Carnegie Mellon
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U.S. Army Acquisition –
The Program Executive
Officer Perspective

Stephen Blanchette, Jr.

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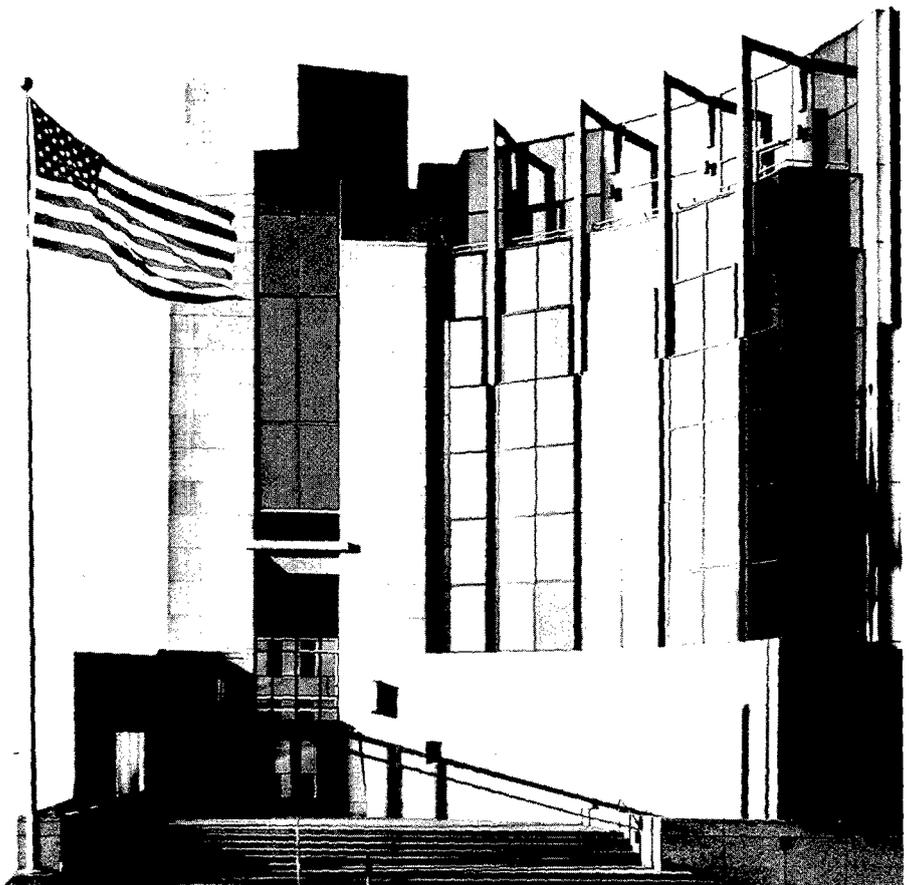
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Abstract

The U.S. Army Strategic Software Improvement Program (ASSIP) is a multi-year effort to improve the way the Army acquires software-intensive systems. As part of the ASSIP, the Carnegie Mellon® Software Engineering Institute interviewed the Army's Program Executive Officers (PEOs) to get their perspectives on the state of Army acquisition of software-intensive systems. The PEOs are senior acquisition professionals with a wealth of experience in Army acquisition and the attempts to improve it in the past.

This report documents the results of the PEO interviews. The PEOs identified shortcomings and some interesting potential solutions in various aspects of the acquisition function, including skills and training, policy, the acquisition organization, metrics, process, commercial off-the-shelf (COTS) products, and facilities and tools.

1 Introduction

In late 2002, the Carnegie Mellon® Software Engineering Institute (SEI) entered into a strategic agreement with the assistant secretary of the Army for acquisition, logistics, and technology (ASA(ALT)). This partnership, known as the Army Strategic Software Improvement Program (ASSIP), seeks to improve the Army's techniques for acquiring systems with high software content, called software-intensive systems[1], or SIS.

This special report relates the results of interviews with the Army's Program Executive Officers (PEOs), which the SEI conducted as part of the ASSIP. The SEI is using the results to help guide the ASSIP improvement initiatives. The intent of this report is to stimulate open discussions about SIS acquisition issues by sharing the information with the acquisition functions of the other services, other government agencies, and industry.

In order to understand these results, a brief review of the ASSIP and of Army acquisition will be helpful.

1.1 The Army Strategic Software Improvement Program

The ASSIP is a multi-year effort targeted at dramatically improving the way the Army acquires software-intensive systems. The ASA(ALT) proactively initiated the ASSIP in 2002 as a means of helping the Army respond to the challenges of developing systems that are increasingly dependent on software. Later, when Congress included Section 804 in the National Defense Authorization Act for Fiscal Year 2003, which required the services to develop plans for their software acquisitions [PL 02], the ASSIP was easily shaped to address those requirements as well.

Organizationally, there are two main bodies involved in the ASSIP. The Senior Steering Group (SSG), composed of the PEOs, the MILDEP, and the Director of the SEI, provides overall guidance to the effort. The ASSIP Action Group (AAG), consisting of representatives from each of the PEOs and from the Army Software Engineering Centers, as well as SEI

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[1] According to the Defense Acquisition University (DAU), a software-intensive system is one in which software represents the largest segment in one or more of the following criteria: system development cost, system development risk, system functionality, or development time [DAU 03].

technical staff members, develops and implements improvement strategies. The ASSIP is a partnership, and the SSG and AAG are co-chaired by the Army and the SEI. In addition, the SEI offers expert guidance on software acquisition and process issues, provides secretariat services to the SSG and AAG, and acts as a catalyst for change. As shown in Figure 1, the ASSIP is predicated on the idea that better acquisition practices will lead to better systems and overall results.

Process   ... to Products
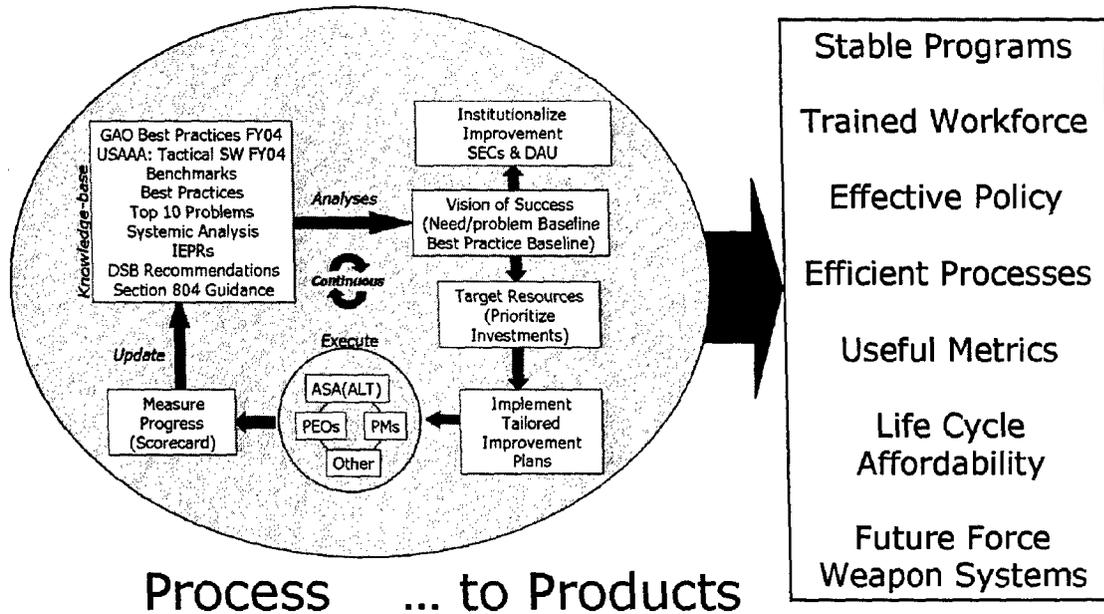
Figure 1: ASSIP Uses Improved Acquisition Processes to Yield Better Results

As with any improvement effort, for the ASSIP to be successful, an understanding of the baseline state of Army acquisition was needed. While there was plenty of anecdotal evidence and speculation about the challenges to successful SIS acquisition, there was very little hard evidence on which to build improvement. The SEI set about gathering the necessary evidence through several means: a survey of Army acquisition managers, direct engagements with several critical Army programs using a technique called Benchmarking for Improvement, and the PEO interviews. The first two methods are described briefly below, while the PEO interviews are the subject of the body of this report.

1.1.1 Survey of Acquisition Managers

The SEI made an initial attempt at characterizing the state of Army acquisition through a survey of Army acquisition managers. While the survey, conducted in 2003, proved useful to set SEI expectations about the range of potential problems, it did not provide reliable or sufficiently detailed information on which to base improvement strategies. Instructions to the target audience were not adequately communicated to achieve consistency of respondents. Many managers delegated responsibility for completing the survey to staff members, whose

backgrounds varied widely. Interested readers may refer to the report *Army Strategic Software Improvement Program (ASSIP) Survey of Army Acquisition Managers* for a detailed discussion of the survey results and their limitations [Kasunic 04].

1.1.2 Benchmarking for Improvement

Benchmarking for Improvement (BFI) formed the backbone of the ASSIP data gathering efforts. This technique employs a series of structured interviews with program office personnel (similar to many program assessment techniques), but the focus is on discovery of the processes in use rather than on compliance with some standard. BFI seeks to elicit those processes employed by a program, using a model as a guideline, instead of rating program office processes against a model. Benchmarking began in mid-2003 and continued throughout 2004.

Although BFI results for individual programs remain the property of the respective program managers, the SEI has aggregated the results in a non-attributable manner to foster analysis. The results are remarkably consistent with the results from the PEO interviews. Refer to the report *Results of the Benchmarking for Improvement Effort in the ASSIP*[2] for detailed discussion of the BFI results.

1.2 The Structure of Army Acquisition

This section provides only high-level insight into the structure of Army acquisition. For details about organization structure and individual responsibilities, refer to the document *Army Regulation 70-1: Army Acquisition Policy* [HQDA 03].

The Honorable Claude M. Bolton, Jr. is the ASA(ALT) and the Army Acquisition Executive (AAE). The highest ranking uniformed official in Army acquisition is Mr. Bolton's Military Deputy (MILDEP), a position currently held by Lieutenant General Joseph L. Yakovac, Jr. The ASA(ALT) organization has the responsibility for Army materiel acquisition. In his role, Mr. Bolton appoints, manages, and evaluates the Program Executive Officers and Program Managers (PMs).

Generally, the Army clusters its acquisition programs under one of 12 program executive offices, each headed by a senior acquisition professional referred to as a Program Executive Officer (PEO). The PEOs provide oversight for a group of related programs. Table 1 shows the program executive offices at the time of these interviews.

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[2] Capell, Peter & Keeler, Kristi L. *Results of the Benchmarking for Improvement Effort in ASSIP*. Pittsburgh, PA: Software Engineering Institute, Carnegie Mellon University, *to be published.*

Table 1: The Program Executive Offices (as of December 2004)

Air, Space and Missile Defense (ASMD)	Enterprise Information Systems (EIS)
Ammunition (Ammo)	Ground Combat Systems (GCS)
Aviation (AVN)	Intelligence, Electronic Warfare and Sensors (IEW&S)
Chemical and Biological Defense (CBD)	Soldier
Combat Support and Combat Service Support (CS&CSS)	Simulation, Training, and Instrumentation (STRI)
Command, Control and Communications Tactical (C3T)	Tactical Missiles (TM)

In some cases, a program manager may report directly to the AAE without an intervening PEO. At the time of the interviews, two such direct reporting PMs, PM Joint Tactical Radio System (JTRS) and PM Unit of Action (UA), existed. Figure 2 depicts the organization in simplified terms. This graphic is by no means a complete representation; it only attempts to convey the relative position of the PEOs within the Army acquisition hierarchy.
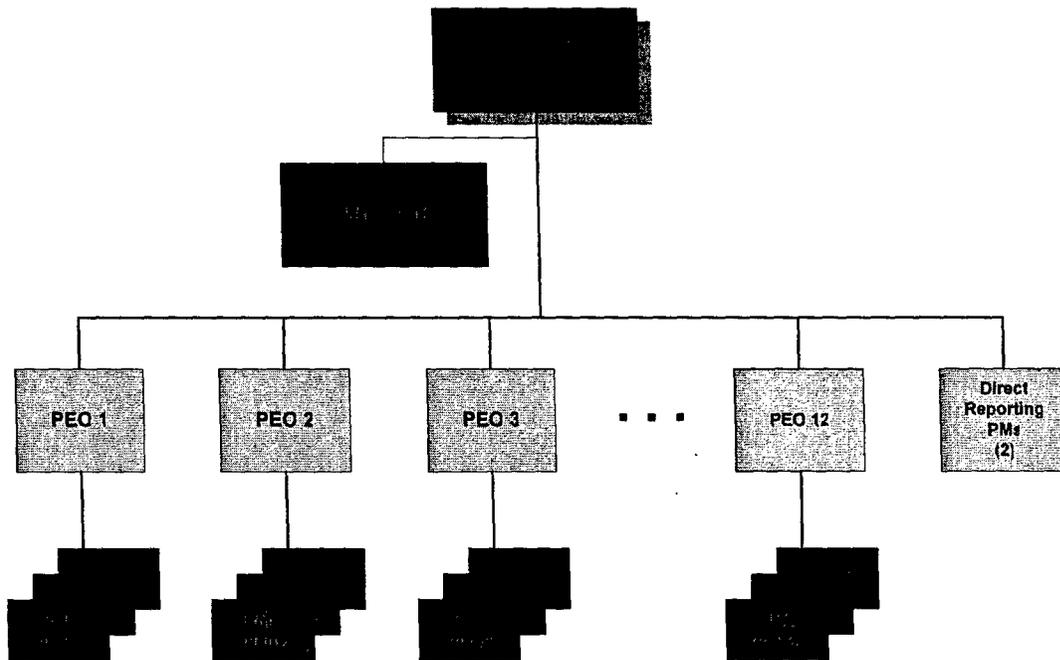
Figure 2: Simplified View of Army Acquisition Structure

1.3 About Army PEOs

PEOs can be senior military officers or civilian members of the government's senior executive service (SES). They serve as the materiel developers, responsible for programmatics and the various aspects of planning and budgeting required to steward their assigned programs

through the applicable milestones. In addition to their many other duties, PEOs are also responsible for technical and functional integration across their assigned programs [HQDA 03].

The DoD Acquisition Career Development Program [DoD 95] defines PEO qualifications. Generally, before assignment, PEOs must have completed specific levels of training, must have been assigned to a PM or deputy PM position during their careers, and must have had at least 10 years of acquisition experience (with 4 of those being in a critical acquisition position). The position of PEO itself is a critical acquisition position, which levies additional requirements.

2 Method Description

The SEI conducted interviews with the PEOs from April 2004 through December 2004. Interview teams consisted of two SEI technical staff members, with one member acting as the primary interviewer and the other acting as the primary recorder. To provide consistency across the interviews, only two individuals acted as the primary interviewer during the course of the interviews.

The interview questions were divided into two sets: primary and secondary. The set of primary questions dealt with the PEOs' opinions about Army acquisition overall and the ways in which the ASSIP could help. The set of secondary questions dealt mainly with specific ASSIP activities and activities in each PEO's office. Appendix B contains the interview questions.

The AAG members from each PEO received all the questions as read-ahead material to facilitate scheduling the interviews. This allowed the PEOs to become familiar with the discussion materials and to decide if they needed any support from their staffs during the interviews. In addition, the AAG representatives pre-briefed their respective PEOs on current ASSIP status prior to the interview meeting.

Each interview was conducted individually; that is, only one PEO was interviewed during each session. Although the PEOs typically had their AAG representative(s) with them, the PEOs themselves answered all of the questions, with only occasional embellishment from their staff. Interviews were conducted in the PEOs' offices.

To accommodate the PEOs' busy schedules, interview sessions were limited to 90 minutes. In a few instances, interviews ran longer than the allotted time, but only if the PEO wanted to continue. One interview began late and ran less than the allotted time due to the PEO's other commitments. Generally, interviewers omitted the secondary questions if time ran short. The interviewers sometimes omitted some primary questions if the answers to other questions sufficiently covered the topic.

While the goal of the interviews was to obtain opinions about the acquisition of software-intensive systems specifically, interviewers did not interrupt the discussions if they touched on broader acquisition issues, and nearly all of the interviews did. Software is but one of

many interrelated components of an acquisition program, and understanding the whole picture is critical to addressing systemic problems rather than individual symptoms.

Not all interviewees held the position of PEO. The SEI also interviewed two deputy PEOs and one direct reporting PM. For ease of discussion, the entire group of interviewees is referred to as PEOs in this report. Readers may find demographic information about the interview group in Appendix C.

3 The PEO Perspective

Each of the PEOs expressed a variety of concerns about the state of Army acquisition. Although they each had specific problems within their respective domains, they also identified some systemic issues as a group. This report addresses only the systemic problems, but if available, the SEI provided additional information, references, and/or contacts to assist PEOs with domain-specific issues. In addition to identifying problems, some PEOs offered ideas for potential solutions. While the SEI maintains the confidentiality of individual respondents, this section of the report includes non-attributed quotes that punctuate the findings. Note that the SEI did not attempt to verify the opinions or assertions expressed herein.

Upon reviewing the interview responses, several broad categories of concern emerged:

- Skills and Training

- Policy

- The Acquisition Organization

- Metrics

- Process

- Commercial Off-the-Shelf (COTS) Products

- Facilities and Tools

The following sections discuss each of these categories in more detail. The order of discussion is not relevant or significant, and readers should not ascribe priority or importance to any of the categories based on the order.

3.1   Skills and Training

Perhaps the most relevant comment regarding skills and training was "I don't know if the Army possesses enough smart buyer insight for software." Another PEO echoed the sentiment: "The government...needs to be a smart buyer." Most of the PEOs acknowledged a mismatch between the software expertise of contractors and the program offices.

Although some PEOs were comfortable with the level of software knowledge possessed by their PMs[3], others said that their PMs were not as knowledgeable about software as they needed to be. The PEOs who felt that their PMs' software comprehension was lacking expressed a range of needs, from "knowing what they don't know" to "knowing what their staff should know" to specific technical deficiencies such as, requirements management, software architecture, and so forth.

Making training opportunities available to PMs is difficult, due to the heavy demands on their time. One PEO said, "We really can't send them back to class all the time." One PEO faulted the Acquisition Corps for not producing technically skilled PMs from the start. "We're creating generalists out of specialists, moving people around instead of letting them build [technical] capability." This particular PEO went on to say that Army acquisition is lacking technical talent because of the overly generalist orientation of the Acquisition Corps.

Knowledge needs extend up to the PEO level, as well. One PEO noted, "I know all about [a particular weapon system]," meaning the physical/mechanical aspects of it, "I don't have expertise in software development." Some PEOs were seeking guidance at an even more basic level. What does the Army judge to be the necessary insights for PEOs? Is there a consistent set of knowledge that PEOs should possess? These two questions point to a fundamental uncertainty on the part of some PEOs.

3.2 Policy

Although none of the primary interview questions asked specifically about it, the topic of policy came up in every interview. The issues expressed included policies at the Department of Army-level and higher. Generally, PEOs used the term "policy" to refer to a range of related guiding documents, including directives, guidance, law, regulations, and so forth. For the purposes of this study, no differentiation is made.

This section of the report addresses two specific policy areas frequently identified during the interviews – software blocking and interoperability. The remainder of this section discusses the general policy concerns that the PEOs identified.

3.2.1 Software Blocking

Virtually without exception, the PEOs singled-out the Army's Software Blocking policy as an example of bad policy. The software blocking policy attempts to create a known set of compatible software (developed by disparate programs) for tactical Command, Control, Commu-

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[3] In the context of subordinates to the PEOs, "PM" can refer to Program Manager, Project Manager, or Product Manager. While each of these positions has meaning within Army acquisition, the differences are not germane to the discussion, and therefore are not differentiated.

nications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) systems. Under this policy, each compatible "block" would be fielded at regular, 18-month intervals. Prior to institution of this policy, programs fielded their C4ISR systems according to their individual schedules, which sometimes resulted in an inability to share C4ISR data across platforms, due to incompatibilities.

The PEOs felt that the software blocking policy is poorly defined and executed, as reflected by statements like "It's killing the Army." One PEO also noted that one of the primary proponents of the policy "doesn't have a hammer," implying that this supporter lacks the clout to truly enforce it.

Another complaint about software blocking is that it does not consider program constraints, such as the need to field software updates and patches more frequently than every 18 months. This was a particular concern for PEOs whose programs make extensive use of commercial-off-the-shelf (COTS) software, since COTS patches tend to be released frequently, especially for security.

Finally, the PEOs indicated that software blocking ignores important technical considerations. For example, one PEO pointed out that the policy does not consider hardware compatibility issues. As a result, although C4ISR software releases may be coordinated across systems, individual systems can experience software-hardware incompatibilities that degrade or disable essential functions.

3.2.2 Interoperability

Interoperability was another popular topic among the PEOs. In general, they recognize the need and importance of developing systems that can interoperate on the battlefield. However, the vagueness of the term itself causes many of them to doubt its achievability. The statement "It's just a cost line to the PMs; no one understands what the directive means," sums up the situation. The definition of interoperability within the Army (and within the DoD) appears to be context sensitive, meaning different things to different people depending on their perspectives. Without clear definition, interoperability becomes an abstract, daunting challenge. As one PEO asked, "How do we bound interoperability?" The question extends beyond the operational considerations of "who do I talk to" into doctrinal concerns of "who should I be able to talk to, and when," especially in joint service, interagency, and multinational operations.

Adding to, or perhaps at the root of, the confusion is a lack of a central authority on the subject. Programs, working with their user representatives and the other organizations that generate requirements, are able to identify and negotiate interfaces to other programs on an ad hoc basis. However, several PEOs identified the need for "one trail boss," that is, a central authority with the broader perspective on interoperability. One PEO suggested that this au-

thority should reside at the Department of Army or Joint Services level. Others thought that the assistant secretary of defense for networks and information integration (ASD(NII)) should assume responsibility. Said one PEO regarding interoperability standards and enforcement, "ASD(NII) must set the standards."

As one PEO noted, real technical barriers make achieving interoperability difficult, such as limited radio capability, dissimilar networks and data formats, dissimilar data processing across platforms and services, to name a few. However, interoperability is not simply a technical issue. PEOs and PMs must also determine how to align schedules, deliverables, and other logistics across organizations. Cultural resistance is also a factor. Relating interoperability to joint warfighting, one PEO admitted, "OSD believes [the services] don't want to be joint, and there is some truth to that."

3.2.3 Broad Policy Concerns

In addition to the concerns raised about software blocking and interoperability, the PEOs made some observations on policy matters in general.

3.2.3.1   Policy Applicability and Volume

The applicability of policy sparked concern. According to the PEOs, policies are frequently developed with acquisition category I (ACAT I)[4] programs in mind, yet all levels of ACAT programs must address the policies ACAT II and ACAT III programs receive no guidance for tailoring policies for use at their respective levels.

The sheer volume of policy causes confusion. "There's too much policy," was a common complaint. Perhaps even more surprising, was the claim that determining which version of a given policy is in effect is sometimes difficult.

3.2.3.2   Policy Contradictions

Many PEOs observed that contradictions between DoD policies and Army policies is a problem. One PEO offered a solution: have policy writers in the office of the undersecretary of defense for acquisition, technology, and logistics (OUSD(AT&L)) coordinate with their service counterparts to provide consistent acquisition policies throughout the DoD.

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[4] Programs are classified into different acquisition categories, primarily based on various dollar values. The ACAT is used, among other things, to determine the level of the Milestone Decision Authority (MDA). ACAT I programs are major defense acquisition programs. Programs can also be designated as ACAT I by the MDA if the MDA has a special interest. ACAT II programs are those that do not meet the ACAT I criteria but are still considered major systems, or those programs so designated by the MDA. ACAT III programs are those that do not meet the ACAT I or ACAT II criteria [HQDA 03].

Apparently, the clarity of policies leaves much to be desired. One PEO suggested, "It would be great if policies came with examples." A number of PEOs pointed out that expectations regarding implementation are not always clear. One PEO described the *bring me a rock* scenario[5], where PMs submit a document intended to address a given policy several times, each time believing that they have completed the task, before the approver finally accepts the document as sufficient.

3.2.3.3 Policy Development

"Policy and directive writers appear to lack tactical experience," is how one PEO characterized the gap between the authors and implementers of policy. A couple of PEOs even implied that policy writing was a way to keep Pentagon staffers busy, an indictment not only of the qualifications of policy authors, but of the entire bureaucracy. Many PEOs expressed the desire to see the implementation level (PEOs and PMs) have a greater say in the development of policy, feeling that this would help address the concerns they have identified. In the words of one PEO, "The more policy derivation done at the PEO/PM level, the better."

3.2.3.4 Policy Implementation Gap

Almost all PEOs noted that policies are frequently imposed without the funding to support them, forcing programs to siphon money from their budgets to comply. Some PEOs also questioned whether compliance is really being checked. Given these practices, a harsh description of reality emerged: if customers do not care about a given policy, system functionality and other *funded* priorities supersede policy implementation.

3.3 The Acquisition Organization

The PEOs expressed concerns in a variety of areas related to the way the Army is organized to perform the acquisition function.

3.3.1 Organizational Efficiency

Some PEOs bemoaned what they perceived as a lack of efficiency in Army acquisition. "We're too bureaucratic," said one PEO, who went on to say that, "we need *better* oversight, not less oversight." Inefficiency in oversight is a large contributor to overall inefficiency in the Army acquisition organization. The resultant slowness of the acquisition system is frustrating for users. "[Users] would rather develop their own solutions" than approach the acquisition community, because they can get the solutions faster. The increasing availability of COTS products only serves to exacerbate the problem. Noted one PEO, commanders go to stores and to trade shows, and they see new features and capabilities, and they want those

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[5]   "Bring me a rock" is a classic story of frustration. Each time you bring me a rock, I tell you it is the wrong rock, without providing any guidance as to what the right rock might be.

new capabilities to enhance fielded systems. When the acquisition process proves unable to support them, they "go out and buy the off-the-shelf stuff [themselves]", and "that's not right."

Some PEOs identified staffers as a significant source of oversight bureaucracy. In order to get required "sign-offs" (document approvals, permission to proceed, etc.), PMs and PEOs must go through multiple staffers who apply inconsistent and uncoordinated guidance. As a solution, one PEO suggested that for each approver, there should be one (and only one) "designated representative that we could work with." Another PEO said bluntly, "Look at the leadership group. Who makes decisions? Who adds value? Remove the rest and reform/restructure the group."

3.3.2 The Role of Software Engineering Centers

Interviews explicitly covered the use of the Army's Software Engineering Centers[6] (SECs) because the SEI wanted to understand how their expertise was being leveraged to supplement program office skills. The response from the PEOs indicated that SEC expertise was used sporadically. Some PEOs benefited from having an SEC nearby, or even co-located with, their program offices. For others, SECs were not as conveniently placed.

Surprisingly, some PEOs chose not to use SEC services even when they were conveniently available because they perceived the SECs to be "weak" in certain tactical domains. This perception caused PEOs to pursue other options for support when tactical domain experience was as important as (and sometimes more important than) the software expertise.

All of the PEOs appeared to make good use of the resources available to them, whether from the SECs, other commands, or industry. The PEOs who were unable or unwilling to use SEC support were usually able to find the help they needed from support contractor organizations or from organizations with software expertise in the other services.

Although not explicitly asked, a couple of PEOs brought up the subject of software maintenance, which is typically handled by the SECs after a system is fielded. One of those PEOs was emphatic, saying, "ASSIP needs to look at how software is supported." Apparently, as the nature of acquisition changes from individual systems to "systems of systems," the existing post-production software support (PPSS) concept is viewed as being inadequate.

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[6] The Army has several Software Engineering Centers, operated as part of the Army Materiel Command, that provide an array of software lifecycle support for the Army, as well as for other services.

3.3.3 The Role of Contractors

Some PEOs took issue with the practice of relying heavily on prime contractors. One PEO acknowledged that acquisition reform sought to achieve "better, faster, cheaper" by allowing industry do the work (referring to past initiatives like Total System Performance Responsibility [TSPR], etc.), but it hasn't worked out. "[Industry has] different goals" than DoD. Another said, "[The Lead System Integrator (LSI) approach] is costing the services millions of dollars." He continued, "[DoD needs] to be deliberate" about when to use, and when *not* to use, an LSI.

3.3.4 Command Continuity

One frequently mentioned organizational problem was the lack of command continuity within programs. Currently, the Army reassigns its military personnel (including program managers) after two-three years on the job. Since most programs last considerably longer, there is a break in leadership continuity whenever the current PM "rotates" out and a new PM comes in. As is the case for anyone starting a new job, the new PM has a learning curve to scale before becoming truly effective in the position. Some programs have civilian PMs, and they tend to stay in their positions longer, although they are still subject to rotational assignments. As one PEO noted, civilian PMs used to be the norm. "We used to take proven managers and assign them until a program was in good shape. We used to have civilians as PMs for five-eight years with the military as deputies." But the solution is not necessarily to make the job of PM a civilian position across the board. As another PEO put it, "[Civilians] can't go up against a green-suiter," expressing doubt that Army culture would allow civilian PMs to be effective in dealing with uniformed peers and superiors.

The PEOs had some interesting thoughts on how to combat the problem of continuity. For instance, one suggested developing a "scorecard" for the life of a program, so that a PM would continue to bear some responsibility for program success even after moving to a new assignment.

Another PEO suggested that the duration of an assignment should be flexible. "A two-year assignment expectation on an ACAT I program does not make sense. The PM cannot get good at the job in two years." Instead, a PM should remain in a position until achieving some measurable accomplishment. The PM should be held accountable for the assignment; it should not be just a matter of getting the program to the next milestone and "leaving the real problems for the next guy." Another PEO said it slightly differently: "PMs aren't around long enough to see the consequences of their actions."

3.3.5 Lifecycle Management

In August 2004, the ASA(ALT) signed a memorandum of agreement with the commander of the Army Materiel Command (AMC) regarding lifecycle management.[7] The details of the implementation were still in progress at the time many of the PEO interviews were conducted, so the PEOs were unable to offer any specific opinions about it. However, many (but not all) expressed some optimism that the agreement would be helpful. Said one, "[Maybe it] will put someone in charge for the life of a program." However, at least one PEO disagreed, saying the arrangement "further dilutes a PM's focus." This particular PEO went on to say that the agreement creates two lines of authority, one within the ASA(ALT) organization and another within AMC, leaving the question, "Who do you report to?"

3.3.6 PM Selection

The PEOs had a great deal to say about the selection process for PMs. The general feeling was that the process does not work well. Currently, candidate PMs are allowed to include a "preference statement" regarding potential duty assignments, including preferred domiciles. Some of the PEOs felt that the process routinely ignores the preference statement during assignment of PM positions.

The PEOs offered some interesting ideas for adjusting the selection process. Perhaps the most straightforward idea was to allow the PM candidates to bid for positions that make the most sense based on their background and domicile preferences. In other words, make the applicant's preference statement meaningful by giving it more weight in the process. The focus should be on getting the right person for the job.

Another idea was to let the candidates themselves make the selections. "These are well-trained professionals. Let them work together to fill the positions," said one PEO. The candidates could go through the list, select the jobs they want (and for which they possess the right qualifications), and then negotiate among themselves to determine final assignments.

One PEO warned against putting out "take it or leave it" job assignments. It forces PMs to make a career choice, and too many opt to leave the service (for higher pay in industry) rather than take an assignment that is not in their preferred location or is a poor match for their background.

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[7] Memorandum of Agreement between the Assistant Secretary of the Army for Acquisition, Logistics, and Technology and the Commander, U.S. Army Materiel Command, dated 2 August 2004. Subject: Life-Cycle Management (LCM) Initiative.

3.3.7 Staffing

Overall, most PEOs expressed some concern about the reduction of the acquisition workforce in both government and support contractor personnel. One PEO summed it up as, "We need a cadre of people with expertise, and we need to have consultant advice available as well." However, as discussed in Section 3.1, finding candidates with the right skills seems to be difficult, and training existing staff has not been a priority in some organizations.

3.3.8 Beyond AL&T

Some PEOs highlighted difficulties in working with the stakeholder community that is not part of the ASA(ALT) organization. One PEO observed a degree of friction between Army acquisition and the requirements development function of the Army's Training and Doctrine Command (TRADOC)[8], calling it "counter-productive" to the goal of providing the best products to the soldier. However, a desire to overcome the friction and work the issues is evident. Said one PEO, "We should reach out to TRADOC" to develop a collaborative understanding of operational and technical architectures. This statement reflects both a fundamental disconnect between acquisition and user proponents and an interest in working together to solve the problem.

Despite organizational attempts to innovate, the bottom line is that there is no incentive to try new approaches. "People want to [try new things to improve acquisition], so get out of the way," as one PEO put it. The consistent problem is that stakeholder organizations are not "bought in" to changes. Streamlining within the acquisition organization quickly meets "business as usual" at its interfaces, thus canceling out the streamlining effect and leading to frustration all around.

3.4 Metrics

The PEOs all expressed some level of frustration with metrics, particularly as applied to SIS. The key concern is understanding when they (or their PMs) need to be worried about software development. Comments such as, "We have metrics on contract. Some appear to be incorrect" and "We don't have the right insight yet" typified the frustration. Even a PEO who was reasonably comfortable with the metrics used acknowledged sometimes being caught off guard by product quality problems and escalating contractor costs. "There are no good metrics" to project those surprises.

In general, two schools of thought emerged regarding software metrics. One school sought standardized metrics, and felt that the ASSIP should be the mechanism to provide them. The

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[8] Among other things, TRADOC is responsible for developing requirements for systems and providing the interface between program offices and system users.

other felt that every program is different and therefore needs individualized metrics. Note that these are not necessarily mutually exclusive goals; conceivably, one could tailor a set of metrics for the specific needs of individual programs from a broader set of standard metrics.

Most PEOs reviewed general program metrics from their respective programs periodically (typically, every one-two months), relying on the PMs to report exceptional information more frequently as necessary. While several PEOs expressed a desire to avoid burdening PMs unnecessarily, they also indicated a desire for better (as opposed to more) information. Some of the data desired included more details about how PMs use the financial resources available to them and better insight into matrixed personnel usage at both the program and PEO levels.

3.5 Process

The PEOs identified a lack of overall process discipline within Army acquisition. Referring to the lack of a standard process for managing SIS, one PEO noted, "Everyone does it differently." A few PEOs were extremely critical of the Army's process discipline, indicating that the Army is too willing to change (or worse, subvert) its processes if following those processes would lead to "unpopular" decisions.

Most PEOs acknowledged that process, by itself, was not a solution. One noted that the best Army acquisition executives "focused on mission and performance." Several PEOs pointed out that the Army, and the DoD as well, has changed processes in the past, but failed to change the associated *behaviors*. The result of these paper-only changes is that the new processes have not been any more effective than the old ones, because nothing has really changed at all. Further, each failure to actually effect change causes the people who might benefit from improvements to view all subsequent attempts with suspicion, ultimately making true change more difficult.

Some specific process areas are of considerable concern to the PEOs. Several noted requirements management as a difficulty (said one, "Requirements management kills me"). Some PEOs have the added complication of addressing more than one user community and, therefore, multiple sources of requirements. Risk management was also acknowledged as a trouble spot for some.

As expected, no one liked the unwieldy process that must be followed to obtain funding. However, although many complained about the legendarily cumbersome system for funding programs, a more pressing concern was what happened *after* budgets were in place. The tendency to shift money from funded programs to pay for other expenses makes it exceedingly difficult for PEOs and PMs to manage their budgets and, ultimately, their programs. Noted one PEO, the constant changes "cannot help but cause requirements creep and system

thrash." This presents an insidious issue for all of DoD acquisition, and has many sources within each service department, within the DoD, and within Congress.

3.6   Commercial-Off-the-Shelf Products

Beyond software blocking implications, several PEOs expressed concerns about COTS products (both software and hardware) and their increasing presence in Army systems. Referring to COTS hardware, one PEO stated, "The big problem with COTS is that later you can't get a specific component," due to obsolescence, forcing redesign and added costs. "COTS components drive up the cost."

As for COTS software, one PEO noted that it posed both technical and non-technical challenges. "Although COTS software does a great deal, it often doesn't meet all of the requirements." He went on to say, "Commanders go to stores and to trade shows, and they see new features and capabilities, and they want those, too." It seems the need for expectations management can be an unanticipated outcome from using COTS. Resisting the trend to incorporate COTS as a routine acquisition strategy, another PEO said he was "not an advocate of COTS unless it makes sense in the context." In other words, there should be a reasoned judgment about the applicability of COTS in a given system, rather than including it as a perfunctory cost savings attempt. Finally, another PEO noted that DAU has a toolkit that helps managers deal with COTS products, "but they must still re-learn how to manage COTS and the process for using COTS."

3.7   Facilities and Tools

Many of the PEOs have geographically dispersed organizations. As with any such organization, communication is a challenge. PEOs noted secure email, Web, and video teleconferencing access as being critical to maintaining communication within their respective organizations as well as with external stakeholders. However, several PEOs have some part of their organizations located in commercial facilities, making it difficult to get the necessary secure access. One PEO quoted 8-14 months as the time lag for installing critical secure communications in commercial facilities. This delay necessitates finding alternate facilities to perform work, attend meetings, and so on.

There were several complaints about some of the automated tools that the PEOs use on a regular basis. The tools do not yield the desired time savings. Said one PEO, the tools shift the "burden onto supervisors while making the bureaucrat's job easier." The civilian personnel and travel authorization systems were identified as examples of aggravating systems. One PEO said, "It takes 20 minutes to do what used to take 3 minutes" using old, paper-based systems. Another comment, "the way the Army handles personnel is frustrating," illustrates concern over not having a good way to get the full perspective on personnel. As a solution,

one PEO commented that someone in ASA(ALT) needs to look at all these systems to see if there's truly value added.

4 Next Steps

This report documented the raw results of the PEO interviews conducted as part of the ASSIP data gathering effort. One of the most important next steps is to analyze these results, along with the results of the other data gathering efforts discussed in Section 1.1 of this document, to discover which problems are the most troublesome systemically. Identification of those problems would then point to potential high-impact improvement opportunities. The analysis task is already underway and upon completion, the SEI will publish a separate report discussing these data and their implications.

The ASSIP Strategic Software Improvement Master Plan (SSIMP) for fiscal year 2005, approved by the PEOs and signed by the MILDEP, outlines several improvement initiatives developed by the AAG to tackle some of the perceived problems in SIS acquisition. The PEO interview results have helped to guide those initiatives, which are discussed briefly in the following paragraphs.

In the area of Policy, one of the ASSIP initiatives for FY05 is to gather more details about the policy problems. With the exception of software blocking and interoperability, policy complaints during the interviews were non-specific. Beginning with software blocking, the SEI will evaluate the policy, its interrelationship with other policies, and the complaints levied against it. This evaluation will determine how the policy might need to change to make it more efficacious. In a separate ASSIP initiative, the SEI is probing interoperability issues within a series of workshops designed to surface and address issues related to implementation of Army interoperability requirements.

In the area of Skills and Training, there are three ASSIP initiatives. In the first, the ASSIP is sponsoring a cohort of approximately 20 students at the Naval Postgraduate School (NPS). The goal is to provide a formal educational opportunity for PMO and SEC personnel who are involved with SIS acquisition. Students who successfully complete the 4-course sequence receive a certificate in DoD Software Improvement. Representatives from NPS and PEO GCS are jointly coordinating the effort. In the second initiative, the ASSIP is continuing to sponsor a special offering of the SEI's software architecture curriculum. This special offering, available to Army PEO, PM, and SEC personnel, will train a cadre of software architecture professionals. Once trained, these professionals will then be able to apply their knowledge to support the needs of the Army acquisition community. In the third ASSIP education initiative, the SEI, AAG members, and DAU are working to evaluate the ongoing training

needs of the Army, leading to the development of a summary of those needs mapped to available courses.

In the Metrics area, another ASSIP initiative focuses on encouraging PMs to use metrics systematically to understand and manage their SIS acquisition programs. To facilitate achieving this goal, the SEI will evaluate the effectiveness of metrics used at the PEO level and above. The SEI will also recommend an addition to the ASA(ALT) Probability of Success metric to ensure adequate visibility into software development progress and risk for SIS acquisitions. Additionally, the SEI will use workshops to help identify the objectives and information needs of Army acquisition managers at all levels.

Finally, as the ASSIP continues to promote acquisition process changes, the SEI will revisit the PEO interviews to determine how those changes have affected Army SIS acquisition. The SEI will also broaden the interview process to include other senior stakeholders in Army acquisition.

5 Summary

The results of the PEO interviews suggest that there are several avenues of pursuit for improving Army acquisition, especially as it relates to software-intensive systems. While each PEO had concerns specifically related to his or her own domain, a number of common issues arose. Common issues revolved around skills and training of PMs (and PEOs), policy and its application, the acquisition organization and its workings, use of metrics, processes and their effects, use of COTS products, and availability of facilities and tools.

While the PEOs expressed a great many concerns and frustrations with the current state of Army SIS acquisition, they also offered some thought-provoking ideas for improvement that bear repeating here.

With regard to conflicting policies, a seemingly simple suggestion was to have OUSD(AT&L) policy writers coordinate with their service counterparts to provide consistent acquisition policies throughout DoD.

To combat the problem of inconsistent and uncoordinated guidance, there were two suggestions worth noting:

- For each approver, designate one (and only one) representative with whom the PEOs/PMs work.

- Shorten approval cycles by restructuring the leadership group to ensure only decision makers are in the approval loop.

The issue of command continuity also generated two thoughts:

- Develop a "scorecard" for the life of a program, so that a PM would continue to bear some responsibility for program success even after moving to a new assignment.

- Make assignment durations flexible, so that a PM remains in a position until achieving some measurable accomplishment.

Several ideas regarding the PM selection process were identified:

- Allow the PM candidates to bid for positions that make the most sense; that is, make the applicant's preference statement meaningful by giving due consideration. Focus on getting the right person for the job.

- Let the candidates themselves make the selections, working together to go through the list, select the jobs they want (and for which they possess the right qualifications), and then negotiate among themselves to determine final assignments.

- Do not put out "take it or leave it" job assignments, which force too many PMs to end their Army careers.

A number of PEOs thought that the ASSIP could be helpful in improving acquisition of SIS. Others were less optimistic, having seen many attempts to improve acquisition come and go in the past. One PEO advised of the need to target "big" changes (>25%). "We can't measure well enough to accurately detect 1% - 10% change." Another cautioned against dictating processes across the board stating, "One size does not fit all."

More work remains to understand the root causes of problems with SIS acquisition, and tackling the problems requires long-term commitment. The ASSIP provides the impetus and infrastructure to identify issues and formulate strategic approaches to address them.

Feedback

Through its Acquisition Support Program, the SEI is working to help improve SIS acquisition across the U.S. government. Consequently, the SEI is very interested in hearing how the perspectives presented here compare with those of senior acquisition officials in the other services, defense agencies, and other federal agencies.

Please send questions or comments about this report to Stephen Blanchette, Jr. (sblanche@sei.cmu.edu).

Appendix A   Acronyms and Abbreviations

The alphabetical listing below contains all acronyms, abbreviations, and their meanings as used in this report.

AAE	Army Acquisition Executive
AAG	ASSIP Action Group
ACAT	Acquisition Category
AMC	Army Materiel Command
Ammo	Ammunition
ASA(ALT)	Assistant Secretary of the Army for Acquisition, Logistics, and Technology
ASD(NII)	Assistant Secretary of Defense for Networks and Information Integration
ASMD	Air, Space and Missile Defense
ASSIP	Army Strategic Software Improvement Program
AVN	Aviation
BFI	Benchmarking for Improvement
C3T	Command, Control and Communications Tactical
C4ISR	Command Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance

CBD   Chemical and Biological Defense

CMM   Capability Maturity Model

CMMI   Capability Maturity Model Integration

CMU   Carnegie Mellon University

COTS   Commercial Off-the-Shelf

CS&CSS   Combat Support and Combat Service Support

DA   Department of the Army

DAU   Defense Acquisition University

DoD   Department of Defense

DSB   Defense Science Board

EIS   Enterprise Information Systems

FBCB2   Force XXI Battle Command Brigade and Below

FCS   Future Combat Systems

FY   Fiscal Year

GAO   Government Accounting Office

GCS   Ground Combat Systems

HQDA   Headquarters, Department of the Army

IEPR   Independent Expert Program Review

IEW&S	Intelligence, Electronic Warfare and Sensors
IPT	Integrated Product Team
JPEO	Joint Program Executive Officer
	Joint Program Executive Office
JPO	Joint Program Office
JTRS	Joint Tactical Radio System
LSI	Lead System Integrator
LTG	Lieutenant General
MDA	Milestone Decision Authority
NPS	Naval Postgraduate School
OSD	Office of the Secretary of Defense
OUSD(AT&L)	Office of the Undersecretary of Defense for Acquisition, Technology, and Logistics
PEO	Program Executive Officer
	Program Executive Office
PM	Project Manager
	Program Manager
	Product Manager
PMO	Program Management Office

PPSS	Post-Production Software Support
RDECOM	Research, Development, and Engineering Command
SAIP	Software Acquisition Improvement Plan
SCAMPI	Standard CMMI Appraisal Method for Process Improvement
SEC	Software Engineering Center
SEI	Software Engineering Institute
SIS	Software-Intensive Systems
SR	Special Report
SSG	Senior Steering Group
SSIMP	Strategic Software Improvement Master Plan
STRI	Simulation, Training, and Instrumentation
SW	Software
TAI	Tri-Service Assessment Initiative
TM	Tactical Missiles
TRADOC	Training and Doctrine Command
TSPR	Total System Performance Responsibility
UA	Unit of Action
USA	United States Army

USAAA   United States Army Audit Agency

USAF   United States Air Force

Appendix B Interview Questions

Primary Questions

The primary questions were asked of all PEOs interviewed.

General

1. How long have you been in your current position?

2. What are your primary responsibilities?

Perceived Problems & Risks

The ASA(ALT) is concerned that we are addressing the right problems and identifying what is needed by the community.

3. What do you see as your primary problems or needs with acquisition of software-intensive systems?

4. With respect to your identified problems or risks, how do you believe the ASSIP could help?

Perceived Problems & Risks, continued

[Note: This question refers to the chart in Figure 3.]

The challenge areas listed along the top row of the chart were indicated by the results of various data-gathering efforts that are represented along the left column. Indicate the degree of your concurrence with these findings by marking the appropriate number in the cell along the bottom row of the chart.

5. For the indicated challenge areas, what are your suggestions for how these can be addressed?

Army Acquisition Challenge Areas

	Project Management	Skills Training	Software Architecture	Requirements Management	Interoperability	Process Discipline
DSB 2000 Report	●	●	●	●		●
Army Lessons Learned Workshop	●	●	●	●		●
FBCB2 Architecture Study			●	●		
TAI – Systemic Analysis	●	●	●	●		●
SECs' Top-5 Problems	●	●	●	●	●	●
PMO Survey	●	●		●	●	●
Emerging Benchmark Results	●	●	●	●	●	●
PEO Interview						

Strongly Agree =	5
Agree =	4
Disagree =	3
Strongly Disagree =	2
Don't Know =	1

Figure 3: Army Acquisition Challenge Areas

Leadership

We are building a Leadership Awareness Briefing. The audience for this briefing is the Army senior acquisition executive level (including both PEOs and DA/OSD levels).The purpose of this briefing is to raise leadership awareness of the challenges involved with the acquisition of software-intensive systems, so that they can become part of the solution and not part of the problem.

6. **What are the key points that you think a senior leader needs to understand to make your job (and your PMs' job) successful?**

Metrics and Reporting Information

Leading software development companies have disciplined development processes and use metrics methodically to ensure that software is developed within cost, schedule, and perform-

ance targets. To track progress, confirm knowledge, manage risk, improve processes, and ensure that customers are well informed, leading developers collect metrics that address:

- cost
- test
- schedule
- defects
- size
- quality
- requirements

ASSIP will be pulling together a common picture of how measurement can be implemented by PMs to manage their programs and to report status to the PEOs. The vision is to define a set of metrics that PEOs and DA/OSD can use for oversight and for program insights.

7. **What measures are your PMs using?**

8. **What measures do you look at each month and how do you use them?**

9. **What measures do you report up the chain to DA and OSD?**

10. **What other types of information would you like to have?**

Skill Competencies and Training

11. **To what extent do your PMs rely on the expertise of the RDECOM Software Engineering Centers?**

Program-Specific Improvement Planning

The ASSIP and Section 804 are directed to improve acquisition of software intensive systems—both process and products. As you know, the ASSIP, FY04 SSIMP includes the following:

- Implementation of a Software Acquisition Improvement Plan (SAIP).

- The AAG will help shape and coordinate the SAIPs and the FY05 SSIMP. As occurred in the creation of the FY04 SSIMP, the PEO will be asked by the MILDEP to support it.

12. **What are your thoughts and opinions as to these expectations?**

[Note: If the secondary questions were included in an interview, they were asked *before* this question.]

13. Is there any other guidance you wish to offer? How can the ASSIP be effective in helping you and your PMs?

Secondary Questions

The secondary questions were asked selectively, and only if time permitted. Some of them were specifically targeted to provide guidance for execution of the ASSIP rather than to determine opinions about Army acquisition in general.

Future Force Workshop

As the MILDEP, LTG Caldwell[9] asked, "What can the ASSIP do to help the Future Force?" In response to this question, there has been a suggestion to hold a workshop for principal programs to ascertain if they are on the right path, regarding software, to reach the Future Force together.

Such a workshop could focus on identifying what we are doing *right* across our programs, and also what is *not being addressed* that needs to be addressed, in order to achieve better coordination, cooperation and synchronization (recognizing that there are numerous IPTs and other groups associated with interoperability, FCS initiatives and Software Blocking, etc.).

14. Is this the correct focus for such a workshop?

There have been topics identified as being important for such a workshop. Among these topics are:

- SW architecture
- Interoperability
- General programmatic issues

15. What is your opinion of including these topics?

16. What other topics would you suggest for such a workshop?

17. Do you have any other suggestions regarding the workshop?

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[9] Lieutenant General Caldwell was the military deputy to the ASA(ALT) until his retirement in January 2004.

The following <u>three</u> statements are one PEO's remarks about the FY04 SSIMP. Please comment and offer a course of action on these statements:

18. "Our biggest concern is with the acquisition process, specifically the requirements approval to permit the flexibility needed to design systems for incremental change."

19. "There needs to be significant reduction in oversight by offices and agencies which should have provided input to the original requirements."

20. "My expectation would be that we need the ASSIP to put dollars against 'blueprinting' the oversight and review process as well as clarifying the approval process for requirements and change orders."

21. What changes in Army acquisition policy do you think could help you and your PMs?

Skill Competencies and Training

22. How well is your staff trained with respect to Systems Engineering and Software Engineering?

23. Do you believe your PMs give the appropriate priority to acquisition training?

24. Are there training plans for your PMs and PMO personnel?

25. What is your perspective on the Software Engineering Institute's (SEI's) suite of process improvement assets such as CMMI, CMMI-Acquisition Module, SCAMPI, etc.?

Appendix C   Selected Demographics

The tables and charts below display selected demographic information to help the audience understand the interview results.

Interviewees

Table 2 lists the officers and senior executives[10] interviewed for this study.

Table 2: Interviewees

Name	Title(s)
Mr. Edward T. Baer	• Program Executive Officer for Intelligence, Electronic Warfare, and Sensors (PEO IEW&S)
Dr. James T. Blake	• Acting Program Executive Officer for Simulation, Training, and Instrumentation (PEO STRI)
Mr. Paul Bogosian	• Program Executive Officer for Aviation (PEO AVN)
Mr. Kevin Carroll	• Program Executive Officer for Enterprise Information Systems (PEO EIS)
Brigadier General Paul S. Izzo, USA	• Commanding General, Picatinny Arsenal • Program Executive Officer for Ammunition (PEO Ammo)
Colonel Steven MacLaird, USAF	• Program Director, Joint Tactical Radio System Joint Program Office (JTRS JPO)
Major General Michael R. Mazzucchi, USA	• Commanding General, United States Army Communications-Electronics Command and Fort Monmouth • Program Executive Officer for Command, Control, and Communications Tactical (PEO C3T)
Brigadier General James R. Moran, USA	• Commanding General, Soldier Systems Center • Deputy Commanding General for Operations, United States Army Research, Development and Engineering Command • Program Executive Officer for Soldier (PEO Soldier)

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[10] All ranks, titles, and commands are as of the time of the respective interviews.

Name	Title(s)
Dr. Shelba Proffitt	• Deputy Program Executive Officer for Air, Space and Missile Defense (PEO ASMD)
Brigadier General Stephen V. Reeves, USA	• Joint Program Executive Officer for Chemical and Biological Defense (JPEO CBD)

As one would expect, the ongoing contingency operations in southwest Asia keep the PEOs very busy addressing soldiers' needs in the field. As a result, PEO CS&CSS, PEO GCS, and PEO TM were unable to schedule interview time. PM Unit of Action (UA) was unavailable due to the acceleration of the FCS program and resulting replanning efforts. In addition, the PEOs for ASMD and STRI were on special assignments in Iraq, so their deputies handled the interviews instead.

Time in Position

Although each interviewee is a senior acquisition professional with many years of experience in lower level positions, not all of them possess equivalent experience in their current roles. The time that an interviewee held the position at the time of the interview varied, from a little over a year to several years. Figure 4 shows each interviewee's tenure. Further, Figure 5 shows the summary statistics for number of years on the job. Of the five interviewees with more than three years of service in their current positions, three are civilians.
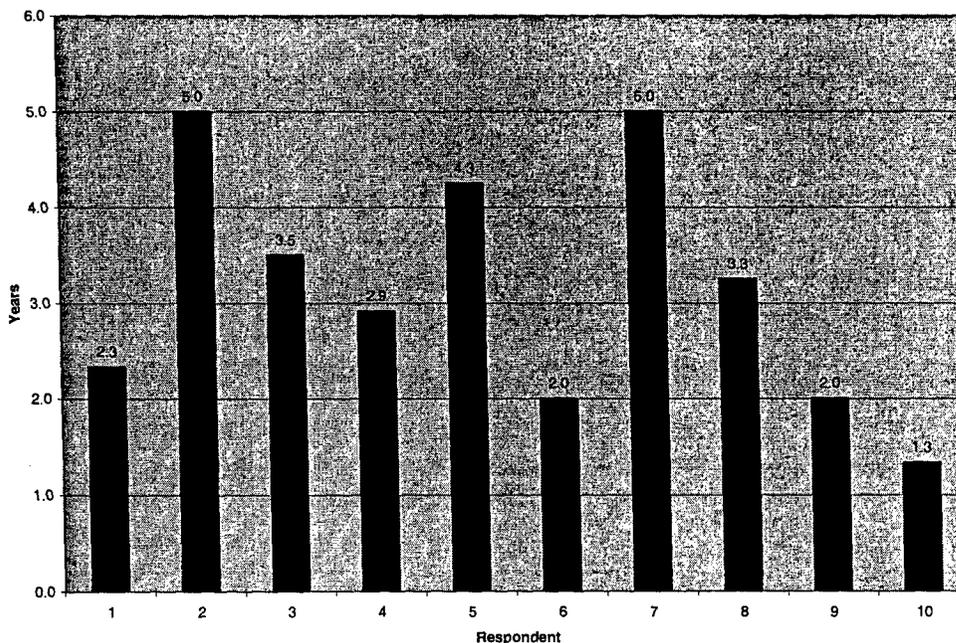

*Figure 4: Number of Years in Position (at time of interview)*
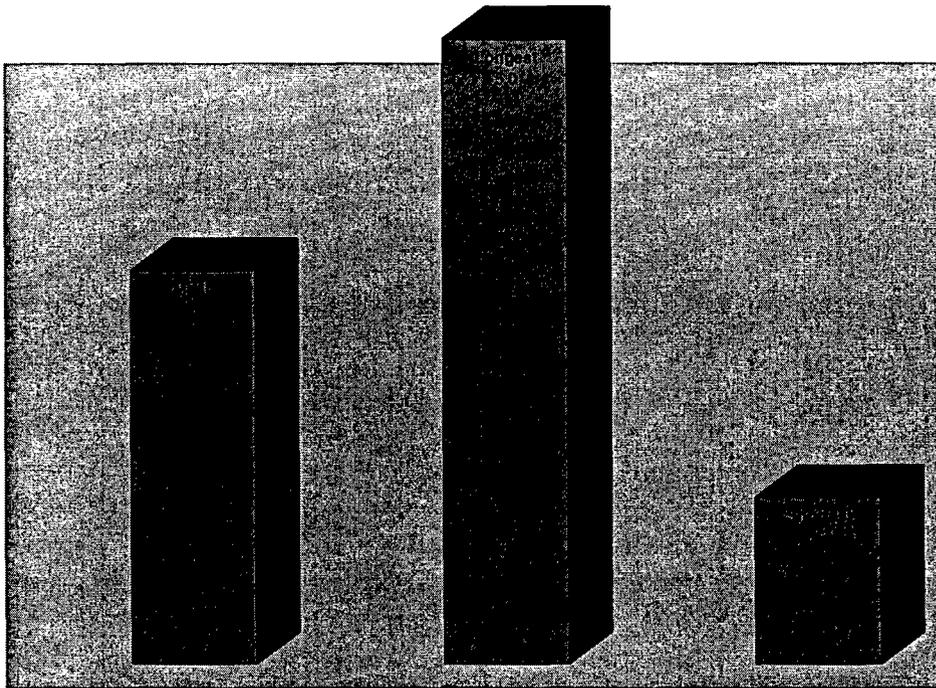
Figure 5: Summary - Number of Years in Position

Grades

Figure 6 shows the distribution of grades among the interviewees. For comparison, Figure 7 shows the overall distribution of grades for the PEOs themselves. While Brigadier General is the predominant rank among all PEOs, the recent trend has been to assign more civilians to the position. Civilian senior executives now make up nearly one-third of the community overall. The interview population included two deputies, which skews the distribution, making it 50 percent civilians.

Grade Distribution Among Interviewees
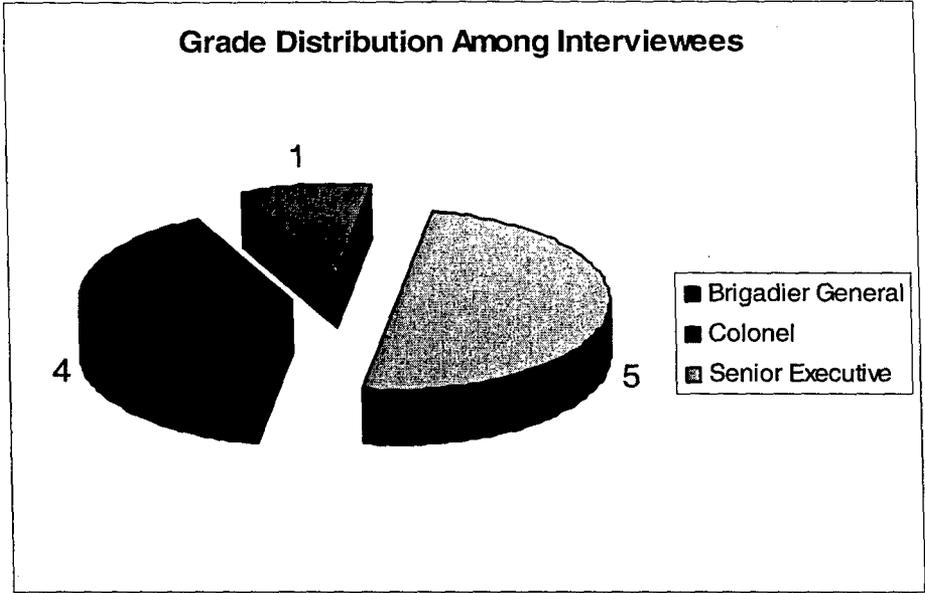
*Figure 6: Grade Distribution Among Interviewees*

Grade Distribution Among PEOs
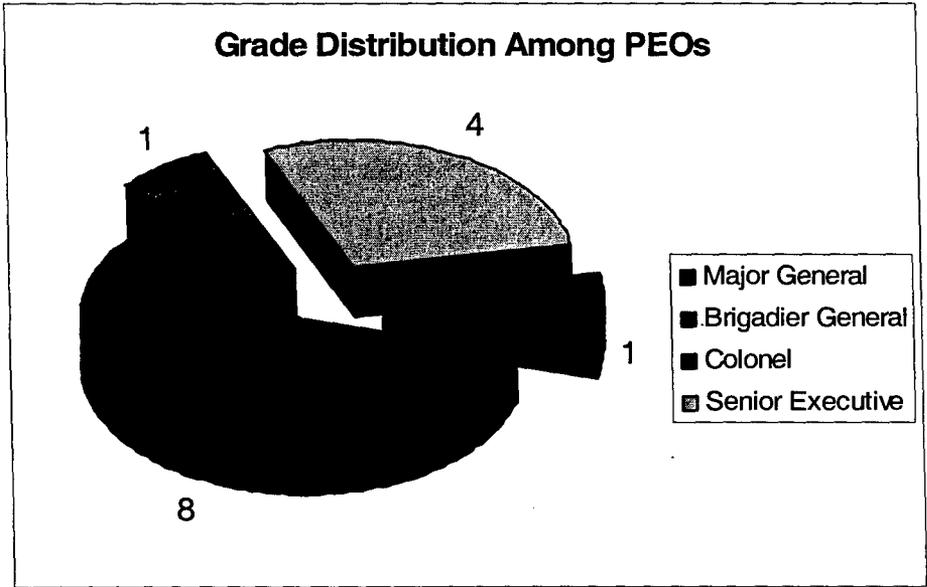
Figure 7: Grade Distribution Among All PEOs

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13. ABSTRACT (MAXIMUM 200 WORDS)

The U.S. Army Strategic Software Improvement Program (ASSIP) is a multi-year effort to improve the way the Army acquires software-intensive systems. As part of the ASSIP, the Carnegie Mellon® Software Engineering Institute interviewed the Army's Program Executive Officers (PEOs) to get their perspectives on the state of Army acquisition of software-intensive systems. The PEOs are senior acquisition professionals with a wealth of experience in Army acquisition and the attempts to improve it in the past.

This report documents the results of the PEO interviews. The PEOs identified shortcomings and some interesting potential solutions in various aspects of the acquisition function, including skills and training, policy, the acquisition organization, metrics, process, commercial off-the-shelf (COTS) products, and facilities and tools.

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