

Understanding and Leveraging a Supplier's CMMI[®] Efforts: A Guidebook for Acquirers

CMMI Guidebook for Acquirers Team

March 2007

TECHNICAL REPORT
CMU/SEI-2007-TR-004
ESC-TR-2007-004

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This report was prepared for the

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This work is sponsored by the U.S. Department of Defense. The Software Engineering Institute is a federally funded research and development center sponsored by the U.S. Department of Defense.

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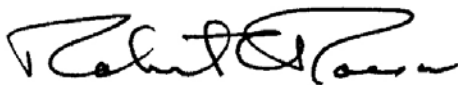
Foreword

The Capability Maturity Model[®] Integration (CMMI) product suite has gained significant traction across the commercial and defense product development community within the United States and a number of foreign countries. As co-sponsors of the CMMI, the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics (OUSD[AT&L]) and the National Defense Industrial Association (NDIA) are concerned with ensuring there is adequate guidance for acquiring organizations to leverage these disciplined practices of the development community.

We developed this guidebook for acquisition office personnel responsible for planning the acquisition strategy and preparing information associated with a request for proposal for systems acquisition. The guidebook provides insight into CMMI terminology and the meaning of CMMI ratings to promote effective communication with supplier organizations and avoid misuse and misinterpretation of the model.

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Finally, our special thanks are reserved for Mr. Lawrence T. Osiecki, OUSD(AT&L), and Dr. Karen Richter, Institute for Defense Analyses, for their original work and the integration of work from numerous contributors. Their leadership and effort made this guidebook a reality and ensured the content reflects the needs of the acquisition community.



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Executive Summary

Capability Maturity Model Integration (CMMI) was developed as an integrated approach to internal process improvement in a broad range of organizations. CMMI for Development (CMMI-DEV), Version 1.2, consists of a collection of best practices that address product development and maintenance activities that cover the product lifecycle, from conception through delivery and sustainment.

This guidebook is designed to help an acquirer benefit from a supplier's use of CMMI-DEV while avoiding the pitfalls associated with unrealistic expectations. It provides insight on the following:

- Interpreting a supplier's claims of achieving a CMMI rating
- The significance of the improvements to the CMMI Product Suite in v1.2
- How to request, understand, interpret, and use the results of a supplier's CMMI appraisals
- How to determine which process areas (PAs) are critical to the success of the program¹
- Methods that leverage a supplier's process improvement initiatives
- How to gather and interpret information for effectively monitoring supplier processes throughout the execution of an acquisition program

This guidebook also describes CMMI fundamentals that acquirers must understand to effectively use information obtained from a supplier's CMMI-DEV efforts on development programs. It includes explanations of capability and maturity levels and the differences between the two CMMI representations—continuous and staged. It also explains some of the more obscure elements of CMMI, such as equivalent staging and high maturity and capability levels (levels 4 and 5). The terms and concepts explained are ones acquirers may encounter in proposals and in everyday dealings with suppliers. This guidebook intends to demystify these terms and concepts.

Acquirers and users of CMMI-DEV, in general, should be cautioned that high capability and maturity level ratings alone do not guarantee program success. The U.S. Department of Defense (DoD) has never promulgated a policy requiring adherence to any CMMI maturity level rating but rather promotes CMMI as a tool for internal process improvement. This guidebook helps clarify what high capability and maturity level ratings can and cannot do for a development program.

For more information on the CMMI Product Suite refer to the CMMI Web site at <http://www.sei.cmu.edu/cmmi/>.

¹ This report uses the term *program* in place of the CMMI model standard term *project*.

Abstract

This guidebook is designed to help acquisition organizations benefit from their suppliers' use of CMMI for Development, which is a collection of best practices that addresses product development and maintenance activities throughout the product lifecycle. This guidebook also helps acquisition organizations avoid problems that can result from unrealistic expectations.

High capability and maturity level ratings alone do not guarantee program success. This guidebook helps clarify what those ratings can and cannot do for a development program. It describes how acquirers can

- interpret suppliers' claims of achieving a CMMI rating
- request, understand, interpret, and use supplier appraisal results, and
- apply methods that leverage a supplier's process improvement initiatives.

1 Introduction

This guidebook is designed to help acquisition organizations² pose the appropriate CMMI-related questions to their suppliers and interpret supplier responses to help identify and evaluate the risks that may be associated with a particular supplier. It also is designed to provide the acquisition organization with approaches for gathering and interpreting supplier data throughout the acquisition process to effectively monitor supplier processes that are part of the acquisition program after contract award. This guidebook deals exclusively with supplier processes. It does not address issues of process application, process capability, or organizational maturity within the acquisition organization.

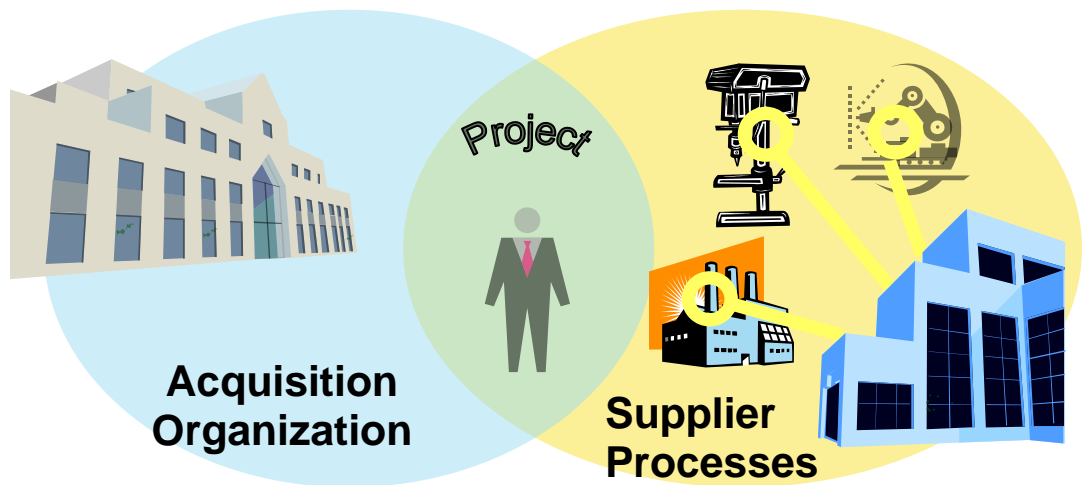


Figure 1: Guidebook Focus – Understanding Supplier Processes

CMMI-DEV contains process requirements based on industry best practices that can be used to guide organizations in pursuit of improving their development processes.³ Organizations that concentrate on process improvement demonstrate reductions in delivered defects, improved speed of development, and fewer post-delivery failures. Given those results, organizations that implement CMMI-based process improvement may provide a lower risk in development over those that do not.

CMMI-DEV provides a reference against which organizations can be appraised using formal appraisal techniques. Using CMMI appraisal data for evaluation in acquisitions can be an effective means of identifying and evaluating risk within the development portion of an acquisition. Acquisition organizations are especially adept at identifying and evaluating risks, and

² An acquisition organization may be a government acquirer (e.g., Program Management Office [PMO], Joint Program Office [JPO]), a government contractor serving as an acquirer for the government, or the acquisition organization within a commercial enterprise. This guidebook is written for all of these audiences, and the term *acquirer* represents all of them.

³ Since this guidebook is part of the v1.2 CMMI Product Suite, it refers to CMMI-DEV [SEI 2006a]. CMMI Version 1.1 model titles included Systems Engineering (SE), Software Engineering (SW) or both (SE/SW) along with additions for Integrated Product and Process Development (IPPD) and Supplier Sourcing (SS) [SEI 2002a, SEI 2002b]. Version 1.2 has an IPPD addition but SS has been incorporated into the basic model.

have always considered development as a risk area. CMMI appraisal data, obtained using the Standard CMMI Appraisal Method for Process Improvement (SCAMPISM), identify and evaluate development processes that organizations defined and utilized in the execution of their programs. Thus, this data can help to identify the degree of risk related to a supplier’s organizational processes used for product development.

CMMI-DEV and its appraisal method provide an approach for determining how well the appraised organization has employed its processes on the programs evaluated as part of the appraisal. This approach can indicate the degree of risk (or lack of risk) that these same processes might contribute when implemented on a new program. This indication is only valid, however, if the supplier actually uses the appraised processes on the program at hand. Implementation of these processes should begin before contract award (in the capture phase), and continue in earnest post award in order to reap the benefits. This guidebook provides guidance to help ensure that this consistent use of appraised processes by the supplier happens.

Sections 1.1 and 1.2 provide foundational material on CMMI-DEV and CMMI appraisals. Readers familiar with CMMI-DEV and the appraisal method may skip these sections. Section 1.3 includes information to help acquirers interpret the results of CMMI appraisals.

1.1 CMMI FUNDAMENTALS

CMMI-DEV consists of a set of process requirements based on industry best practices that are organized into 22 different process areas across four categories, as shown in Table 1. (The process areas related to Project Management, Engineering, and Support are discussed in Chapter 2.) The Process Management process areas are used at the organization level to define, deploy, and improve processes across the organization and are important because they play a large part in how effective the organization deploys its processes on a new program.

Table 1: CMMI-DEV Process Areas

Process Category			
Project Management	Engineering	Support	Process Management
Project Planning (PP)	Requirements Management (REQM)	Configuration Management (CM)	Organizational Process Focus (OPF)
Project Monitoring and Control (PMC)	Requirements Development (RD)	Process and Product Quality Assurance (PPQA)	Organizational Process Definition (OPD)
Supplier Agreement Management (SAM)	Technical Solution (TS)	Measurement and Analysis (MA)	Organizational Training (OT)
Integrated Project Management (IPM)	Product Integration (PI)	Decision Analysis and Resolution (DAR)	Organizational Process Performance (OPP)
Risk Management (RSKM)	Verification (VER)	Causal Analysis and Resolution (CAR)	Organizational Innovation and Deployment (OID)
Quantitative Project Management (QPM)	Validation (VAL)		

CMMI-DEV does not dictate specific processes, but rather defines the best practices that suppliers incorporate into their development processes. The degree to which an organization’s development

processes conform to CMMI-DEV is measured using an appraisal on a representative sample of programs in the appraised organization. Many organizations use appraisals as a means of assessing their process capabilities and guiding process improvement activities.

An appraisal can result in a capability level profile across a number of process areas or a maturity level rating for the organization, depending on the model representation used. CMMI-DEV has two representations that are used for appraisals—continuous and staged—that lead to capability level and maturity level ratings, respectively. The staged representation predefines the appraisal structure for each grouping of process areas, while an appraisal using the continuous representation appraises each selected process area independently. Organizations may choose one representation over the other for a variety of reasons, including the current state of ongoing improvement initiatives, the supplier’s historical familiarity with a particular approach, and perceived business needs and objectives.

In general, an organization’s progress in defining and improving its processes is measured by numbers 1–5 representing levels of capability or maturity. Level 1 is the lowest, meaning that the process is being performed but in an ad hoc manner. Regardless of the representation used, the capability and maturity levels of interest are 2–5, indicating to increasing degrees the sophistication and institutionalization of the process improvement efforts in the organization:

- Level 2 indicates managed processes
- Level 3 indicates defined program processes tailored from the organization’s set of standard processes
- Level 4 indicates quantitatively managed processes and subprocesses
- Level 5 indicates optimizing processes and subprocesses

The continuous representation of CMMI-DEV measures process capability within each process area. It allows an organization to choose which process areas to appraise based on its business objectives and process improvement goals. An appraisal using the continuous representation consists of a capability level profile showing the capability level achieved within each chosen process area.

The staged representation specifies sets of process areas in an ordered grouping of five maturity levels and predefines which process areas must be successfully appraised to achieve a maturity level rating. An appraisal for the staged representation results in a maturity level rating, interpreted as follows:

- Maturity level 2 indicates that the organization has achieved capability level 2 for each process area at maturity level 2. Maturity level 2 is primarily demonstrated at the program level and focuses on Project Management and Support process areas.
- Maturity level 3 indicates that the organization has achieved capability level 3 for all maturity level 2 and maturity level 3 process areas, which include Engineering and Process Management process areas. It also indicates that the organization has adopted a process focus at an organizational level and has a set of standard processes that can be tailored for specific programs.

- Maturity level 4 indicates that the organization has demonstrated that it quantitatively manages selected processes (program and organizational activities that are deemed important and are consistent with business objectives) and that it has achieved capability level 3 on all maturity level 2, 3, and 4 process areas.
- Maturity level 5 indicates that the organization has demonstrated that it has used its measurement data to improve and optimize selected processes and subprocesses, and that it has achieved capability level 3 on all process areas in the model.

Organizations that use the continuous representation can convert their appraised process area results into an organizational maturity level rating using *equivalent staging*. Figure 2, adapted from CMMI-DEV, illustrates the grouping of process areas into the maturity levels of the staged representation, the rules for equivalent staging, and what constitutes high maturity.

Although **high maturity** is not defined in CMMI-DEV, when practitioners of CMMI refer to high maturity, they are referring to behaviors associated with organizations performing at maturity level 4 or 5, or having process areas performing at capability levels 4 or 5. Basically, such behavior entails quantitatively managing and optimizing a limited number of processes or subprocesses.

The grouping of process areas into maturity levels is no indication of their relative importance. It is merely illustrating a path or sequence for process improvement.

Name	Abbr	ML	CL1	CL2	CL3	CL4	CL5
Requirements Management	REQM	2	[Shaded]	[Shaded]	[Shaded]	[Shaded]	[Shaded]
Project Planning	PP	2					
Project Monitoring and Control	PMC	2					
Supplier Agreement Management	SAM	2					
Measurement and Analysis	MA	2					
Process and Product Quality Assurance	PPQA	2					
Configuration Management	CM	2					
Requirements Development	RD	3	[Shaded]	[Shaded]	[Shaded]	[Shaded]	[Shaded]
Technical Solution	TS	3					
Product Integration	PI	3					
Verification	VER	3					
Validation	VAL	3					
Organizational Process Focus	OPF	3					
Organizational Process Definition +IPPD	OPD +IPPD	3					
Organizational Training	OT	3					
Integrated Project Management +IPPD	IPM +IPPD	3					
Risk Management	RSKM	3					
Decision Analysis and Resolution	DAR	3					
Organizational Process Performance	OPP	4					
Quantitative Project Management	QPM	4					
Organizational Innovation and Deployment	OID	5	High Maturity		[Dark Shaded]	[Dark Shaded]	[Dark Shaded]
Causal Analysis and Resolution	CAR	5					

Figure 2: Illustration of Maturity Level Groupings, Equivalent Staging, and High Maturity

1.2 CMMI APPRAISALS

Three types (generally referred to as Classes) of the SCAMPI appraisal method are defined: Class A, Class B, and Class C. Each Class has a different purpose, but all are capable of identifying process-related strengths, weaknesses, and risks. The appraisal team examines one or more programs within the organization for compliance to the portions of the CMMI model specified in the appraisal scope. The appraisal process generally involves the review of process documentation (e.g., policies and procedures), examination of process artifacts (e.g., work products), and

interviews with staff to ascertain the degree of process deployment within the organization. Irrespective of the representation of the model the organization selected, the SCAMPI appraisal method applies.

- **SCAMPI Class A** is the only formal appraisal type available for official capability or maturity level ratings. Suppliers that claim a maturity or capability level rating can do so only as a result of a SCAMPI Class A appraisal.
- **SCAMPI Class B** generally is used for internal process improvement, as it does not result in a maturity level or capability level rating. The SCAMPI Class B appraisal identifies gaps in process implementation and is commonly referred to as a gap analysis.
- **SCAMPI Class C** (commonly called a “quick look”) is less comprehensive, but more flexible than the SCAMPI Class B, and can be performed with a small team. There are fewer evidentiary requirements for a SCAMPI Class C than for a SCAMPI Class B appraisal. Often, a SCAMPI-C appraisal is a document or artifact review without staff member interviews. It primarily identifies gaps in process implementation.

Conducting a SCAMPI Class A appraisal requires the participation of a SCAMPI Lead AppraiserSM authorized by the Software Engineering Institute (SEI). With the latest release of CMMI-DEV (v1.2), the Lead Appraiser for a SCAMPI Class A must be independent (i.e., from an external, third party organization). Qualified Lead Appraisers are listed in the *SEI Partner Network Directory* [SEI 1]. Conducting a SCAMPI Class B or SCAMPI Class C appraisal requires a trained and qualified appraisal Team Leader authorized by the SEI. The Team Leader for these appraisals is not required to be from an external organization. Qualified SCAMPI Class B and C Team Leaders also are listed in the *SEI Partner Network Directory*. Both SCAMPI Lead Appraisers and Team Leaders will be referred to throughout this document as *appraisal leads*.

Appraisal team members that completed the training requirements delineated by the SEI may be drawn from within the appraised organization or external organizations. Generally, an organization conducting a SCAMPI Class A appraisal may include more external than internal staff members to clearly demonstrate appraisal independence to bolster any maturity or capability level claim.

The results of SCAMPI Class A appraisals are documented in an Appraisal Disclosure Statement (ADS) and an appraisal findings document. The Lead Appraiser provides these documents to the organization (i.e., the appraisal sponsor) and to the SEI for validation. Until the SEI validates appraisal results, any claims made by suppliers about levels are not valid.

For a SCAMPI A appraisal, many organizations also permit the appraisal results to be publicly posted on the *SEI Published Appraisal Report Site (PARS)* [SEI 2]. The acquirer should always check the PARS to validate a claim, since only validated results are posted on PARS. With the publication of version 1.2, all U.S. Department of Defense (DoD) contractor ADSs will be posted on the PARS site. Version 1.2 of the ADS significantly improved the reporting requirements over the previous version making the ADS particularly useful to acquirers in determining the breadth of an appraisal. While appraisals conducted prior to v1.2 do not have the requirement to post the ADS to PARS, most organizations will make the ADS and Findings document available to the acquirer, when requested, as a means of demonstrating the organization’s achievements in process improvement. Additional information about the ADS is provided in Section 3.6.

The SCAMPI Class A appraisal is described in detail in the *SCAMPI Method Definition Document* [SEI 2006b].

SCAMPI Class B and Class C appraisals are described in the *Handbook for Conducting Standard CMMI Appraisal Method for Process Improvement (SCAMPI) Class B and C Appraisals* [Hayes 2005].

1.3 INTERPRETING CMMI RATINGS

Various claims made about capability models and maturity level ratings over the years have led to some misperceptions. This section addresses these misperceptions. Organizations that attain a CMMI maturity level rating of 3 or higher should have documented organizational standards, defined processes, and procedures that are demonstrated to be repeatable. While a maturity level 3 supplier should tailor the organization's standard processes for use on all new programs, the acquirer cannot infer that the processes are necessarily effective or even consistently applied across the enterprise. Some warnings for the acquirer follow. The discussion centers on maturity level ratings rather than process capability profiles, since the majority of appraised organizations end up with a maturity level rating, and maturity levels are most often touted by suppliers.

A CMMI rating or CMMI level is not a guarantee of program success. While process capability and organizational maturity have been shown to be critical factors for program success, they are not the only ones. Mature suppliers that have capable processes in place on a program can still encounter problems. There are a number of factors that contribute to program success or failure, such as an incomplete understanding of the job, program constraints (e.g., funding, schedule), the skills of the people assigned to the program, and the maturity of the technology applied to the program. Organizations anticipate that adoption of CMMI-DEV will contribute to program success because it is an improvement over previous capability maturity models and because it integrates both systems and software engineering in a single framework that instills development discipline. However, the acquirer cannot assume that the supplier will execute the program at the same maturity level that the organization has achieved and advertised.

Organizations that have attained CMMI maturity level ratings do not necessarily apply those appraised processes to a new program at program start-up. Maturity level ratings are achieved by an organizational unit (e.g., the corporation, a major division, a few key programs) and are not an indication of how an individual program is performing. CMMI maturity level ratings indicate potential organizational performance and how the next program could perform based on a sampling of past and current programs if the appraised processes are applied in the same manner as on the chosen sample programs. While organizations with maturity level 3 and higher maturity level ratings are expected to employ their organizational processes on new programs, there is evidence that some organizations do not or that it takes some time before processes are applied to new programs. Therefore, acquirers should determine if rated organizations have a policy for using their organizational processes on new programs and a history of following that policy. CMMI-DEV, V1.2 added material to explicitly address process deployment to newly started programs.

Organizations that claim CMMI ratings are not always dedicated to process improvement. While most organizations that invest in the improvement of their development processes take the

investment seriously and commit to implementing those processes, some apparently seek a maturity level rating only for use in pursuit of opportunities (e.g., so that they can present the credential in proposals). These organizations, once they have achieved their maturity rating, may not apply the appraised processes as implied.

Additionally, organizations not committed to process improvement may choose to abandon their processes during contract execution when they perceive it to be to their advantage (e.g., costs start to overrun or schedule slips occur). These pressures can cause the acquirer or the supplier to abandon mature processes by not performing certain design, analysis, or verification activities in an attempt to save time or money. Such supplier organizations expose acquirers to additional risk through poor program execution. However, there are ways for acquirers to identify organizations that give short shrift to process improvement and are not committed to using their processes as a normal part of their work. For example, organizations that are actively pursuing process improvement have a demonstrated change history regarding the use of their processes, policies, and procedures. Acquirers can request documentation in the solicitation that provides a clear indicator of active use, monitoring, and improvement of these artifacts. Additionally, suppliers may use other tools, complementary to CMMI, that provide an indication of their commitment to process improvement, such as Lean Six Sigma or Team Software ProcessSM (TSPSM).⁴

Organizations may sample only a few exemplar programs and declare that all programs are being executed at that CMMI level rating. Ratings apply to an organizational unit; however, it is often not practical for a whole organization to be appraised. Historically, organizations identify to appraisal teams those programs that are available to be reviewed in the upcoming appraisal. The organization can be expected to nominate successful programs instead of those having difficulties. The appraisal team selects the number of programs that it can reasonably appraise in the allotted time and that it deems to be representative programs of the organizational unit from this identified set.

Recent changes to CMMI are intended to improve program selection integrity by placing more responsibility on Lead Appraisers to ensure a representative sample. The v1.2 ADS includes information about the type and number of programs sampled within the organization and what portion of the development population the appraised programs represent. This improvement in the ADS seeks to prevent “cherry-picking” of programs and provides acquirers with a better understanding of the breadth of the appraisal. These changes are not reflected in earlier versions of the ADS.

Most organizations are far from being homogeneous entities. In fact, many defense suppliers are an amalgamation of smaller organizations acquired over time. They are, therefore, dispersed geographically and bring different legacy processes to the table. Even though one would like to believe that all sectors, divisions, and locations of a supplier operate in the same way, this is seldom the case. Consequently, one supplier location may indeed utilize verified, capable processes, while another location may not. Thus, awarding a contract to a supplier at location A

⁴ For more information on continuous process improvement, see the *Continuous Process Improvement Transformation Guidebook* [DoD 2006a].

that has capable processes at location B is not a guarantee that the capable processes will be applied to the program at location A immediately, or ever.

Organizations that claim a high maturity level rating (level 4 and 5) are not necessarily better suppliers than a level 3 supplier. Maturity levels 4 and 5, when compared across different suppliers, are not created equal. An organization must select one process or subprocess that is important to its business objectives and quantitatively manage (maturity level 4) or optimize (maturity level 5) it. Another organization would likely select different processes or subprocesses. Thus, if the chosen processes or subprocesses are not those of value to the current program, the supplier's high maturity activity may not add benefit. With v1.2 of the ADS, Lead Appraisers have the additional responsibility of verifying that the chosen processes relate to the organization's business objectives; however, acquisition organizations should have insight into the profile of capability levels across all the process areas that are critical or relevant to the program. Examination of the capability profile clearly shows the levels of any particular process area, while relying on a maturity level will not. In this regard, the profile is more meaningful than relying on a single maturity level.

A high maturity level rating is *not* an indication of how the next program *will perform*; it is only an indication of how the next program *could perform* provided other critical success factors remain the same. Organizations that have attained high maturity level ratings are not immune to the aforementioned pitfalls. Achieving a high maturity rating often involves modifying the behavior of a number of individuals throughout the organization and disrupting organizational inertia. It takes management focus and staff commitment to improve. Unfortunately, there is a tendency to “take a breath” after the organizational surge that produced the maturity level rating. Management must be diligent to assure that once organizational change occurs, the behaviors become institutionalized. Clearly, past performance only indicates the potential performance for the current program. To achieve the anticipated performance on the current program, the mature organization must instantiate the appraised processes on that program.

1.4 OVERVIEW OF THIS GUIDEBOOK

Although many organizations have adopted CMMI, nothing in the rules of government acquisition demands the use of CMMI by government suppliers. While some government organizations specified that their suppliers demonstrate achievement of maturity level 3 to the Capability Maturity Model for Software (SW-CMM®) in the 1990s, and some continue that practice today with CMMI, the DoD has never promulgated a policy requiring adherence to any CMMI maturity level rating. DoD does not place significant emphasis on capability level or maturity level ratings, but rather promotes CMMI as a tool for internal process improvement. This guidebook continues that theme.

While this guidebook is intended for use by those without an extensive background in CMMI, some readers may feel that they need additional information on process capability and process improvement. Additional sources of help include the SEI, the Defense Contract Management Agency (DCMA), and the various software engineering centers (SECs) or software support activities (SSA) established within the Services.

If acquirers choose to capitalize on their suppliers' use of CMMI-DEV, the remainder of this guidebook describes approaches for solicitation planning and execution and contract monitoring:

- Chapter 2 covers identifying and understanding the critical process areas of the program.
- Chapter 3 describes approaches for leveraging the process capabilities of the supplier by enabling them in the request for proposal (RFP).
- Chapter 4 describes how to monitor the supplier's performance to ensure that the identified process capabilities are being applied to the program.

The implementation of these approaches is discussed in detail in the appendices. The acquirer must determine which of these methods are applicable to its program. Appendix A contains a checklist of the methods identified in this document. It can be used as an aid in implementing and tracking the status of each selected method.

2 Identify the Critical Process Areas of the Program

Identifying and understanding the processes that are most critical to the success of the program is an important first step in determining the criticality of process related risks. This chapter describes how to determine the critical process areas of the program. The more critical a process may be to the program's success, the more importance should be placed on the capability of the supplier's process, and the more risk may be incurred if its process is not well defined and implemented.

Suppliers that establish and use effective processes, working as part of a mature organization, are more likely to do the following:

- plan and execute development programs predictably
- support those programs with an engineering and management infrastructure that will enable them to succeed
- communicate more accurately and frequently with customers and stakeholders
- stay on schedule and deliver quality products

Evaluation of the supplier's proposed development processes—and then ensuring that the supplier actually applies those processes to the program from the start—are the acquirer's primary process challenges. To meet these challenges, the acquirer must first understand the critical process areas of the program.

2.1 ESTIMATE PROGRAM DEPENDENCE ON PROCESS CAPABILITY

Experience has shown that the program attributes in Table 2 may make a program more vulnerable to immature development processes. These six attributes are a critical subset of risk-inducing program characteristics. Other attributes of the program may also indicate vulnerabilities to immature supplier development processes.

Table 2: Factors Driving the Need for Process Capability

Program Attribute	Discussion	Effect of Immature Development Processes
Complexity	This attribute includes factors such as the number and complexity of interfaces, integration complexity, the number and diversity of stakeholders, software reuse, the degree of interoperability with other systems, and domain complexity.	Immature development processes reduce the program's ability to deal with the planning, execution, and oversight of complex programs.
Size	Program size indicators include the number of developmental components, the number of acquirer and supplier teams participating in the development lifecycle, and the number of user, system, or software requirements.	Large programs require geometrically increasing lines of communication for oversight and stakeholder involvement in various lifecycle development activities. Immature processes typically result in inaccurate or late communication, poor planning, a lack of teamwork, and rework.
Lack of precedent	This attribute includes five aspects of the program: <ol style="list-style-type: none"> 1. Has this system functionality been developed before with these quality attributes? 2. How mature is the technology? 3. Has the target technology been applied in this domain before? 4. Does this team have experience with this type of system? 5. Are disparate systems or technologies brought together to provide a new integrated capability? 	Immature processes can fail under the pressure of responding to unprecedented challenges. Mature programs with highly disciplined team members have a better chance of rising to the challenge.
Dependence on software	This attribute can generally be described by its components: proportion and reliance. Proportion reflects the relative investment in software development versus hardware or systems development. Reliance indicates functional dependence of the system on the software.	Development of a system that is software dependent imposes challenges at the system, software, and, potentially, hardware levels. Immature processes may result in a breakdown of basic engineering functions, such as requirements allocation, the development of coherent architectures, and system integration and testing.
Schedule or funding constraints	This attribute reflects program imperatives to deliver a useful capability to the customer for a limited expenditure. "Hard" delivery dates and inadequate funds stress both the acquirer and the supplier team.	Programs that exhibit immature processes have little or no capability to react reasonably to schedule or funding stress, to properly manage expectations, or to effectively manage the resulting risks.
Requirements instability	There is always some level of requirements evolution for complex, unprecedented systems. However, if user needs or system requirements are highly volatile, either through lack of definition or in response to changing customer needs, excessive requirements variation will occur at the system and software levels.	Programs with immature processes often find it difficult to respond to a changing requirements base from either an engineering or management perspective.

Table 3 is a diagnostic tool that the acquirer can use to judge the program's rating with respect to six attributes. For each of the attributes shown in the left column, the program is rated low, medium, or high. For example, if schedule urgency is driving the program to be kicked off before

user needs are clearly understood, both *Schedule and Funding Constraints* and *Requirements Instability* might be rated high.

Table 3: Program Characterization

Program Attribute	Ratings		
	Low	Medium	High
Complexity			
Size			
Lack of Precedent			
Dependence on Software			
Schedule or Funding Constraints			
Requirements Instability			
TOTAL			

The results of this diagnostic may be interpreted as follows:

- If the program has no high ratings and no more than two medium ratings, it probably has a low dependence on process capability.
- If the program has one high rating or three or more medium ratings, it probably has a moderate dependence on process capability.
- If the program has two or more high risk ratings, it probably has a high dependence on process capability.

If the program is rated as moderate or high, the process capabilities of the suppliers as they are applied during the development effort can be a critical factor in the success of the program, and the approaches in this guidebook may be used to alleviate some of the risk.

2.2 UNDERSTAND THE RELEVANT PROCESS AREAS

In nearly every program, all 17 of the CMMI-DEV process areas related to Project Management, Engineering, and Support are used at some time during the program’s lifecycle. Of the process areas included at maturity level 2 and 3 related directly to the execution of the program, some are more important than others at different phases in the program lifecycle. The capability of these processes *at the time when they are most needed* determines the risk that they pose to the program. While all process areas must be planned for early in the lifecycle and can apply throughout the lifecycle, it may be beneficial for some to begin earlier in the program than others, as illustrated in Figure 3:

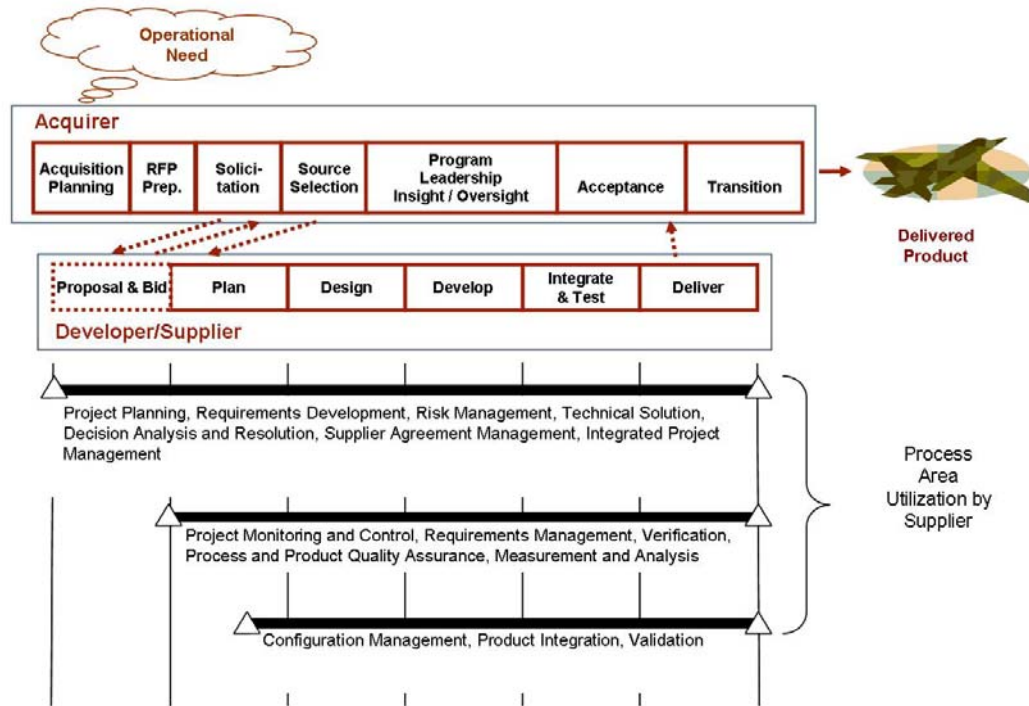


Figure 3: Notional Time Sequencing of Process Areas Mapped to Development Lifecycle

The process areas of interest and their corresponding purpose statements are as follows:

- Configuration Management – to establish and maintain the integrity of work products using configuration identification, configuration control, configuration status accounting, and configuration audits.
- Decision Analysis and Resolution – to analyze possible decisions using a formal evaluation process that evaluates identified alternatives against established criteria.
- Integrated Project Management – to establish and manage the project and the involvement of the relevant stakeholders according to an integrated and defined process that is tailored from the organization's set of standard processes.
- Measurement and Analysis – to develop and sustain a measurement capability that is used to support management information needs.
- Process and Product Quality Assurance – to provide staff and management with objective insight into processes and associated work products.
- Product Integration – to assemble the product from the product components, ensure that the product, as integrated, functions properly, and deliver the product.
- Project Monitoring and Control – to provide an understanding of the project's progress so that appropriate corrective actions can be taken when the project's performance deviates significantly from the plan.
- Project Planning – to establish and maintain plans that define project activities.
- Requirements Development – to produce and analyze customer, product, and product component requirements.

- Requirements Management – to manage the requirements of the project’s products and product components and to identify inconsistencies between those requirements and the project’s plans and work products.
- Risk Management – to identify potential problems before they occur so that risk-handling activities can be planned and invoked as needed across the life of the product or project to mitigate adverse impacts on achieving objectives.
- Supplier Agreement Management – to manage the acquisition of products from suppliers.
- Technical Solution – to design, develop, and implement solutions to requirements. Solutions, designs, and implementations encompass products, product components, and product-related lifecycle processes either singly or in combination as appropriate.
- Validation – to demonstrate that a product or product component fulfills its intended use when placed in its intended environment.
- Verification – to ensure that selected work products meet their specified requirements.

These process areas align well with the technical and technical management processes described in Section 4.2 of the *Defense Acquisition Guidebook* (DAG), Chapter 4, “Systems Engineering” [DoD 2004]. (See Appendix E on page 67 for more information about mapping between DAG Chapter 4 processes and CMMI process areas.) According to Section 4.5.1 of the DAG, the systems engineering plan (SEP) will include the following:

The systems engineering processes to be applied in the program (e.g., from a standard, a capability maturity model, or the supplier's process). Describe how the processes will be implemented and how they will be tailored to meet individual acquisition phase objectives. Describe how the systems engineering processes will support the technical and programmatic products required of each phase. Sections 4.2 (process) and 4.3 (process application to SE phase) provide a “roadmap” of how SE processes can be applied to an acquisition program.

2.3 ASSESS AND PRIORITIZE THE CRITICAL PROCESS AREAS FOR THE PROGRAM

Based on the previous discussion and the context of the envisioned program, the acquirer can determine which process areas are critical. Two methods are described in this section that can be used to assist the acquirer with this determination. The objective is to assess and prioritize the critical process areas of the program, using CMMI-DEV as the reference model. Once identified, the program’s critical process areas can be addressed in the RFP. Supplier processes that relate to those critical areas can then be evaluated in relationship to the risk that poorly defined or executed processes can create.

2.3.1 Self Assessment

A self-assessment of the program’s critical process areas can be performed as part of acquisition strategy development. Knowing the critical process areas helps to identify the process capabilities that a successful supplier must possess. This method requires that the acquirer has basic process knowledge. This knowledge should be resident within the acquirer’s office under normal

circumstances. (See “Self-Assessment Questionnaire” on page 33 in Appendix B for implementation details.)

2.3.2 Facilitated Assessment

A facilitated assessment of the program’s critical process areas can be used as an alternative to the self-assessment method. A facilitated assessment may be performed by a trained and qualified outside agency with both domain and process expertise. This method requires sufficient funding and time for external support. (See “What to Do” in the “Self-Assessment Questionnaire” on page 36 section in Appendix B for implementation details.)

3 Leverage the Process Capabilities of the Supplier

Chapter 2 described how to identify process areas that are critical to a program and determine what to concentrate on when considering the supplier's approaches. This chapter includes methods for gathering information about the capabilities of suppliers to perform development activities. The acquirer can use these methods to determine organizational strengths, weaknesses, or risks associated with a supplier's approach and organizational processes. These methods are fully independent and may be used individually or in combination. Each method is useful in limiting process performance risk within an acquisition, but the acquirer can balance the need for information with the resources available to review that information. Table 4, at the end of the chapter, provides guidance on selecting the methods that may be most appropriate for the acquisition program.

Once the acquirer selects one or more of these methods, they have to be enabled in an RFP, the contract, or in some other manner. Examples of sample evaluation criteria and instructions that apply to Sections M and L of the RFP, are available in the *Guide for Integrating Systems Engineering into DoD Acquisition Contracts* [DoD 2006f]. The sample language in that guide should be adapted to align with specific selections of the following methods.

3.1 CONSIDER PROCESS PROPOSALS IN CRITICAL AREAS

One way for the acquirer to understand the supplier's plans for process application to the program is to request and evaluate process proposals in areas critical to the program. When preparing a proposal, the offeror⁵ plans and estimates the work that will be done on the program. This estimate is based on the offeror's intended methods for executing the work (i.e., its work processes). The acquirer can ask for a detailed description of processes in areas especially critical to program success, as identified in Chapter 2. Each offeror's response to this request illustrates how its processes are adapted to and applied to the program.

Offerors with a strong process focus and capable processes (i.e., maturity level 3 or capability level 3 as defined by CMMI-DEV) already have process descriptions. Offerors who have not implemented CMMI-DEV can still participate by submitting the specific processes that they plan to use on the program.

The acquirer must balance the desire for detailed information against the impact that a large volume of information will have on the evaluation effort. Concentrating on only the most critical process areas, as defined in Chapter 2, may help achieve such a balance.

The information supplied by the offeror in process proposals that address the most critical process areas can be formally evaluated as part of the source selection. The SCAMPI Class C process appraisal method can be used to review the process information from the proposals such as process definitions, templates, process descriptions, and sample work products. The appraisal

⁵ An offeror is a supplier competing for a contract.

team uses this process information and the practices in CMMI-DEV as a reference to identify strengths and weaknesses in the offeror's proposed processes.

Furthermore, certain aspects of the proposed processes can then be captured in the contract, creating an obligation for the chosen supplier to implement them and providing a basis for contract monitoring. (See "Consider Process Proposals in Critical Areas" on page 40 in Appendix C for implementation details.)

3.2 CONSIDER INTEGRATED MASTER PLAN DOCUMENTATION OF PROPOSED PROCESSES

An integrated master plan (IMP) that describes how the offeror intends to execute the program is linked to the offeror's integrated master schedule (IMS) and uses the same program work breakdown structure (WBS) used to prepare the basis of estimate (BoE) documentation. If the proposed processes are included in the IMP, the acquirer will have the means to verify process execution without additional process monitoring actions.

The work described in this set of documentation represents how each offeror has planned to execute the program and, as such, represents a commitment to the incorporation of its work processes into program execution. The value of the complete package is that it enables the acquirer to review each offeror's approach to implementing the program in a holistic sense, especially if the offeror is asked to map its proposed activities to its processes and the critical process areas identified by the program. This mapping can be done with little additional documentation and allows the evaluator to see how well the offeror's processes will incorporate into the program plan. More importantly, the acquirer can use it to evaluate the degree to which each offeror intends to invoke its processes and practices, especially if the offeror is specifically asked to provide that information in the IMP as well as provide a map of its process set to the program's identified critical process areas in the IMP or elsewhere in the proposal. This evaluation provides a valuable assessment of the degree to which each offeror can be expected to execute its processes after contract award and allows the evaluator to assign an appropriate risk to each offeror. (See "Consider Integrated Master Plan Documentation of Proposed Processes" on page 42 in Appendix C for implementation details.)

General guidance on the IMP and IMS can be found in the *Integrated Master Plan and Integrated Master Schedule Preparation and Use Guide* [DoD 2005].

3.3 CONSIDER INCORPORATION OF PROCESS REVIEWS INTO PROPOSED PROGRAM SCHEDULES

Organizations that have institutionalized their processes should conduct periodic reviews or audits of their processes. Incorporation of these process reviews in the offeror's IMS and IMP provides visibility into the rollout of the offeror's processes and work products for critical program processes.

The acquirer can request that the offeror include its planned process reviews in its IMP and IMS, including a list of process work products for the program's critical process areas, which will be included in the earned value management system (EVMS) and initial baseline review (IBR). (See

“Consider Incorporation of Process Reviews into Proposed Program Schedules” on page 43 in Appendix C for implementation details.)

3.4 CONSIDER THE APPROACH TO INTEGRATION WITH SUBCONTRACTOR PROCESSES

Process relationships between the prime contractor (supplier) and major development subcontractors can be a potential source of risk to the program. Therefore, it is important for the acquirer to know and understand the risks arising from the integration of prime contractor and subcontractor processes to properly monitor and manage these risks. The RFP can request a plan from the prime contractor addressing this subject, and it can ensure that all activities and risks are captured in the IMP, IMS, and risk management plan (RMP). (See “Consider Approach to Integration with Subcontractor Processes” on page 44 in Appendix C for implementation details.)

3.5 CONSIDER THE APPROACH TO INTEGRATION WITH ACQUIRER PROCESSES

Relationships between the acquirer and supplier processes can be a source of risk to the program. Since the acquirer and the supplier have significantly different roles and responsibilities in an acquisition program, their processes differ significantly. However, in areas where responsibility for processes is shared or where significant interaction exists between the acquirer and supplier processes, it is desirable to ensure that supplier processes critical to the program (identified in Chapter 2) are compatible with the acquirer processes. Process compatibility requires the following:

- A common vocabulary (e.g., what is the meaning of a high-risk exposure)
- Consistent and compatible process objectives
- Efficient and clear bidirectional communication of process performance
- A clear understanding of the acquirer and supplier processes
- Alignment of supplier lifecycle phase deliverables and work products with the acquirer’s lifecycle expectations

Examples of process integration include the following:

- The acquirer and the supplier share responsibility for risk management. To ensure effective risk management for the program, common definitions can be established for risk impact, risk probability, etc. Furthermore, guidelines can be established to help determine which risks are the responsibility of the supplier, which are the responsibility of the acquirer, and which are shared. Issues such as the frequency of risk reporting must also be addressed.⁶
- Both the acquirer and the supplier will perform requirements management and requirements development activities. The acquirer will translate stakeholder needs (e.g., user requirements) into contract requirements. These requirements must be accurate, complete, and consistent; they must also be baselined and managed. The supplier takes the contract requirements and derives product-based requirements from them. These requirements must

⁶ For further information on the alignment of acquirer and supplier risk management activities, see the Risk Management Guide for DoD Acquisition [DoD 2006e].

also be baselined and managed. To ensure satisfaction of user needs, traceability must be maintained from the user needs through the product-based requirements.

- Configuration management (CM) is a shared responsibility between the acquirer and the supplier; both must manage the configuration of program documents to ensure accurate communication and real-time understanding of program status. Coordination of CM processes creates a consistent baseline on which both the acquirer and the supplier can base their efforts.

The acquirer can monitor and manage any risks arising from the integration of its processes and the supplier processes once they are known. (See “Consider Approach to Integration with Acquirer Processes” on page 45 in Appendix C for implementation details.)

3.6 CONSIDER RECENT APPRAISAL RESULTS

Many organizations perform formal process appraisals as a means of understanding their process capabilities and degree of compliance with CMMI. In these appraisals, a representative sampling of programs within the organization is examined to identify evidence that best practices as defined in CMMI-DEV were deployed.

Results of previous organizational appraisals (within the past 3 years) can be requested and collected from each prime contractor and each subcontractor that will perform major development activities. Knowledge and understanding of appraisal results can help the acquirer identify the process capabilities of the supplier in relationship to the critical process areas identified in Chapter 2.

The acquirer should look for answers to the following questions from data supplied on the ADS:

- Is the organization named in the ADS the same organization that is bidding on and will execute the program?
- Was the bidding organization involved in the appraisal?
- Was the appraisal performed by a third party not affiliated with the organization or the company, or by a Lead Appraiser associated with the appraised organization?
- How many programs were included in the appraisal?
- Was the appraisal performed less than two years ago?
- What was the appraisal method used?
- Which process areas were included in the appraisal?
- What is the organizational significance of the appraisal sponsor?

Additional questions that can be asked about the appraisal findings include the following:

- Do the appraisal findings match the scope of the ADS or do they document a modification of the appraisal scope?
- Do the appraisal findings declare any process areas *not applicable* (NA)?
- Will weaknesses noted in the appraisal findings have a significant impact on the program?

(See “Consider Recent Appraisal Results” on page 46 in Appendix C for implementation details.)

3.7 CONSIDER HISTORICAL DATA ON PROCESS PERFORMANCE

Organizations that have institutionalized their processes should collect and maintain data on the historical use of their processes on programs. Data may include statistics on the following:

- Breadth of process application across the organization (e.g., what percentage of programs employ standard or tailored versions of the organization’s standard processes)
- Consistency of process application (e.g., what percentage of processes applied to programs are modified from the organization’s standard processes)
- Program compliance with the defined processes (e.g., metrics resulting from process monitoring or process audits)

The acquirer may request and evaluate any relevant data on historical process performance. As part of the evaluation of the past performance of source selection, the acquirer may ask the offeror to identify the historical performance of selected processes for the number of completed programs the offeror submitted for consideration. In addition, the acquirer may request that past performance data be submitted for on-going programs coincident with the present bid, recognizing that some of these programs may not be sufficiently advanced in their lifecycle to have completion data available. The acquirer may also contact DCMA to obtain past performance assessment information on suppliers.⁷ (See “Consider Historical Data on Process Performance” on page 51 in Appendix C for implementation details.)

3.8 CONSIDER RECENT POST-AWARD APPRAISAL DATA FROM OTHER PROGRAMS

Over the past few years, several government acquisition programs planned for and executed post-award appraisals within the winning supplier or supplier team. These appraisals were performed by trained and authorized appraisal teams consisting of members from the acquisition organization, the supplier organizations, and independent members. The purpose of these appraisals was to address the process-related risks of the appraised program. These appraisals are limited to the scope of the program and the portion of the organization executing the program. The purpose is not to evaluate an organization’s process capability, but to identify risks introduced into the program by process performance.

These appraisals have been performed at several stages of the program lifecycle and, therefore, may or may not be useful to the program:

- Some were performed near the end of one phase of system development, preceding a down-select⁸ to provide input to the source selection process.
- Some were performed shortly after contract award to encourage the supplier to instantiate the necessary processes on the program quickly.

⁷ See also the *Guide for Integrating Systems Engineering into DoD Acquisition Contracts* [DoD 2006f].

⁸ A downselect is an acquisition term that describes the process of determining a winning bid after two or more competing contractors demonstrate their designs or prototypes. Often, to alleviate program risk, an acquisition strategy will award two contracts to two offeror teams with competing designs. Downselect is the term used when one design or prototype is finally selected after it is proven to be superior in nature to the others.

- Some were performed later in the development lifecycle to monitor the supplier's conformance to process performance commitments.

(See "Consider Recent Post-Award Appraisal Data from Other Programs" on page 53 in Appendix C for implementation details.)

3.9 CONSIDER PROCESS COMPLIANCE EVALUATIONS DURING EXECUTION

The degree to which a program complies with the organization's set of standard processes is extremely important and indicates how the offeror might perform on the program. The compliance of the offeror's standard processes should be measured early in each program's lifecycle and remeasured at reasonable intervals throughout the lifecycle.

During the execution of the program, the acquirer can monitor the implemented processes to ensure the program is benefiting from the process capabilities of the supplier. There are several ways to monitor a supplier's process performance:

- If organizations include process compliance evaluations as part of regular quality assurance reviews, the acquirer should obtain and review their collected data.
- If organizations evaluate process performance as part of a global mission assurance review process, the acquirer should obtain and review the collected data.
- The acquirer should contact the local DCMA office to request performance of independent process reviews.

(See "Consider Process Compliance Evaluations during Execution" on page 53 in Appendix C for implementation details.)

3.10 CONSIDER THE REPORTING OF PROCESS STATISTICS

Receiving reports of process statistics can provide the acquirer with near-continuous insight into the supplier's process capability. Organizations that have institutionalized their processes, monitor and control them. As a fundamental part of the supplier's own process monitoring activities, it collects, analyzes, and uses process metrics to ensure its processes are being applied, are appropriate, and are being used as a basis for improvement. As part of the metrics program, the acquirer can include reporting of process performance metrics (e.g., process compliance data or defect rate data) in the RFP. Ensure that this reporting requirement is incorporated into the contract. (See "Consider the Reporting of Process Statistics" on page 54 in Appendix C for implementation details.)

3.11 CONSIDER ACCESS TO SELECTED PROCESS ARTIFACTS

Executing a process results in work products, also called process artifacts. Examining these work products can provide insight into process performance. For example, if a peer review process calls for the publication of meeting minutes, the presence (or absence) of those minutes can give some idea of the number of peer reviews, the subjects of peer reviews, and even the quality of the peer reviews. Likewise, the acquirer can evaluate the risk management process by periodically examining the risk database to reveal information such as the following:

- Currency of the program risks: Are risks being added and resolved on an ongoing basis?
- Breadth of the risk management process deployment: Who is identifying and managing risks?

Many process artifacts mentioned in CMMI-DEV are plans or other documents that are typically part of any development program. The acquirer can decide which of the artifacts should be delivered formally and which should only require informal access. (See “Consider Access to Selected Process Artifacts” on page 55 in Appendix C for implementation details.)

3.12 CONSIDER CONDUCTING PRE-AWARD PROCESS APPRAISALS

While the results of previous appraisals using CMMI-DEV can be helpful in identifying the supplier’s process capabilities, they may not be sufficient for a pending program’s needs because of the following:

- The portion of the organization bidding on this program was not involved in the previous appraisal.
- The programs evaluated in the previous appraisal were not in the same technology domain as this program.
- Processes critical to this program were not appraised in the previous appraisal.

If sufficient information on process capability has not been submitted by the offeror to make the acquirer comfortable in the source selection, it may be helpful to conduct an appraisal of the offeror’s organizations and locations performing the work on the program. Such an appraisal can be conducted prior to the release of the RFP in an Advisory Multi-Step Process⁹ or after the RFP release as part of the evaluation of the source selection. While it is generally not practical to conduct a comprehensive appraisal of all process areas within the organization, it is feasible to conduct an appraisal of a few process areas as a means of filling gaps in understanding the offeror’s process capabilities. A SCAMPI Class B or Class C appraisal may be used.

An appraisal conducted prior to or during source selection will not evaluate the specific team and the specific tailored processes that will execute the program. Although CMMI-DEV requires the early deployment of processes on new programs, in most cases the program team will not exist and the processes will not be implemented until after contract award. These process appraisals only allow the acquirer to evaluate the process capabilities of teams similar to the envisioned program team, working on a similar program in the same organization and environment that the actual program will have. (See “Consider Conducting Pre-Award Process Appraisals” on page 56 in Appendix C for implementation details.)

3.13 CONSIDER CONDUCTING POST-AWARD PROCESS APPRAISALS

If the program’s dependence on process capability was determined to be significant using the methods prescribed in Chapter 2, the acquirer can require that the winning supplier undergo one or more process appraisals of the program’s critical process areas. Typically, these appraisals are

⁹ This process is explained on Defense Acquisition University’s Acquisition Community Connection Web site [DoD 2006b].

performed using a SCAMPI Class B method that only addresses the processes proposed for the program.

The acquirer can require the supplier to incorporate process appraisals directed by the acquirer into its proposed IMS and IMP and to plan for cooperation with these appraisals. The acquirer also can provide instructions on approximate timeframes for the conduct of each appraisal as well as information on how far in advance the supplier will be notified. Typically, two process appraisals are performed—one shortly after contract award and a second later in the program, possibly before a major program decision point. The first appraisal establishes a benchmark of process performance and can be used to encourage the supplier to expedite process instantiation on the program. The second appraisal conducted in advance of a key event can help the acquirer assess the quality of the efforts and products contributing to that event. (See “Consider Conducting Post-Award Process Appraisals” on page 57 in Appendix C for implementation details.)

3.14 CONSIDER PROCESS-BASED, OUTCOME-ORIENTED AWARD FEE DETERMINANTS

A risk mitigation technique, oriented to encourage the winning offeror to embrace process implementation, is to negotiate adding an award fee determination based on process adoption and improvement. If process performance is included as part of the contract award fee conditions in the RFP, then the acquirer can set the details of the award fee conditions for each offeror as part of the contract negotiations. The acquirer must keep any award fee related to process performance in balance with program outcomes. According to *existing guidance* on contracts that contain award fee conditions, “it is imperative that award fees be tied to identifiable interim outcomes, discrete events or milestones, as much as possible” [USD 2006].

The acquirer may contact the local DCMA office to request its support with the evaluation of award fee criteria implementation during contract execution. (See “Consider Process-Based, Outcome-Oriented Award Fee Determinants” on page 58 in Appendix C for implementation details.)

The methods presented in this chapter are not mutually exclusive. Any or all of them may be used on a program. Table 4 provides guidance on selecting the methods most appropriate given program needs.

Table 4: Opportunities to Leverage Supplier Capabilities—Selection Guidance

Title	Purpose	Prerequisites	Outputs	Impact
<p>3.1</p> <p>Consider Process Proposals in Critical Areas</p> <p>Pages 17 and 40</p>	<p>Identify and understand the offeror's intended application of processes to the program</p> <p>Establish a basis for a contractual obligation for process performance</p> <p>Provide insight into artifacts available to the acquirer for process monitoring</p> <p>Gain insight into organizational process capability</p>	<p>Process knowledge and experience on the part of the acquirer staff or external support for process proposal evaluation</p>	<p>Proposed processes</p> <p>List of available process artifacts</p> <p>Identification of gaps between offeror capabilities and program needs</p>	<p>Provides a basis for contractual obligation for process performance</p> <p>Requires significant effort from the acquirer and may require significant effort from the offeror</p> <p>Use this method</p> <ul style="list-style-type: none"> on acquisitions for which dependence on process capability is significant for offerors whose process capabilities are largely unknown to the acquirer to address only the process areas most critical to the program
<p>3.2</p> <p>Consider Integrated Master Plan Documentation of Proposed Processes</p> <p>Pages 18 and 42</p>	<p>Gain visibility of the degree to which offerors are planning to execute their processes on the program (i.e., contractual commitment to proposed processes)</p>	<p>Defined offeror processes and identified artifacts that can be referenced in the IMP and IMS</p>	<p>An integrated IMP and IMS that incorporate process elements into the program plan and schedule</p>	<p>Requires minimal effort from the acquirer and the offeror</p>
<p>3.3</p> <p>Consider Incorporation of Process Reviews into Proposed Program Schedules</p> <p>Pages 18 and 43</p>	<p>Provides the acquirer with visibility into the deployment of processes critical to the program</p>	<p>The acquirer has knowledge of the expected execution of processes critical to the program within the program's development lifecycle</p> <p>The acquirer has knowledge or external support available for evaluation of the IMS, IMP, and proposed process-related work products</p>	<p>An IMS and IMP that include effort and resources for periodic reviews of processes critical to the program</p> <p>List of process-related work products for the processes critical to the program</p>	<p>Requires minimal effort from the acquirer and the offeror</p> <p>A supplier at maturity level 2 or higher is required to conduct process reviews under CMMI requirements. While placing it in the schedule may increase the formality, costs associated with this approach should not be significant.</p>

Title	Purpose	Prerequisites	Outputs	Impact
3.4 Consider the Approach to Integration with Subcontractor Processes Pages 19 and 44	Assure adequate integration and coordination of prime contractor and subcontractor processes	Subcontract relationships	Subcontractor management plan List of subcontractor integration risks	Requires minimal effort from the acquirer and the offeror
3.5 Consider the Approach to Integration with Acquirer Processes Pages 19 and 45	Assure adequate integration and coordination of the acquirer and supplier processes Establish expectations for cooperation and integration Provide the basis for creating a contractual obligation for cooperation and integration	Defined critical process interfaces	The supplier processes aligned with the acquirer processes	Requires minimal effort from the acquirer and the offeror
3.6 Consider Recent Appraisal Results Pages 20 and 46	Gain insight into the organizational maturity and process capability of offerors	Appropriate appraisal data available (e.g., relevant scope, organization, domain)	Identification of process assets available to the program Identification of gaps between offeror capabilities and program needs	Requires minimal effort from the acquirer and the offeror Use on acquisitions where a sufficient subset of potential offerors can provide appraisal data
3.7 Consider Historical Data on Process Performance Pages 21 and 51	Understand and identify risks associated with the application of the offeror's process capabilities to new programs	Sufficient data on the application of mature processes to new programs Process knowledge and experience on the acquirer staff's part or external support for process proposal evaluation	Insight into the offeror's ability to instantiate organizational processes rapidly on new programs Risks associated with the offeror's consistency in applying mature processes to new programs	Requires minimal effort from the acquirer and the offeror Can provide an extremely useful analysis that can differentiate offerors based on their commitment to define and execute capable processes on new programs Use if there are doubts about the intent of offerors to define and apply capable processes on the program

Title	Purpose	Prerequisites	Outputs	Impact
3.8 Consider Recent Post-Award Appraisal Data from Other Programs Pages 21 and 53	Gain an improved understanding of the supplier's process execution capability on recent programs	Ideally, the offeror had post award appraisals performed on recent and similar programs within the organization bidding this proposal	Appraisal data, including the following <ul style="list-style-type: none"> • Final findings presentation • ADS • Action plans The collection and analysis of this data provides increased confidence in the abilities and risks of the offeror as demonstrated by performance in actual programs.	Requires minimal effort from the acquirer and the offeror When this data is applicable and available, use this method on acquisitions where processes have been deemed to be a critical factor.
3.9 Consider Process Compliance Evaluations During Execution Pages 22 and 53	Facilitate contract monitoring activities later in the program by including provisions in the contract	None Execution of the method later in the program may require one or more of the following: <ul style="list-style-type: none"> • Expertise in measurement and analysis to monitor supplier data • Process and appraisal knowledge and experience on the part of the staff • External support for measurement and analysis • External support for process and appraisal activities 	Contract language establishing the acquirer's access to relevant supplier data and rights to perform program process appraisals	Enables later contract monitoring, requires minimal effort from the acquirer and can greatly facilitate later monitoring activities Later execution of some of these activities (e.g., program process appraisals, data reviews) will impose demands on the acquirer; however, judgments on proceeding with the activities can be made at that time based on program conditions. One drawback is the slight increase in cost to cover supplier support for these efforts.
3.10 Consider the Reporting of Process Statistics Pages 22 and 54	Ensure process compliance during program execution	Measurement and analysis knowledge Process knowledge and experience on the part of the acquirer's staff or external support for process proposal evaluation	Process audit reports Process compliance statistics	Can provide significant benefit at a low cost to the acquirer and the supplier A supplier at maturity level 2 or higher is required to collect process statistics, so additional costs should not be significant.
3.11 Consider Access to Selected Process Artifacts Pages 22 and 55	Ensure process compliance during program execution through monitoring of process artifacts	Measurement and analysis knowledge Process knowledge and experience on the part of the acquirer's staff or external support for process proposal evaluation	Process artifacts Indications of process compliance	Can provide significant benefit at a low cost to the acquirer and the supplier

Title	Purpose	Prerequisites	Outputs	Impact
<p>3.12</p> <p>Consider Conducting Pre-Award Process Appraisals</p> <p>Pages 23 and 56</p>	<p>Evaluate the offeror's organizational process capability, or capability of proposed or actual development processes</p> <p>Differentiate the offerors' process capabilities during source selection</p> <p>Reinforce the commitment of the supplier team to process capability after the contract award</p>	<p>Appraisals must be set through source selection or contract action.</p> <p>Process knowledge and experience on the part of the acquirer's staff or external support for process proposal evaluation</p>	<p>Strengths, weaknesses, and risks of the offeror's organizational processes, proposed processes, or actual processes</p>	<p>A process capability evaluation of the offeror's proposed process can reveal lapses in intent or knowledge associated with mature development processes. SCAMPI Class C appraisals provide fairly inexpensive, quick mechanisms for an in-depth understanding of the offeror's intent that can support comparison and differentiation of offerors.</p>
<p>3.13</p> <p>Consider Conducting Post-Award Process Appraisals</p> <p>Pages 23 and 57</p>	<p>Ensure rapid application of organizational processes to the acquirer's program</p> <p>Ensure process compliance during program execution</p> <p>Gain deeper insight into supplier progress</p>	<p>Process knowledge and experience on the part of the acquirer's staff or external support for process proposal evaluation</p>	<p>List of process-related risks to the program</p> <p>Supplier process-compliance data</p>	<p>Can provide significant benefit, but the cost to the acquirer and the supplier is not trivial</p> <p>Use if the supplier has a history of process-related issues (e.g., slow application of organizational processes, poor process compliance), or if the acquirer has other reasons to expect process issues in execution</p>
<p>3.14</p> <p>Consider Process-Based, Outcome-Oriented Award Fee Determinants</p> <p>Pages 24 and 58</p>	<p>Encourage process compliance and continuous improvement</p>	<p>Process knowledge and experience on the part of the acquirer's staff or external support for process proposal evaluation</p>	<p>Process-based outcome-oriented award fee determinants</p>	<p>Can provide significant benefit at a low cost to the acquirer and the supplier</p>

4 Monitor Supplier Process Performance After Award

This chapter provides guidance on how to ensure that the supplier is effectively using capable processes on the program, as promised during solicitation and award. Monitoring supplier execution after contract award is a cornerstone of the acquirer's role as an acquisition organization.

Several methods can be used to obtain the correct process insight throughout the duration of the contract. Some methods are inherent in a typical contract through the submission and review of contract deliverables that typically result from process execution. Others involve deliberate review of process documentation and artifacts specifically involved in the program. In addition, DCMA is a source for performing on-site process monitoring.

The methods used are a function of the program risks, the leverage provided within the contract structure, and the resources available for risk reduction. Artifact reviews can be conducted on formal contract deliverables already prescribed for the program. Other types of reviews involving risk assessments or audits have been proven to provide greater insight into process performance and execution risks, but often require enabling clauses in the contract to execute them.

Early invocation of these methods can be a means of jump-starting a program's process execution. The methods are independent and presented in no particular order—any or all of them may be used.

4.1 PROCESS MONITORING THROUGH ARTIFACT REVIEWS

Acquirers regularly review deliverables (e.g., contract data requirements lists [CDRLs], status reports, audit reports) to evaluate performance. These same reviews, when linked to the supplier's contractual processes, can also provide a validation of both a supplier's adherence to its processes and its timely and effective performance.

Requiring the supplier to provide and commit to the processes that it proposed and link its work products to the IMS, through methods described in Chapters 2 and 3, facilitates the ability to reference its processes and specified work products as part of its activities and to monitor the completion of its work products as part of Earned Value Management (EVM) reporting. (See "Process Monitoring through Artifact Reviews" on page 61 in Appendix D for implementation details.)

4.2 PROCESS MONITORING THROUGH REVIEW OF PROCESS METRICS AND AUDITS

Supplier organizations should regularly gather metrics related to both their program and process performance and perform periodic audits of process performance. A review of these metrics and audit results can give the acquirer needed information on the supplier's process implementation and performance. (See "Process Monitoring through Review of Process Metrics" on page 61 in Appendix D for implementation details.)

4.3 PROCESS MONITORING THROUGH PROCESS REVIEWS

Early review of the supplier team's process capability reinforces process capability in low-risk teams and will motivate process capability in high-risk teams. Whether these reviews are initiated by the acquirer or the supplier, ideally they include participation by both.

After contract award, the following development process issues are common:

- Is the supplier team's development process defined and being implemented? If not, when will this happen?
- Are critical development processes in place for program kick-off?
- Has the lead supplier put a plan in place to integrate the team's development processes, including all subcontractors?

The acquirer can perform process reviews through the access clause in the contract. DCMA can perform them on a continuing basis as part of its contract monitoring activities. (See "Process Monitoring through Process Reviews" on page 62 in Appendix D for implementation details.)

4.4 PROCESS MONITORING USING POST-AWARD APPRAISAL RESULTS

Post-award appraisal results (generally, a SCAMPI Class B appraisal) are characterized as strengths, weaknesses, or gaps, not as capability levels or maturity levels. These findings provide an accurate indicator of the state of process areas that are determined to be critical to the program.

Process areas identified as low risk do not require immediate action, but continued monitoring is advised. Those identified as medium risk require further investigation to determine what is causing implementation gaps and what steps can be taken to improve. Those identified as high risk require immediate action as they pose a significant barrier to successful deployment of critical processes. The acquirer can collaborate with the supplier on a process improvement plan prioritized according to the appraisal findings. (See "Process Monitoring through Post-Award Appraisals" on page 63 in Appendix D for implementation details.)

Appendix A: Questions and Checklists

Table 5: Acquirer's Decision Summary

Selection	Method Title	Responsibility	Assignment Date	Planned Implementation Date	Actual Implementation Date	Status
Identify the Critical Process Areas of the Program						
<input type="checkbox"/>	2.3.1 Self Assessment					
<input type="checkbox"/>	2.3.2 Facilitated Assessment					
Leverage the Process Capabilities of the Supplier						
<input type="checkbox"/>	3.1 Consider Process Proposals in Critical Areas					
<input type="checkbox"/>	3.2 Consider Integrated Master Plan Documentation of Proposed Processes					
<input type="checkbox"/>	3.3 Consider Incorporation of Process Reviews into Proposed Program Schedules					
<input type="checkbox"/>	3.4 Consider the Approach to Integration with Subcontractor Processes					
<input type="checkbox"/>	3.5 Consider Approach to Integration with Acquirer Processes					
<input type="checkbox"/>	3.6 Consider Recent Appraisal Results					

Selection	Method Title	Responsibility	Assignment Date	Planned Implementation Date	Actual Implementation Date	Status
<input type="checkbox"/>	3.7 Consider Historical Data on Process Performance					
<input type="checkbox"/>	3.8 Consider Recent Post-Award Appraisal Data form Other Programs					
<input type="checkbox"/>	3.9 Consider Process Compliance Evaluations During Execution					
<input type="checkbox"/>	3.10 Consider the Reporting of Process Statistics					
<input type="checkbox"/>	3.11 Consider Access to Selected Process Artifacts					
<input type="checkbox"/>	3.12 Consider Conducting Pre-Award Process Appraisals					
<input type="checkbox"/>	3.13 Consider Conducting Post-Award Process Appraisals					
<input type="checkbox"/>	3.14 Consider Process-Based, Outcome-Oriented Award Fee Determinants					
Monitor Supplier Process Performance After Contract Award						
<input type="checkbox"/>	4.1 Process Monitoring Through Artifact Reviews					
<input type="checkbox"/>	4.2 Process Monitoring Through Review of Process Metrics					
<input type="checkbox"/>	4.3 Process Monitoring Through Process Reviews					
<input type="checkbox"/>	4.4 Process Monitoring Using Post-Award Appraisal Results					

Appendix B: Identify the Critical Process Areas of the Program

The two methods in this appendix can help the acquirer assess and prioritize the program’s critical process areas. These methods may be used individually or in combination. When the acquirer chooses the method to be deployed on the program, the acquirer staff assigned to execute this decision may then use this detailed implementation guidance.

SELF-ASSESSMENT QUESTIONNAIRE

The questionnaire in Table 6 is an example of what might be used to identify the process areas that are important to the program, using the taxonomy of CMMI-DEV. The questionnaire is amenable to execution on a spreadsheet. By identifying those process areas that are of particular importance, the acquirer can focus on the more critical processes and request information related to them. This questionnaire uses the specific goals of each process area in CMMI-DEV that were discussed in Chapter 2.

Table 6: Process Needs Self-Assessment Questionnaire

#	Process Area and Goals	Not Important	Slightly Important	Important	Very Important	Essential
		1	2	3	4	5
Project Planning						
	1. Establish Estimates	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	2. Develop a Project Plan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	3. Obtain Commitment to the Plan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Project Monitoring and Control						
	4. Monitor Project Against Plan	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	5. Manage Corrective Action to Closure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Supplier Agreement Management						
	6. Establish Supplier Agreements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	7. Satisfy Supplier Agreements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

#	Process Area and Goals	Not Important	Slightly Important	Important	Very Important	Essential
		1	2	3	4	5
Integrated Project Management + IPPD						
	8. Use the Project's Defined Process	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	9. Coordinate and Collaborate with Relevant Stakeholders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	10. Apply IPPD Principles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Risk Management						
	11. Prepare for Risk Management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	12. Identify and Analyze Risks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	13. Mitigate Risks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Requirements Management						
	14. Manage Requirements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Requirements Development						
	15. Develop Customer Requirements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	16. Develop Product Requirements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	17. Analyze and Validate Requirements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Technical Solution						
	18. Select Product Component Solutions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	19. Develop the Design	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	20. Implement the Product Design	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

#	Process Area and Goals	Not Important	Slightly Important	Important	Very Important	Essential
		1	2	3	4	5
Product Integration						
	21. Prepare for Product Integration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	22. Ensure Interface Compatibility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	23. Assemble Product Components and Deliver the Product	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Verification						
	24. Prepare for Verification	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	25. Perform Peer Reviews	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	26. Verify Selected Work Products	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Validation						
	27. Prepare for Validation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	28. Validate Product or Product Components	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Configuration Management						
	29. Establish Baselines	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	30. Track and Control Changes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	31. Establish Integrity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Process and Product Quality Assurance						
	32. Objectively Evaluate Processes and Work Products	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	33. Provide Objective Insight	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Measurement and Analysis						
	34. Align Measurement and Analysis Activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	35. Provide Measurement Results	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

#	Process Area and Goals	Not Important	Slightly Important	Important	Very Important	Essential
		1	2	3	4	5
Decision Analysis and Resolution						
	36. Evaluate Alternatives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What to Do

This self-assessment questionnaire can be used by the acquirer in the context of the following activities:

- Distribute the questionnaire to key individuals within the acquirer staff, and ask them to independently complete it.
- Convene a meeting of all responders.
- Discuss the evaluations of each item to reach a consensus.
- Record the consensus evaluation.

FACILITATED ASSESSMENT

The acquirer can conduct a facilitated assessment by performing the following activities:

- Review program documentation to develop an understanding of the program and its risk exposure.
- Interview acquirer staff to further understand the program.
- Interview program stakeholders to develop an understanding of their needs and expectations.

The results of the assessment are delivered in a report identifying and prioritizing the process needs of the program, along with the supporting rationale.

What to Do

The acquirer arranges for a facilitated assessment by performing the following steps:

1. Contact the appropriate organization (e.g., a qualified federally funded research and development center (FFRDC) like the SEI, an SEI Partner organization qualified to perform appraisals, or the various SECs or SSA established within the Services) to request assistance in appraising the process needs of the program
2. Work with the assigned assessor¹⁰ to identify documentation needs, knowledgeable acquirer staff, and critical stakeholders.

¹⁰ The facilitated assessment of critical process areas does not have to be performed using a SCAMPI appraisal method; therefore, the term "assessor" is used here instead of "appraisal lead."

3. Provide the identified documentation to the assessor for review.
4. Work with the assessor to schedule interviews with the acquirer staff and critical stakeholders.

When to Do It

The selected assessment method¹¹ can be used early in the development of the acquisition strategy.

How to Use the Results

Either method can be used to focus on the process areas that are important, very important, or essential to the program or to evaluate the process capabilities of potential offerors. The critical areas identified should be part of the RFP so that offerors can propose processes mapped to the critical areas.

¹¹ The term “assessment” as used here means that the acquirer hires someone from the outside to determine the critical process areas. No methodology or standard is implied.

Appendix C: Leverage the Process Capabilities of the Supplier

This appendix provides implementation details for the various approaches discussed in Chapter 3. It covers various ways to get a chosen approach into a contract with a supplier.

Traditionally, all proposal information is requested as part of Section L of the RFP and the evaluation of the resulting proposal submission is governed under the provisions of Section M. In cases where the organizations expected to participate in the acquisition are known entities and the risks of process implementation are relatively well understood, this traditional approach works well.

An alternative approach, especially when the potential offerors are not as well known, is to request the process-related information as part of a request for information (RFI) prior to the release of an RFP. This approach gains access to the process-related information prior to release of the RFP so additional conditions might be included in the RFP to further reduce program risk. For example, if an offeror is not able to adequately demonstrate that it has adequate processes in place and is not involved in a process improvement program, the risk to the program may be great enough to require an acquisition-related process appraisal as part of the acquisition process.

While this alternative requires additional time, it may be the only way of gathering information on process capability for organizations that have not been previously appraised. It also provides some additional risk quantification when used to supplement the findings from a previously performed third party appraisal. If the acquirer believes there is enough process-related risk to the program, an appraisal could be performed on an offeror prior to the RFP release (e.g., as part of an Advisory Multi-Step Process prior to RFP release [Federal Acquisition Regulation Subpart 15.202]). If an additional (unanticipated) offeror submits a proposal, this new offeror would be subjected to the same requirements as the other offerors (i.e., the appraiser would conduct the appraisal after receipt of the proposal).

Guidance is also provided for approaches to take when process-related risks associated with the potential winner are discovered. Assuming evaluation notices (ENs) have been issued and discussions have begun, the potential winner can be requested to address its weaknesses in its best and final offer (BAFO) and include corrections in its final proposal document (FPD). This course of action can be considered when the risks identified are severe enough to potentially increase the award price. However, when such action is warranted, particularly on programs in which process capability is deemed to be especially critical, having the opportunity to mitigate risk in advance of award has its benefits.

Once the acquirer chooses the methods to be deployed on the program, the acquirer staff assigned to execute these decisions may then refer to the detailed implementation guidance in this appendix to help them implement the methods.

3.1 CONSIDER PROCESS PROPOSALS IN CRITICAL AREAS

The acquirer should be aware that requesting process information can result in large volumes of information from each offeror. By requesting process information the acquirer can rapidly accumulate proposal page counts that are daunting to review, and the sheer volume of information may overshadow other key aspects of the proposal that are just as important to evaluate. The acquirer should concentrate on the areas of critical concern by carefully selecting the information needed and ensuring that it directly supports evaluation and decision making. Any process information requested can be tailored by the offeror for application to the program. This amount of activity is charged to the offeror Bid and Proposal budget, so the acquirer should select the process areas so the amount of work does not unnecessarily drive up the offeror's costs.

Information on how the offeror plans to tailor and deploy processes on the program can be provided in several ways and to varying levels of detail. If the acquirer is familiar with the offeror organization that will be performing on the program or if a pre-award appraisal has been conducted, the appraisal findings and the offeror schedule for training and deployment of the processes may be sufficient.

When the acquirer is less familiar with the offeror and its process execution history, more detailed information may be necessary. With a focus on the critical process areas for the program, the acquirer should select the types of information required. This information can be provided in the form of process proposals, which should be the offeror's organizational processes tailored specifically for the program.

The offeror should also provide process information on major subcontractors. Typically, prime contractors take two approaches with their subcontractors:

1. have subcontractors execute the prime contractor's processes as team members
2. have subcontractors execute their own processes in development of a product to be delivered to the prime

The acquirer should exercise caution in cases in which prime contractors integrate their processes with those of their subcontractors. This method may take many months to result in efficient, well understood, and executed processes for the program. (See "Consider Approach to Integration with Subcontractor Processes" on page 44 in Appendix C.) The offeror should be required to describe its approach and provide process, schedule, and task information (i.e., process proposals, IMP, IMS, WBS, and plan for training all team members) in its proposals. At a minimum, the offeror should be required to provide process documentation for critical program process areas for all major subcontractors, especially those that will be executing their responsibilities under the contract using their own processes. Depending on the risks associated with the subcontractor portion of the work, process proposals may also be required.

If the offeror is using process methodologies other than CMMI and SCAMPI (e.g., ISO/IEC 15288, 12207, 15504; ISO 9001, EIA 632, and IEEE 1220), or if there are processes to be implemented that are not captured by CMMI-DEV (e.g., manufacturing practices), the acquirer should require the offeror to map the information into a format consistent with the one being used to map processes to CMMI-DEV (as shown in Chapter 2 and Appendix B). This mapping should include process descriptions and tailoring as well as any formal audit results.

ISO-9001:2000 is a quality management standard for development created and maintained by the International Organisation for Standardisation (ISO). The American National Standard equivalent is ANSI/ISO/ASQ Q9001-2000. Organizations attain ISO-9001:2000 registration through an independent audit process that examines their compliance to identified practices. Because ISO-9001:2000 is primarily a quality standard, it is less prescriptive of the development process than CMMI-DEV, but it does provide evidence of a process focus within the organization. If the bidding organization (prime contractor or subcontractors) claims ISO 9001:2000 registration, the acquirer should determine if the processes being bid are included. Since ISO 9001:2000 is a quality system registration, it only includes those processes that are specifically cited. Therefore, a development organization may have a subset of its processes (e.g., assembly and test of hardware) within its registration but may not include its full set of development processes.

The information supplied in offeror process proposals can be formally evaluated and scored as a factor in source selection.

What to Do

The acquirer can request descriptions of the processes in areas critical to the program that must be examined in detail to thoroughly assess the potential risk of execution. These requests can be made in Section L of the RFP. The acquirer should include evaluation criteria related to process performance and risk in Section M of the RFP. Any process proposal information provided by the offeror should be above and beyond what is included in the software development plan (SDP) or systems engineering plan (SEP), which will have much of the information already provided for evaluation [DoD 2004]. The descriptions can include a list of work products produced by the process, as well as some samples of these work products.

When to Do It

Collecting process proposals is the first step in ensuring that the proposed processes will be actually applied to the program. If there are concerns over the detailed implementation of processes in specific areas, additional information can be requested. As part of the proposal evaluation, the acquirer can then determine the capability and suitability of these processes for the program.

If the acquirer knows the expected offerors well, and they have demonstrated the application of capable processes to other similar programs, the information can be requested in the RFP. If the acquirer does not know the expected offerors well, the information can be in an RFI for earlier pre-qualification evaluation.

How to Use the Results

Process proposals form the basis for determining the risk related to their execution on the program and provide the basis for requiring adherence to those processes as part of the contract. The acquirer should request that each prime contractor and major subcontractor provide descriptions of the processes that they commit to use immediately after contract award.

One method of evaluating these proposed processes is to use a SCAMPI Class C appraisal prior to award. This appraisal evaluates the process proposals in the critical program process areas for compliance with CMMI-DEV. Because it looks only at the process proposals to determine the

intent of the organization, this appraisal method is considerably less intrusive, less time consuming, and less expensive than more comprehensive appraisals.

Process proposals are appraised to answer the following questions:

- Do the proposed processes reflect the best practices of CMMI-DEV?
- Are the processes, particularly those in the process areas identified as critical to program success, complete and adequate to perform the desired functions?
- Are the activities and work products listed in the processes visible in the proposed IMS?

The result of this appraisal is a collection of risks arising from gaps between CMMI-DEV and the proposed processes. These risks may be factored into the source selection criteria. These process proposals can also be referenced in the contract of the selected supplier, thereby providing a contractual commitment to execute the processes on the program, as proposed.

Commitment to follow a set of processes can provide the acquirer with the means to monitor supplier performance after award. Having process descriptions, including definitions of work products, can also provide the acquirer with the means to verify that the supplier intends to execute the processes.

3.2 CONSIDER INTEGRATED MASTER PLAN DOCUMENTATION OF PROPOSED PROCESSES

What to Do

The offeror should identify processes that map to critical process areas identified for the program in the RFP and include references to organizational process materials (or materials already tailored for the program) in the IMP. The offeror should also include dates for development program team training (if any) and process deployment in the IMS. The offeror should be required to describe its approach and provide process, schedule, and task information (i.e., process proposals, IMP, IMS, WBS, and plan for the training of team members) in its proposals. These activities should be traceable to the WBS as referenced in the IMP and IMS. A matrix can be provided for offerors to map their proposed processes to the program's identified critical process areas. In addition, offerors should map the artifacts of their critical processes to the IMS and identify the nomenclature they are using to identify those artifacts.

If the acquirer is familiar with the offeror organization that will be performing on the program or if a pre-award appraisal has been conducted, the formal appraisal findings and the offeror schedule for training and deployment of the processes may be sufficient to provide and understanding of the maturity of each offeror's set of processes.

When to Do It

Normally, the requirement to provide an IMP, IMS, a program WBS, and associated BoE are included in the RFP along with directions to complete the process portion of the IMP and IMS and any mapping matrix.

How to Use the Results

When in receipt of an offeror's IMP, IMS, WBS, BoE, and mapping matrix, the acquirer should determine where the offeror identifies its program-critical processes and how it identifies the artifacts for those critical processes in its IMS. The completeness of the offeror's process implementation can also be examined in its process mapping against the program's critical process areas. The completeness of the submission along with the degree of support provided by the offeror's BoEs can allow the acquirer to estimate the degree to which each offeror is planning to execute its processes on the program.

3.3 CONSIDER INCORPORATION OF PROCESS REVIEWS INTO PROPOSED PROGRAM SCHEDULES

What to Do

The acquirer should request that the offeror include planned process reviews in its IMP and IMS and request that the offeror provide a list of the process work products for the program's critical process areas that will be included in the following:

- EVMS (if applicable)
- IBR (if applicable)
- Data accession list (DAL)

If the acquirer includes a request for process reviews in the IMS, the acquirer should include this requirement in the model contract and in the final contract so the results can be monitored. If an offeror has not fully incorporated process reviews into its proposed IMS, the acquirer may want to direct them using an EN to include additional reviews in the supplier's final proposal submission. If the acquirer does not include a request for process reviews in the IMS, the acquirer can still negotiate the inclusion of the reviews in the final IMS as a risk reduction activity and introduce the subject as part of a review of the IMS in discussions.

When to Do It

In Section L of the RFP, the acquirer should include directions to incorporate proposed process reviews in the IMP and IMS and include process work products in the IMS. Based on the risks related to process determined earlier, the acquirer should ask for the appropriate process reviews to be included immediately after contract award and before the initial review of the IMP and IMS.

How to Use the Results

The acquirer should answer the following questions in reviewing the offerors' proposals:

1. Has the offeror incorporated appropriate levels of process reviews in its IMP and IMS submittals?
2. Is the first process review soon enough after award to allow the acquirer to determine if the critical, early processes are being employed effectively?
3. Does the offeror propose appropriate metrics that will allow the acquirer and its management to verify and track the rollout of the offeror's processes?

4. Are the key artifacts and work products required by offeror processes identified and tracked in the IMS?

The IBR establishes the EVMS baseline. A review of process deployment could assess whether the deployed processes are included in support of the baseline, particularly through the listing of process work products as milestone events.

3.4 CONSIDER THE APPROACH TO INTEGRATION WITH SUBCONTRACTOR PROCESSES

Typically, prime contractors take two approaches with their subcontractors:

1. Have the subcontractors execute the prime contractor's processes as team members.
2. Have the subcontractors execute their own processes in development of a product to be delivered to the prime contractor.

The acquirer should exercise caution in cases where prime contractors integrate their processes with those of their subcontractors, as this method may take many months to result in efficient, well-understood and executed processes for the program.

What to Do

The acquirer should request each offeror's approach to the integration of its critical processes with its subcontractors, including the means that the offeror proposes to eliminate risks associated with start up and training. This approach provides an indication of how well this important aspect of process integration has been thought out. When available, the offeror can provide an ADS or appraisal findings for all subcontractors, especially those executing their responsibilities under the contract using their own processes. Depending on the risks associated with the subcontractor portion of the work, process proposals may also be required

When to Do It

This information is important for any program that includes a significant amount of subcontracting. If the expected offerors are well known and have demonstrated the application of mature processes to other similar programs, this information can be requested in the RFP. If the expected offerors are not well known, this information can be requested in an RFI for earlier pre-qualification evaluation.

How to Use the Results

There are two different situations that result in two different approaches to address the potential risk of prime contractor and subcontractor process relationships. Both can occur on the same acquisition program within different bidding teams.

1. If a prime contractor proposes that all subcontractors, or even some of the critical subcontractors will use their own processes to perform development, then the evaluation team must be prepared to determine whether the prime and the subcontractors have substantiated the following about themselves:
 - They are sufficiently mature in their own right to execute their processes effectively.

- They have addressed in their proposal how they will integrate their processes to minimize duplication and effectively address all the practices related to the program's critical processes.

Unless the bidding team has already analyzed and agreed on process interfaces, a significant risk exists that the processes will not effectively execute from the outset. Considering that early execution of time-critical processes most often determines the success of a program, it is imperative that the bidding team address those interfaces in detail prior to contract award and assure the evaluation team that it has an effective approach.

2. If the prime contractor proposes a distributed development facility with each major subcontractor using its own processes, the risk resides in the ability of the prime to deploy an integrated development environment (IDE) and to integrate its overarching processes with the subcontractors through an organizational and technical interface structure. If the prime intends to execute a distributed development environment, its productivity will be lower at the start of the program unless it plans to implement the IDE prior to award and train its subcontractors on the tools that it intends to use.

If the prime contractor proposes a single development site with all subcontractors using the prime's processes, the risk resides in the ability of the prime to rapidly train and employ its subcontractors. If the prime intends to execute this training after the award, its productivity will be lower at the start of the program and early design and architectural activities may incur additional risk and effort.

If a prime contractor proposes that it will impose its processes on subcontractors, then it should have a plan for training the subcontractors on its organizational processes. If the prime contractor proposes to do so after award, then it is imposing considerable risk that the early activities will not effectively use its processes. It is not unreasonable to expect a prime contractor to propose instituting training of prospective subcontractors prior to contract award. If such training is not proposed, then the evaluation team can consider the early execution of program processes to be at risk, at least at risk for errors or omissions.

In assessing the risk to the program, the acquirer should determine whether the approaches chosen by each offeror will add to or mitigate the risks associated with effective program start up or with implementing effective processes critical to the program.

3.5 CONSIDER THE APPROACH TO INTEGRATION WITH ACQUIRER PROCESSES

What to Do

The acquirer should request each offeror's approach to integrating critical program processes that will be executed in coordination with the acquirer. This information indicates how well each offeror can address critical program processes in concert with the acquirer processes after award.

When to Do It

This information is important for any program that includes a significant dependence on process capability. If the expected offerors are well known and have demonstrated the application of mature processes to other similar programs, this information can be requested in the RFP. If the

expected offerors are not well known, this information can be requested in an RFI for earlier pre-qualification evaluation.

How to Use the Results

A detailed understanding of the acquirer processes, and plans for developing and improving those processes, is a necessary first step. If otherwise appropriate, it is a good idea for the acquirer to provide the offeror with a brief description (or list) of the processes it expects to put in place so that the offerors can provide inputs or suggest additional processes that might further reduce risk in the overall program.

Offerors can provide detailed benefits and approaches to acquirer and supplier process integration. The acquirer might consider the following typical attributes of process integration as beneficial:

- increased visibility into supplier operations
- enhanced timeliness for the delivery or sharing of program management information
- enhanced accuracy and understanding of information
- enhanced ability of both the acquirer and supplier to make (specific and appropriate) program decisions
- enhanced plans for the acquirer’s participation with the supplier in integrated project teams (IPTs) (Preferably, such participation is not limited to information sharing, but includes shared decision-making.)

Typically the acquirer should expect a supplier to recommend the integration of risk management, requirements management, requirements development, and configuration management processes. In certain circumstances, it might also be appropriate for the acquirer to consider the integration of project monitoring and control, measurement and analysis, and product integration (if the acquirer will act as the final or system integrator) processes.

To be considered viable, offeror recommendations for process integration should be defined well enough to be clearly implemented in a timely manner. In general, recommendations for process integration should also address known or identifiable program risks.

3.6 CONSIDER RECENT APPRAISAL RESULTS

When available, data on previous organizational appraisals can be gathered from each prime contractor and subcontractor that will perform major development activity.

With the release of version 1.2 of the SCAMPI Method Definition Document (MDD), the ADS must contain the following information:

- the appraisal sponsor and sponsor’s organizational affiliation
- the appraisal team leader, appraisal team members, and their organizational affiliations
- the organizational unit appraised
- the projects and other groups, function and placement within the organizational unit, and their geographic locations

- sample size, in quantifiable terms of the organizational sample in relation to the size of the organizational unit
- CMMI model used (version, representation, and disciplines)
- appraisal method used (name and version)
- itemization of process areas rated and process areas not rated
- maturity level and capability level ratings assigned
- goal ratings for process areas within the scope of the appraisal
- dates of on-site activity
- date the ADS was issued and period of the validity of the appraisal results
- statement affirming that all SCAMPI requirements were met
- signature of appraisal team leader and sponsor with indication of agreement to publish appraisal results

The SCAMPI ADS Example Template, in appendix A of the SCAMPI MDD, contains the guidance provided to Lead Appraisers on the content of the v1.2 ADS [SEI 2006b]. There is a requirement to define the percentage of people and projects appraised in relation to the organizational unit. There is also a requirement to provide the percentage of each critical factor identified in appraisal planning covered by the organizational scope in relation to the organizational unit.

Examples of critical factors include the following:

- application domains (i.e., lines of business)
- geographical breadth
- disciplines (i.e., systems engineering, software engineering, hardware engineering)
- effort types (e.g., development, maintenance, services)
- project types (e.g., legacy, new development)
- customer type (e.g., commercial, DoD, NASA)
- lifecycle models in use within the organization (e.g., spiral, evolutionary, waterfall, incremental)

The acquirer can use this information to determine the relative sample size of the projects appraised as part of the ADS documentation. For offerors that submit version 1.1 of the ADS, the acquirer should ask for the information in the previous lists.¹²

The appraisal findings usually take the form of a briefing containing an overview of strengths and weaknesses and the final results of the appraisal described in the ADS. Often, individual practice characterizations aggregated to the organizational level are also presented. At the request of the

¹² The data requirements for the ADS have been strengthened with the release of SCAMPI Version 1.2. An ADS from a SCAMPI appraisal within the last 3 years is based on the previous version of the SCAMPI method and may contain less information and require further investigation.

appraisal sponsor, program-level data may also be included in the final findings. This level of data is not found in the ADS.

What to Do

For the prime contractor and for each subcontractor or team member involved in major development activity, request the ADS and the appraisal findings that were generated as the result of any SCAMPI Class A appraisals within the last 3 years. This documentation can be requested for subcontractors as well as for the prime. The most reliable data are from the most recent appraisal. Any supplier claiming a maturity level in its proposal should be willing to release this documentation.

The acquirer can also request the offeror to specify the exact relationship of the organization that was appraised to the bidding organization. Was the bidding organization, and specifically projects within the bidding organization, within the scope of that appraisal? If not, will the bidding organization be using the processes that were within the scope of the appraisal?

Determining whether or not the organization's ADS represents the organization as a whole and whether or not it represents the team executing the program is important. Methods used to sample the organization are varied and have in the past not been governed by any strict rules or disclosure requirements.

The acquirer should request information on the number of active development projects at the site being proposed to perform the work, the number of active development projects contained in the bidding organization (if different), and the number of active development projects contained in the organization that was appraised (if different).

Each offeror (prime contractor and major subcontractor) that provides ADS data can also be required to provide information on the number of major development projects that are currently under contract in the appraised organization. Additionally, the acquirer should request the number of staff members assigned and the revenue for each project (e.g., major development programs may be defined as those greater than 18 months in duration and greater than \$10 million in total contract size).

When reviewing the ADS, the acquirer should determine the number and identity of the programs appraised in the ADS and compare them to the active major development program totals provided. This determination should provide a good estimate of how reasonable the sampling was and how representative the appraisal is of the organization. It will also provide some idea of the sampling rates that the bidding organizations used for their appraisals. For more recent appraisals, this information will be included within the ADS. Regardless, it is prudent for the acquirer to pursue this issue to ensure that sampling used by the appraised organization is understood.

When to Do It

By requesting this information in an RFI preceding the formal RFP release, the acquirer can examine the potential offerors' organizational maturity and process capability. This information can then help fine-tune the evaluation criteria. Issuing such an RFI also puts potential offerors on notice that process capability is a concern. Such notice may discourage non-process-focused

offerors from participating in the RFP, or may encourage them to take significant action to rectify their shortfalls.

Offerors can be instructed (in Section L of the RFP) to provide this information as part of their proposal submissions. Evaluation criteria can be included in Section M of the RFP. Phrase these evaluation criteria in the form of risk assessments—risks posed to the program as a result of the process proficiency of offeror organizations especially in the process areas of key importance to the program. Special consideration can be given to the process areas that must be enabled from the start of the program, as performance in the early stages of the program is critical to overall success.

How to Use the Results

The acquirer should use the data supplied in the ADS to address the following questions:

1. Is the organization named in the ADS the same organization that is bidding on and will execute the program?

If not, ask

- a. Is the organization named in the ADS at a higher level in the organizational structure than the organization bidding on and planning to execute the program?
 - If not, investigate the relationship between the two organizations. If the relationship is tenuous, the information in the ADS is probably not useful.
 - If so, then investigate the current relationship between the two organizations. Has the organization been reorganized since the appraisal? If so, there could be some differences in the organizational commitment to the processes to be employed that must be verified

2. Was the bidding organization specifically involved in the appraisal?

- a. Was the site proposed to perform the work represented by a program in the appraisal?

3. Was the appraisal performed by a third party, not affiliated with the organization or the company, or by a Lead Appraiser associated with the appraised organization?

Many organizations employ SEI-authorized Lead Appraisers as well as other staff members trained in CMMI appraisal methods. Many organizations also contract with process improvement consultants who are also SEI-authorized Lead Appraisers, to guide them on their quest for high process maturity. Publicly reported appraisals that are led by independent appraisal leads and staffed largely by independent appraisers are generally considered to reflect a high confidence level for findings. This does not mean that the team cannot contain some members of the organization. Internal team members are considered an especially valuable resource for interpreting organizational structures and obtaining artifacts during an appraisal; however, a higher percentage of independent members on the appraisal team is generally considered to reflect a higher confidence level for findings.

4. How many projects were included in the appraisal? (Use some of the supplemental information to support this analysis.)

- a. What was the size of the organization stated in the scope?
- b. What criteria were used to select programs to be included in the appraisal?

- c. How many development programs are currently active in that organization?
 - d. What is the size of the bidding organization where the work will be performed?
5. Was the appraisal performed less than two years ago?

It is unlikely that an organization that is actively involved in process improvement would leave all its processes untouched for more than two years. In organizations at maturity or capability level 3 and higher (and occasionally at lower levels), process assets should be gathered in an organizational repository and be placed under change control. Change records from this repository are a clear indicator of process change. Review of these records provides two pieces of information:

- a. An indication of the activity in the process repository. A noticeable absence of submissions or revisions may be an indication of a lack of process focus
 - b. A view into the changes in the processes since the last appraisal. Substantial changes in the processes may invalidate the findings of prior appraisals. Explanations and motivations for the changes, as well as discussions of the applicability of the prior appraisals can be requested.
6. What was the appraisal method used?
- a. If the offeror is claiming maturity level or capability level ratings, expect that the appraisal data submitted is from a formal SCAMPI Class A appraisal. Organizations have been known to wrongly claim ratings based on SCAMPI Class B appraisals or “internal assessments of their process.” Neither employs the rigor of a SCAMPI Class A appraisal, particularly related to artifacts and interviews, and is not approved for bestowing a rating.
 - b. Two SCAMPI method versions and models might have been employed. Prior to August 2006 and for a sunset period until September 2007, version 1.1 can be used. After August 2006, the latest version of the model, CMMI-DEV, V1.2, and the corresponding method, is preferred. After November 1, 2006, v1.2 of the ADS must be used
7. Which process areas were included in the appraisal? Organizations can choose to appraise using one of two model representations, staged or continuous. Staged appraisals require certain sets of process areas to be appraised to achieve a maturity level rating and success is designated by an indication that the goals of the process area are “satisfied”. Continuous appraisals require that each process area included in the appraisal be examined and a capability level be designated for each process area. When viewing the results of an appraisal, it is important to determine if the specific process areas that were designated as critical to the program were included in the appraisal.
- a. Prior to v1.2, organizations using the staged representation were allowed to designate some process areas as NA. In practice, the NA designation is most often applied to the Supplier Agreement Management (SAM) process area. In v1.2 and later, only Supplier Agreement Management (SAM) can be declared NA, and only for organizations that do not have significant supplier inputs. If SAM was not included in the appraisal, the prime’s process for dealing with critical subcontractors has not been appraised and the risk associated with managing subcontractor activities should be examined in more detail.

8. What is the organizational significance of the appraisal sponsor? Is the sponsor's position appropriate for the declaration of the appraisal scope? If multiple organizations are represented in the appraisal, is the sponsor in the overarching organization and able to attest to the commitment and policy of the overarching organization?

Use the appraisal findings to answer the following questions:

1. Do appraisal findings match the scope of the ADS, or do they document a modification of the appraisal scope? The ADS might report that a program initially included was not fully involved or provided only part of the information. Programs are only expected to provide artifacts that demonstrate the effort expended at the stages in the lifecycle that they have actually executed. For example, newer programs may not have test and evaluation data or complete product integration data. In such cases, the appraisal team may use the term *not yet* which contains no negative implications to the findings.
2. Do the appraisal findings declare any process areas NA? If any of the process areas declared NA are related to critical program processes, then there would be additional risk to the program in selecting an organization that has not demonstrated capability in a critical area.
3. Will weaknesses noted in the appraisal findings have a significant impact on the program? Has the organization addressed or corrected any of these noted weaknesses? Has the sufficiency of the corrections been evaluated? Appraisal findings are required to list any critical weaknesses found. Critical weaknesses are those that keep a maturity or capability level from being achieved and will be clearly indicated in the findings. Identified strengths and weaknesses, especially critical weaknesses, can be evaluated against the program's required process areas, particularly when they are identified in the portion of the organization that would be performing on the program.

Use the publicly reported appraisal data to corroborate the ADS information on the PARS [SEI 2]. If discrepancies are found between the publicly reported data and the data supplied in the proposal response, additional requests for information may be required.

3.7 CONSIDER HISTORICAL DATA ON PROCESS PERFORMANCE

Reviewing the results of past appraisals is only one way of examining the history of process application within an organization. The appraisal process provides an in-depth examination of the process utilization on a selected sample of projects either completed or in-process. However, due to the intrusive nature of the appraisal process, it is not practical to examine more than a few programs within an organization. While the chosen programs are expected to be representative of the broader organization, they may constitute an extremely small sample, and it may be impossible to verify their application throughout the remainder of the organization.

An alternative method of examining the history of process application within an organization is to review that organization's own records of process application. Many higher maturity organizations collect data on the application and performance of their processes.

This data typically includes metrics that track the following:

- the organizational processes applied to a program

- modifications to the organizational processes required for a program
- compliance of program activities with the applied processes

If this data is available, it can be valuable to provide insight into the process focus of the organization, the consistency of process application within the organization, and the monitoring and enforcement of processes within the organization.

Most solicitations request examples of performance on past contracts. Looking for correlations between the examples provided in the supplier's proposal and projects participating in prior process appraisals can also be useful.

What to Do

Request information detailing the historical use of organizational processes on past and current projects. In particular, the acquirer should seek statistics on the following:

- the breadth of process application across the organization (e.g., what percentage of projects employ standard or tailored versions of the organization's standard processes)
- the consistency of process application (e.g., what percentage of processes applied to projects are modified from the organization's standard processes)
- project compliance with the defined processes (e.g., metrics resulting from process monitoring and process audits)

When to Do It

The optimal time to request most of this information is before the formal RFP is distributed. If the acquirer has a detailed understanding of the process capabilities of potential offerors, it can understand the potential risk of selecting an offeror with immature development processes. An analysis of the information provided allows the acquirer to structure the risk evaluation during technical evaluation and source selection.

If appropriate to the evaluation, the acquirer can request that the offerors indicate which programs provided for past performance evaluations also have historical process data.

How to Use the Results

Historical data of process performance on programs in the same (or similar) domain as the program being bid is more relevant and more likely to be a better predictor of potential performance.

The most desirable situation regarding the consistency of process application (percentage of processes actually applied to projects) is that all or most programs in the organization actually apply tailored versions of the standard processes. Historical data reflecting process capability for programs at multiple points in their lifecycle is a clear indicator of an organization's commitment to the implementation of standard processes in the development of their work products.

3.8 CONSIDER RECENT POST-AWARD APPRAISAL DATA FROM OTHER PROGRAMS

What to Do

The acquirer should request all available post-award appraisal information on any recent (i.e., within two years) government-mandated, post-award appraisals of the bidding organization and sites proposed for development activities.

When to Do It

The optimal time to request most of this information is before the formal RFP is distributed, but this information may be helpful at any time during the life of the program.

How to Use the Results

During the last year or so, acquiring organizations have often requested post-award appraisals of winning organizations. If the prime contractor or key development subcontractors have had a post-award appraisal on a newly awarded program, the acquirer should use the results of these appraisals to answer the following questions:

1. Has the post-award appraisal result shown that the organization adopts its processes rapidly and effectively?
2. Has there been more than one instance of post-award appraisals on a single project? Did the sequence of appraisals demonstrate progress in resolving process deficiencies?
3. Were the results indicative of effective deployment or contradictory to organizational commitment to effective process deployment?

3.9 CONSIDER PROCESS COMPLIANCE EVALUATIONS DURING EXECUTION

Some organizations have process compliance evaluations as part of regular product and process quality assurance reviews and others make those evaluations part of a more global Mission Assurance review process. Regardless of how the individual organization performs that function, it benefits the acquirer to have access to the process reviews performed on the specific program for which it is responsible. Most process-focused organizations welcome customer involvement in their process program, primarily because it improves understanding of the process issues that would improve program performance.

What to Do

In preparing the RFP, the acquirer should include a requirement in “Instructions for Preparation of the Offeror’s Proposal” in Section L to confirm agreement to the acquirer’s participation in process compliance evaluation actions and request the offeror to propose how that participation would best fit its organizational process enforcement approach.

Typically, DCMA relies on the FAR standard inspection (access) clause to gain access to the contract, supplier, products, services, data, etc. This approach is sufficient for many contract monitoring purposes. If the acquirer intends to have a support party, such as DCMA or an

FFRDC, be involved in verifying process compliance, that intention can be identified in the RFP so agreements can be made regarding access to information by the support party prior to award.

When to Do It

The acquirer can lay the groundwork for participation in the process compliance evaluations as part of the RFP. By making the request when competition is paramount, the offerors should be more willing to meet the request. An additional option is to evaluate the offeror's response to the request, include it in any ENs created, and resolve any issues as part of the discussion process.

How to Use the Results

During the proposal evaluation, if the acquirer is proactive, it can use the willingness of an offeror to ensure that processes are executed on the new program and to provide visibility during execution as an indication of lower risk and a higher probability of success.

3.10 CONSIDER THE REPORTING OF PROCESS STATISTICS

What to Do

The acquirer may simply request that the supplier furnish the process metrics that are collected for the program. If the supplier's response is inadequate, additional metrics can be requested. For example, some or all of the common process statistics listed below may be applicable to the program; however, the acquirer should consider the supplier's effort needed for reporting of these metrics:

- process implementation timelines (i.e., how long from project kick-off did it take to implement and begin using a process)
- number (or percent) of the organization's standard processes being adopted (tailored for use) by the project
- number (or percent) of work products required by a process that were actually produced
- number (or percent) of supplier processes actually reviewed during or after execution for the purpose of identifying problems, providing lessons learned, or for improving the process
- number of process defects identified over the project lifecycle
- percent of process defects that were corrected (closed)
- number of project processes found to be compliant with CMMI-DEV (at each capability level)
- number of process audits performed on the developer's processes, for each process
- number of improvements made to the developer's processes, for each process

When to Do It

The reporting of process metrics or statistics can be requested in the RFP, or, if omitted, may be easily requested before contract award.

How to Use the Results

A mature, well-defined, and understandable set of process metrics and statistics is desirable. The timeliness of process metrics can support continuous insight into the supplier's process capability and may also provide insight into its process readiness to support major program milestones.

The technical means and timelines associated with providing process metrics to the acquirer should be well defined and realistic. A combination of independent process metrics into *key process indicators* is helpful, as are process metrics that measure the adequacy or performance of integration with the acquirer processes, where appropriate. Process control metrics should be found in high maturity organizations (i.e., those with maturity or capability level ratings of 4 or 5). Failure of the supplier to provide meaningful process metrics and statistics increases program risk. Ideally, the supplier has a process for developing metrics and then using them for specific periods or when triggered by certain events instead of simply applying the same set of metrics to each program.

3.11 CONSIDER ACCESS TO SELECTED PROCESS ARTIFACTS

Process performance can be monitored through the evaluation of the artifacts produced by those processes when applied to the program. The artifacts needed for process performance evaluation are accessible to the acquirer by doing one or more of the following:

- Reference them in the IMS and/or IMP
- Reference them on the DAL
- Reference them on the CDRL
- Participate in integrated process teams with the supplier
- Attend peer reviews or other program reviews

Process implementation indicators (PIIs), which suppliers may collect for their own SCAMPI appraisals, can be used if they are from the actual program.

What to Do

The acquirer should request that the supplier illustrate process performance by identifying artifacts produced through the execution of the program processes, including the process descriptions for the critical process areas of the program. The acquirer then should review the process documents to identify work products that may be useful in assessing process performance. Periodically, the acquirer should obtain copies of the identified work products from the supplier and analyze them to ascertain the degree of deployment of processes on the program.

When to Do It

The RFP can establish the requirements for the offerors to share their process descriptions and provide access to relevant work products. Access to the work products can be addressed through the CDRL and the DAL.

Process artifacts can be monitored throughout the duration of the acquisition. In the course of the acquisition, different process areas vary in their level of importance. When reviewing artifacts for

process performance, the acquirer should choose the processes that are most significant at the current time given the phase of the program.

How to Use the Results

If the supplier is contractually obligated to perform specific processes, the acquirer should first assess the impact of any non-compliance and address the non-compliance issue with the supplier to determine any justification for the discrepancy. If reasonable justification does not exist and the impact on the program is significant, the acquirer should first try to address the issue informally with the supplier, ensuring the understanding of both the requirements of the contract and the acquirer's expectations. If this does not resolve the issue, the acquirer should consider directing the supplier to comply with stated contractual requirements using formal contracting actions.

3.12 CONSIDER CONDUCTING PRE-AWARD PROCESS APPRAISALS

What to Do

The process appraisals referenced in this guidebook are adapted (tailored) to the situations most useful to acquisition, generally limited to SCAMPI Class B and Class C appraisals. A SCAMPI Class B appraisal team may be as small as two or the investigation team may be expanded to include other stakeholders such as representatives of the user community, supplier process engineers, or other affected organizations. The design of the appraisal allows for a focused productive dialog structured by the relevant process areas in CMMI-DEV. A SCAMPI Class C appraisal may be conducted by one or more qualified and trained individuals. The output of either of these appraisal methods is a list of findings from the appraisal and a list of risks that these findings pose for the project.

In general, if the acquirer desires to perform an appraisal, it does not need appraisal expertise; the acquirer can work with a trained and qualified appraisal lead to conduct the type of appraisal desired. The appraisal lead works with the sponsor (normally a senior manager of the organization to be appraised) to clarify the needs and requirements for the appraisal. The appraisal lead may then recommend various approaches to fulfill the requirements. Once an approach is chosen, the appraisal lead begins to develop detailed plans and estimates for approval by the sponsor.

To employ these appraisals, the acquirer should use the following key steps:

1. Determine that an appraisal is warranted.
2. Work with a qualified appraisal lead to do the following:
 - a. Define the goals and objectives of the appraisal. An experienced appraisal lead can be helpful in ensuring that the design and execution of the appraisal delivers the expected information and value.
 - b. Develop a detailed appraisal plan. The appraisal lead works with the sponsor to translate the goals of the appraisal into a detailed appraisal plan with estimates of time and resources.
 - c. Determine the size of the appraisal team; appraisals typically require an appraisal team (i.e., individuals in addition to the appraisal lead). The team size and qualifications of the team members have an impact on the time, cost, and depth of the investigation.

- Team members can include acquirer, user, supplier/offeror, or external personnel. The appraisal lead works with the sponsor and project stakeholders to develop a staffing strategy appropriate to the type of appraisal and the goals of the sponsor.
- d. Be clear about the outputs of the appraisal and how they will be used to satisfy the goals of the sponsor.
 3. Approve the appraisal plan.
 4. Arrange for appraisal resources.
 5. Help coordinate with appraised entities.
 6. Analyze the data.

The appraisal team collects data from the organization. This data can be documents, work products, processes, written affirmations, and interviews. The appraisal team uses CMMI-DEV as a framework for collecting and evaluating the evidence provided by the organization.

Typical outputs from the appraisal include the following:

1. Statements of strengths and weaknesses mapped to model practices
2. Practice characterizations, typically of risk of level of compliance
3. Other information requested by the sponsor or deemed important by the team

When to Do It

These on-site appraisals must be scheduled to support source selection needs within the planned selection period. Planning for the use of these methods often precedes the release of the RFP, and depends on how the results of the appraisals are fed into the source selection process. If results of the appraisals are an independent risk factor, for example, timing of the appraisals may be flexible. But if the results of the appraisals feed other teams, the appraisals may need to be scheduled relatively early in the source selection period.

How to Use the Results

Frequently, appraisal results are included in a broader look at elements such as Contractor Performance Assessment Reports. This broader look may require careful timing of appraisal visits so that the appraisal information can be integrated with other risk determinants.

3.13 CONSIDER CONDUCTING POST-AWARD PROCESS APPRAISALS

What to Do

In the RFP package, the acquirer should reserve the right to execute post-award appraisals using CMMI-DEV focused on the process areas that are determined to be critical to the program at any given time. The acquirer should not choose CMMI maturity levels as the scope of post-award appraisals; instead, it should follow the direction given in this guidebook and scope any appraisal to those process areas deemed critical and proven to be beneficial to the success of the program. At the appropriate time, the acquirer should execute a SCAMPI Class B appraisal using an authorized SCAMPI Class B appraisal lead and a team trained and qualified according to the SCAMPI Class B appraisal method. Depending on the model and organizational scope, this type

of appraisal can be expected to be completed in approximately five to seven working days, with only a portion of this time at the offeror's site.

The acquirer should make sure that this requirement includes subcontractors so that the entire supplier team may be appraised.

When to Do It

Ideally, it is best to reserve the option for post-award appraisals prior to RFP release. The acquirer should include information on the time frame of the planned post-award appraisals and provide a range during which the appraisals could be planned and require that the offeror include its proposed dates in its IMS.

When planning the second post-award appraisal, it may be appropriate for the acquirer to schedule it preceding significant milestones. The importance of different processes varies throughout the development lifecycle. Just as requirements development, requirements management, and project planning may dominate process attention in the early phases, increased attention to configuration management, verification, and validation may merit greater attention later in the lifecycle.

How to Use the Results

See Section 4.4 on page 30 and its associated Appendix.

3.14 CONSIDER PROCESS-BASED, OUTCOME-ORIENTED AWARD FEE DETERMINANTS

To facilitate discussion and share proven incentive strategies across the entire U.S. Defense acquisition workforce, the DoD established the award and incentive fees community of practice (COP) under the leadership of the Defense Acquisition University (DAU) [DoD 2006d]. The COP serves as the repository for all acquisition-related materials, including policy information, training courses, examples of good award fee arrangements, and other supporting resources.

What to Do

An approved acquisition strategy may result in award fees being included in the approved contract. Process improvement planning and execution can be part of award fee determination. The acquirer should evaluate effective process implementation across the supplier team to mitigate integration risks. An evaluation plan, linked to award fee timing, must be developed and coordinated with stakeholders. Agencies like DCMA can assist with such efforts.

When to Do It

The first decision point is associated with assuring that the acquisition strategy allows award fees. If it does, the best time to introduce process discipline as an award fee element is in the RFP.

How to Use the Results

Award fees give the acquirer a powerful way to recognize achievement, or failure, in risk mitigation. The results provide an excellent method to encourage team accomplishment through a reward system. It provides regular checks for continued progress and management attention. (See

Appendix B, “Systems Engineering in an Award Fee Plan,” in the *Guide for Integrating Systems Engineering into DoD Acquisition Contracts*, for further guidance.)

Appendix D: Monitoring Supplier Process Performance After Contract Award

4.1 PROCESS MONITORING THROUGH ARTIFACT REVIEWS

What to Do

Joint reviews of progress are frequent and familiar to most acquirers. Occasional reviews of the process quality assurance data may provide excellent insight into areas that may pose risks to development. Some organizations establish separate reviews for technical performance, cost and schedule (i.e., EVMS) performance, and development process performance.

When to Do It

It is desirable to link process reviews with other related activities, such as ISO audits or the company's independent process improvement appraisals.

How to Use the Results

The acquirer should use the results to manage the risks to ensure successful completion of the development program.

4.2 PROCESS MONITORING THROUGH REVIEW OF PROCESS METRICS

What to Do

Process performance is a measure of the actual results achieved by following a process. These measures can be used to determine if processes are performing within the expected bounds set by the organization. The acquirer should request documentation from the contracted organization that includes its established performance baselines and performance models for the processes determined to be critical to the program. Any high maturity organization should have this documentation available. Also, throughout the life of the program, the acquirer should request performance data periodically, as documented by the supplier for effective monitoring of these processes.

When to Do It

Monitoring process performance metrics can be addressed in the RFP. Examples of process performance monitoring can be examined in pre-award SCAMPI appraisals if properly scoped. Shortly after contract award, the following can be agreed to:

1. the exact process performance metrics
2. the expected amount of time before specific metrics would be available
3. how often reporting of those metrics will occur.

Monitoring these metrics can occur throughout the life of the program, prioritized based on risk, if necessary, to properly manage the acquirer's resources.

How to Use the Results

Based on the supplied performance baselines, the need for supplier action should be evident when metrics fall outside the expected bounds of performance. The need for supplier action is most evident for suppliers using statistical process control. Both the acquirer and supplier can jointly review thresholds and confirm that they are understood and appropriate. The acquirer should monitor and track these actions to ensure they come to appropriate closure.

4.3 PROCESS MONITORING THROUGH PROCESS REVIEWS

The acquirer should obtain process performance reports from the supplier to gain insight into the gaps that the supplier has identified in its own processes. If these are not available, the acquirer should consider conducting process reviews, potentially using DCMA.

What to Do

For high risk efforts, or if there are doubts about the supplier team's development processes, a high-level evaluation of the supplier team's defined processes can be performed within a few weeks of contract award. The evaluation provides direct information concerning the intent of the supplier team to fully define its development processes and integrate them into a cohesive development process—activities that will likely cause program failure if not attended to. A SCAMPI Class C appraisal is an effective, quick, low-cost method for this type of evaluation. The initial evaluation can be followed by a second, more in-depth evaluation of the integrated development process capability. The timing of this second evaluation is dependent on the situation, and the SCAMPI Class B appraisal is of significant value in these cases.

In low (process) risk efforts, the acquirer may elect to perform just the in-depth evaluation at an appropriate time—perhaps two months or so after contract award. In both the high and low (process) risk cases, follow-on evaluations may be warranted to ensure process weaknesses are addressed appropriately and to ensure the supplier team's development processes do not degrade over time.

When to Do It

One review is conducted shortly after contract award, when the initial processes have been tailored and are in execution, to obtain a benchmark of process performance. A second review can be conducted later in the program, possibly around the same time as a major program decision point (e.g., critical design review).

In addition to reviews, the acquirer may request process metrics and the results of supplier quality audits of its development processes or products.

How to Use the Results

The acquirer should use the results of process reviews, process audits, or process metrics to ensure that the supplier's development process is mature, capable, and responsive to acquirer needs. Any process interfaces to acquirer processes should be analyzed and understood. Process review data should provide a picture of firm commitment by the supplier to process capability and continuous

improvement. Process gaps and findings can be considered for their risk implications. The action plans that are part of risk mitigation can then be tracked to resolution.

4.4 PROCESS MONITORING THROUGH POST-AWARD APPRAISALS

What to Do

The acquirer should provide instructions on approximate time frames for the conduct of such appraisals. In general, two process appraisals are beneficial. The acquirer can then schedule and conduct an appraisal of the supplier team.

To exercise this method, it is not necessary to have appraisal expertise. Most often, the acquirer can work with an appraisal lead trained and qualified to conduct the appraisal desired. The appraisal lead works with the sponsor to clarify the needs and requirements for the appraisal. The appraisal lead may then recommend alternative approaches to fulfill the requirements. Once an approach is decided, the appraisal lead begins to develop detailed plans and estimates for approval by the sponsor (i.e., the acquirer).

The acquirer should be careful when choosing an appraisal lead. Many suppliers employ internal staff who are trained in CMMI and are qualified to lead appraisals. Many appraisal leads also offer process improvement consulting services to help client organizations achieve desired process maturity. Use of appraisal leads employed by suppliers, either directly or as consultants, should be avoided. While such appraisal leads offer the advantage of familiarity with the organizations being appraised, this advantage is offset by the potential conflict of interest. It is best for the acquirer to choose an appraisal lead who is independent from the supplier organization and has experience within the technology domain of the project.

The acquirer should clearly communicate the goals to the appraisal lead and ensure that the appraisal lead understands the following:

- the process areas that are critical to the project
- the scope of the appraisal (Unlike most appraisals that examine the processes within an organization, this appraisal is examining processes *only within the program*.)
- the current status of the program
- the motivation for the appraisal (e.g., to encourage rapid process application on a newer project, to check for compliance commitments made during bidding, or to assess problem areas within the program)
- the expectations for reporting (e.g., a report of process capability in selected process areas, a report of process strengths and weaknesses, or a report of risks arising from processes)
- the cost and schedule targets for the appraisal

Based on this information, the appraisal lead recommends the type of appraisal (i.e. SCAMPI Class B, or Class C), and develops an appraisal plan for review and approval.

The appraisal lead forms an appraisal team consisting of suitably qualified members. Including both qualified staff members from the acquirer's organization and qualified supplier staff members on the appraisal team is helpful. The supplier team members understand the supplier's

processes and can aid the team in finding and interpreting data. The acquirer team members understand the needs of the acquirer, and can focus the team on the aspects most critical to the program. Once the team is formed, team training is conducted to establish the appraisal ground rules and make appropriate assignments to team members.

When to Do It

When to execute the post-award appraisal can be driven by several factors, including when the resulting work products related to the processes in question will be present and where in the development lifecycle the processes are expected to be implemented. Depending on the program, this appraisal might also be an opportunity to look forward in the development lifecycle and examine processes not previously examined. Typically, post-award SCAMPI appraisals are not executed prior to six months after contract award unless there is high risk in processes related to early stages of the program's development lifecycle.

The timing of supplier team appraisals depends on the motivation for the appraisal. If the motivation for the appraisal is to encourage rapid process application on a newer project, the appraisal should be conducted soon after contract award. The acquirer should allow enough time to elapse to enable the supplier to start the program, to coordinate with subcontractors, and to produce some process artifacts for evaluation. Six months after contract award is usually a good time for this type of appraisal; however, not all processes may be implemented at this early stage of the program.

Processes such as project planning, risk management, project monitoring and control, requirements development, and requirements management should be evident. If the motivation for the appraisal is to check for compliance commitments made during bidding, this appraisal can be performed at any time during the project. The process areas appraised should be consistent with the current lifecycle phase. If the motivation for the appraisal is to assess problem areas within the program, this appraisal should be done as soon as process issues become evident. Early intervention may contain the impact of the problems and can also indicate to the supplier that the acquirer is serious about processes. The supplier may therefore be more proactive in preventing future process problems.

How to Use the Results

For process weaknesses, risks, or process implementation issues identified by the appraisal, the acquirer should ask the following questions:

1. What is the impact of this on the program?
2. What suitable methods are available to address it?
3. When must it be addressed?
4. Whose responsibility is it to address it?
 - a. Is the supplier willing to address it?
 - b. Is the supplier contractually obligated to address it?
 - c. Is a contract change necessary to address it?
 - d. Should incentives be used to encourage the supplier to address it?

5. How will the status of the issue and the plan to address it be monitored and reported?
6. Is this issue symptomatic of other problems?

Appendix E: Mapping Between DAG Chapter 4 Processes and CMMI Process Areas

Table 7: Mapping between DAG Chapter 4 Processes and CMMI Process Areas

Ch. 4, Defense Acquisition Guidebook	CMMI-DEV, V1.2, 2006
Technical Processes	
Requirements Development	Engineering: Requirements Development
Logical Analysis	Engineering: Requirements Development
Design Solution	Engineering: Technical Solution
Implementation	Engineering: Technical Solution
Integration	Engineering: Product Integration
Verification	Engineering: Verification
Validation	Engineering: Validation
Transition	Engineering: Product Integration
Technical Management Processes	
Decision Analysis	Support: Decision Analysis and Resolution
Technical Planning	Project Management: Project Planning
Technical Assessment	Support: Measurement and Analysis
	Project Management: Project Monitoring and Control
Requirements Management	Engineering: Requirements Management
Risk Management	Project Management: Risk Management
Configuration Management	Support: Configuration Management
Technical Data Management	Project Management: Project Planning
Interface Management	Engineering: Product Integration

Appendix F: Acronyms

ADS	Appraisal Disclosure Statement
ANSI	American National Standards Institute
BAFO	best and final offer
BoE	basis of estimate
CAR	Causal Analysis and Resolution
CDRL	contract data requirements list
CM	Configuration Management
CMMI	Capability Maturity Model Integration
CMMI-DEV	CMMI for Development
COP	community of practice
DAG	Defense Acquisition Guidebook
DAL	data accession list
DAR	Decision Analysis and Resolution
DAU	Defense Acquisition University
DCMA	Defense Contract Management Agency
DoD	Department of Defense
EN	evaluation notice
EVMS	earned value management system
FAR	Federal Acquisition Regulation
FFRDC	federally funded research and development center
FPD	final proposal document
IBR	initial baseline review
IDE	integrated development environment
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers
IMP	integrated master plan

IMS	integrated master schedule
IPM	Integrated Project Management
IPPD	integrated product and process development
IPT	integrated project team
ISO	International Organisation for Standardisation
JPO	Joint Program Office
MA	Measurement and Analysis
NA	not applicable
NASA	National Aeronautics and Space Administration
OID	Organizational Innovation and Deployment
OPD	Organizational Process Definition
OPF	Organizational Process Focus
OPP	Organizational Process Performance
OT	Organizational Training
PA	process area
PARS	Published Appraisal Report Site
PI	Product Integration
PII	process implementation indicators
PMC	Project Monitoring and Control
PMO	Program Management Office
PP	Project Planning
PPQA	Process and Product Quality Assurance
QPM	Quantitative Project Management
RD	Requirements Development
REQM	Requirements Management
RFI	request for information
RFP	request for proposal
RMP	risk management plan
RSKM	Risk Management

SAM	Supplier Agreement Management
SCAMPI	Standard CMMI Appraisal Method for Process Improvement
SDP	software development plan
SE	systems engineering
SE/SW	systems engineering and software engineering
SEC	software engineering center
SEI	Software Engineering Institute
SEP	systems engineering plan
SS	supplier sourcing
SSA	software support activities
SW	software engineering
SW-CMM	Capability Maturity Model for Software
TS	Technical Solution
TSP	Team Software Process
VAL	Validation
VER	Verification
WBS	work breakdown structure

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REPORT DOCUMENTATION PAGE			<i>Form Approved OMB No. 0704-0188</i>
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.			
1. AGENCY USE ONLY (Leave Blank)	2. REPORT DATE February 2007	3. REPORT TYPE AND DATES COVERED Final	
4. TITLE AND SUBTITLE Understanding and Leveraging a Supplier's CMMI Efforts: A Guidebook for Acquirers		5. FUNDING NUMBERS FA8721-05-C-0003	
6. AUTHOR(S) Joseph P. Elm, Jeffery L. Dutton, Brian P. Gallagher, Dr. Gene Miluk, Mike Nicol, Lawrence T. Osiecki, Mike Phillips, Dr. Karen J. Richter, Linda M. Rosa, Joe Wickless, Hal Wilson			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Software Engineering Institute Carnegie Mellon University Pittsburgh, PA 15213		8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) HQ ESC/XPK 5 Eglin Street Hanscom AFB, MA 01731-2116		10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES			
12A DISTRIBUTION/AVAILABILITY STATEMENT Unclassified/Unlimited, DTIC, NTIS		12B DISTRIBUTION CODE	
13. ABSTRACT (MAXIMUM 200 WORDS) This guidebook is designed to help acquisition organizations benefit from their suppliers' use of CMMI for Development, which is a collection of best practices that addresses product development and maintenance activities throughout the product lifecycle. This guidebook also helps acquisition organizations avoid problems that can result from unrealistic expectations. High capability and maturity level ratings alone do not guarantee program success. This guidebook helps clarify what those ratings can and cannot do for a development program. It describes how acquirers can - interpret suppliers' claims of achieving a CMMI rating - request, understand, interpret, and use supplier appraisal results, and - apply methods that leverage a supplier's process improvement initiatives.			
14. SUBJECT TERMS acquisition, CMMI		15. NUMBER OF PAGES 89	
16. PRICE CODE			
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL