test and Evaluation (T&E)" (DoD AT&L, 2007). In fact, the 2006 Department of Defense Acquisition, Technology and Logistics Workforce numbered 128,242 personnel (DoD AT&L Human Capital Strategic Plan, 2007). The focus of this research article is on contracting professionals. Specifically this applies to GS-1102 contracting specialists in the government and their industry counterparts.

ASSESSMENT OF GOVERNMENT CONTRACTING WORKFORCE

WHO ARE THE GOVERNMENT ACQUISITION PERSONNEL?

In fiscal year 1991, the government employed 31,436 GS-1102 contracting specialists managing $150 billion in contracts. In 2007, the number of government-employed GS-1102 contracting specialists dropped to 28,434 while the value of the government contracts they managed jumped to $450 billion (Federal Acquisition Institute Workforce Report, 2007). The magnitude in contract dollars can and will fluctuate by government agency as priorities change, particularly in light of the nation's recent transition to a new political administration. In aggregate, however, the magnitude of government contract spending is expected to continue at the high levels reported in 2007. This will continue to put pressure on both the government acquisition and contracting workforce and the commercial (industry) contracting and acquisition workforce to effectively manage the $450 billion contracts and programs portfolio.

ASSESSMENT OF INDUSTRY CONTRACTING WORKFORCE

WHO ARE THE COMMERCIAL CONTRACTING PERSONNEL?

In fiscal year 2007, an estimated 50,000 industry contracting professionals were considered counterparts to their government process partners. The commercial contracting personnel included two main categories—Sellers and Procurement. Sellers included:

- Managerial contracting personnel (directors, managers of contracting organizations)
- Nonsupervisory contracting managers equivalent to nonsupervisory government contracting officers
- Contracting administrators of all levels

Commercial procurement included:

- Managerial subcontracting personnel (directors, managers of contracting organizations)
- Nonsupervisory subcontracting managers equivalent to nonsupervisory government contracting officers
- Subcontracting administrators of all levels

COMMERCIAL PROCUREMENT PROFESSIONALS

Prime contractors in particular have significant organizations to handle the full life cycle of acquisition for negotiating and managing a plethora of subcontractors. Major prime contractors have multiple tiers of subcontractors. Prime contractors have the full responsibility for the performance of their multiple tiers of subcontractors. To successfully manage the performance of a prime contractor's multiple tiers of subcon-

tractors, prime contractors have significant subcontract management organizations to perform the full life cycle of subcontract acquisition, including contract negotiation and post-award contract management.

- Managerial subcontracting personnel (directors, managers of contracting organizations)
- Nonsupervisory subcontracting managers equivalent to nonsupervisory government contracting officers
- Subcontracting administrators of all levels

ASSESSMENT OF MOTIVATIONAL FACTORS COMMON TO THE CONTRACTING WORKFORCE

Essential commonalities for motivating government (Department of Defense and civilian agency) and industry (commercial) contracting and acquisition professionals are focused in a number of critical areas:

- Professional development
- Promotions and advancement
- Pay Incentives
- Stability of employment
- Influence in the organization
- Retention

This research discusses specific differences motivating the government contracting workforce versus the commercial contracting workforce in each of these areas.

MOTIVATING GOVERNMENT-INDUSTRY CONTRACTING WORKFORCE—PROFESSIONAL DEVELOPMENT

Contracting is a very dynamic profession. Continuing legislative and statutory initiatives demand that acquisition and contracting professionals retain currency. The transition to a new administration will provide even more significant changes in the acquisition legislative and regulatory framework. Significant new oversight of government contractors and major government systems programs can be expected with the new administration. This stems in part from the significant cost and schedule overruns and performance issues from a number of major Department of Defense (DoD) weapons systems and civilian agency "system of systems" programs and information technology systems programs.

Currency in the contracting field goes beyond certification. It also encompasses day-to-day contracting operations and problem-solving skills needed by leaders and

contracting officers. Contracting and acquisition professionals in both government and industry must have the commitment, support, and sponsorship from management—on a consistent basis—for contracting and acquisition professional training. Managers in the contacting profession need to "walk the walk" and not just "talk the talk." Consider: When have you as a contracting professional heard, "We do not have the money in the budget," or "Don't you think this is not a good time for training or professional development given your involvement in this critical, major enterprise services acquisition?" When is there ever a good time for training and professional development? Contracting professionals will always be critical leaders and core team members in fast-track, complex, systems and services acquisitions.

So what motivates contracting professionals from both government and industry in professional development?

- Motivation: Management support for professional development—budget and time
  - Paid professional development on a regular basis
  - Paid time off for professional development
- Sources for Professional Development
  - National Contract Management Association (NCMA) conferences, seminars, and chapter professional development events
  - Defense Acquisition University (DAU) courses
  - Federal Acquisition Institute (FAI)-provided courses
  - Commercial acquisition and contracting course providers

Commercial organizations in the government contracting community may generally allocate an annual amount of up to $2,500 per year for professional development as part of their benefits package.

By government mandate, DoD must provide regular professional development for acquisition personnel that meets Defense Acquisition Workforce Improvement Act (DAWIA) and Federal Acquisition Certification (FAC) requirements. The Federal Acquisition Institute (FAI) facilitates career development and strategic human capital management in support of a federal acquisition workforce including Federal Acquisition Certification in Contracting (FAC-C) and continued professional development. The payment for this type of professional development comes from the government agency budget and the FAI training fund.

PROMOTIONS AND ADVANCEMENT

Promotions and advancement represent a clear commonality in motivation for both government and commercial contracting and acquisition professionals. Wise entrepreneurs, government, and business executives recognize the value of their human capital. In any organization, employees are the greatest asset. Managers

should value their human capital—including contracting, acquisition, and program professionals—and compensate them at a level commensurate with their efforts. In other words, do not be cheap. From the government perspective, offer compensation incentives and—in the case of Base Realignment and Closure-affected employees—moving and transportation incentives to the professional staff, including contracting

Wise entrepreneurs, government, and business executives recognize the value of their human capital.

specialists, team leaders and senior contracting officers, and administrative staff. Ensure the professional and administrative staff feel appreciated and recognize them as valuable members of the organization. From a commercial contracting perspective, offer promotion and compensation incentives to supervisory contracting managers, supervisory subcontracting managers, contracting and subcontracting managers, contracting administrators, and subcontracting administrators of all levels.

SALARY AND COMPENSATION

Salary and compensation for both government and commercial contracting and acquisition professionals are dependent on a number of critical factors:

- Years of experience
- Position Type
- Education
- Certifications

The NCMA Contracts Professional Salary Survey (2007) provides significant insight into salary and compensation motivation for both government and commercial contracting professionals.

- The average salary for contracting professionals is $85,000 per year.
- Thirty percent of contracting professionals are above the average salary and earn into the $100,000+ category.
- Certifications do matter from a compensation and position perspective. Executive and managerial-level contracting professionals are more apt to have Certified Professional Contracts Manager (CPCM) credentials at 23 percent and 16 percent respectively.

Other certifications that matter in terms of position and compensation include DAWIA Level III (15 percent), CPCM (11 percent), DAWIA Level II (9 percent), Certified Federal Contracts Manager (CFCM) (5 percent), DAWIA Level I (5 percent), and Certified Purchasing Manager (CPM) or Accredited Purchasing Practitioner (APP) (4 percent).

MOTIVATIONAL FACTORS ANALYSIS

SALARY AND COMPENSATION SPECIFIC TO GOVERNMENT CONTRACTING PROFESSIONALS

Traditionally, the preponderance of 1102 series contracting professionals is in the government GS personnel system. The pay table showing salary and compensation within the GS pay grades is by incremental (1-year, 2-year, and 3-year) step increases. All GS government employees are also granted an annual, across-the-board percentage increase. Both the amounts of the per-grade step increases and the annual percentage increase (essentially inflation- and cost-of-living-based) are the result of extensive negotiations between the President, the head of the Executive Branch of the Federal Government, and the Legislative Branch of the Congress.

Today, government employees work under a proliferation of personnel systems outside of the traditional GS system. An example is the DoD's National Security Personnel System (NSPS). The NSPS provides for pay bands and pools of money as merit incentives for 1102-series professionals. Although NSPS is a good concept, it needs to be applied appropriately and practically to motivate and retain government contracting acquisition professionals.

GOVERNMENT CONTRACTING PROFESSIONALS' PROMOTION AND ADVANCEMENT

Promotion and advancement avenues specific to government professionals include nonsupervisory GS-14 and GS-15 positions in the 1102 contracting series. The percentage of GS-14 nonsupervisory 1102-series positions is much larger than the percentage of GS-15 nonsupervisory 1102-series positions.

Retaining a reasonable number of GS-14 and GS-15 nonsupervisory contracting operations, policy, and oversight positions provides an avenue for promotion and advancement for government contracting professionals who prefer to remain "technical specialists" in their field or who do not like, or have an interest in, supervising other contracting professionals and administrative personnel.

In the commercial sector, promotions to positions equivalent to the GS-14 and GS-15 levels in government are much more focused on supervisory management positions. An exception to this is the contracting manager, which in some major government defense contractors such as Raytheon, is a high-level, nonsupervisory professional generally equivalent to a nonsupervisory government contracting officer at the GS-14 level.

DoD GOVERNMENT CONTRACTING PROFESSIONALS—SPECIFIC

Of major impact specific to DoD government contracting professionals is the Base Realignment and Closure (BRAC). The BRAC commissions are formed with an eye toward membership from independent high-level experts to provide sound, unbiased recommendations. The commission provides its results in the form of a Report to the President of the United States recommending DoD base closures and realignments. These recommendations potentially impact a significant number of active military and DoD civilian personnel. The current commission delivered its final report to the president on September 8, 2005, listing its recommendations for revamping the U.S. military's infrastructure and force structure.

Of DoD's 33 major closure recommendations, the commission recommended that seven bases be realigned rather than closed, and rejected five recommendations outright. In addition, the commission recommended closing rather than realigning another installation, for a total of 22 major closures. The President chose to approve the BRAC 2005 Commission's report, and sent the report to Congress for legislative review on September 15, 2005. Congress accepted the commission's report in its entirety within the required 45-day period. Subsequently, the recommendations of the BRAC 2005 Commission became law on November 8, 2005. Within this law are a number of timetable requirements for the DoD. The DoD had until September 15, 2007, to begin the process of closing and realigning the installations called for in the BRAC 2005 Commission's report. The process must be completed by September 15, 2011.

POSITIVE IMPACTS

Organizational change due to BRAC may bring positive promotion and advancement opportunities (Dobriansky, 2007). These positive opportunities are:

Promotion opportunities. The BRAC process creates opportunities for those professional contracting and acquisition employees at various levels who do choose to relocate with their agencies or organizations. These opportunities include promotion potential and advancement. Ensure that team leaders and other leadership professionals have real advancement opportunities. The loyalty gained from promoting deserving employees may far outweigh the additional compensation and incentive costs.

Compensation and other monetary awards-retention and motivation. Professional and administrative employees are motivated in a number of ways. Substantive salary increases and other monetary rewards are important motivating factors. Substantive compensation increases and other monetary awards can be powerful motivating factors toward retaining professional and administrative staff. In the case of an organization relocating under BRAC, the use of retention bonuses for DoD acquisition and contracting professionals as an incentive to stay with their current organization, should be authorized and implemented. A combination of a substantive salary increase and substantive monetary awards can be a powerful motivator toward retaining professionals. Again, the loyalty gained may far outweigh the additional compensation and incentive costs.

COMMERCIAL CONTRACTING PROFESSIONALS' PROMOTION AND ADVANCEMENT

In commercial organizations—for example a particularly large government contractor such as Lockheed Martin—an established career progression is in place. Typically, the types of progression are:

- Director of Contracts
- Manager of Contracts
- Contracts Manager
- Contract Administrator III
- Contract Administrator II
- Contract Administrator I

The commercial career progression for nonsupervisory contracting personnel from Contract Administrator I through Contracts Manager essentially involves higher levels of pay, responsibility for more complex contracts and programs, and, in theory, more latitude for decision making. Unlike their government contracting professional counterparts, beyond Contracts Manager only a small percentage of nonsupervisory promotion opportunities exists. Most promotional opportunities in industry within the government contracting community are within the supervisory management ranks. Not every contracting professional has the skills, personality, and fortitude for becoming a successful supervisor of contracting professionals. Many contracting professionals with excellent technical skills have been promoted into the supervisory management ranks, but have been less than stellar as leaders.

COMPENSATION DIFFERENCES—INDUSTRY VS. GOVERNMENT CONTRACTING PROFESSIONALS

A key difference in compensation that motivates commercial contracting professionals but is unavailable to their government counterparts is the bonus for meeting division business goals. The commercial (industry) business goals are normally defined in terms of:

- Meeting and exceeding profitability goals
- Existing business retention
- New business capture

Profitability goals are normally set by the division vice president on a negotiated basis with the division president. Profitability goals are normally expressed in terms of better than 15–20 percent on fixed price program contracts. Profitability goals for cost plus, labor-hour, time and material, and other hybrid contract types will normally be less given the lesser risk exposure on the commercial contractors from using these contract types.

Commercial employees in a government contractor's division will share in a compensation pool for that division if the division's profitability goals are met or exceeded. How much each commercial contracting professional will get from the bonus compensation pool will be dependent upon a number of factors:

- Level of the contracting professional's position
- Level within the grade of the position (i.e., close to the mid-point or close to the top of the pay scale)
- Perceived contribution to exceeding profitability goals

This can be a disincentive for commercial contracting professionals. Government contractors have given larger bonuses to their program office personnel for meeting or achieving profitability goals due to the perception of a larger value-added by the program office versus the "regulatory" or "administrative" function of their contracting professionals.

Generally those commercial contracting professionals are above the mid-point in the salary range for their positions and close to the high end of the salary range for their positions.

STABILITY FOR CONTRACTING PROFESSIONALS: GOVERNMENT VS. COMMERCIAL

Traditionally, the world of the government contracting professional has been the more stable and secure world. Not so today—the environment in the government has changed. With the dramatic government downsizing—50 percent of the 1102 series

The government grants no guarantee that the top five government contractors will be able to maintain their contracting professional base.

starting in the 1990s—the supposedly secure government position does not exist anymore. In fact, the government and the commercial sector may be at parity when it comes to stability and security of employment for contracting professionals.

The government contracting industry has in the last 10 years undergone an unprecedented wave of mergers, acquisitions, and consolidations. The top five government contractors—Lockheed Martin Corporation, Northrop Grumman Corporation, Boeing Corporation, Raytheon Corporation, and General Dynamics—receive

a combined 50 percent of the discretionary procurement dollars from the federal government, particularly the DoD. Winning large contracts is critical to sustaining the infrastructure, including the contracting departments of these large government contractors. In fact, the government grants no guarantee that the top five government contractors will be able to maintain their contracting professional base. A current example is Boeing Corporation, which is facing worldwide competition from large international government contracting conglomerates, such as London-based BAE Systems. Boeing Corporation's contracting professionals may be facing layoffs, reductions-in-force, and early retirements with Boeing's existing government contract base. However, this may be more of a unique situation given the highly publicized and highly political U.S. Air Force Tanker Acquisition program in 1995. For the most part, the contracting professionals of the other top major government defense contractors may enjoy as much or more security than their government contracting counterparts, with more flexibility and less hierarchical snobbery than can be found in some federal agencies.

INFLUENCE IN THE ORGANIZATION

GOVERNMENT

Contracting organizations in government today have an increasingly significant influence in their respective agencies. Warranted contracting officers have express authority to commit the government to contracts with commercial organizations. Well-publicized cost and schedule overruns, along with performance problems have led to the cancellations of major government programs and contracts, including DoD weapons systems and federal enterprise financial and information technology systems implementation. The Government Accountability Office (GAO) high-risk list currently contains 16 major government acquisition programs from various government agencies, including the Department of Energy and the Department of Defense. This has amplified not only the need for more government acquisition personnel, but has gained federal acquisition personnel more extensive influence within the organization and with the programs they manage.

COMMERCIAL

Large prime contractors such as Lockheed Martin, Northrop Grumman, General Dynamics, and Raytheon will generally have their contracts management groups reporting at a high level to a division vice president in an operational division environment. These companies will also have strong corporate contracting departments aligned to a very high headquarters executive management reporting level. This type of structure provides contracting professionals within these commercial companies with the opportunities to exercise significant business decision making and discretion vis-à-vis their program office counterparts.

This is not an industry-wide state of affairs. In many companies—some of them rather large government contractors—the contracting management function reports as a subordinate organization through legal departments, finance departments, and

even commercial product companies that sell to the government through the sales or marketing departments. This type of subordinate reporting structure is more prevalent among smaller companies.

Reporting as a subordinate function through finance or legal does not provide opportunities for contracting professionals to exercise the business discretion and influence with the program office counterparts within their organization. Even more importantly, with this type of subordinate organization structure, commercial contracting professionals have limited authority in dealing with their government counterparts. Commercial contracting professionals within these subordinate organizational structures may not, and in many cases do not, have the authority to negotiate with the government contracting officer. This type of subordinate organizational placement does not motivate commercial contracting professionals.

RETENTION

This is a much talked about issue, with a retirement bow wave predicted for the acquisition workforce in government by 2017. The table shown here displays statistics concerning the 1102-series government contracting specialists (FAI Workforce Report, 2007):

TABLE. RETENTION STATISTICS—FEDERAL ACQUISITION INSTITUTE WORKFORCE REPORT 2007

Total Series 1102 Government Contracting Specialists	28,434
DoD	19,119
Civilian Agencies	9,315
Average Grade	11.68
Average Age	46.46
Percent Female	60%
Percent Eligible to Retire–FY 2007	14%
Percent Eligible to Retire–2017	54%

Declining retention rates due to retirement in the near term is an issue. The flagging economy and the huge drop in the stock market where a large percentage of people have seen the value of their retirement assets drop significantly will probably delay a substantive percentage of retirements. However, a potential 54 percent retirement rate for 1102-series government contracting specialists in 2017 is a projected tsunami.

A critical issue is the retention of key institutional and program knowledge as the government contracting workforce retires. A number of solutions, used in combination and individually, present themselves. These solutions can be classified under the heading of knowledge management.

An information technology (IT)-based knowledge management solution can capture specific components of a retiring government contracting officer's body of knowledge on specific, critical, complex, government performance-based services acquisition or weapons systems acquisitions. However, an IT-based knowledge management solution can not apply that knowledge to new government contracting officers who are taking on the new responsibility for those programs. A new transitional approach may be effectively used, whereby the retiring government contracting officers then come back on a part-time basis for a period of up to a year to work with the new government contracting officers on critical, complex, performance-based services or weapons systems acquisitions. This approach, used in conjunction with the IT-based knowledge management system, will enable a smooth transition and application of critical institutional and programmatic (contractual) knowledge transfer from the retiring government contracting officers to the new government contracting officers. This two-pronged solution may effectively mitigate damage to complex, long-term government programs and the contracts supporting those programs in light of the projected retirements of a significant number of 1102-series contracting personnel.

AREAS FOR FURTHER ANALYSIS

Much data and information exists concerning the government acquisition workforce—particularly the 1102-series government contracting specialist. However, in the data collection, research, and analysis for this article, significantly less information was readily available concerning the government's commercial (defense contracting) counterparts. The government defense contracting community represents a large and very significant shadow workforce in the government acquisition arena. Further analysis and research of this shadow workforce as to its size, position make-up, skills, experience, compensation, and motivation would be worthwhile.

CONCLUSIONS

An essential level of commonalities exists, with specific differences, for motivating government (Department of Defense and civilian agency) and industry (commercial) contracting professionals' employment.

The commonalities, with specific differences, are focused in a number of critical areas:

- Professional development
- Promotions and advancement
- Pay Incentives
- Stability of employment
- Influence in the organization
- Retention of Personnel

Most government and commercial contracting professionals are motivated by employer-paid regular professional development and advancement. Some do not want supervisory management responsibilities, but rather want to be high-level technical specialists in contracting and acquisition. Compensation and incentives are very critical motivators for both government and commercial contracting personnel. The perception of enhanced stability of employment appears to be more of a motivation for government contracting professionals.

Influence in the organization appears to be more of a motivation for government contracting professionals, while retention of contracting personnel is more of a motivational issue for government contracting personnel and less of a motivational issue with commercial contracting personnel.

The government acquisition workforce, including 1102-series contracting specialists, was decimated in the 1990s through a number of congressional initiatives. According to a 2005 GAO report on government acquisition trends, the acquisition workforce went from 75,000 in 1997 to 68,000 in 2001, while the number of contracting transactions, contracts, and dollar values managed trebled. Accordingly, continued advancement of those initiatives and incentives that increase employee retention and motivate both government and commercial contracting professionals is critical.

Keywords:
acquisition workforce, contracting professionals, motivation-contracting professionals, leadership team, defense industry contracting

Mr. John Dobriansky, CPCM , MBA, NCMA, is a trained acquisition and contracting professional, with supervisory experience in government contracting operations and policy within federal agencies and the Department of Defense. His expertise also encompasses the application of Lean Six Sigma. He is currently the vice president for operations for the National Contract Management Agency (NCMA) Washington, DC, Chapter, and also holds the title of NCMA Fellow. Mr Dobriansky is a Certified Professional Contracts Manager and holds an MBA and MS from The George Washington University and Marymount University, respectively.
(E-mail address: jd.speed@verizon.net)

AUTHOR **BIOGRAPHY**

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SHAPING THE LIFE CYCLE LOGISTICS WORKFORCE TO ACHIEVE DESIRED SUSTAINMENT OUTCOMES

Bill Kobren

Successful implementation of DoD life cycle management policies requires an innovative logistics workforce with unparalleled knowledge, skills, abilities, creativity, and interdisciplinary insights to achieve desired sustainment outcomes in an increasingly resource-constrained environment. The defense acquisition workforce in general, and the life cycle logistics community in particular, must therefore be equipped and incentivized to develop, implement, and oversee increasingly more effective and cost-efficient performance-based life cycle product support strategies to sustain DoD weapon systems at every stage of their life cycle. This will be achieved in large measure through an innovative, integrated, joint logistics human capital development initiative that prepares the defense life cycle logistics workforce to deliver effective and efficient weapon system support and sustainment in the coming decades.

Analogous to the crew members of the fishing vessel *Andrea Gail* in the 2000 film of the same name, the Department of Defense (DoD) logistics community faces a "perfect storm" of creatively having to support an inventory of rapidly aging weapon systems (many of which are well past their originally envisioned design lives) in the face of potentially declining *sustainment* funding, higher than anticipated equipment operational tempo rates (often in harsh operating environments), and supported by an increasingly mature civilian workforce. While in the short run, a large measure of the success DoD has experienced in supporting these aging systems is directly attributable to the experience, maturity, and expertise of the *logistics workforce*, the fact remains that a significant portion of that workforce is or will be retirement-eligible over the next 5 years. Further complicating the situation is the prospect of reduced weapon system procurement and sustainment funding resulting from the global economic slowdown, anticipated troop withdrawals from Iraq, and a

new administration at least initially focused on a variety of non-defense priorities. In fact, Estevez (2007) wrote, "DoD future funding [was already] under great pressure, with Congress signaling a priority for other national programs. Supplementals will shrink and [potentially even] disappear before [the] force is reset and re-equipped [to support the] national military strategy."

DoD logistics costs, primarily focused on weapon system maintenance, supply, and transportation, have steadily increased over the last 8 years, largely, but not exclusively, in support of ongoing operations in Iraq and Afghanistan, reaching $178 billion a year in 2007 (Estevez, 2008). Given current political, revenue, and economic realities, expenditures of this magnitude are likely to be unsustainable over the long-term.

Successful implementation of effective *life cycle management* policies—particularly in view of the fact similar initiatives in earlier decades often lacked strong enforcement mechanisms, requisite funding, long-term management commitment, or for a variety of other reasons, failed to deliver desired cost and readiness improvements—requires not only strong policies, but just as importantly entails an innovative logistics workforce with unparalleled knowledge, skills, abilities, creativity, and interdisciplinary insights to achieve desired sustainment outcomes in an increasingly resource-constrained environment. The defense acquisition workforce in general, and the *life cycle logistics* community in particular, must therefore be equipped and incentivized to develop, implement, and oversee increasingly more effective and cost-efficient performance-based life cycle product support strategies to sustain both legacy and new DoD weapon systems at every stage of their life cycle. Is it achievable? If so, what exactly would it look like? The answer lies in an innovative, integrated, joint logistics *human capital* development initiative that recognizes the new economic, political, and military realities America and the Department of Defense face, while at the same time prepares the life cycle logistics workforce to deliver effective and efficient weapon system support and sustainment in the coming decades.

BACKGROUND

Life cycle management itself is not a new concept, as the Air Force Logistics Command (now Materiel Command) history office so eloquently stated nearly 30 years ago:

> … [The] most vital function was seeing that logistics, including supportability and costs, throughout the life of the system were considered whenever decisions were made about the form of the system. It generally was far less difficult, costly, and time consuming to make design changes before a weapon system entered production than to make modifications in the completed system…Incorporating logistics considerations into the design of weapon systems was, in fact official policy dating back to 1964. The Department of Defense obligated the Services to conceive weapon systems with logistics in mind, emphasizing the cost of the system over its entire life, not just

> the cost of an item at the end of the production phase. This concept of integrated logistics support was, of course, not even new even in 1964; it represented the continuation of the long-standing interplay between the research and development process, and the logistics dimension. (Termena, Peiffer, & Carlin, 1981)

DoD assigns life cycle management responsibility to the program manager:

> The Program Manager (PM) is the designated individual with responsibility for and authority to accomplish program objectives for development, production, *and sustainment* [italics added] to meet the user's operational needs. (DoD Directive 5000.01, 2003, Pt. 3.5)

Current DoD Life Cycle Management guidance (or Total Life Cycle Systems Management) states:

> The PM shall be the single point of accountability for accomplishing program objectives for total life-cycle systems management including sustainment…PMs shall consider supportability, life cycle costs, performance, and schedule comparable in making program decisions. Planning for Operation and Support and the estimation of total ownership costs shall begin as early as possible. Supportability, a key component of performance, shall be considered throughout the system life cycle. (DoD Directive 5000.01, 2003, Pt. E.1.29)

DoD reiterated the importance of Life Cycle Management principles by acknowledging the long-term benefits of addressing long-term sustainment planning, including cost containment early in a system's life cycle in August 2006 when the Joint Requirements Oversight Council (JROC) strengthened current DoD Total Life Cycle Systems Management (TLCSM) policy by issuing JROC Memorandum 161-06 "Key Performance Parameter (KPP) Study Recommendations and Implementation." The JROC memorandum established a mandatory Materiel Availability KPP for all ACAT I Major Defense Acquisition Programs (MDAP) and selected ACAT II and III programs, along with two Key System Attribute (KSA) requirements for materiel reliability and ownership cost. This guidance was codified in the May 1, 2007, Chairman of the Joint Chiefs of Staff Manual (CJCSM) 3170.01C, *Operation of the Joint Capabilities Integration and Development System (JCIDS)*, which stated "a Sustainment KPP (Materiel Availability) and two mandatory supporting KSAs (Materiel Reliability and Ownership Cost) will be developed for all JROC Interest programs involving materiel solutions. For non-JROC Interest programs, the sponsor will determine the applicability of this KPP."

Shortly thereafter, the Deputy Under Secretary of Defense for Logistics and Materiel Readiness (L&MR) issued a March 10, 2007, policy memo entitled "Life Cycle Sustainment Outcome Metrics" providing detailed guidance to the logistics and sustainment community, including a series of 14 life cycle sustainment enablers

to assist program managers, life cycle logisticians, and systems engineers in meeting the new KPP and KSA requirements. Implementation of these policies was critical in institutionalizing a methodology for establishing enforceable sustainment requirements early in program development, while simultaneously directly supporting earlier guidance, which mandated program managers "consider supportability, life cycle costs, performance, and schedule comparable in making program decisions." (DoD Directive 5000.01, 2007, Pt. E.1.1.29)

In July 2008, the Under Secretary of Defense for Acquisition, Technology and Logistics issued another critically important policy memorandum, reiterating that "implementing life cycle management is a top priority for the Department of Defense. To achieve that objective, we must seamlessly integrate our acquisition and life cycle sustainment policies ... [and] institutionalize implementation of mandatory life cycle sustainment metrics; align resources to achieve readiness levels; track performance throughout the life cycle; and implement performance-based life cycle product support strategies." (Young & Fowler, 2008)

PBL offers the best strategic approach for delivering required life cycle readiness, reliability, and ownership costs.

The memo goes on to emphasize the department's long-standing commitment to performance-based sustainment, stating, "for several years, acquisition and sustainment management have been appropriately focused on performance-based strategies. DoD Directive 5000.01 currently recognizes *performance-based logistics (PBL)* as a key policy principle. I direct the Services to continue this emphasis with a more precise orientation on life cycle product support. PBL offers the best strategic approach for delivering readiness, reliability, and reduced ownership costs. *All of the policies and directions discussed in this memorandum are enabled by effective PBL implementation* [italics added]."

This emphasis was again reiterated in the recently updated December 2008 version of DoD Instruction 5000.02, which states "life-cycle sustainment planning and execution seamlessly span a system's entire life cycle, from Materiel Solution Analysis to disposal. It translates force provider capability and performance requirements into tailored product support to achieve specified and evolving life cycle product support availability, reliability, and affordability parameters." (DoD Instruction 5000.02, 2008, Pt. 8.c.[1])

Additionally, the new instruction instructs the program manager to "employ effective Performance-Based Life Cycle Product Support (PBL) planning, development, implementation, and management" (Pt. 8.c.[1][d]), emphasizing that "Performance-Based Life Cycle Product Support represents the latest evolution of Performance-Based Logistics. Both can be referred to as 'PBL.' PBL offers the best

strategic approach for delivering required life cycle readiness, reliability, and ownership costs. Sources of support may be organic, commercial, or a combination, with the primary focus optimizing customer support, weapon system availability, and reduced ownership costs." (Pt. 8.c.[1][d])

Indeed, the requisite policies needed to effectively implement life cycle management are now in place. On the front lines of successful implementation, shoulder-to-shoulder with their program manager counterparts, stands the DoD Life Cycle Logistics workforce.

LIFE CYCLE LOGISTICS

To accomplish an undertaking of this magnitude, it is important to first understand exactly what life cycle logistics is and how it integrates into the broader DoD logistics community. DoD defines life cycle logistics as "the planning, development, implementation, and management of a comprehensive, affordable, and effective systems support strategy." (Defense Acquisition Guidebook, 2006, Pt. 5.1.2)

Moreover, "the demand for life cycle logistics expertise will remain strong as the acquisition community supports: 1) almost 100 major acquisition programs; 2) recapitalization of equipment and systems used to support the global war on terror; 3) an expanded and evolving expeditionary requirement, including surge requirements for security, stabilization, and reconstruction operations; contingency operations; and/or humanitarian assistance; 4) supply chain management; and 5) expanded use of logistics services to support deployed systems." (DoD *Human Capital Strategic Plan*, 2008)

Significant concern exists by all stakeholders on the departure of the "baby boomer" workforce, and it is often described as a retirement bow wave.

The approximately 12,600 life cycle logisticians in the defense acquisition workforce are responsible for nothing short of translating warfighter performance requirements into tailored, cost-effective product support spanning a system's life cycle from concept to disposal. Charged with ensuring "sustainability requirements are addressed comprehensively and consistently with cost, performance, and schedule during the life cycle" (DoD Human Capital Strategic Plan, 2008), the life cycle logistics workforce literally stands at the nexus between the defense acquisition workforce and the almost one million logistics personnel serving in a variety of related DoD supply, distribution, transportation, maintenance, and product support positions. Ensuring this workforce is properly recruited, supported, trained and developed is clearly essential to the successful development, sustainment, and life cycle management of DoD

weapon systems. The department, however, has its work cut out for it, particularly as the average age of the workforce increases:

Significant concern exists by all stakeholders on the departure of the 'baby boomer' workforce, and it is often described as a retirement bow wave. Today, 21 percent of the life cycle logistics civilian workforce are eligible for full retirement and approximately 24 percent [more] will become eligible for full retirement over the next five years. *The department must strengthen and sustain the life cycle logistics mission-critical workforce capability in order to continue to meet warfighting requirements* [italics added]. (DoD Human Capital Strategic Plan, 2008, Appendix 3, pp. A3-1, A3-2, A3-21)

DoD LOGISTICS HUMAN CAPITAL STRATEGY

The May 2008 DoD Logistics *Human Capital Strategy* (HCS) (available at http://www.acq.osd.mil/log/sci/hcs.html) represents a major milestone for the Department of Defense. Not only does it align with the other career fields within the defense acquisition workforce, consider inputs from industry logistics counterparts, and encapsulate all aspects of the broader DoD Logistics enterprise, but perhaps more importantly, it was endorsed by every major logistics stakeholder across the department. Among many other aspects of this initiative is the fact the strategy identifies a series of overarching workforce categories spanning the entire logistics career field (including life cycle logistics), supported by specific required competencies and detailed proficiencies for each. While the DoD Logistics HCS is necessary to "DoD developing an integrated, agile, and high-performing future workforce of multifaceted, interchangeable logisticians that succeed in a joint operating environment" (DoD Logistics Human Capital Strategy, 2008), as the goal of the initiative states, it is only a first step. In addition to addressing recruiting and retention issues resulting from an aging workforce, the department must also shape that workforce with the requisite knowledge, skills, and tools to effectively support and sustain both new and aging legacy weapon systems, and assist program managers in achieving the programmatic life cycle management requirements discussed earlier.

PROFESSIONAL DEVELOPMENT AND GOVERNANCE

The Defense Acquisition Workforce Improvement Act (DAWIA) requires the Secretary of Defense establish education, training, and career development standards for persons serving in acquisition positions in the department (Grosson et al., 2008). Life cycle logistics professional development requirements are spelled out in career field DAWIA certification requirements. Practitioner training is provided by the Defense Acquisition University (DAU), focusing on competencies and proficiencies DoD has deemed necessary. But how are these competencies and proficiencies identified? "The Logistics HCS identifies the competencies and proficiencies required to achieve [required] performance outcomes ... Identification of these technical competencies will result not only in continued improvement and refinement of the learning

assets and DAWIA certification training provided by the DAU, but will ultimately enhance the quality of the support provided by, and the expertise of, the life cycle logistics workforce." (Blodgett, Conrad, & Kobren, 2008)

The life cycle logistics community also has in place a highly effective, joint governance structure widely regarded as setting the standard for the defense acquisition workforce, and which could easily serve as a template for implementation across the broader DoD logistics community. Led by the Assistant Deputy Under Secretary of Defense for Materiel Readiness (Life Cycle Logistics Functional Leader, or functional proponent,), career field training, education, experience, and certification

[The Life Cycle Logistics FIPT] will pay dividends … for years to come.

requirements are established by a joint *functional integrated process team (FIPT)* with participants from defense agencies, the Joint Staff J4, and the military services. The Council on Occupational Education Reaffirmation of Accreditation Preparation Team highlighted the crucial role the Life Cycle Logistics FIPT plays in linking Service workforce competency outcomes to workforce professional development, stating, "the logistics program is using their FIPT to not only assure the congruency and currency of their curricula, but also to better integrate their curricula with [that] of other academic programs. This initiative will pay dividends … for years to come." (Cant & Bivens, 2008)

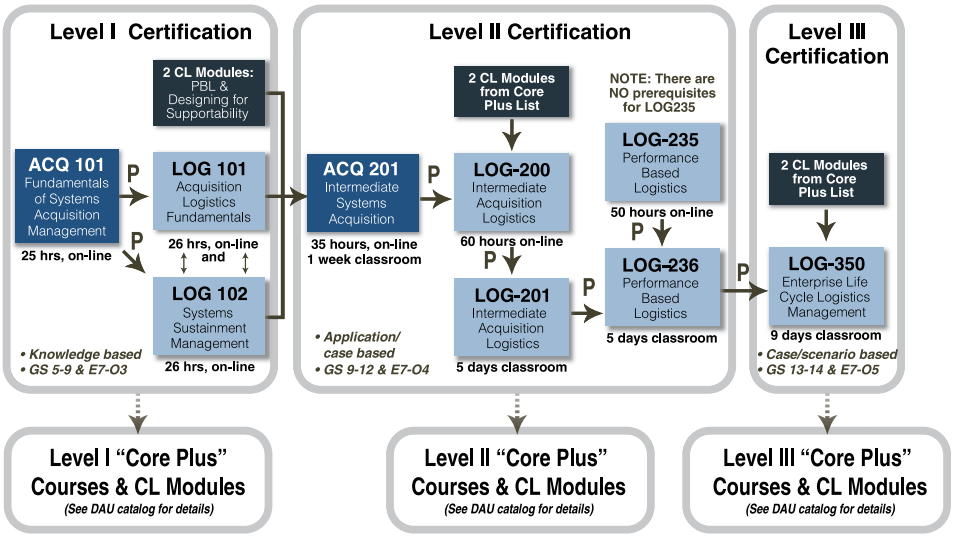
LIFE CYCLE LOGISTICS WORKFORCE TRAINING

Validated by Service and Agency Life Cycle Logistics FIPT representatives, and approved by the OSD career field Functional Leader, DAU offers the DoD Life Cycle Logistician rigorous DAWIA certification training, with particular emphasis on acquisition, acquisition logistics, sustainment, and PBL-related competencies. In addition, since the start of fiscal year 2008, a robust Core Plus Development Guide is available to each workforce member to guide their individual development plan. "Designed to advance the Defense Acquisition Workforce competency management model by providing a road map for the development of acquisition workforce members beyond the minimum certification standards required for their position … Core Plus helps identify the right learning for the right people at the right time during their professional development." (2009 Defense Acquisition University Catalog, 2008)

Built around key career field competencies, the Life Cycle Logistics Core Plus guide is available through the Web-based DAU Interactive Catalog at http://icatalog.dau.mil/onlinecatalog/CareerLvl.aspx. The guide is particularly robust in that it iden-

tifies not only a variety of other Life Cycle Logistics courses and continuous learning modules for the workforce to avail themselves of, but also identifies dozens of training assets from other career fields containing competencies that will directly benefit the Life Cycle Logistician. This Core Plus initiative not only facilitates critically important cross-functional and inter-disciplinary integration, but also clearly emphasizes the linkages between functional competency sets across the Defense Acquisition Workforce. The figure depicts the FY 09 Life Cycle Logistics Training process and certification levels.

FIGURE. FY 09 LIFE CYCLE LOGISTICS TRAINING



WHERE TO FROM HERE?

> Going forward, the [DoD Logistics] Human Capital Strategy charts an ambitious course for implementation … Key next steps include identifying consistent criteria and a standard process for assessing a logistician's competency levels and overall professional development; publication of career path roadmaps ….” (Blodgett, Conrad, & Kobren, 2008)

Acting in concert with the life cycle logistics FIPT, DAU is in the process of performing a gap analysis between existing learning assets and the new competency set, cross-walking individual proficiencies contained in the DoD Logistics Human Capital Strategy with individual Terminal Learning Objectives (TLO) taught in DAU courseware. Concurrently, DAU staff are developing and staffing a robust strategic road map to ensure each competency and proficiency is addressed, either through incorporation

into existing courseware, or through development of new training courses and continuous learning modules. Once this strategic road map is approved by the Life Cycle Logistics FIPT and the Functional Leader, revision of existing DAU certification and core-plus courses, development of new courseware, and updates to the career field Defense Acquisition Workforce Improvement Act (DAWIA) career field certification requirements will need to be aggressively implemented.

Even so, broader and more far-reaching issues remain. Recruiting and retention, particularly of younger personnel entering the career field, is an increasingly difficult challenge due to the fact pay and benefits can lag the private sector, the concept of lifetime employment is increasingly uncommon, greater numbers of mid- and senior-level civilian logistics positions are being filled by retired military logisticians, and in some cases, logistics may simply not be viewed as a desired career choice. Several ideas proposed by the National Defense Industrial Association could also be considered for the DoD life cycle logistics workforce, including scholarship programs for college students who commit to serve for a number of years, internships to familiarize students with the benefits of a logistics career, discussions with academia about integrating life cycle logistics competencies in their system engineering programs, development of more formalized mentorship programs, creation of a government-industry exchange program, and establishment of awards to encourage junior logisticians to remain in the career field (Grosson et al., 2008).

Yet successful implementation of these and other such initiatives is essential if the department is to proactively be able to anticipate the pending retirement of many more experienced life cycle logisticians. While no small comfort to those who had planned to retire sooner rather than later, one potential benefit of the current economic climate may be the slowing of this bow wave of anticipated retirements, as personnel choose to remain in the civil service workforce longer than originally envisioned. Unintended consequences, however, may also be the slowing of needed ascensions in the near term, followed by a potentially more rapid exodus of experienced personnel once the economy begins to recover.

Proper workforce sizing remains a critical consideration as well. Potentially sizeable expansion of the Life Cycle Logistics workforce is likely in the coming years. Specifically, the "Defense Logistics Agency (DLA) anticipates their Life Cycle Logistics workforce to grow as they gain employees from the various BRAC [Base Realignment and Closure] industrial sites. DLA plans to recode several thousand positions under the DAWIA Life Cycle Logistics position category description … As DLA assumes an expanded role in directly supporting the warfighter in this regard, it is imperative their workforce become familiar with more of the factors influencing their customers' requirements and expectations for support throughout the total systems life cycle." (DoD Human Capital Strategic Plan, 2008)

In addition, "the United States Air Force also anticipates a potentially sizeable increase in the number of DAWIA-coded Life Cycle Logistics positions. To meet the demands of developing, fielding, and sustaining weapon systems with increasingly long life cycles and to successfully provide effective total life cycle systems management, the Air Force chartered a team to "develop and right-size the life cycle logistics workforce engaged in systems acquisition, with the competencies, skills,

and management support necessary to translate and design warfighter performance requirements into tailored, affordable, effective product support spanning the entire system life cycle. Actual additive requirements remain to be determined, although preliminary estimates are between 1,000–2,000 additional positions." (DoD Human Capital Strategic Plan, 2008)

The potential for a 25 percent or more increase in coded life cycle logistics defense acquisition workforce positions will require careful oversight and well-managed implementation. DAU is already working closely with their Air Force and DLA functional and acquisition career management stakeholders to ensure the assimilation of any new personnel into the defense acquisition workforce is done effectively and efficiently. Significantly easing any potential additions the fact is, for the most part, that these new life cycle logisticians would not require creation of new positions or hiring new personnel, since the personnel will largely be drawn from the current DoD civilian logistics workforce.

A professional, well-trained DoD life cycle logistics workforce, supported by human capital initiatives including, but certainly not limited to, those outlined in the DoD Logistics Human Capital Strategy and in this article, and coupled with unprecedented levels of collaboration among DoD and Service logistics leaders and subject matter experts are essential ingredients to successful life cycle management and by extension, getting a handle on long-term weapon system sustainment cost. Only through cutting-edge innovative strategies such as the DoD Logistics Human Capital Strategy, defining critical workforce competency and proficiency requirements, aggressive workforce professional development initiatives, and implementation of targeted training, recruiting, and retention strategies can DoD ensure the life cycle logistics workforce is prepared and incentivized to effectively support and sustain both aging legacy systems and newly acquired weapon systems throughout their life cycles, today and well into the future.

Keywords:
Life Cycle Logistics, Sustainment, Human Capital, Life Cycle Management, Performance Based Life Cycle Product Support, Performance-Based Logistics (PBL), Human Capital Strategy, Human Capital Strategic Plan, Logistics Workforce, Functional Integrated Process Team (FIPT)

Mr. Bill Kobren is Director, Logistics and Sustainment Center, at the Defense Acquisition University. He is responsible for development of DAU logistics learning assets, and serves as Life Cycle Logistics Functional Integrated Product Team (IPT) Executive Secretary. A retired Air Force officer, he is Level III certified in Life Cycle Logistics and is a Certified Professional Logistician. He holds an MBA from Golden Gate University, and is currently attending the Industrial College of the Armed Forces (ICAF) at the National Defense University. This article is based on a research paper he wrote during the course of his studies at ICAF.

(E-mail address: kobrenw@ndu.edu)

AUTHOR **BIOGRAPHY**

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A NEW ACQUISITION BREW: SYSTEMS ENGINEERING AND LEAN SIX SIGMA MAKE A GREAT MIX

Robert L. Tremaine

Since 1990 when Congress first passed the Defense Acquisition Workforce Improvement Act (DAWIA), the Department of Defense has provided ample guidance to "improve the effectiveness of the personnel who manage and implement defense acquisition programs." Eighteen years later, and after an evolutionary training transformation intended to strengthen each functional area of expertise, the defense acquisition workforce is poised to meet even greater acquisition challenges. However, programs are becoming more technically complex. Acquisition challenges continue to dominate. Fortunately, the inherent synergy that already exists between Systems Engineering and Lean Six Sigma can help unravel the more difficult technical hurdles associated with many complex defense acquisition programs. This article addresses the common attributes that make their union the next logical step.

What do you get when you mix together *Systems Engineering* (SE) and *Lean Six Sigma* (LSS) professionals? More than likely, you will get a high-octane exchange. If you need to stoke the discussion, ask them to describe what matters most in the daily execution of their professions. Oddly enough, they would probably add the same ingredients. If you asked them what separated their two disciplines, you might notice an immediate silence—even a dead calm. Why? Well, both camps actually have more in common than you think, especially in the way they:

- Implement problem-solving techniques;
- Assess key processes;
- Employ a variety of analysis, control, and performance tracking tools;

- Draw on their functional competencies even though their educational pedigrees are noticeably different; and
- Leverage experience.

Today, it is fundamentally important that the defense acquisition workforce capitalize on their combined intellectual muscle. Directives and guidance governing their individual actions are not enough to obtain the performance outcomes the

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Department of Defense (DoD) needs. Acting together, these two distinctive groups more than others can close the development, production, and operational support gaps we occasionally see in our defense acquisition business. After all, they know how to:

- Carefully assess requirements and decompose them into optimal solutions;
- Craft comprehensive blueprints and reduce unnecessary design implications;
- Creatively integrate new systems with legacy ones;
- Build manufacturing techniques that safely and efficiently guide production;
- Optimally support products under fire;
- Unify interdisciplinary teams; and
- Influence performance outcomes.

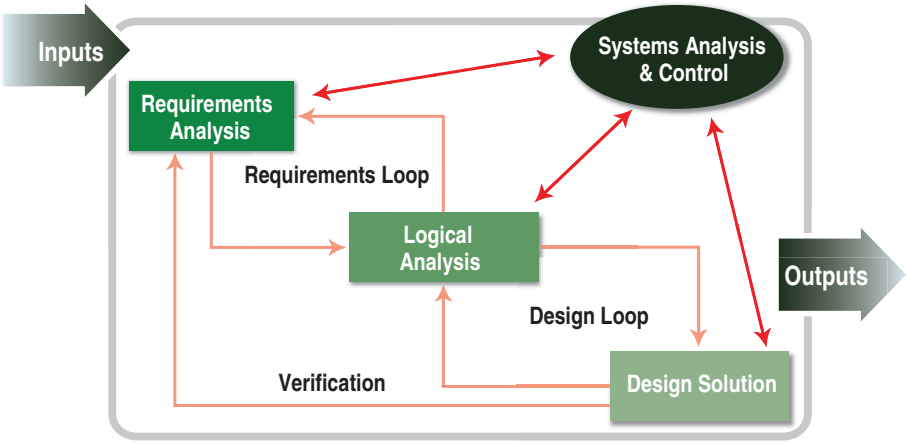
They also ask questions all the time and, not surprisingly, they are frequently asked what went wrong and/or what is needed to fix a deficiency in the event of a performance failure.

Not unlike other key functional areas, both SE and LSS seek to implement only necessary actions that favorably drive the development, production, and support of a quality product or essential service. Naturally, there could always be more synergy between any two groups, especially ones like SE and LSS that exert such a major influence on performance outcomes. So, the time is now to go way beyond simple collaboration. They need to officially join forces. The Defense Acquisition Workforce would be well-served if these two camps jointly led the charge against escalating costs and performance failures that in today's procurement environment, appear to surface ever more frequently along the acquisition continuum inside DoD's weapon system developments or during their modification and adaptation.

PROBLEM SOLVING

Problem solving is a good launching point to start understanding one of the common bonds both camps already share. Do they approach problems much differently? Actually, SE and LSS start their respective journeys by implementing very similar practices. SE itself is actually a "problem-solving process that drives the balanced development of system products and processes" (Defense Acquisition University, 2001, p. 10). Systems Engineering also kicks off problem solving with the identification of a problem and/or deficiency. After further investigation, a problem or deficiency gets translated into a definitive requirement of some kind, eventually resulting in a solution that traces back to the problem/deficiency. The hallmark of SE has been its ability to justify everything built in terms of the original requirements. To SE, this well-known construct looked something like Figure 1 in the early 1990s when it was codified in draft Military Standard (MIL-STD) 499B. In its basic form, it continues to survive as evidenced by its 2005 MIL-STD 499C descendant.

FIGURE 1. SYSTEMS ENGINEERING PROCESS MODEL



Systems Engineering clinches to a problem-solving process that is deeply rooted in subjective and objective scrutiny. Classical SEs: a) perform a requirements analysis by assessing the deficiency; b) logically, efficiently and iteratively decompose the requirements into design functions; c) synthesize the overall design; and d) conduct relevant trades within the overall design envelope, then build it, test it, and field it—analyzing and controlling the design along the way. This early methodology was eventually adopted by the International Council on Systems Engineering (INCOSE) in the 1990s. The U.S. industry eventually adopted a variant in the form of the Institute of Electrical and Electronics Engineers (IEEE) 1220 version as the standard for the application and management of systems engineering.

In DoD, SEs are trained to help transform a concept into reality through Technical Processes and Technical Management Processes. These processes become essential since new technology and the integration of new technology frequently find their

way into either already very complex systems or new ones just getting underway. These processes serve as barometers and gate checks while products evolve from concept to deployment to ensure technology readiness levels (TRLs), manufacturing readiness levels (MRLs), and system readiness levels (SRLs) are hitting their mark. In actual practice, Technical Processes are used to design and realize system products while Technical Management Processes are used to manage the technical development of the system along the way (Table 1).

TABLE 1. TECHNICAL & MANAGEMENT PROCESSES

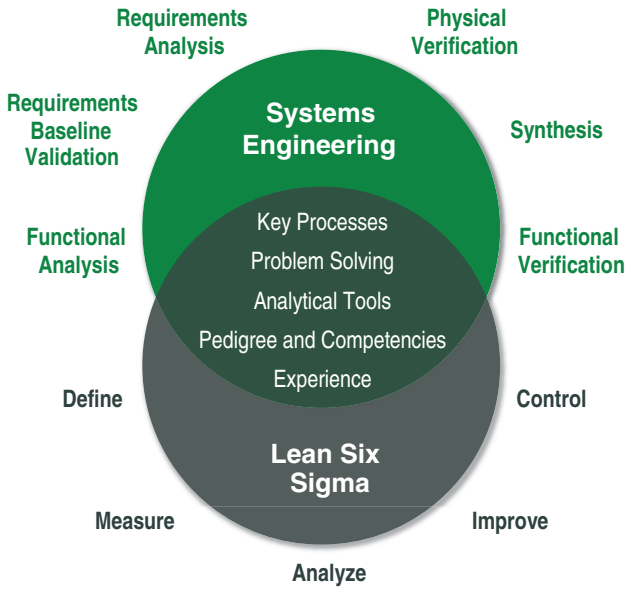
Technical Processes	Technical Management Processes
Top-Down Processes (include requirements development, logical analysis, and design solution)	Technical Planning
	Technical Assessment
Bottom-Up Realization Processes (include implementation, integration, verification, validation, and transition)	Decision Analysis
	Technical Control Processes (include requirements management, risk management, configuration management, and technical data management)

The LSS business management strategy does not necessarily include system design, but it does use a variety of complementary problem-solving processes to influence or change designs that would improve speed, quality, and cost. This element of Six Sigma is called Define-Measure-Analyze-Improve-Control (DMAIC) and takes aim at improving and balancing processes.

- Define means to "have the team and its sponsor reach agreement on the scope, goals, and financial and performance targets for the project" (George, Price, & Maxey, 2005, p. 4).
- Measure means to "determine inputs and outputs" (p. 8).
- Analyze means to "pinpoint and verify causes affecting the key input and output variations" (p. 12).
- Improve means to "learn from pilots of the selected solution(s) and execute full scale implementation" (p. 14).
- Control means "to complete project work and hand off improved process to process owner with procedures for maintaining gains" (p. 17).

By inspection, both SE and LSS employ many similar key systems processes in the development and assessment of systems. They also share several other fundamental attributes as indicated by the Venn diagram in Figure 2.

FIGURE 2. COMMON SYSTEM PROCESS COMPONENTS



LSS uses a number of handy problem-solving mixtures like value stream mapping and process flow diagrams to ensure that only necessary processes take place (George et al., 2005). These tools are also known as *system thinking diagrams*—a method of visualizing system behavior through a series of feedback links and loops. They illuminate inefficient processes and reduce variations and defects in fundamental processes. System thinking also forces an understanding of the relationships and interactions among its parts (Powell, 2002). And, LSS goes beyond Six Sigma since the best solution would be to eliminate inefficient ones (Olsen, 2008).

So, the LSS problem-solving process does look a lot like the problem-solving process used by SE. The DMAIC model appears to inject a little more creativity and scrutiny into the problem-solving equation, however. Better said, both camps do indeed have a very similar solution-oriented process. They both take a broad view of customer needs/users and extend it to people inside and outside the company. They both temper the inputs that drive their respective processes and ultimately build solutions (or build better ones) in the form of outputs that satisfy a user's needs. They both have built-in controls, improvement mechanisms, and feedback loops that guide and attenuate their decisions, selections, and solutions. Granted, the labels might be a little different; the characterization and language may even be a little different, but the intent is still the same. Both camps would probably agree that this generalized iterative form of thinking is intuitive and has been ingrained in their training. For SE, it has served their community rather well. After all, in one form or another, it ultimately helped them place a man on the moon on July 20, 1969. In retrospect, LSS might even argue that SE possessed many of the key LSS components back then, particularly in areas like innovative thinking and ground-breaking improvements—especially in safety, which became a necessity after the Apollo1 fire in 1967. Since

safety and efficiency became a necessity with space flight, then many LSS elements were already invoked to a large extent from the outset.

Today, LSS strategists go a little beyond the standard way SE solves problems, displaying a tendency to look more closely at the efficiency quotient with a greater focus on the trade space. They even build in a few more triggers that focus on quality. They also try to avoid the decisions that most groups make—rushing to design decisions (e.g., convergent thinking), which can lead to lower quality outcomes (Lamb & Rhoades, 2008, p. 5). Historically, quality has been the Six Sigma community's original focus since poor quality has a ripple effect downstream—especially negative performance outcomes. Sometimes, its effect is catastrophic. LSS identifies and attempts to eliminate sources of waste and activities that do not add value to create maximum

Process is not the enemy of innovation.

productivity, capacity, and throughput. Even though SE tries to make quality an integral element in all of engineering, the root cause of a few performance failings can generally be traced back to limited trade analyses, poor design, product pedigree, or even insufficient testing. In those instances, was there perhaps less attention on good systems engineering practices that caused any failings to surface? In many cases, failings can be traced back to lack of a disciplined problem-solving methodology, a reduced focus in a process, or a failure in following a prescribed process (or following a dysfunctional one). In all cases, both groups would probably agree that when organizations start rationing their processes, problems can quickly mount.

So where does *process* play in problem solving between both camps, and does process have a quality all of its own? It does indeed—and here is why: It bounds *problem solving* by invoking the necessary terms, conditions, assumptions, and anything else associated with the execution of a disciplined and comprehensive problem-solving methodology. In fact, process is inextricably linked to just about everything that SE and LSS do—reinforcing the underlying common process bond they both share. Oddly enough, process is not the enemy of innovation that some might think. Instead, it is the foundation for innovation since it more critically describes what should stay and what could go.

KEY PROCESSES

What do we mean by process anyway? Actually, process is one of the most instinctive practices known to mankind—one of those critical necessities important to any action let alone any profession. In fact, we would be hard-pressed to find an activity that does not depend on some type of process of some kind whether it is comprehensive or not. Processes can be evolutionary in many ways, and even revolu-

tionary in others. Processes are everywhere and in some cases they are internalized as a procedure, method, course of action, routine, means, training, practice, etc. Whatever the name, they are pervasive and the examples that follow help emphasize the importance of their structure, execution, and intended results in the face of changing conditions—especially environmental and human factors. For instance:

- Can a quarterback help drive the offense down the field without a process, especially in the face of a defense that has learned to read all the options and stop any forward momentum? The quarterback might be forced to call an audible at the last minute if he sees a blitz coming on. Is there a process involved? Yes.
- Can a race car driver ultimately get by the checkered flag first without the synchronization and responsiveness of the pit crew in the face of some pretty formidable mechanical odds that accompany car speeds exceeding 200 miles per hour? What if the pit crew sees something the driver can not and needs to quickly advise the driver that immediate action is required without complicating matters? Is there a process involved? Yes.
- Can a military commander successfully execute and win a military campaign without a highly equipped, trained, and tested battalion in the face of a tireless enemy that is determined to seek the same outcome? Military personnel train day and night. But, something as simple as improvised explosive devices and suicide bombers, now household words, have changed the dimension of warfare; these simple yet deadly devices have also forced the military to re-think force protection. Is there an overall process involved in assessing and responding to this dynamic form of warfare? Yes.
- Can a program manager overcome the consistent programmatic turbulence and successfully meet the warfighter's needs without the full complement and synchronization of functional experts working diligently to mitigate all known development risks, test the design through various methods as it evolves from concept to production, and safely deliver the product? Yes. However, trouble can easily derail progress in no time flat without a known and disciplined process.

In any of these examples, clearly the lack of certain processes can have very unfavorable results, which makes process particularly consequential in many cases. Take International Launch Services and their Proton M Satellite launcher that left their AMC-14 spacecraft stranded in the wrong orbit leaving it useless (Taverna, 2008, p. 31). A ruptured exhaust gas conduit caused a turbo pump on the upper stage to shut down prematurely. Eventually, they traced the problem to the conduit walls that were thinner than specified. A root cause analysis found the forming process of the conduit "thinned" when it was bent. No one caught it. No one thought to measure it. Apparently, their design process did not call for more intensive testing on such a critical component. Regrettably, there are many more well-known engineering process breakdowns etched in history with more tragic human consequences, including the Titanic,

the Tacoma Narrows Bridge, Chernobyl, 3-Mile Island, Bhopal India chemical plant, the Concorde, Space Shuttles Challenger and Columbia, TWA Flight 800, etc. What could have helped prevent these failures? Possibly a more holistic approach to certain processes that are today better understood by the SE and LSS communities.

So, what do SE and LSS practitioners say about process today? Inarguably, both camps embrace many key processes and have begun to emphasize even further the "evaluation" part of the equation when it comes to thoroughness in meeting the requirements, and the *value* to their customers when it comes to importance and usefulness.

ANALYSIS, CONTROL, AND PERFORMANCE TRACKING TOOLS

What about the analytics? Both camps employ a number of useful and critical thinking tools that are either deterministic, probabilistic, or a combination of both. Each is designed to ultimately help influence decisions—whether it be a design, production, test, operations, or support decision. From trade studies to risk assessments, these helpful decision aids can provide significant contributions to the decision-making process because they are designed to avert premature solutions and combat developmental, production, and operational risk. The following represent just a few of the examples available:

TRADE STUDIES

Used to determine the optimal course of action or solution that satisfies a known requirement; compares alternatives against multiple criteria (either weighted or unweighted). Example: What [fictitious] vendor offers the best deal on tires if we need a new set (Table 2)? Based on weighted criteria such as price, installation, warranty, and future rotation and alignment labor, it looks as if Tire Land offers the best deal.

TABLE 2. TIRE SELECTION TRADE SUMMARY

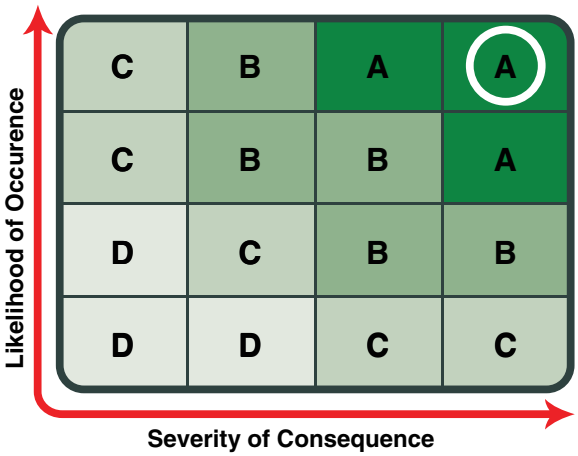
	Criteria Weighting				
	3	1	2	1	
Available Vendors for Tire Needed	Tire Prices	The Installation, Balancing and stems	Tire Warranty	Free Rotation Free Alignment	High Score Wins
Tire Land	$99/Tire 3x2	$9.99/Tire 1x2	Life of Tire 2x3	Yes 1x1	15
Tire Planet	$94/Tire 3x3	$8.99/Tire 1x2	65,000 1x2	No 0	13
Tire Galaxy	$101/Tire 3x1	Free 1x3	65,000 1x2	No 0	8
Tire Universe	$99/Tire 3x2	$12.99/Tire 1x2	Life of Tire 1x3	Yes 1x1	12

Criteria Weighting Factors (1=Low; 2=Medium; 3=High)
Best Value (3=Best; 2=Good; 1=Fair)

RISK ASSESSMENT MATRIX

A risk assessment matrix is used to weigh the likelihood of a risk materializing against the consequence if it actually does. Example: Consider an automobile tire with significant wear pattern where the steel belts are starting to show through the rubber treads. Riding on an unsafe tire at any speed might endanger the occupants. Riding on an unsafe tire under excessive speeds could have devastating results for its occupants. Is it a risk that the driver and occupants are willing to take with the odds of a fatality so likely and the consequences so severe (denoted by the circled cell "A" in Figure 3)? Probably not.

FIGURE 3. RISK ASSESSMENT FOR UNSAFE TIRES AT HIGH SPEEDS



FIVE WHYS

The Five Whys are used to narrow a decision pathway through the use of sequenced and logical questioning. Example: *Why* do we need to buy a new car? Because our old car is too costly to maintain any more. *Why* is our car too costly to maintain? Because the major parts that need to be replaced are becoming obsolete. *Why* are the parts becoming obsolete? For safety reasons, the manufacturer has discontinued the production line and the second-tier spare parts vendors have vanished. *Why* is this car unsafe? Because this car has a significantly higher serious injury rate whenever it is involved in accidents compared to other vehicles in the same class. *Why* does it have such a high injury rate? Because when the car is hit from behind, the gas tank tends to explode like a Molotov cocktail—seriously injuring the occupants inside!

OTHER COMMON TOOLS

Modeling and Simulation. Used to imitate or mimic specific aspects of a particular system in a synthetic environment to safely and cost-effectively gain insight into the operational and/or behavioral characteristics of its individual and/or collective components.

Technical Performance Measures (TPMs). Used to compare actual versus planned technical progress throughout system development. Reports the degree to which system requirements are met in terms of performance, cost, schedule, and progress in implementing risk handling; traceable to user-defined capabilities.

Force field analysis. Used to support requirements analysis by describing the forces that either promote or oppose a decision of action.

Sensitivity analysis. Used to determine the robustness of an optimal solution when subjected to different sets of parameters.

Multivariable analysis. Used to determine the effects of all variables on an outcome and to help identify design drivers and uncover correlations.

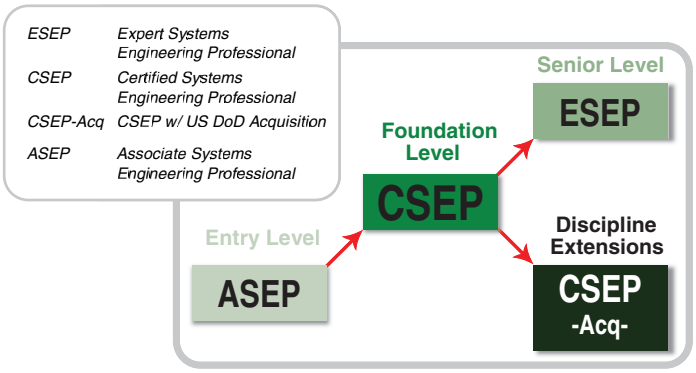
Cause and effect diagram (also known as a fishbone diagram). Used to show causes of certain events that contribute to overall effects; starts with a problem, then identifies possible causes depicted by branches (or bones) of a fish.

Value stream mapping. Used to analyze the flow of material and information used to support product or service development while discovering areas of lead time improvement.

PEDIGREE AND CORE COMPETENCIES

SE and LSS strategists tend to be deep system thinkers and have been known to behave like collaborative campaigners—actively seeking participation from their teams (Lamb & Rhoades, 2008). But, what about their education and training? Not surprisingly, both SE and LSS practitioners have certain educational pedigrees and expected technical competencies, but SE is more established at many colleges and universities. As of 2006, INCOSE (2008) reported there were about 75 institutions in the United States that offered 130 undergraduate and graduate programs in systems engineering. INCOSE also recently "established a multi-level Professional Certification Program to provide a formal method for recognizing the knowledge and experience of systems engineers, regardless of where they may be in their career" (Figure 4). (Kepchar, 2006)

FIGURE 4. INCOSE CERTIFICATION MODEL



For LSS, no colleges or universities to date offer exclusive undergraduate or graduate degrees in LSS nor is there a certification body for LSS. However, many colleges, universities, and training institutions offer LSS certificates; and they all follow an acknowledged practitioner stratification such as White Belts, Yellow Belts, Green Belts, Black Belts, and Master Black Belts (George, 2004, pp. 48-49). Attainment of each belt requires a minimum level of training and experience.

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Most industries as well as the DoD recognize the potential LSS dividends and welcome any functional expert with the motivation to seek the training and apply the methodology. At first glance, the business world might appear to be where LSS could make the most visible contributions to efficiencies and savings. And, according to the Six Sigma Academy, Black Belts (where they exist) can save companies approximately $230,000 per project. "General Electric, one of the most successful companies implementing Six Sigma, has estimated benefits on the order of $10 billion during the first 5 years of [their] implementation." (iSixSigma, 2008)

Industry is not alone in their quest to promote efficiencies and achieve savings though. In 2007, the U.S. Army completed about 770 Lean Six Sigma projects with an estimated savings of $1.2 billion (Robinson, 2008, p. 2). Given the potential for even greater savings to DoD, Deputy Defense Secretary Gordon England intends to have 5 percent of the department's employees trained as Green Belts, and 1 percent of its workforce trained as Black Belts (Robinson, 2008). To satisfy this kind of nationwide interest and potential demand, many undergraduate and graduate engineering programs have already started to blend LSS into their SE curriculum.

Early on and as a result of their education and training, SE and LSS are expected to have the requisite knowledge, expertise, and leadership to unite all the disciplines required during the evolution of a system's design or uncover the cause(s) for its shortcomings in order to prevent performance limitations or failures in operations. Three *core competencies* central to Systems Engineering are embodied in the following business processes: 1) Systems Thinking (e.g., the underpinning system concepts and system skills required by the business and technological environment); 2) Holistic Life Cycle View (e.g., all the skills associated with a system's life cycle from requirements identification through disposal; and 3) Systems Engineering Management (e.g,. all the skills associated with a managing/affecting a system's life cycle, including the planning, monitoring, and control that are integral to the systems

engineering process) (Cowper, et al., 2005, p. 7). In industry, LSS competencies are not as consistently codified across the community but in general include the essential soft skills (e.g., leadership, strategic planning, communication, change management, organizational development, and relationship building) and many of the same systems engineering technical competencies. Within DoD, LSS competencies can be found within their aggregate Continuous Process Improvement (CPI) strategy. The top-level categories are very similar to the ones found under SE and include: 1) conceptual skills (e.g., CPI philosophy, project management, process management, systems thinking, systems engineering, problem solving, decision analysis); 2) human interaction skills (e.g., conflict resolution, leadership, change management, team dynamics, communications); and 3) technical skills (e.g., value analysis, waste analysis, risk analysis, flow analysis, constraints analysis, metrics, probability/statistics, and TPM/RCM) (Department of Defense, 2006, pp. C2-4).

To be more effective, both SE and LSS strategists would need to understand the other disciplines that ultimately impact design solutions and associated support concepts.

Naturally, to be more effective, both SE and LSS strategists would need to understand the other disciplines that ultimately impact design solutions and associated support concepts. Traditionally, systems engineers are taught that the virtues of program management, logistics, test and evaluation, budget and finance, and even contracting are indispensable—and practice them—especially since these other disciplines tend to dictate the available trade space that guides just about every design alternative.

For example, aside from the ground stations that support them, satellites need no logistics support since repair in space at such high orbits is impractical. In sharp contrast, combat tanks need comprehensive logistics support. Routine maintenance and sometimes unscheduled maintenance occur frequently. Invariably, the design phase of each of these systems would have different considerations. For satellites, reliability is always an imperative. It must be extremely high since routine or unscheduled maintenance is not part of the equation. With very little exception, satellites are not repaired in space because it is cost-prohibitive. Consequently, the aggregate component "mean-time-between-failure (MTBF) in medium to high earth-space orbits should equal satellite life—on the order of 15 years or more. To the credit of the development teams, many satellites have already exceeded their design life. Of the 245 satellites Boeing has launched into service (with more than two–thirds built by Hughes before they were acquired in 2000), 166 are still flying beyond their expected life span (Pae, 2008, p. 1). Conversely, tanks have a much different supportability concept. Their survival is heavily dependent on maintenance intervention. They have a lot more moving mechanical parts that wear out quickly in the face of different inhospitable environmental

conditions. Since tanks are terrestrial and easy to access, operational support is a much easier and cost-effective proposition. Invariably, the aggregate MTBF for tanks is much lower and, again, to the credit of the development teams, every design characteristic is optimized for safety and warfighting effectiveness.

If space engineers designed tanks, tanks might never fail but the costs might be out of this world! Ultimately however, to be successful with the development of satellites, tanks, ships, aircraft, missiles, etc., SE must be tightly integrated with all functional disciplines. And, LSS must do the same. Otherwise, the DoD and industry might never see the potential gains.

Without question, SE and LSS practitioners unequivocally understand the environmental constraints that bear on design considerations and design constraints. Consequently, they vigilantly weigh system design features against a wide range of supportability concepts. Along the same line, based on the wide array of product lines and services in the DoD, SE and LSS practitioners have had to quickly recognize

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and anticipate unforgiving operational environments as well as recognize the need for tight integration of all the disciplines to make those systems peerless in the face of anticipated adversaries. Certainly, DoD's weapon and support systems need to be second to none in their combat roles. Toward that end, today's SE and LSS strategists have become much more focused on processes, with LSS seemingly leading the charge. Further, the tangible and recurring benefits seen with LSS give ample justification for LSS practitioners to be embedded into the design solution process from day one versus merely serving as process referees. They need to join SE practitioners who already sit at the center of gravity of the development and execution of key design processes. In fact, no one is in a better position to uncover a process that is not working/required or at least one that could be improved than LSS practitioners. They bring a new view of performance improvement—that improvements should be both reactive and proactive (Setijono, 2007, p. 9). More process awareness and even more proactive behavior on the Proton M Satellite team could have made a favorable difference if perhaps LSS and SE practitioners had joined forces beforehand.

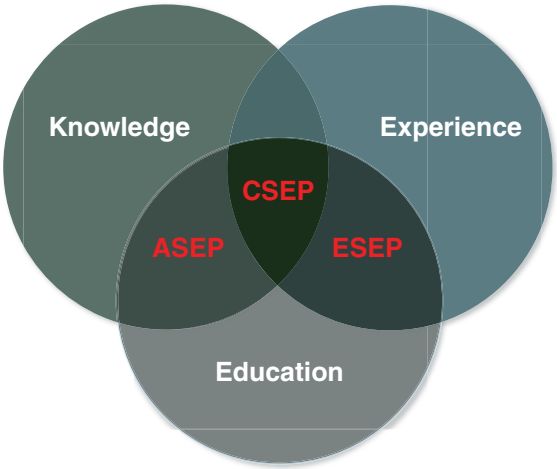
Unmistakably, education and training has served as a guidepost for the capabilities expected of SE and LSS. Practitioners of both disciplines are encouraged to take courses that promote thinking within and beyond their specific functional areas of expertise. In DoD, these two disciplines like other functional areas also undergo mandatory certification training that verifies whether competency levels have been met. And, thanks to an extensive network inside and outside DoD, both camps have access to a rich source of knowledge and expertise that can further develop and nurture the

necessary experience they need over time—which leads to the next key area both camps have in common.

EXPERIENCE

Experience plays a huge role in the success of any profession, and it is no different for these two disciplines. Theoretical concepts that form the knowledge foundations for any discipline have significantly greater value if they can relate to practical experience. Within the DoD, this relationship is a necessity. The INCOSE recently codified experience as a fundamental part of their certification construct (Figure 5). Already, major companies including Booz Allen Hamilton, General Motors, Lockheed Martin, Northrop Grumman, SAIC, and Scientia Global are posting SE jobs requiring these certification qualifications (INCOSE, 2008).

FIGURE 5. INCOSE CERTIFIED SYSTEMS ENGINEERING PROFESSIONAL (CSEP) KEY REQUIREMENTS



In DoD, we operate as a multi-discipline cohort (e.g., intact) teams. We practice as teams. We become better teams with practice. Likewise, both SE and LSS require a set of unique skills that must be partially learned by practicing. Over time, SE and LSS help give teams the technical depth, collaborative instinct, and practical experience they need. In sharp contrast, inexperience can be perilous as exemplified by Boeing's Future Imagery Architecture (FIA) Satellite development program. Boeing built satellites before, but this was a specialized domain. They had never built the kind of spy satellites the government was seeking. Defective parts, like gyroscopes and electric cables, repeatedly stalled work. An elementary rule of spacecraft construction—never use tin because it deforms in space and can short-circuit electronic components—was violated by one of its parts suppliers. By the time the project was killed in September 2005—a year after the first satellite was originally to have been delivered—final cost estimates ran as high as $18 billion. The original cost was $5

billion (Taubman, 2007). Many other issues including ethical ones surfaced, but inexperience quickly complicated matters and appeared to be the predominant factor.

To combat the threat of inexperience, SE and LSS practitioners undergo a wide array of "practical" training and educational programs throughout their careers. Before long, their training and education is reinforced by actual experiences, and even

We practice as teams. We become better teams with practice.

sometimes guided by personal mentors. Eventually, their expertise deepens over time. They begin to ask the tough questions and conduct more comprehensive analyses and assessments. These varied and shared experiences that SE and LSS practitioners learn can help them more carefully and "jointly" sense, think, judge, and assess the challenges and opportunities they face before and after selecting the most fitting analytics. Tough decisions prevail in DoD. To make matters worse, the slow rate of performance improvement is usually not due to a lack of knowledge but in making the transition from theory to implementation (Stephen, 2004), which invariably depends on confidence and experience. Based on the expectations of their job tasks and assignments, both DoD and industry continue to look to these two particular groups for insights, especially when the need arises for any necessary design, development, production, or process adjustments.

CONCLUSION

So, what do you get when you mix together SE and LSS professionals? In short, you get a comprehensive multidisciplinary collaboration team. You get a natural blending of two camps with exceptional, unifying, and many common functional competencies. You get a profitable merger of two camps steeped in disciplined yet creative problem-solving processes. You get a far-reaching problem prevention team that can jointly mitigate design, production, and fielding issues—early. In fact, you gain immediate efficiencies. You get full technical coverage thanks to complementary and educational pedigrees. You get experiences that are priceless. More importantly, you get one integrated camp that can have a profound effect to help drive down programmatic risks and costs while helping to attain difficult schedule and performance goals—and eliminate process waste. Moreover, no two groups could do more to build in extra cohesion among all the functional disciplines so critical to DoD and the warfighter. Invariably, tightly integrating both SE and LSS can have a favorable multiplier effect.

So, go ahead and try to flavor the discussion between SE and LSS. Ask what divides them. There will indeed be a conspicuous silence. However, once these two

opposing camps engage in deeper thought, they will not stop talking about how much they actually have in common, and how much more they can jointly influence performance outcomes, especially when they begin to ask a few questions of each other and of themselves. Ask them what matters most. Many of them might just be inclined to say, as did Kipling in 1900 (p. 85): I keep six honest serving-men (They taught me all I knew); Their names are What and Why and When And How and Where and Who.

Keywords:
Systems Engineering, Lean Six Sigma, common processes, core competencies, experience

Mr. Robert L. Tremaine is associate dean at the DAU West Region. Prior to joining DAU, he served over 26 years in the U.S. Air Force in acquisition assignments that spanned air, missile, and space. He holds a BS from the U.S. Air Force Academy and an MS from the Air Force Institute of Technology. He graduated from the Canadian Forces Command and Staff, and U.S. Army War Colleges. He is level III certified in Program Management and Systems Planning, Research, Development and Engineering.

(E-mail address: Robert.tremaine@dau.mil)

AUTHOR **BIOGRAPHY**

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