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Carnegie-Mellon University
Software Engineering Institute

Software Capability Evaluation
Version 3.0
Implementation Guide for Supplier Selection

Rick Barbour

April 1996

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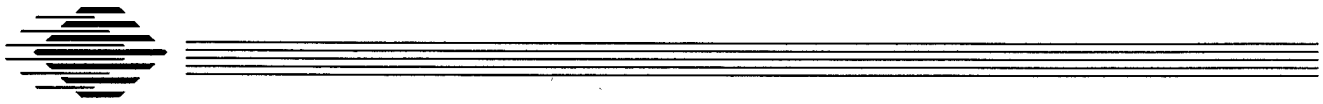

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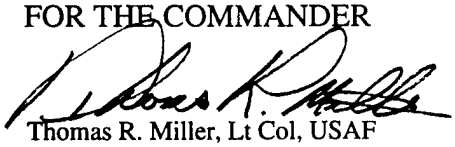

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Acknowledgments

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Part 1 Introduction

Abstract: This report describes implementation guidance for Version 3.0 of the Software Capability Evaluation (SCE) method. This version of the Implementation Guide is updated to reflect the new method and provides specific guidance for selecting software product and services suppliers in an acquisition application (government or commercial) and provides suggested language and examples of usage.

1.1 About This Document

Purpose

This document provides software organizations with guidance for planning and implementing Software Capability Evaluation (SCE) ➠**appraisals** in various software efforts (e.g., full-scale development, maintenance). This guide addresses such topics as incorporating SCE into government ➠**source selections**, ➠**process monitoring**, and the use of SCE by contractors to determine suitable teaming or prime contractor-subcontractor arrangements.

SCE can help acquisition managers achieve the following goals:

- Identify program risk by evaluating ➠**software process capability** in source selection.
- Manage program risk by motivating contractors to improve their software development processes without forcing compliance to specific practices.

This guide can be used to implement the SCE Method and help achieve the goals above. This guide provides the information necessary to orchestrate SCE during the source selection process. Specifically, this guide

- Provides guidance on how to use the SCE method as a tool to identify software risk during a source selection.
- Provides standardized SCE implementation guidance which is documented, available for review and comment, and periodically modified as experience is gained with its use.

An arrow (➠) preceding a term in **boldface** type indicates that the term is defined in the Glossary on page 99. This format is used only on the first occurrence of a glossary term.

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- Provides information which will help acquisition organizations develop appropriate policies, implementing instructions, and guidelines to use SCE in source selection and institutionalize SCE as a routine practice.
- Supplements, but *does not* replace, team training for evaluating the software process capability of contractors.

Audience

The primary audiences for this document are government and industry software acquisition and software development managers and SCE lead evaluators. Two perspectives are offered in Part 3. The primary perspective is that of an SCE ➠**evaluator**—the individual responsible for carrying out SCE activities. The second perspective is that of the ➠**recipient**. A recipient is the organization or person responsible for "receiving" or being subject to an SCE.

Structure

This document is divided into four parts:

Part 1 Introduction

Part 2 Overview of SCE Implementation Guidance

Part 3 Activity Implementation Guidance

Appendices

1.2 Background and Context

➠ **Software Capability Evaluation (SCE)** is a method for evaluating the software process of an organization to gain insight into its software development capability. This insight can be a valuable input to process improvement activities.

Hence, the SCE Method helps evaluate the software process capability of a software ➠**development organization** (an organization that develops and/or maintains software products). Software process capability refers to the range of expected results that can be achieved by following a process.

The processes evaluated by SCE include decision-making processes (such as project planning), communication processes (such as intergroup communication), and technical support processes (such as peer reviews and product engineering)—but not technical production processes (i.e. processes required by a particular methodology, such as object oriented design). The SCE Method does *not* evaluate technical production process-

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es such as requirements analysis, specification, and design, but instead focuses on the management of the technical production processes and on other key processes, as shown in Figure 1-1.

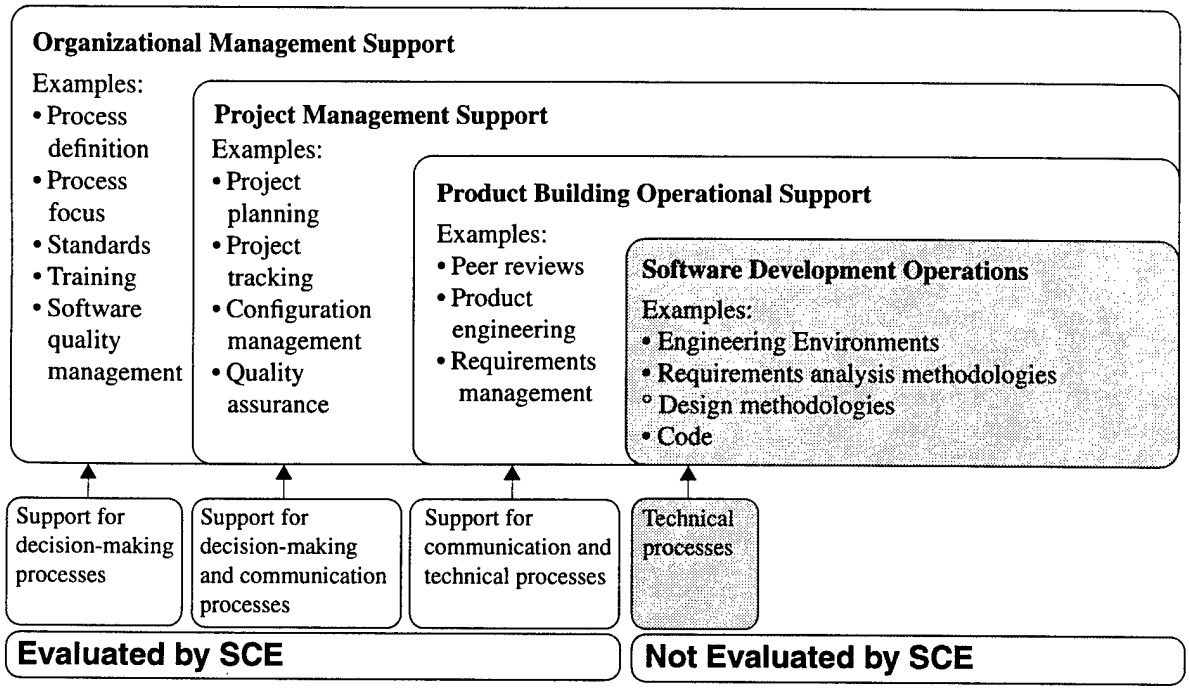

Figure 1-1: Processes Evaluated by SCE

SEI software process principles are derived from the works of Deming, Juran, and others [Deming 86], [Juran 88], [Juran 89], [Crosby 79], who promoted the idea that close attention to the processes used to create products leads to improved product quality—i.e., the product will fully satisfy the customer's requirements and will be produced within existing constraints such as cost and schedule. There are many examples of this principle and its successful application in the manufacturing domain, but the principle can be applied anywhere management and communication processes play an important role in the success of an organization's mission.

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The SEI's ➡**Capability Maturity Model**[SM] **(CMM**[SM]**)** applies this principle to the software development arena. The CMM defines several ➡**key process areas** (KPAs); each KPA "identifies a cluster of related activities that, when performed collectively, achieve a set of goals considered important for enhancing process capability."[1] Each KPA contributes to the environment in which development organizations create software products. Within the CMM, the KPAs are organized into five basic levels of process maturity to describe the progression from an ad hoc software process to one that is well defined and can act as a stable foundation for continuous process improvement.

By evaluating the development organization's software projects against the KPAs in the CMM, the SCE team determines whether the development organization follows a stable, predictable software process. Although mature processes do not guarantee a successful product, the likelihood of success should increase as the software processes mature toward the Optimizing level. In other words, mature processes reduce the risk associated with the planned development.

1.3 Relationship to Other Documents

Figure 1-2 shows an overall SCE product suite. SCE products can be characterized by their function served. They are products necessary to

- transfer the SCE method to users (method and guidance),
- train personnel about various aspects of SCE, (education, training and qualification) or
- install SCE as a routine business practice of an organization (transition and installation).

Each type of product is useful by itself. However, all are intended to form a comprehensive, integrated product suite

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[1] Mark Paulk, et al. *Capability Maturity Model for Software, Version 1.1* [Paulk 93a], page A-10.

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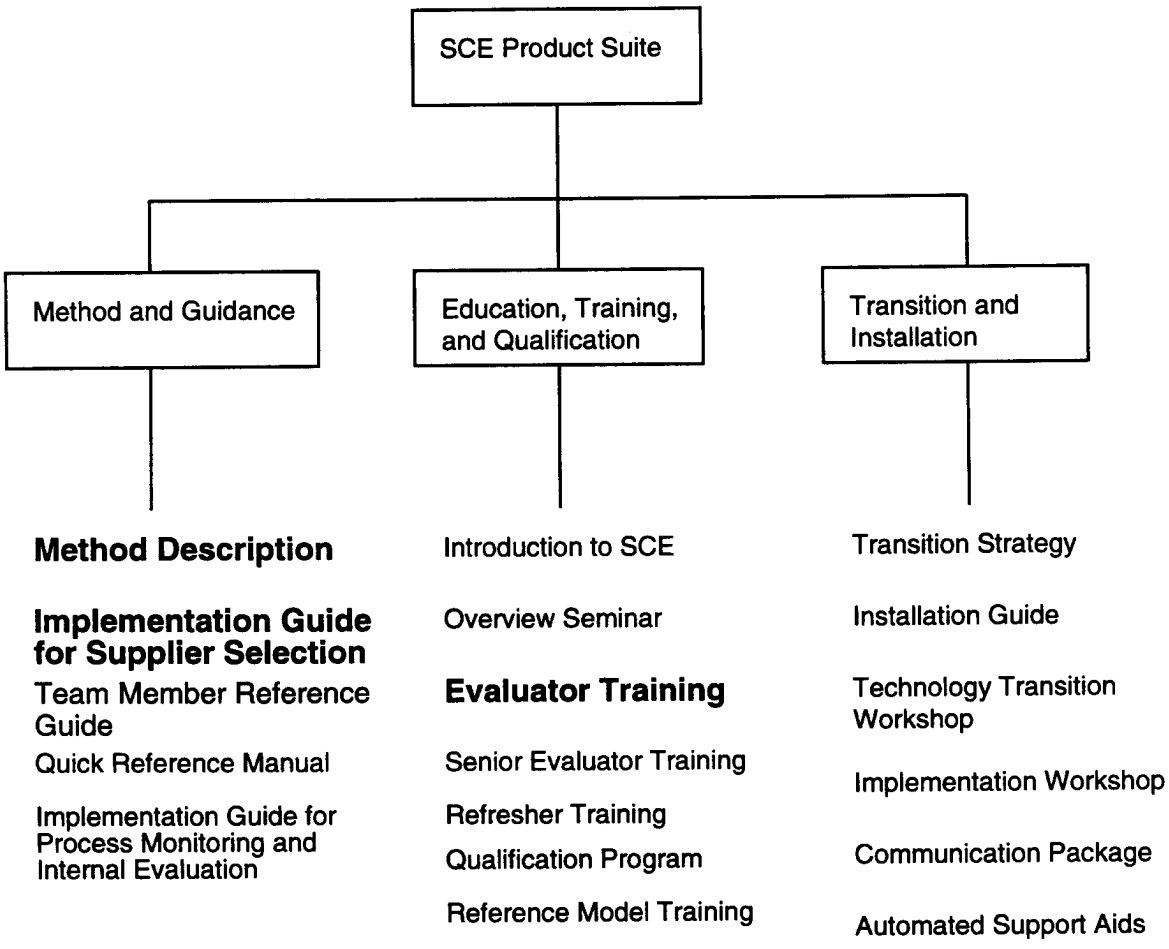

Figure 1-2: SCE Product Suite

Bold items in the figure above reflect the specific pieces of the initial release of the SCE V3.0 product suite. Licensed SEI providers of SCE services may provide additional items not listed in bold above. With SEI approval, they can become part of the Product Suite. Reference model (e.g. CMM) knowledge and skill building is essential to the successful use of SCE. Related CMM products and services that could be offered to fulfill

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these needs are: Beginner's CMM Education, Advanced CMM Training, CMM Self-Study Course, and CMM Test. The table below depicts the primary SCE product types and their respective purposes.

Product Type	Purpose
Method Description	Describes the "what" aspects of the method. Provides a high level process description and a baseline for all related products, and future improvement.
Team Member Guidance	Describes the "how to" aspects of the method. Provides a detailed process description including step by step instructions for reliable usage and quick reference material for field use.
Implementation Guidance	Describes tailoring aspects for different method application environments. Provides cost, resource, and benefit information. Provides application specific templates for use.
Education, Training, and Qualification	Provides information necessary for executives, managers, and practitioners to communicate about evaluation use. Provides essential knowledge and skill building necessary to successfully implement the method. Provides a basis for evaluator credibility and career enhancement. Establishes a necessary prerequisite to certifying evaluation results.
Transition and Installation	Provides technology transition and change management information necessary to successfully make evaluation use a routine business practice in an organization.

To provide both general process concepts, appraisal process description, and implementation details effectively, method material is divided into several components:

- a method description, which defines basic "what and why" concepts for the SCE method
- a more detailed Team Member's Reference Guide which describes the "how-to" aspects of the method. Additionally, it is a quick reference manual with matrices, cards, and checklists for use by teams in the field during process enactment.
- implementation guides for each method application type (such as SCE for supplier selection, process monitoring, or internal evaluation), which describe application tailoring differences. Users select the guide most appropriate to their environments. The initial SCE V3.0 release includes the Implementation Guide for Supplier Selection.
- evaluator training, based on a case study approach to participant learning. Reference model (CMM) knowledge is a prerequisite to attending Evaluator Training. Different case studies are envisioned for use in different environments, depending on the background of the participants. Formal training is one component of an overall evaluator qualification process that will enhance credibility of teams and evaluation results.

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Part 2 Overview of SCE Implementation Guidance

This section provides an overview of the guidance necessary for implementing SCE V3.0 into the typical acquisition environment.

Government acquisitions are a complex environment with many different processes, products, and players. Because every acquisition has unique requirements, it is beyond the scope of this implementation guidance document to provide specific information on what is important for every variation of an acquisition (source selection, award fee, monitoring, surveillance). Nevertheless, the suggestions given in this document provide a solid basis for implementing SCE V3.0 into your acquisition. This document concentrates on the activities necessary for integrating SCE V3.0 into supplier selection application. Contract monitoring activities are discussed as appropriate, but will be the subject of a separate, more extensive guidance document.

2.1 Origin of SCE in Government Acquisitions

Guidance for the use of SCE in government acquisitions has its roots in the Department of Defense Directives (DoDD) 5000 series. Specifically, the following:

DoDD 5000.1:

Page 1-6, item 5 "Competition and Source Selection"

c. Contractor's past performance and current capability (technical... managerial) shall be considered in source selection and responsibility determinations...

Department of Defense Instruction (DoDI) 5000.2:

Page 6-D-1-1 under "Software Engineering Practices"

b. Specific practices that should be used are: (1) Establishment of a software process maturity model and process improvement plan...

Figure 2-1 shows at a high level the context in which the SCE method interacts with and relates to the major source selection activities and participants (this figure was adapted from the Software Development Capability Evaluation (SDCE) pamphlet [AFMC 93]). Note that the preponderance of the implementation guidance is based upon DoD usage.

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It may be useful, therefore, to define some of the typical acquisition terminology with an equivalent commercial term. Table 2-1 below attempts to set the context of the depicted government terms into terms more applicable to the layperson or non-government person. See Appendix A on page 99 for formal definitions of the government terms.

Government Term	Layperson Term
➠ **Source Selection Authority (SSA)**	Decision maker
➠**Source Selection Advisory Council (SSAC)**	Committee- Advisors charged with recommending action on specific proposed alternatives
➠**Source Selection Evaluation Board (SSEB)**	Action team - chartered to evaluate various proposed alternative solutions against a predetermined set of standards/evaluation criteria
➠**Evaluation Teams (Technical, Management, Cost)**	Working group - teams of individuals responsible for performing analysis of differing segments of alternative approaches to a set of requirements
➠**Procuring Contracting Officer**	Contracts manager

Table 2-1: Government Acquisition Terms vs. Layperson Terms

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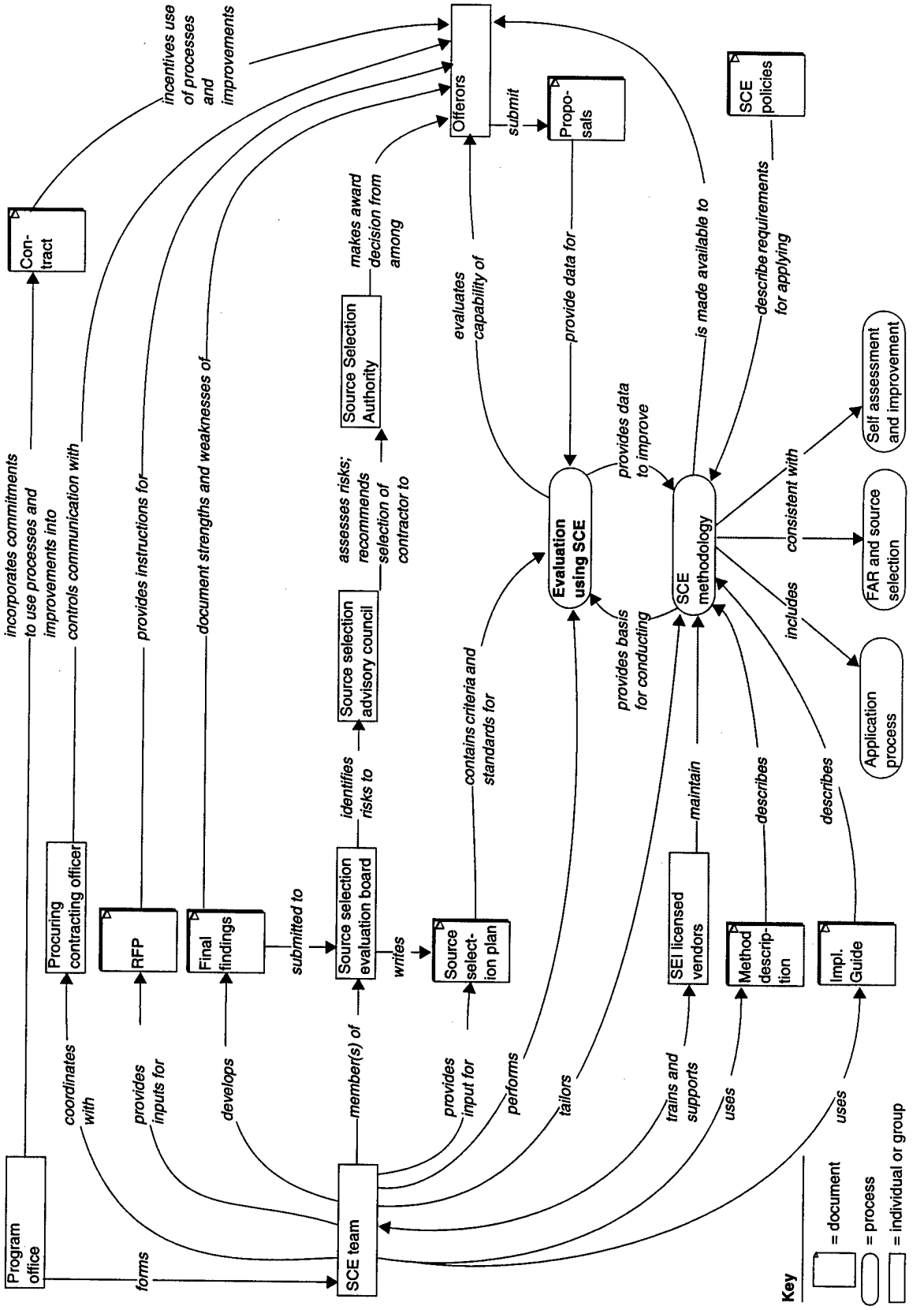

Figure 2-1: SCE Method in Context

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2.2 Overview of SCE Applications

SCE typically is used in two different environments within government acquisitions: source selection and contract monitoring. Source selection, the application for which SCE was originally developed, has had the largest percentage of use since 1987. Recent trends, however, have seen a consistent application of SCE in the post-contract award environment; similarly, the commercial sector of the software community has been applying SCE in the selection of subcontractors and teaming partners.

Factors to consider before deciding to use SCE in an acquisition include the following:

- criticality of an acquisition or the software component
- total dollar value of the acquisition or software component
- management control priority
- unprecedented system mission needs
- acquisition life cycle phase
- length of acquisition time period
- software size, the number of computer software components (CSCs)
- prime contractor - subcontractor relationship

These factors are examined in detail in Section 3.1.1.1 on page 25.

2.2.1 SCE in Supplier Selection

The factors listed above affect the implementation of an SCE and become visible in the acquisition documentation:

- Commerce Business Daily Announcement
- Source Selection Plan (SSP)
- Evaluation Plan (EP)
- Bidder's Briefing
- ➠**Request For Proposal**
- possibly, the Statement of Work or Award Fee Plan
- briefing to winning offeror
- briefing to losing offerors

When used effectively, virtually every major activity in a source selection is affected by SCE. Each of these documents, particularly the SSP, the EP and the RFP, smooths the use of the SCE on the contract.

Figure 2-2 shows a global view of a representative source selection schedule that includes SCE activities.

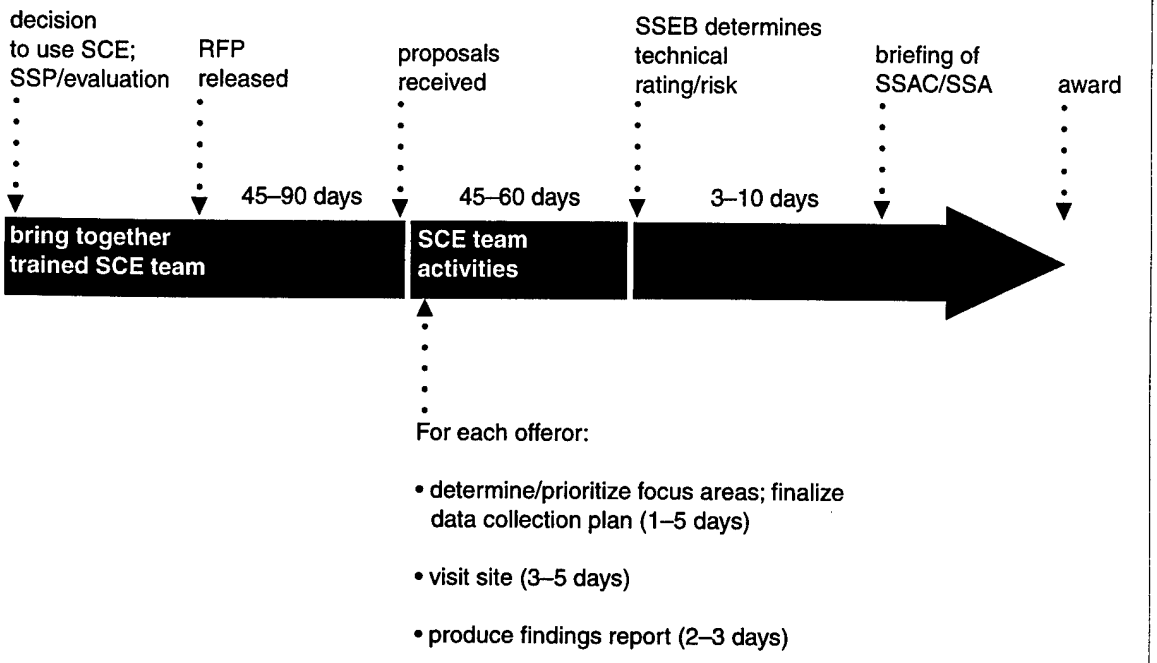

Figure 2-2: SCE Activities in a Typical SS Timeline

Decision Point to Proposal Receipt

The decision to use SCE immediately sets things in motion for appraisal planning and implementation. Nominally, the decision is articulated in the Source Selection Plan, and detailed usage of the determination of SCE results is delineated in the Source Selection Evaluation Plan. Appropriate language is selected and tailored for insertion in the Request for Proposal specifying SCE usage and how the development organizations are to provide SCE related information for the acquisition. Selecting the team leader and SCE team members and training them will occur normally prior to proposal receipt.

Proposal Receipt to Site Visit

Following proposal receipt, the evaluation team will determine the specific data collection plan to be carried out for each development organization remaining in the ➟**competitive range** of the source selection. The appraisal plan will have defined the ➟**organizational scope** as well as the ➟**reference model scope** that are the precursors for defining the

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explicit data collection strategy. During the onsite period, the team collects information and turns the information into findings in the form of ➡**strengths**, ➡**weaknesses**, and ➡**improvement activities**. A ➡**rating**, may be determined if all necessary criteria are met and the sponsor has requested it. The data and findings are then provided to the sponsoring organization in the format agreed upon.

It is crucial that the environment in which an SCE is executed for acquisition be understood. Normally in a source selection, SCE results become part of a Risk Assessment.

Note that in most source selections the SCE team is normally one of a number of teams involved in providing evaluation services to the Source Selection Evaluation Board (SSEB). Typically, there will be other "teams" evaluating criteria in management, cost, and other technical areas (Appendix B on page 121 provides an example of SCE use as a technical criterion). These teams provide their findings—just as the SCE team provides theirs—according to the SSP and SSEP.

For example, the SSEB evaluates development organizations' proposals for an acquisition relative to a prescribed/published set of evaluation criteria and identifies the risks (relative to the evaluation criteria) of development organizations being able to fully execute a contract if awarded to them. This risk assessment is provided to the Source Selection Advisory Council (SSAC). The SSAC's responsibility is that of risk assessment. The SSAC compares the risks identified by the SSEB of each development organization against one another (e.g., organization A compared to organization B, compared to organization C). They assess the overall risks of selecting one organization relative to the other and provide their assessment of risk to the Source Selection Authority (SSA), who is empowered to make an award of an executable contract. The SSA's responsibility is to make an award decision that minimizes risks and maximizes the benefits to the sponsoring governmental agency.

2.2.2 SCE in Contract Monitoring

The value of performing an SCE in source selection can continue past the contract award and into contract performance. The source selection SCE identifies a set of risks associated with the winning development organization. Those same risks, defined as weaknesses associated with individual key process areas, can be tracked. Additionally, these same weaknesses can be monitored for improvements as the contract progresses. Monitoring improvements can be done by

- using weaknesses to define the risks
- developing a plan to mitigate the risks
- performing trade off analysis for surveillance of strong or weak areas
- negotiating Contract Data Requirements List (CDRL) trades with the development organization (e.g., accept contractor format for some documentation while requesting additional status on process improvement in selected KPAs)

In contemplating using SCE as a contract process monitoring risk management tool the following questions could be considered:

- What would you like (need) to know at the start of the contract?
- What expertise would the program office need to monitor performance?
- What are the program office's expectations about CDRLs (e.g., SRS, SDD)?
- What action should be taken
  - at the start of the contract?
  - if identified risks occur?

Use the SCE data to define the risks to execution of the contract, develop a plan to mitigate those risks and work the plan. This plan could entail such items as trading off the surveillance of strong areas for weak ones. If an organization is found to have excellent configuration management procedures, it is wasteful to check on this process area in the same way that would be applied to an area found to be weak (e.g., Software Project Tracking and Oversight).

2.2.3 Using SCE to Baseline Performance

SCE has been used to "baseline" contract process performance. One strategy successfully used is baselining the development organization's performance relative to the CMM reference model. This entails a number of planning and execution factors. Below are two environments and the salient points to be integrated into a plan for use of SCE.

For new contracts:

- RFP must identify SCE use
- SCE still an evaluation factor in selection

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- criteria should be based on
  - eliminating weaknesses
  - creating additional strengths
  - improving actual versus planned tracking within KPAs

For existing contracts SCE, as a process monitoring tool, can be used

- as a negotiated contractual action
- when a long-term relationship is expected
- with the same criteria as for new contracts

Establishing a "process baseline" lends further utility of the SCE method in process monitoring in the situation of award fees or for consideration of a value engineering incentive for software process improvement. Note, however, award fee applications (i.e., an award for meeting specified measures of performance) are not appropriate in all instances. The award fee application of SCE is most appropriate when

- a long-term relationship is involved
- the contractor lacks a sufficient number of programs over which to spread improvement costs
- process investments in general would not otherwise be made
- the sponsoring organization believes direct investment incentives will be the best motivator of action
- the program environment includes
  - mission-critical software
  - software embedded throughout system
  - history of software issues
  - long relationship with contractor expected
  - SCE is used by sponsoring organization to mitigate risks
- the SCE application objective and ultimate goal are the following:
  - objective: provide incentive for contractor to improve the total software development process
  - goal: exceed the software development quality, cost, and schedule requirements

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The sponsoring organization and contractor should view themselves as team members in an effort to derive benefit from an overall software process improvement plan. This teaming approach has some specific characteristics:

- CMM is the basis for the improvement effort
  - contractor uses CMM to establish plans
  - sponsoring organization evaluates using CMM
- Contract incentive is the contractual vehicle.
  - describes sponsoring organization's goals
  - describes method of evaluating progress
  - sponsoring organization and contractor jointly agree to criteria and approach
- Award fee plan increments and criteria are used to help achieve long-range objectives:
  - can tailor specifically to government/contractor needs
  - SCE is used to baseline software process capability
  - findings are provided to the contractor
  - contractor uses findings to focus the improvement plan
  - sponsoring organization and contractor jointly agree to goals
  - SCE is then used to measure progress against the improvement plan
  - incentive awards are determined by the contract provisions
  - findings establish the new baseline for the next increment

The keys to successful application of award fee usage of SCE are to perform the source selection SCE, use the findings to frame the award fee plan, perform a baseline SCE (after a suitable time frame (six months) for the contractor to begin contract performance), have the contractor submit a software process improvement plan (SPIP), and involve the contractor to obtain the understanding of the SCE findings and impacts upon the award fee pool.

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Value engineering for software process improvement is another mechanism available on government contracts. This is described in the Federal Acquisition Regulations (FAR) Part 48. This FAR clause is extensible to process improvement. There are five elements required:

1. FAR clause 52.248-1
2. Separately identifiable software work packages in an earned value system
3. Baseline of prices for software effort
4. SCE to establish process baseline and validate process improvements
5. Statement of Work (SOW) requirement to develop process improvement plan and support periodic SCEs

What are the advantages? Exercising the value engineering clause has a greater financial reward potential than award fee. In addition

- award fee requires an increase in government obligation authority; value engineering does not
- however, value engineering requires visibility into software work packages and pricing; award fee application of SCE does not

Ultimately, a company exercising the value engineering clause has the potential to demonstrate the software process improvement instantiated the resulting cost savings as well as value added to the software products produced for the sponsoring organization.

The bottom line in the brief discussions of award fee and value engineering is that both incentivization approaches help management (sponsoring organization and contractor) to focus on software process.

Table 2-2 provides the essentials of the SCE version 3.0 method and corresponding source selection activities.

Note that much of the material Table 2-2 duplicates information from the SCE Method Description. The information is included in this document for completeness of this overview section—that is, to give the reader a brief, global view of SCE.

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Each activity and its relationship to acquisition guidance from an "evaluator perspective" and a "recipient perspective" are presented in Part 3 of this document.

Activity	Purpose	Inputs	Outputs	Source Selection-Specific Activities
1. Analyze Requirements	Understand the business needs, objectives, and constraints to design the most appropriate appraisal, and to gain sponsorship and commitment for the appraisal.	Business context, Sponsor objectives, External schedule, Budget, Personnel availability, Geographic constraints, Facility availability, Project availability Specific sponsor req'ts, Program plans	Appraisal goals, Appraisal constraints, CMM scope, Organizational scope, Product profile, List of appraisal outputs, Sponsor commitment	Determine Requirements Initiating Acquisition Planning Decision to use SCE
2. Develop Appraisal Plan	Create an artifact that will guide and define execution of the appraisal such that it is in concert with business needs and constraints.	Appraisal goals, Appraisal constraints, CMM scope, Organizational scope, List of appraisal outputs, Team leader selection	Initial appraisal plan, Revised appraisal plan	Sources Sought Commerce Business Daily (CBD). Develop SSP Document how the Source Selection will be accomplished. Write Evaluation Plan (EP), Develop Request for Proposal (RFP). Note: The Following implementation activities generally occur in conjunction with SCE Method activities 2 - 4. Definitize SCE Role in Source Selection (e.g., specific criterion, general consideration). Input SCE language into RFP.
3. Select and Prepare Team	Have an experienced, trained team ready to execute the appraisal.	Appraisal constraints, Product profile, CMM scope, Organizational scope, Appraisal plan	Team leader selection, Team member selection, Prepared team	Development: SSP, EP, RFP SCE personnel selected, trained and prepared with acquisition requirements in context.
4. Obtain Organization Information	Obtain information from the organization that allows the team to refine the plan and focus the investigation in subsequent activities.	Product profile, CMM scope, Organizational scope, Appraisal plan	Request for organization information, Site information packet (from organization)	RFP issued SCE specific information is requested and delineated via RFP.

Table 2-2: SCE Activities and Their Primary Inputs and Outputs

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Activity	Purpose	Inputs	Outputs	Source Selection-Specific Activities
5. Analyze Instrument Data	Identify issue areas for further investigation during appraisal conduct, and to get a preliminary understanding of the organization's operations.	Product profile, Site information packet	Questionnaire response summary analysis, Profile analysis	Proposal Receipt Evaluation of Proposals initiated. Competitive Range Determination. Offerors SCE information analyzed for establishing "general" prioritization of reference model components for all offerors.
6. Select and Prepare Participants	Ensure the most appropriate personnel participate in the appraisal, and ensure that they understand the appraisal process and shared expectations.	Appraisal plan, Site information packet, Profile Analyses	Selected site(s), Selected project(s), Selected interviewees, Initial briefing charts, Prepared participants	Evaluation of Proposals continues. Offerors projects are selected to undergo SCE. Specific preparation for individual offerors initiated. Logistical coordination initiated.
7. Prepare For Data Collection	Plan the detailed site intervention to make optimum use of available site visit time to attain appraisal goals and objectives.	Appraisal plan, Organization charts (from site info packet), Questionnaire response summary analysis, Selected sites, Selected projects, Selected interviewees	Data collection strategy • interview • document review • roles/responsibilities Interview questions Initial document request list	Evaluation of Proposals continues. Prioritization of Reference Model components and data collection strategy for onsite completed. Logistical coordination finalized.
8. Receive Presentations	Refine/update the appraisal team's understanding of the organization's software process operations.	Site information packet, Appraisal schedule, Development organization presentation	Updated site information, Updated appraisal schedule, Updated terminology, roles/responsibilities, Presentations, Working notes	Evaluation of Proposals continues. SCE onsite for each offeror is executed.
9. Review Documents	Understand processes actually implemented in the organization.	Site information packet, Initial document set, Document review strategy, Annotated worksheets/checklists	Working notes, Requests for additional documents	Evaluation of Proposals continues. SCE onsite for each offeror is executed.
10. Conduct Interviews	Understand site personnel perspective on processes implemented in the organization.	Appraisal schedule, Interview strategy, Site information packet, Interview questions, Working notes, Annotated worksheets/checklists, Requests for additional/new documents	Working notes, Requests for additional documents, Requests for additional/new interviewees	Evaluation of Proposals continues. SCE onsite for each offeror is executed.

Table 2-2: SCE Activities and Their Primary Inputs and Outputs (Continued)

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Activity	Purpose	Inputs	Outputs	Source Selection-Specific Activities
11. Consolidate Data	Transform the data collected into formal team observations of process strength and weaknesses relative to the reference model (e.g., the CMM).	Working notes, Annotated worksheets/checklists	Observations • CMM • Non-CMM Revised data collection plan • document review strategy • interview strategy Annotated worksheets/checklists Requests for additional/new interviewees or documents	Evaluation of Proposals continues. SCE onsite for each offeror is executed.
12. Deliver Draft Findings	Validate preliminary team observations, build credibility in the appraisal, and generate buy-in to the eventual results.	Annotated worksheets/checklists • Observations	Working notes, Draft findings presentation	Evaluation of Proposals continues. SCE onsite for each offeror is executed. A decision to conduct this activity is made during Activity 2 Develop Appraisal Plan. Typically, this activity will NOT be conducted during a Source Selection SCE.
13. Make Rating Judgments	Make decisions, based on validated observations, about the organization's process capability, using the reference model components.	Annotated worksheets/checklists, Working notes	Ratings of CMM components	Evaluation of Proposals continues. SCE onsite for each offeror is executed.
14. Deliver Final Findings	Provide a clear and actionable summation of the appraisal results to the organization.	Annotated worksheets/checklists	Final findings presentation, • global findings • final findings • non-CMM findings • ratings	Evaluation of Proposals continues. SCE onsite for each offeror is executed.

Table 2-2: SCE Activities and Their Primary Inputs and Outputs (Continued)

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Activity	Purpose	Inputs	Outputs	Source Selection-Specific Activities
15. Produce Reports and Support Follow-On Activities	Produce a formal baseline of the appraisal conduct and results for the sponsor and other stakeholders, and ensure the appraisal results are used appropriately to achieve stated business objectives.	Appraisal plan, Site information packet, All presentations • Initial briefings, • Organization, • Draft findings, • Final findings, All annotated worksheets/checklists, All working notes	Appraisal reports • findings • outcomes • appraisal data • method evaluation Disposition of data Determination of post appraisal activities	Source Selection Evaluation Board (SSEB) compares data collected against Evaluation Standard- assigns technical rating and risk identification Source Selection Advisory Council compares and ranks offeror proposals submits Risk Assessment to SSA Source Selection Authority makes award decision. SCE findings/outcomes are submitted to SSEB. SCE Team consults with SSEB if requested. SCE team may act as advisors to SSAC and SSA.

Table 2-2: SCE Activities and Their Primary Inputs and Outputs (Continued)

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Part 3 Implementation Guidance

This section examines the SCE activities individually from an acquisition context perspective. The focus is on integrating the method activities with the acquisition application of the method. SCE application in the acquisition environment typically takes two forms, source selection and post contract award "process monitoring." The principal thrust of the discussions that follow is on the source selection application. The "process monitoring" application is the subject of a separate document, but where there is a direct tie into the supplier selection activity as well as the SCE implementation and the "process monitoring" application, appropriate comments/guidance are provided.

The discussion will reflect the following structure:

Tables illustrating the generic SCE activity's purpose, actions, and outcomes compared with the Supplier Selection SCE's purpose, actions and outcomes begin each Activity section. Discussion of implementing activities from an evaluator and recipient perspective follow these tables. Note that in many cases the Supplier Selection SCE section of the table will contain "Same as Generic SCE." This demonstrates the overall applicability of the SCE method. The bulk of the implementation differences of using SCE by an organization with or without formal acquisition rules occur in appraisal planning and use of the SCE results.

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3.1 Activity 1 Analyze Requirements

Table 3-1 provides an overview of this activity.

	Generic SCE	Supplier Selection SCE
Purpose	Understand the business needs, objectives, and constraints to design the most appropriate appraisal, and to gain sponsorship and commitment for the appraisal.	Understand the sponsor's business needs, objectives, and constraints in incorporating the SCE methodology into the acquisition and the sponsorship necessary for integration and execution of the methodology.
Actions	Develop appraisal goals, constraints, and scope. Determine what appraisal outputs will be and how they will be used.	Same as generic SCE Initiate acquisition planning Decide whether to use SCE
Outcome	The decision to proceed with the appraisal, based on a shared understanding of the evaluation goals, constraints, and scope.	Commitment to integrate SCE into the acquisition.

Table 3-1: Analyze Requirements Overview

3.1.1 Evaluator

The central question to be answered is whether software capability information is needed or desired to proceed with the acquisition.

Determining How to Use SCE

Most organizations selecting suppliers of software products and services would prefer to have more discriminators available other than cost and/or the technical performance promised in a proposal. Use of SCE can provide such a discriminator among the various software development organizations that are under consideration. Table 3-2 and Figure 3-1 demonstrate the need for some analysis of the requirements at the outset. Note that the decision diamond (Figure 3-1 on page 24) labelled Source Selection, Teaming, or Subcontracting, considers three acquisition applications. The sections that follow will discuss SCE with respect to a "yes" answer to this decision diamond in relation to the perspective of deciding to use or not use the SCE Method. The "no" option leading to a "yes" regarding incentivization will be discussed as a separate appendix to this document.

Source Selection: This is the traditional use of an SCE. This application typically has referred to the application whereby a U.S. government agency (e.g., Army, Navy, Air Force, Coast Guard, Federal Aviation Administration) uses SCE as a contract award evaluation criterion. For a company contemplating the selection of suppliers of software services

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or products (non-government procurement) many of the goals, objectives, constraints, strategies, and planning factors are germane and should be considered.

Teaming: The teaming situation refers to the industry practice of selecting partners or "teammates" to collaboratively compete for contracts, government or commercial. This a variation of the source selection application use of SCE. For this application, the degree of legal formality may typically be reduced. However, the considerations for selecting such a "teammate" remain essentially the same.

Subcontracting: The subcontracting instance refers to the situation whereby one entity (e.g., government prime contractor, or commercial entity) establishes a relationship with another entity for the purposes of receiving services or products that will then be applied to an existing effort. This could take the form of the primary organization "subcontracting" a specified portion of an existing contract, statement of work or for separately identified services that will supplement its own efforts on a contract or product.

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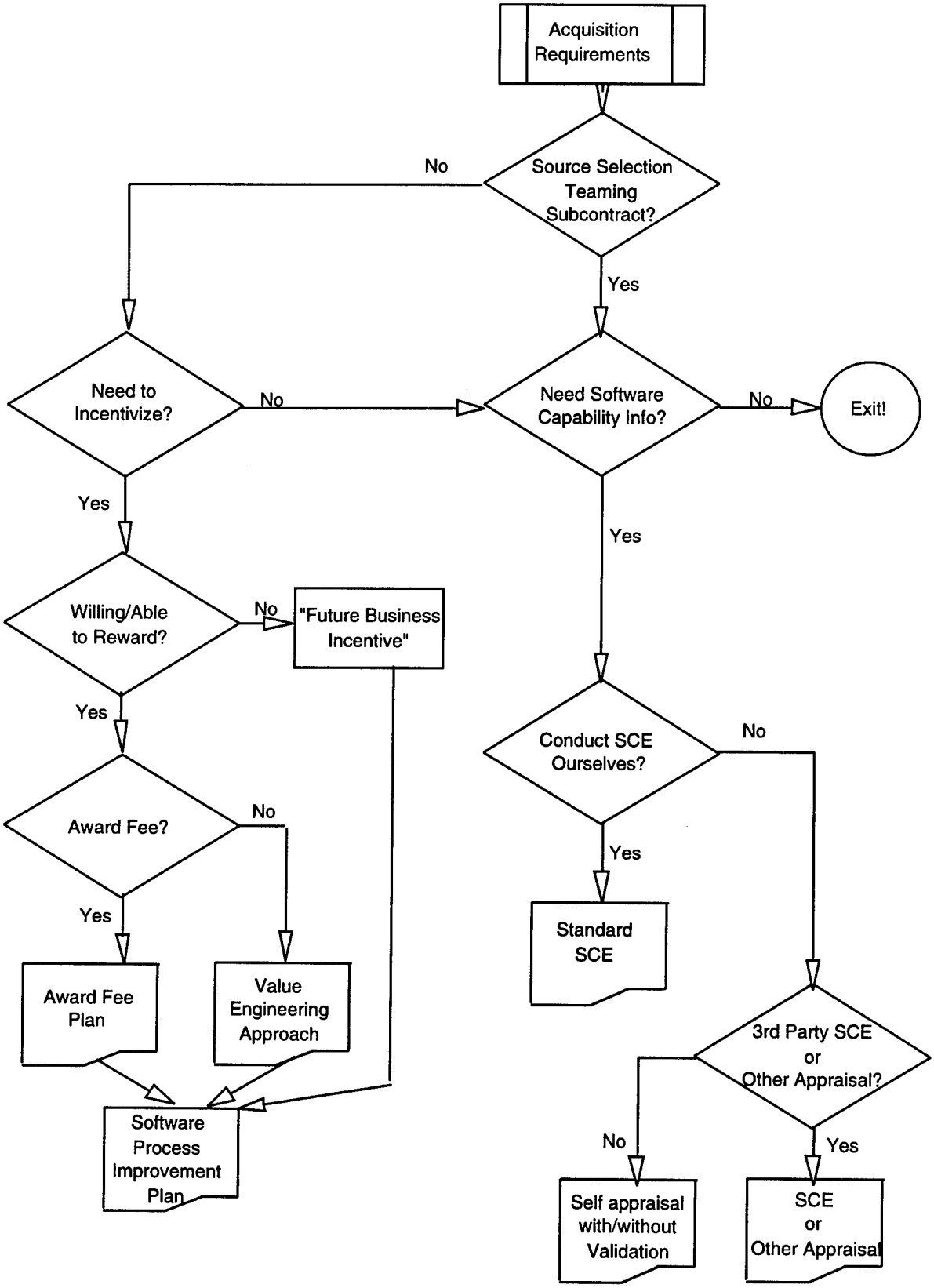

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3.1.1.1 Criteria for Using SCE in Supplier Selection

General familiarity with the acquisition organization source selection process is assumed for purposes of focusing on each participant's (evaluator or recipient) relationship to SCE. Clearly, SCE should not be used for every software acquisition. Both the costs and benefits of using SCE as well as the specific nature of the acquisition should be considered when making this decision. These costs and benefits may indicate that other approaches are necessary for very small acquisitions involving software. See Appendix C for current government policies regarding the use of SCE in acquisitions. This section discusses criteria related to the nature of an acquisition.

There is no minimum number of lines of code or measure of software intensity dictating that SCE must be used in an acquisition. Several considerations must be weighed by a program manager when making the decision. Each of the following factors are important considerations, but the program manager or person responsible for determining SCE usage for an acquisition must weigh these factors in accordance with the organization's method of procuring systems and services. These are general guidelines that must be refined to meet the context of the organization:

- criticality of an acquisition or the software component
- total dollar value of the acquisition or software component
- management control priority
- unprecedented system mission needs
- acquisition life cycle phase
- length of acquisition time period
- software size, the number of CSCs
- prime contractor - subcontractor relationship

Table 3-2 illustrates the relationship of each of these factors as a general guideline for determining appropriateness of SCE usage. Each box should be read independently, and then combined with other factors, to make an overall judgement on SCE applicability.

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Criteria	Decision: Definitely Use SCE	Decision: Strongly Consider Using SCE	Decision: Consider Using SCE	Decision: SCE Use Likely Not Appropriate
Critical Software	Major government program MCCR systems		Non-MCCR systems	
Dollar Value	Software > $5M	Total program > $25M	Total program > $10M	• Software < $5M; < 30% of total cost • Total EMD < $10M
Management Control	High Priority			Low priority
Software Precedence	Unprecedented system	Need defined, any software CSCIs unprecedented	Precedented system	
Lifecycle Phase	EMD phase	• Dem/Val • concept exploration	Operational readiness support	Production/ deployment
Schedule Length	Upgrades, major modifications or follow-ons expected	• Development > 24 months • System life > 10 years	Program length ≥ 5 years	
Software Size	> 100 KSLOC	> 50 KSLOC	> 25 KSLOC	< 25 KSLOC

Table 3-2: SCE Usage Decision Making Criteria

Criticality of an Acquisition or the Software Component

The criticality of an acquisition may necessitate SCE use. The SEI recommends that any government-defined "major" program use SCE as an integral part of its strategy for producing the highest quality end product and motivating government contractors to focus on software process improvement as a means to effect this goal. In all Mission Critical Computer Resource (MCCR) systems, regardless of total dollar amount, software size, or DoD priority ranking, SCE use should be strongly considered. MCCR, and software in general, are critical components of modern weapon systems. The success of the system is largely dependent upon software precisely performing its intended function. An example of a small, but highly critical piece of software warranting the use of SCE in an acquisition would be software needed to control the hardware for an access control system for nuclear weapons or other munitions.

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Total Dollar Value of the Acquisition or Software Component

Dollar value is important because of the investment in resources and time necessary to implement SCE effectively. Use of SCE should be considered when the total value of an acquisition software component exceeds $10 million. On any acquisition in which total cost is greater than $25 million, SCE use should be strongly considered.

Where the software component of a program itself exceeds $5 million or is greater than 30% of the total program cost, SCE should be used. This criterion often may take precedence over the $25 million threshold described above. On the other hand, some acquisitions in the $10 to $25 million range may not warrant the use of SCE because of program-unique circumstances. Perhaps the software component is not mission critical and is less than 10% of the total dollar value. These guidelines are not absolute; they are intended to aid the decision-making process and the development of appropriate policies and procedures.

Management Control Priority

When management control is a high-priority concern, SCE use should be considered. An environment under effective management control will be more able to produce data that is useful for lessons learned which can be incorporated into the overall system development process. These lessons help the acquisition organization avoid "re-inventing the wheel." Successful management control also facilitates effective implementation of modern methodologies, tools, and techniques.

A controlled environment is essential to managing contractor processes—processes for maintaining the development environment, bringing new people and technology into the environment, identifying problems early in the contract, and managing requirements changes. A controlled environment enables improved risk assessment and abatement.

System/Software Precedence

SCE should be used when the contractor is likely to develop software implementations that are unprecedented. Unprecedented systems (i.e., those solving new or unique problems) pose special problems for software development organizations. An SCE of each offeror would identify whether the requisite controls are in place on the contractors' existing programs and whether they will be easily transferred to the new, unprecedented system.

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When the mission of the system system/software component, especially the role played by the software component, is known and defined by the end user, and portions of the system will be unprecedented, use of SCE should be strongly considered. SCE helps identify program risks associated with the capability of contractors to succeed in producing quality software in an unprecedented environment.

Use of SCE yields information about an organization's ability to manage risks inherent in unprecedented software development, as well as its ability to manage tasks which are new but are similar to ones they have successfully completed previously.

Acquisition Lifecycle Phase

The lifecycle phase of an acquisition is an important factor in determining SCE usage. The SCE Method and CMM were originally developed in response to DoD's and industry's recognized problems in managing the development of increasingly complex mission critical, software-intensive products in the real-time, embedded domain. Given this background, SCE fits in any engineering manufacturing development (EMD) program within this domain, since EMD is the typical phase associated with major new software development. The SEI recommends that any EMD program consider SCE use, in accordance with the other factors listed here. However, SCE use is not limited to the EMD phase. The SCE Method has been used successfully in demonstration/validation, concept exploration, and operational readiness support phases.

Length of Acquisition Time Period

The SCE Method should be considered in any procurement where software is a major component and the program duration period is expected to be greater than 24 months. This time frame is recommended because of the amount of resources necessary to apply SCE effectively, and because the typical process improvement program implemented by a contractor requires at least 18-24 months to attain and sustain improvements in process maturity. Thus, more software development time is necessary to see improved results directly on the contract.

SCE should also be used when the program office expects significant block upgrades, modifications, or follow-on programs to occur, and the original contractor is expected to be a primary offeror or likely performer of the new work. Often, the processes put in place by the contractor at the start of a software development will be frozen, meaning that process changes will be limited during that development period. Software up-

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grades or major modifications to existing systems are good times to unfreeze the current software development process and install new, improved processes, methods, and technology. Therefore, using SCE during the initial software development and the subsequent improvement programs will enable any improved processes to be implemented on the follow-on developments.

SCE use may still be appropriate even if neither of these criteria is met and the government Program Executive Officer (PEO), center/commander or activity committee is attempting to motivate and gain improvements in a particular domain area, such as avionics systems. These PEO decisions may entail long-range considerations that go beyond the current contract, and thus SCE use may be appropriate to meet other government objectives.

Software Size, Number of Computer Software Components (CSCs), and the Prime Contractor-Subcontractor Relationship

The amount of software to be developed will directly affect the number of CSCs required to effectively partition the software system into manageable chunks and the likelihood of a prime contractor performing integration of software produced by several subcontractors. When the estimated size of the software component exceeds 100 thousand source lines of code (KSLOC), SCE should be used. At this threshold, the complexity of the software development will be a significant concern of the program manager. Scaling up small software engineering teams to meet the challenges of a large development creates additional pressures on effective software development processes.

When below this threshold, there are several related considerations that should also be weighed by the program manager when determining whether to use SCE:

- Software size between 25 and 100 KSLOC
- Minimum development team of 20 to 100 people in under a year with several years of support and enhancements
- Software embedded on multiple platforms in different languages for a real-time application
- Highly specialized technologies: for example, radar signal processing on a unique programmable signal processor or image processing on a customized parallel processor
- Software pieces to be subcontracted to geographically distant locations

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These examples highlight different managerial/technical capabilities a contractor must possess depending on the type, complexity, and size of the software and the nature of the delivery schedule.

A clear understanding of acquisition-specific circumstances, rather than knowledge of hard criteria, is necessary to determine whether SCE use is appropriate. In general, for all acquisitions with a software component, the acquisition organization should seek to do business with contractors who understand and effectively implement modern software development practices, and also with those contractors taking actions to improve these practices. SCE is a tool that can augment other acquisition organization techniques for discerning differences in the capabilities of offerors.

Several organizations have established criteria for SCE use which reflect the individual needs of these organizations, and supplement the information contained in this guide. One major military command drafted a policy requiring SCE use on all MCCR programs exceeding $10 million. Another military division is taking the approach of requiring SCE use on procurements which include software size estimates greater than 50 KSLOC. One commercial company is requiring its subcontractor to undergo a SCE and develop an action plan to correct weaknesses. These examples underscore the importance of refining SCE usage criteria to best reflect the acquisition practices implemented at a particular acquisition organization, both government and industry. Different organizations have different business bases, contractor communities, product types, application domains, etc., all of which affect site-specific implementing instructions for SCE.

3.1.1.2 Benefits of Using SCE in Supplier Selection

Use of the SCE Method in Army, Navy, Air Force and non-DoD agencies indicates that SCE helps the acquiring organization in multiple ways:

- Added software development capability realism in the source selection process
- Increased objectivity in information collected for an acquisition
- Motivation for contractor software process improvement actions

Software Development Capability Realism: One benefit SCE provides is the software development capability realism introduced into the proposal review and contractor analysis process. The information SCE

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collects is timely, real, and is based on current projects and the practices actually being implemented by offerors' engineering and managerial personnel.

For moderate to large software development efforts, a currently popular means of evaluating a contractor's software development abilities during a source selection is the review of the offeror's Software Development Plan (SDP). Comparing the SCE findings with the evaluation of the contractor's proposal and SDP will clarify for the program office whether the proposed approach is realistic in light of the offeror's current process capability. Based on this comparison, the program office can better evaluate the risks posed by each offeror and work with the winning contractor on a realistic software process improvement program.

Objectivity: A second major benefit of SCE is the objectivity it introduces into the proposal review process. The SCE Method helps ensure an objective review by putting a trained evaluation team on site to evaluate the offeror's activities and compare them against a public ➠**reference model** or standard (e.g., the CMM). In the typical source selection, evaluating software risk is a difficult task because there are few avenues for addressing this issue other than by evaluating what is in the proposal.

With the goals of the CMM KPAs as a basis, contractor software process capability can be reliably measured against a common standard. This permits consistent, repeatable, and fair evaluation of contractor software process capability. This adds value to the source selection process by making software reviews more objective.

3.1.1.3 Cost of Using SCE

Using SCE requires personnel and financial resources, on both the contractor and acquisition agency sides. The resource considerations affecting the implementation of SCE are:

- Personnel
- Time
- ➠**Rating Baseline** (scope of evaluation: one of three options selected)
- Financial
- Development organization's resource requirement

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Determining the Rating Baselining

An important aspect of the appraisal requirements and planning process—determining the rating baseline option needs to be understood by all, as the decisions made impact all aspects of the SCE. Figure 3-2 represents the three options available to an organization contemplating the use of SCE.

The option selected is directly related to determining reference model scope, and will drive the rest of the appraisal process, including Activity 13, Make Rating Judgments. The rating baseline decision affects the time, labor, and cost constraints determined in Activity 2, Develop Appraisal Plan. A decision to rate ➡**maturity level** based on full coverage will require additional resources relative to the more "standard" SCE approach of selecting a subset of model components.

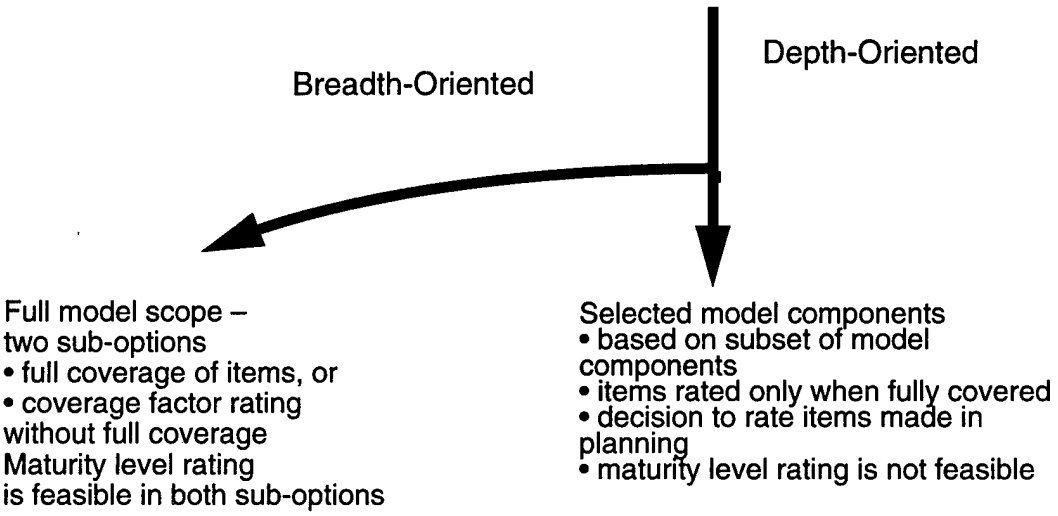

Figure 3-2: SCE Rating Baseline Options

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Figure 3-3 on page 34 illustrates the selection of the Depth-Oriented option from Figure 3-2 and shows the estimated acquisition agency labor, in person days, required to

- implement SCE in program documentation
- train SCE team members
- conduct the site visits
- incorporate the SCE findings into source selection results/ decisions

The estimate assumes a single source selection, a program office having no prior experience with SCE, and three offerors within the competitive range who must be evaluated. For a team of five who conduct three site visits, the total labor is approximately 115 person days. For reference, the estimated labor for an acquisition involving only one site visit is 65 person days (Total Effort Fixed Costs 39.75 person-days plus Variable Cost Effort of 25 person-days for site visit). Certainly, there are economies of scale and there are many non-recurring costs, such as team training, which will continue to reduce overall acquisition agency labor costs as trained resources are utilized on subsequent acquisitions. In an instance where the Program Manager (PM) and SCE team have been trained and have used the method previously, and the ➡**Procuring Contracting Officer** (PCO) is SCE knowledgeable, the estimated labor to implement SCE on an acquisition (with 3 site visits) declines to 83.5 person days (114.25, less SCE information gathering 5.25, less RFP preparation 1, less SCE Training 25).

This analysis leaves it up to members of the individual program office to determine their own average person cost per day, average travel and per diem costs, and subsequently add these to the cost of team training to estimate a total dollar cost for implementing SCE.

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	SCE Effort Phase	Who Does It	Effort days per person	Number of People	Total Effort
Fixed Costs	SCE Information gathering	PM, PCO, SCE team lead	0.25 1.5	3 3	0.75 4.5
	RFP Preparation	SCE team leader or PM	1.0 1.0 0.5 0.5	1 1 1 1	1.0 1.0 0.5 0.5
	SCE Training	SCE team members	5.0	5	25.0
	SCE Findings Preparation	SCE team members	1.0	5	5.0
	Contractor Debriefs	PM, PCO, SCE team leader	0.5	3	1.5
Subtotals			*11.25*		*39.75*
Variable Cost	SCE Site Visits 3	SCE team members	5.0	5	75.0
Total Person Days Effort					**114.75**

Figure 3-3: Estimated SCE Labor For One Source Selection

Constraints

Personnel Constraints: The largest constraint on the acquisition agency is the labor effort expended by the individuals constituting the SCE team. This team is needed for one full work week for every SCE site visit that is performed. In addition, several person-days are needed to prepare for each site visit and prepare the detailed report or set of findings that is submitted to the management body sponsoring the evaluation.

In addition to the site visit requirements, the SCE team leader or the program office's software focal point will be needed on a part-time basis prior to the site visits to incorporate appropriate language into the source selection materials that are affected by SCE, assemble an SCE team, and schedule training for any untrained team members. This part-time task will be minimal once the acquisition organization has put in place support materials for SCE, including this guide. After the site visits, the

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SCE team leader will likely be needed to advise the evaluation sponsor and perform outbriefs to the development organizations as directed by his or her PCO.

Time Constraints: The SCE team is needed for at least one and a half weeks for every a site visit. This includes

- Preparation: 1-2 days
- Travel time: 1 day
- Site visit: 3 - 5days (includes caucus and findings preparation)
- Time off between site visits: 1 day

Time off is important because site visits are intense activities. Another time constraint is imposed by the typical source selection schedule. Site visits cannot begin until after the initial proposal evaluation and only on those offerors remaining in the competitive range. This typically allows a one to two month window to conduct the on-site phase of the SCE. A program manager does not know the number of offerors until proposals are received. This means that the program manager will have to estimate how much time is needed to complete all the SCEs based on the estimated number of offerors.

Financial Constraints: Given a $10 million acquisition, which was introduced earlier as a reasonable threshold for seriously considering the use of SCE, and the number of offerors shown in Figure 3-3, the SCE cost is 0.6% of the total program cost. While using SCE to help select the most qualified offeror will not eliminate cost or schedule problems, it will point out the offeror(s) with the best proven practices to mitigate such problems, which can more than pay for itself over the life of the contract.

Suggestions For Optimizing Resources

Acquisition organizations performing SCEs routinely for multiple acquisitions can optimize the resources required for SCE implementation by assigning full-time SCE support. This option offers the greatest savings in both cost and personnel. Full-time support could take the form of ded-

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icated personnel within the organization or from a contracted organization. Dedicated support can take on two levels of involvement. Personnel can:

- Help with the source selection documentation needed to use SCE, identify team members, and coordinate their training.
- Augment the SCE teams for specific acquisitions by participating in the on-site visits.

Fully dedicated personnel, who have already gone up an SCE learning curve, should be capable of implementing local SCE policies and procedures quickly and effectively, which should reduce overall costs.

The use of full-time resources to augment a program's SCE team will insure organizational consistency in the practice of the SCE Method, and assist the training of personnel through a form of on-the-job technology transition. Utilizing at least one full-time resource will act as a significant acquisition "force multiplier" when it comes to implementing SCE in an organization.

The following approaches to cost reduction should be avoided under all circumstances because they would *not* follow the SCE Method.

- Team members untrained.
- Using Maturity Questionnaire responses alone without performing site visits.
- Accepting self assessment results in lieu of conducting site visits.

These approaches undermine the consistency, repeatability, and reliability of the SCE Method.

3.1.2 Recipient

From the recipient's view, the decision to use SCE is a given. The recipient organization will be aware of the acquisition organization's ultimate decision to use SCE. As a result, the recipient must understand what the decision to use SCE actually means to the organization. The U.S. Government has been steadfast in its support of total quality management principles and the belief that concentrating on software process improvement will pay dividends in the form of better, less costly, shortened time to customer/market software systems.

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To remain competitive on successive acquisitions, development organizations must improve their software development processes. In contract monitoring, software capability evaluation can be used to measure progress relative to the process capabilities measured during source selection, augmenting an action plan for improvement. The Government's Performance Risk Analysis Group (PRAG) can evaluate process improvement based on past performance risk assessments of the software process.

By making SCE a discriminator in conducting acquisitions, program offices will motivate contractors to focus on software process capability as a means of retaining or increasing acquisition agency business. Given the premise that product quality will follow process quality, focusing on software process improvements resulting in increased process maturity

will increase the likelihood of

- accurate estimates
- decreased variance among projects
- reduced cost and schedule targets

Although there is no definitive study validating these benefits quantitatively, there is significant anecdotal evidence from individual government and industry organizations to suggest these benefits are real. See the listing of *Case Studies of Software Process Improvement* located in Appendix F References.

A focus on improving software process capability should lead to error prevention, earlier detection of errors in the lifecycle, and an ability to manage requirements changes effectively. Improvement in processes that yield earlier detection of errors and better management of the requirements change process should save the acquisition agency money over the lifecycle of major systems.

3.1.2.1 Development Organization Resource Requirements

The costs of an SCE to the development organization are significant—though not always as high as those of the acquisition agency/organization. Considerable preparation time is expended by a company; the company is typically trying to put its best foot forward for the acqui-

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sition agency, especially if the SCE is done in conjunction with a source selection. Thus, all development organizations will perform some preparatory tasks to accommodate an SCE.

Table 3-3 provides an estimate in person-weeks. The preparation time of four person-weeks accounts for one person full-time for four weeks or two individuals working full-time for two weeks prior to the SCE site visit. Activities include identifying projects for review, getting maturity questionnaires and project profiles completed, and coordinating the site visit activities.

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Items	Time—Person Weeks
Preparation Time (4 person-weeks)	4
Site Visit Impact (1 person-week)	1
POC and Debriefing Time (3 person-weeks)	3
Total Time	**8**

Table 3-3: Example SCE-Imposed Development Organization Costs

The site visit costs are those associated with conducting individual interviews (that is, the cost of the interviewees' time). The final costs are those incurred by the offeror point of contact (POC), who supports the SCE team, coordinates activities with the company, and schedules individuals for interviews. This POC also prepares individuals before their interviews and debriefs the interviewees after each interview. These costs vary considerably from organization to organization.

Travel Expenses

Costs can increase if some contractor staff must travel to another site to accommodate an SCE. Sometimes the projects selected for the evaluation are within a product line and division that may be at different locations. While the SCE Method encourages project selection within the same geographical location, this cannot always be done because of the development organization's organizational structure. Development organization personnel traveling to accommodate an SCE will not only be spending travel funds, their SCE-associated labor costs will be greater as well. Under these circumstances, the SCE team should work with the development organization's POC to help minimize the impact on those affected projects.

The development organization's preparatory costs are significant: for a period of at least one week, the offeror's operations will be disrupted by SCE site activities, company SCE preparation, and debriefing activities. These estimated costs will change depending on the contractor, and also as contractor familiarity with the SCE process grows and preparation becomes more standardized.

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3.2 Activity 2 Develop Evaluation Plan

Table 3-4 provides an overview of this activity.

	Generic SCE	Supplier Selection SCE
Purpose	Create an artifact that will guide and define execution of the evaluation such that it is in concert with business needs and constraints.	Create a plan guiding the acquisition-specific implementation of SCE.
Actions	Develop and refine initial evaluation plan.	Develop/provide inputs for documents such as • Sources Sought Commerce Business Daily (CBD). • Source Selection Plan (SSP) • Evaluation Plan (EP) • Request for Proposal (RFP). *The following usually occur during activities 2- 4:* • definitize SCE Role in Source Selection (e.g., specific criterion, general consideration). • insert SCE language into RFP
Outcome	The sponsor and team leader agree on the planned course of action for the evaluation.	The sponsor and team leader agree on the detailed implementation of SCE in the acquisition.

Table 3-4: Develop Evaluation Plan Overview

3.2.1 Evaluator

3.2.1.1 Scheduling SCE in a Supplier Selection

This section presents the source selection process using the RFP release point as the date from which to build a source selection schedule that incorporates SCE. This information is presented from a government perspective i.e., the government is planning to use SCE teams in a specific procurement, government and its team are the evaluator. Industry users will find the information useful, but will need to tailor their evaluation planning to their individual needs. Although specific steps are not necessary from an individual contractor basis, they do provide a sequencing of activity at a level of detail useful to any company contemplating using SCE to select a development team or suppliers of software.Government contracting knowledge of the source selection schedule is critical to the development of the overall evaluation plan. The following subsections will examine the SCE schedule within a source selection before and after RFP release. Each will present a schedule of SCE-related activities showing a range of time in which the activities need to be completed, not the time to complete the activity. These schedules are approximate rather than absolute, and should be tailored

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to the acquisition's/evaluation's circumstances. Each activity on the schedule is annotated with a comment describing the activity and a number, which will be referenced in the text for further discussion of each SCE-related activity.

SCE Schedule Leading Up To RFP Release

The schedule presented in Figure 3-4 refers to the major SCE-related source selection activities that are typically accomplished before the release of the RFP. The first three activities—annotated with a "1," "2," and "3"—show start dates in the range of seven or eight months prior to the release of the RFP. Depending on the acquisition, these dates could be too close or too far from the target RFP release date.

Activity 1—SCE Implementation Planning. This is the activity discussed in Activity 1 Analyze Requirements—deciding to use SCE in an acquisition. This activity could continue until the day the proposals are received, depending upon the proposed application of SCE. Part of the activity may include inserting wording about planned SCE usage into the Commerce Business Daily (CBD) announcement. This activity starts before the formation of an SCE team.

Activities 2 and 3—Documentation. This activity involves preparing the documentation needed for the Source Selection Plan (SSP) and the RFP. These documents describe how SCE will be used for the acquisition—the former for the SSA, SSAC and SSEB, the latter for the offeror community.

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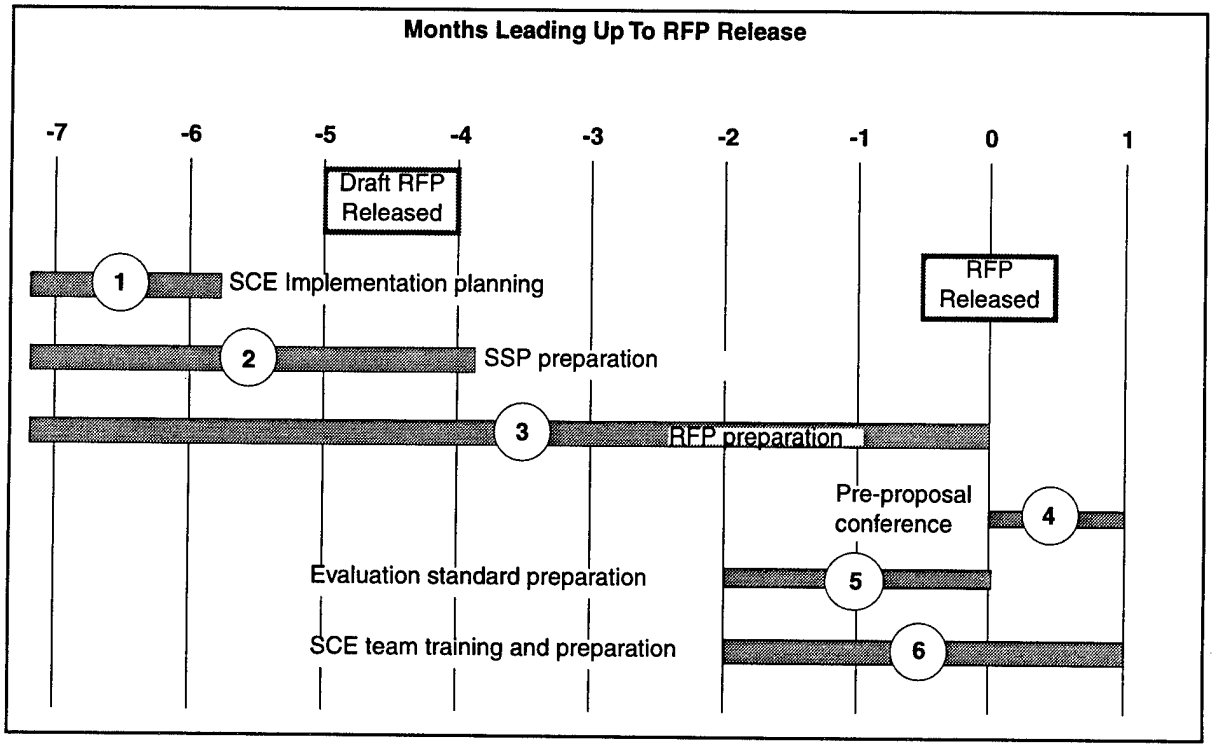

Figure 3-4: Sample SCE Schedule Leading Up To RFP Release

Activity 4—Pre-Proposal Conference. This is usually a one-day event to present the acquisition strategy, contract type, evaluation criteria, and major program milestones to prospective offerors. It is an opportunity for the offeror community to hear first-hand about the pending program and for the government to receive feedback on the program and their source selection approach. Typically, a portion of the event will be dedicated to briefing how SCE will be used, and allowing offerors to seek further guidance or explanation, if needed.

Activity 5—Evaluation Standard Preparation. This activity is one of the most important activities the SCE team leader or other individual responsible will be engaged in related to SCE. The evaluation standard will dictate to the government team how the SCE site visit strengths and weaknesses by key process area are measured and then translated into findings used in the source selection decision. Standards are not provided to the offerors. Appendix B provides examples of findings translated into source selection data.

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Activity 6—SCE Team Training and Preparation. This activity will vary in amount of work according to the experience of the team and the SCE infrastructure in place at the acquisition organization that supports the team. It is recommended that team training take place within one to two months of the actual site visits. If all members of the team have been trained, but have not worked together on an SCE, a practice SCE is recommended. All team members should have been trained in SCE by the SEI or one of its licensees.

SCE Schedule After RFP Release

Figure 3-5 on page 45 depicts a typical source selection schedule after RFP release. As with previous schedules, this one is given for illustrative purposes only.

Activity 1—Offerors Prepare Proposals. Within the acquisition organization, while offerors are preparing proposals, the month after the RFP has been released is spent preparing for SCE site visits. During this period, the SCE team should come together to prepare for the site visits, including performing team-building activities. The offerors will have received instructions in the RFP on exactly how to prepare for the possibility of SCE site visits. This will have included specifics regarding project selection, responding to the maturity questionnaire, and establishing a point of contact who will help with the logistics of the site visit.

Activity 2—Initial Evaluations. After receipt of the proposals, the technical, cost, and past performance PRAG or other evaluation teams begin their activities. The SCE team may also evaluate written proposals in software area(s). The receipt of proposals is typically the initiation of the formal preparation for on-site visits to the offerors; however, the visits themselves will not be conducted until after the competitive range determination is made. The particular circumstances of the acquisition (e.g., number of offerors, SCE team availability, competitive range determination) will dictate the exact sequence of activities that occur for the SCE team during this period of time.

Activity 3—SCE Site Visits. The SCE team will perform ➠**site visits** with all the offerors remaining in the competitive range. Precisely when the SCEs are to be conducted is largely dictated by how SCE is being used in contributing to the source selection decision as described in the SSP or evaluation plan. For instance, if the SCE results will be factored into an item or items of specific criteria, they should be conducted after receipt of responses to clarification requests (CRs) or deficiency reports

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(DRs) but before face-to-face discussions. If SCE is to be used to support PRAG (past performance) findings, then site visits can be accomplished anytime after competitive range determination but before best and final offers (BAFOs) are issued. The instance described above would be considered as part of the source selection activity, discussions, and negotiations described below. These two activities are described separately for illustrative purposes. SCE site visits can be and are conducted as separate events from the formal legal definitions of discussions and negotiations.

Activity 4—Discussions / Negotiations. This activity addresses that part of the process where CRs, DRs, and Points For Negotiation (PFNs) are communicated to the offerors within the competitive range. These tools can be used by the government to communicate SCE findings to the offerors. The government allows all remaining offerors to respond to each and then requests these offerors to submit a BAFO. The government will also begin developing "model" contracts for those offerors still within the competitive range to reflect the terms and conditions agreed upon by both parties (the government and that particular offeror). Offerors are advised that any deviation from the agreed-to terms and conditions that are not traceable from their original proposal may result in their proposal being unacceptable. This period, too, can last more or less time than depicted in Figure 3-5.

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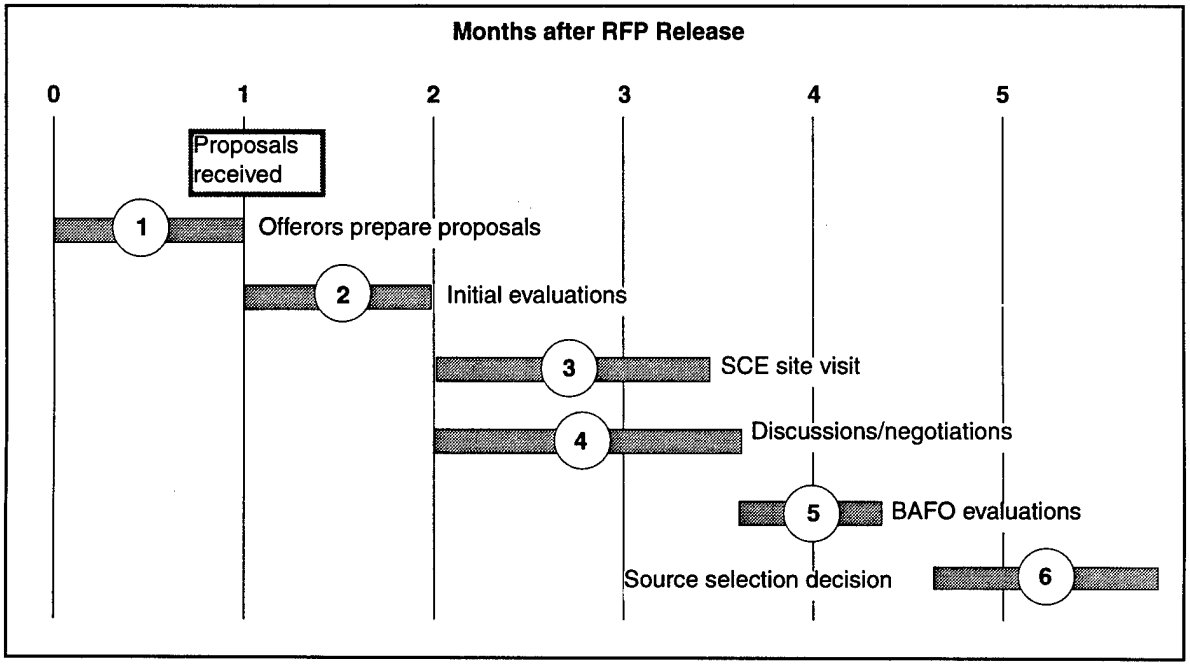

Figure 3-5: Sample SCE Schedule After RFP Release

Activity 5—BAFO Evaluations. Here, the government considers the offerors' BAFOs. This may entail significant analysis comparing the offeror's responses as to their effect upon the analysis and determinations formulated to this point. Here again the new or revised information is analyzed/evaluated against the approved evaluation standards used in evaluating the offerors initial proposal.

Activity 6—Source Selection Decision. Once all of the aforementioned activities have been completed, an award decision will be made. The SSA will have been convinced that an equitable, effective and objective evaluation of each offeror's strengths, weaknesses, and improvement activities has been made by the SSEB. The time from receipt of BAFOs to contract award can take some time as there are a considerable number of legally imposed actions that must take place before announcing an award.

3.2.1.2 Incorporating SCE into the Relevant Acquisition Documentation

The major documents related to the source selection process affected by the incorporation of SCE are discussed below. The documents examined are: CBD announcement, SSP, Pre-proposal Conference presentation, RFP, and the Evaluation Standards. A discussion accompanies

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each section describing why a particular approach was taken and contains at least one example that can be tailored to the unique needs of the acquisition.

Making the Commerce Business Daily Announcement

Figure 3-6 presents a slightly modified SCE-related portion of an actual CBD announcement. This announcement informed the potential offerors that

- SCE would be performed to identify the offeror's software process capability.
- an offeror's software process capability would be an integral part of the source selection decision.
- the government was linking quality, cost, and schedule performance directly to software process capability.
- the offeror should have an SPIP in place designed to achieve higher maturity levels of the CMM.

The message from the government is that offerors should be implementing process improvement programs to achieve higher levels of process capability and should have a program in place to be a "viable" competitor. The RFP that would follow a CBD announcement such as that shown in Figure 3-6 could reinforce this concept by requiring the submission of a SPIP as an appendix to the offerors' proposals.

The statement in the CBD, "Contractors' software process capability will be verified by analyzing KPAs through the Defined maturity level, and a demonstrable software process improvement program leading to levels of process capability higher than the current capability" makes it clear that the Defined maturity level is not a contract requirement. Rather, it is a standard by which the evaluation will be conducted, and the source selection will consider. It essentially defines the ➡**target process capability**, which is the capability the acquirer is seeking for this particular acquisition program.

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As part of <Acquisition Agency's> overall effort to improve software quality, cost, and schedule performance, the software process capability of the responding offerors will be a consideration in the source selection decision. <Acquisition Agency> will use the Software Capability Evaluation (SCE) method developed by the Software Engineering Institute (SEI) to evaluate the current software process of responding offerors (see *Capability Maturity Model for Software* (CMU/SEI-93-TR-24, February 1993). Offerors who are determined to be in the competitive range will have their software process capability verified by an SCE team. The SCE team will analyze key process areas (KPAs) through the Defined maturity level and look for a software process improvement program leading to levels of process capability higher than the current capability. A conference will be held at <time> on <date> at <where> to answer any questions.

Figure 3-6: Sample CBD Announcement

Why place SCE wording into the CBD announcement? SCE is a technique requiring significant logistical planning and preparation, and not all offerors will be familiar with its use by either the government or companies performing their own supplier selections. Describing SCE in the CBD allows the acquisition organization to provide a first glimpse of the acquisition particulars and describe specifics so industry has a better understanding of the requirements.

Placing SCE in the Source Selection Plan

The SSP outlines how the source selection will be conducted and subsequently how the award decision will be made. This document is not seen by the offerors. SCE has a relatively small impact on the production of the SSP. SCE is discussed in several places in an SSP. The following subsections address several of these.

Source Screening

In this case, the government would publish a sources-sought synopsis in the CBD requesting that interested offerors provide to the government their qualifications in any one of a number of technical areas important to the acquisition. The purpose of this activity is to produce a list of technically qualified offerors. Maturity level should not be used as a screening criterion at this stage. However, the presence of an ongoing software process improvement program could be used as a screening criterion.

Figure 3-7 provides sample wording to place SCE in the Source Screening section of the SSP. The hypothetical source selection is using Ada Software, Radar Signal Processing, and Software Engineering Capability as screening criteria. The last statement in this example communi-

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cates the organization's desire to keep assessment results out of the source selection process. The SCE team should not ask to see assessment results when on site. Many organizations' process improvement programs can be undermined by offerors trying to demonstrate to, via maturity level attainment, the government a process capability they cannot support on a new program.

3.0 Source Screening

3.1 Screening Criteria. Initial screening of potential offerors was conducted by the publication of a sources-sought synopsis in the Commerce Business Daily on <date>. The synopsis requested that interested offerors provide their qualifications in the following areas:

a. Software Engineering Capability. Knowledge of software process improvement with a verifiable program for process improvement using the Software Capability Evaluation (SCE) Method developed by the Software Engineering Institute (SEI) to evaluate the current software process of responding offerors (Capability Maturity Model (CMM) for Software, Version 1.1(CMU/SEI-93-TR-24, Feb 93) and Key Practices of the Capability Maturity Model, Version 1.1, CMU/SEI-93-TR-25, Feb 93) The offerors who are determined to be in the competitive range after initial government evaluation of proposals is completed will have their software process capability verified by an SCE team. The SCE team will evaluate key process areas (KPAs) through the Defined maturity level and look for a demonstrable software process improvement program leading to levels of process capability higher than the current capability. Do not provide software process assessment results.

b....

Figure 3-7: SCE as a Screening Criterion in the SSP

SCE as a Specific Criterion

The following example shows how to use SCE as a specific criterion. Keep in mind that this is only an example. Each application of SCE should be tailored to accommodate the unique demands of the acquisition.

Figure 3-8 provides a detailed description of how a source selection could use SCE in the source selection evaluation process.

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6.4 Evaluation Criteria

6.4.1 Assessment Criteria
a. Soundness of approach
b. Compliance with requirements

6.4.2 Specific Criteria
a. Technical Area - This area will evaluate three items (Software Engineering Capability (SEC), Technical (TECH) approach, and Management) represented here in descending order of importance:

1. Software Engineering Capability. The government will evaluate the software process by reviewing the offeror's Software Process Improvement Plan (SPIP) and by using the Software Engineering Institute- (SEI) developed Software Capability Evaluation (SCE) Method. The government will determine the software process capability by investigating the Key Process Area (KPAs) defined in the SEI Technical Reports, *Capability Maturity Model for Software, Version 1.1*(CMU/SEI-93-TR-24, February 1993) and *Key Practices of the Capability Maturity Model, Version 1.1*, (CMU/SEI-93-TR-25, February 1993). The reports contain a description of the Capability Maturity Model (CMM). The government will perform an SCE of each offeror remaining in the competitive range by reviewing current projects at the site proposing on this contract and comparing processes used on those projects in the written proposal/SPIP.

The evaluation will result in a composite, substantiated through individual interviews and reviews of documentation, of the offeror's software process on the government-selected projects. A risk assessment to compare proposed practices to current, validated practices may be performed. The evaluation team will determine findings of the offeror's strengths, weaknesses, and improvement activities in all KPAs through the Defined maturity level. Results of the SCE will not be pass/fail. Identified weaknesses will be provided in writing during subsequent discussions. The offeror will be allowed to respond to the findings with a limited number of pages of text. The on-site evaluators may be separate and distinct from the proposal evaluation team and may include a government contracting representative. All evaluators have been trained in the SCE Method.

Figure 3-8: SCE as a Specific Criterion For The SSP

In Figure 3-8, the use of SCE as a specific criterion falls under one of three items under the technical area (SEC, TECH Approach, and Management) in this case, SCE is the most important technical item. The SCE findings in this case will form the basis of an item color code and risk assessment and will be compared to an evaluation standard based on the Defined maturity level. The SCE is not pass/fail—that is, being less than Defined maturity level will not exclude an offeror from the competitive range. In this example, all offerors within the competitive range will experience an SCE site visit and be given the opportunity to respond to their evaluated software process weaknesses through DRs, CRs, and

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PFNs. Complete SCE findings (strengths, etc.) should be provided to each unsuccessful offeror during the post-award debriefings and to the winning contractor at the post-award conference.

What is presented in Figure 3-8 tracks closely with what is presented in a later section "Placing SCE in the Request for Proposal."

Presenting SCE at the Pre-Proposal Conference

The pre-proposal conference is an important opportunity for the offerors to learn the specific, detailed requirements of the contract and for the government to communicate its intentions and receive feedback from the potential offerors. The presentation consists of the following parts to guide the interaction with the prospective offerors:

- The activities that usually take place in an SCE.
- The SCE team process.
- A description of validation procedures.
- A sample of the documentation that may be looked at by the SCE team.
- A sample site visit schedule.
- The CMM and KPAs against which the team will evaluate the offerors.
- A sample of the findings the SCE team will produce before leaving the site.

Placing SCE in the RFP

This section contains the information needed to incorporate SCE into the RFP. The RFP is the document used by the government to explain to offerors:

- The government's requirements.
- Evaluation criteria.
- The mechanisms that will be employed in making the source selection decision.
- How to propose for the contract.

The examples in this section continue the approach of previous examples of having Software Engineering Capability being used as a specific criterion in the Technical area of the proposal. If the SCE findings are planned to be used as a consideration under performance risk, these examples can be easily tailored to meet such usage.

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General Language for the Request for Proposal

Regardless of how SCE is to be used in making the source selection decision, the description of its use is found in Sections L (Instructions, Conditions, and Notices to Offerors) and M (Evaluation Factors for Award) of the RFP. The example shown in Figure 3-9 closely mirrors an actual description of SCE use found in Section M of an RFP. The example begins by identifying Software Engineering Capability as an item under the technical area (specific criterion).

For this example, there were two areas of evaluation: 1) Technical and 2) Cost. The specific reference to SCE in the RFP begins by describing in general terms:

- What will be evaluated in the technical area (process capability) and the importance placed on each.
- What the technical basis of the evaluation is (the CMM KPAs).
- What the results of the evaluation will be (identify strengths, weaknesses, and risk which will also consider improvement activities by KPA).
- How the government will conduct the evaluation (select the projects to be reviewed, conduct interviews, and review documentation).

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B. Evaluation Criteria

1.0 Introduction

2.0 Basis for Contract Award

3.0 General Considerations

4.0 Assessment Criteria

4.1 Specific Criteria

4.1.1 Technical Area

a. Technical Area - This area will evaluate three items (SEC, TECH approach and Management) represented here in descending order of importance:

1. Software Engineering Capability. The government will evaluate the software process by reviewing the offeror's Software Process Improvement Plan (SPIP) and by using the Software Engineering Institute (SEI)-developed Software Capability Evaluation (SCE). The government will determine the software process capability by investigating the Key Process Area (KPAs) defined in the SEI Technical Report, *Capability Maturity Model for Software, Version 1.1*(CMU/SEI-93-TR-24, February 1993) and *Key Practices of the Capability Maturity Model, Version 1.1*, (CMU/SEI-93-TR-25, February 1993). The reports contain a description of the Capability Maturity Model (CMM) and the SEI-defined maturity levels. The government will perform an SCE of each offeror remaining in the competitive range by reviewing current projects at the site proposing on this contract and comparing methods/processes used on those projects in the written proposal/SPIP.

The evaluation will result in an organizational composite, substantiated through individual interviews and reviews of documentation, of the offeror's software process activities on the government-selected projects. A risk assessment to compare proposed practices to current, validated practices may be performed. The evaluation team will determine findings of the offeror's strengths, weaknesses, and improvement activities in all KPAs through the Defined maturity level. Results of the SCE will not be pass/fail. Identified weaknesses will be provided in writing during subsequent discussions. The offeror will be allowed to respond to the findings with a limited number of pages of text. The on-site evaluators may be separate and distinct from the proposal evaluation team and may include a government contracting representative. All evaluators have been trained in the SCE Method.

4.2 Cost/Price Area...

Figure 3-9: General RFP Language To Include SCE (Section M)

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References to Maturity Levels in the RFP

While Figure 3-9 treats the maturity level as a basis for evaluation rather than a requirement, SCE V3.0 allows the sponsor to decide whether a Maturity Level Rating will be determined by the SCE team provided necessary criteria are met. Election to determine a Maturity Level Rating should be explicit to the offerors.

Placing SCE in the Evaluation Plan

This section provides a sample of the type of information needed to incorporate SCE into the EP, and to assist in the preparation of an evaluation standard for SCE findings.

Evaluation standards must be completed before RFP release. Evaluation standards are written in a detailed manner to enhance the ability to discriminate among the offerors.

It is imperative that the SCE team leader be a member or advisor to the SSEB to work with SSEB members to apply the evaluation standard to the findings from each of the offerors.

Sample Evaluation Standard

The example presented in Table 3-5 is a sample evaluation standard for evaluating strength, weaknesses and improvement activities applied to the reference Model (CMM KPAs). This standard would be used by the SCE evaluation teams. Figure 3-10 provides an example of a streamlined evaluation standard that would reside as part of the EP. This is a detailed evaluation standard written describing the requirements for the acquisition. This implies that if the requirement is met, the standard is met, and the offeror is scored, in the case of USAF acquisitions, Green. If the standard is exceeded, the offeror is scored Blue. If the requirement is not met, depending on how near it is to being met, the offeror is scored as Yellow. A Red score denotes serious deficiencies (failure to meet requirements). The application of the color ratings to a standard should be correlated with the appropriate regulations and procurement policies affecting your acquisition. See Appendix B, SCE Implementation Examples, for a full depiction of the USAF use of colors with SCE.

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Finding	Description
Strength	A strength indicates a particular part of the software process capability that is sufficiently robust to mitigate the development risks due to the software process.
Weakness	A weakness indicates a particular part of the software process capability that has characteristics that increase the risks due to the software process.
Improvement Activity	A process improvement that is not yet institutionalized for example, a pilot program that implements a new configuration management process. It indicates potential mitigation of risk due to software process.

Table 3-5: Strength, Weakness, and Improvement Activity Guidelines

DESCRIPTION: Software Engineering Capability—The government will evaluate the offeror's organizational software process capability by:

- Performing a Software Capability Evaluation (SCE).
- Evaluating the offeror's program for software process improvement.
- Evaluating the extent to which the offeror's software process supports the goals, objectives, and requirements of the solicitation.

STANDARD- The standard is met when the offeror presents a sound, compliant approach and:

1. The findings from the SCE show that the offeror is strong or acceptable in each of the following key process areas:
   - Software Configuration Management
   - Software Quality Assurance
   - Software Subcontract Management
   - Software Project Tracking and Oversight
   - Software Project Planning
   - Requirements Management
2. The findings from the SCE show that the offeror is strong or acceptable in at least one of the following software process areas:
   - Peer Reviews
   - Intergroup Coordination
   - Software Product Engineering
   - Integrated Software Management
   - Training Program
   - Organization Process Definition
   - Organization Process Focus
3. The Software Process Improvement Plan submitted with the offeror's proposal portrays the offeror's current process capability realistically and presents a realistic plan for process improvement. The offeror's plan is consistent with the SCE findings. The SPIP outlines the offeror's plan to achieve higher maturity levels and demonstrates that the offeror understands software process improvement, both technically and in the effort required to increase and sustain higher maturity levels.

Figure 3-10: Streamlined SCE Evaluation Standard

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Maturity Level Rating

How well the offeror's observed processes satisfy the reference model (CMM) is the most important consideration the evaluation team must assess. Each Maturity Level of the CMM has an associated set of KPAs and key practices against which the offeror's observed processes are evaluated. All collected data (questionnaires, presentations, documentation reviews, and interviews) are compared to the CMM. Based upon this comparison, the SCE team must determine the degree of conformance of the offeror's processes with each of the CMM KPAs. The level of conformance to the model and the relative importance of the individual KPAs to the particular acquisition are then used to rate the offeror's processes observed as strong, acceptable or weak. General guidelines for developing a SCE CMM rating are shown in Table 3-6. Note that SCE V3.0 now has a rating baseline option. The options defined allow for the determination of a Maturity Level, the standard SCE approach of selecting model components for a deep versus broad evaluation, or selecting model components for less than full coverage. Table 3-6 is applicable to the second, middle option whereby direct determination via model coverage of a Maturity Level Rating is not feasible. Note that the application of Table 3-6 assigns an adjective rating to the KPAs of a particular Maturity Level as whole. This is not a rating whereby Maturity Level attainment has been verified.

Rating	Description
Strong	Conformance to a majority of the model criteria is strong and there are no significant areas of non-conformance.
Acceptable	Conformance to a majority of the model criteria is acceptable and there are no significant areas of non-conformance.
Weak	There are significant areas of non-conformance to the model criteria.

Table 3-6: Capability Assessment Guidelines

This section present an example of an evaluation standard which deemphasizes maturity levels while keeping with the spirit of the CMM. A Maturity Level Rating, if elected to be done and the necessary criteria met, would enable the team to summarize the current state of a particular contractor's software development processes. Trained SCE users are able to take this example and tailor it to meet the specific needs of their acquisition. Thus, SCE can contribute effectively to the source selection decision. The findings, provided to the SSEB by the SCE team,

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are a snapshot of process capability for a specific site at a particular point in time. The way those findings are used by the acquisition organization can be modified through the design of the evaluation standard.

3.2.2 Recipient

The CBD announcement depicted in Figure 3-6 on page 47 will probably be the first inkling to a development organization that the government is contemplating the use of SCE in a formal acquisition. As described, this notice gives the recipient development organization the opportunity to decide whether to bid or not bid the particular solicitation. In the situation of the more informal industry organization to organization solicitation, this may take the form of a letter or memorandum.

With a decision to bid or compete; the development organization can initiate appropriate arrangements regarding the following items for preparing for and subsequently participating in the execution of an SCE:

- Geographical site and candidate project submissions
- Conduct internal SCE to assess candidate site and projects' readiness for formal SCE
- Documentation assembly
- Traceability matrices (e.g., CMM components to company documents)
- Acquisition schedule impacts
- Project personnel availability
- Facilities preparation

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3.3 Activity 3 Select and Prepare Team

Table 3-7 provides an overview of this activity.

	Generic SCE	Supplier Selection SCE
Purpose	Have an experienced, trained team ready to execute the evaluation.	Have an experienced, trained team ready to execute the acquisition SCE.
Actions	Select and prepare the SCE team.	Select and prepare SCE personnel, with acquisition requirements in context Continue to prepare the SSP, EP, and RFP.
Outcome	An experienced, trained team is ready to execute the evaluation process.	An experienced, trained SCE team is ready to execute the acquisition SCE.

Table 3-7: Select and Prepare Team Overview

3.3.1 Evaluator

3.3.1.1 Selecting the SCE Team

Selecting qualified, experienced software acquisition personnel to serve as SCE team members is one of the most difficult and important tasks a program or software manager may do in the course of implementing SCE in an acquisition. The key considerations for assembling an SCE team are:

- Individual experience.
- Team skills and experience.
- Individual interpersonal skills.
- Team leadership skills, team building activities, and team staffing.

Individual Experience

SCE team members should be selected from the most experienced people available. The most successful teams will be those that average at least ten years of appropriate development or management (acquisition) experience across the team. At least one member of the team should have source selection experience. (In the case of commercial applications, one team member should be experienced in the company's policies and procedures for selecting suppliers, subcontractors or teaming partners.)This is important because what can and cannot be done during

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a source selection is different from what is permissible after award. An acceptable spread of experience levels that have been found to be successful in an SCE team is

- At least one or two senior personnel (more than ten years appropriate experience).
- Two or three mid-level personnel (eight to ten years appropriate experience) and ideally, participation in at least one SCE as team members.
- One junior person (five years appropriate experience). Note: This is a recommended minimum. Junior personnel typically will not have the background to understand certain aspects of software processes they will observe. No team member should have less than five years of professional experience.

Team Skills and Experience

The background of SCE team members should strike a balance among software technical, software management, and software acquisition experience. They should, as a minimum, share a mix of knowledge and experience in the following disciplines:

- Acquisition policies and procedures (particularly source selection procedures or company specific acquisition policy and procedures)
- Project management and planning
- Software configuration management
- Software design, development, and methodologies
- Software quality assurance
- Systems engineering
- Technical requirements of the contract
- Testing
- Application domain, e.g., Avionics, Missiles, C3I, MIS, databases.

In general, expertise will be necessary from at least one team member in each of the key process areas to be investigated. Certain areas may be stressed over others depending on the acquisition.

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Interpersonal Skills

SCE team members must be "team players." Conducting SCEs requires professional judgement and team consensus—attributes that are necessary to work effectively in an SCE team are patience and perseverance. Past experience has demonstrated that if team members lack interpersonal skills—essential to fostering good, open communications between team members and the contractors—the team is less effective, less credible, and less motivated to fulfill the SCE objectives. The ability to communicate with the contractor and other team members is the essence of SCE teamwork.

Team Leadership Skills

Experience shows that an effective team leader is critical to the operation of the team. The team leader:

- Ensures that the team meets its schedule and objectives, encourages teamwork and consensus building.
- Is the SCE team focal point for both the acquisition office and the contractors (planning, scheduling, communicating).
- Should have enough basic leadership skills to ensure that the team functions effectively.

The team leader should be the most qualified, based on knowledge, experience, and amount of direct SCE site visit experience. Occasionally, teams can break down when an inappropriate team leader is appointed. Program office management should be on guard to prevent this from happening. Previous SCE experience should be a criterion for assignment as an SCE team leader. New SCE team leaders should have participated on at least two SCEs as a team member before assuming a leadership role. This experience of participating on SCEs will prepare the new leader to understand the SCE team process, team dynamics, and contractor sensitivities.

Team-Building Activities

An essential aspect of preparing a team to conduct an SCE is performing team-building activities before going on site. Assume the SCE team has never worked together: an activity that would help bring the individual members together as a team could be an exercise whereby a simple task is assigned and discussed. For example, each team member would interview the person to his or her right at a table or in a room. The task of the interviewer is to learn the person's background, interests, and

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area of expertise. Each team member would then introduce and briefly state the results of their interview. The team could then identify its relative background expertise areas to the evaluation task they are being asked to perform. For reference, Appendix E of this guide contains three references, [Bucholz 87], [Denton 89], [Kelly 91], that contain more on teams and team-building activities. These exercises will help determine how the team members work together. Often, many months may pass after teams have completed SCE team training and before they conduct site visits. The team building activities are important for the team members to re-acquaint themselves as a single operating entity able to reach consensus effectively. There may be times when trained individuals are brought together who have not completed training together. In this scenario, team building is crucial, since they have not operated as a team before.

The success of the SCE team hinges on its ability to identify and reach consensus on the strengths and weaknesses of a contractor's observed processes. An SCE team is neither an autocracy, where the leader dictates what decisions are made, nor a democracy, where the team votes and the majority prevails. Instead, the decisions are reached by team consensus, meaning all members agree to the findings, and there is no significant minority dissent on issues. If consensus on an issue cannot be reached, then there is no finding in that area. This is where team-building activities will pay large dividends.

Team Staffing

Staffing the team is another issue for consideration. Creating a "software center of excellence" is an excellent mechanism for building a core of individuals who are highly skilled in conducting SCE.

Program Offices or companies (development organizations) performing routine software process improvement will normally draw SCE-trained personnel from within their own organization. If this pool does not have enough individuals, a request to the central organization would then be made to assist in identifying team members. In this manner, the program offices or development organizations can take advantage of key components mentioned above under individual and team skills. This alternative makes better use of limited software skilled resources while ensuring that the program office acquisition expertise, knowledge of the product type and contractor base, and "domain" knowledge of the product to be acquired is present on the team. Furthermore, the "in house" resources

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will become valuable assets to the organization as they gain more experience conducting evaluations for multiple supplier selections in different programs.

3.3.1.2 Training the SCE Team

Training, preparation, and experience separates good SCE teams from poor ones. There are three levels of training needed before an individual should be considered fully qualified to conduct SCEs:

- Preparation
- Coursework
- Experience

Preparation

The preparatory stage consists of on-the-job experience, prior training, and professional reading. It is recommended that SCE team members take courses in team work, assertiveness training, and total quality management. Watts Humphrey's book, *Managing the Software Process* [Humphrey 89] and the latest release of the CMM [Paulk 93a] are two essential readings that are provided to participants of the evaluation team training course. Participation in the one-day Software Process Improvement Overview Seminar or SCE Refresher Training are also beneficial background to prepare team members.

Course Work

SCE team training consists of a multi-day, case-study-oriented course that all SCE team members must successfully complete. This course is intended for experienced personnel who have been selected to exercise the SCE Method. It provides the knowledge and reinforces the skills required to conduct SCEs effectively, and helps the group develop into a cohesive team. A sampling of course content follows:

- Team-building exercises
- Preparing for the site visit
- Conducting interviews
- Reviewing documents
- Validating observations
- Developing and presenting findings

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SCE teams need effective communicators willing to take on different roles (e.g., facilitator, recorder, interviewer, timekeeper), as demanded by the dynamics of the team and constraints of the acquisition. The SCE team needs to know how to evaluate the contractor in relation to the CMM, so a working understanding of the CMM is required. Teams are taught that processes implemented are to a large degree dependent on several non-process variables such as management commitment, and the ability to perform the given tasks. It takes experience to understand these relationships and exercise professional judgement, which is why the team characteristics and profile are crucial in addition to the course-work. Roles taken on by team members to accomplish the site visit include the following:

- Team Leader: manages process, keeps to agenda, guarantees deadlines and deliverables
- Facilitator: sustains team spirit, moves team toward consensus, and encourages participation
- Recorder: captures information, does not editorialize, and lists documents to be reviewed
- Reference Model Component Monitor (e.g., CMM KPA Monitor)
- Participant: assists other team members and carries out assigned tasks
- Timekeeper (monitors elapsed time, particularly during interviews)

Experience

Every graduate of the SCE training program should be a member rather than a leader of an SCE team for at least two SCEs. Junior- and mid-level personnel should take part in at least three SCEs before being considered for the team leadership role. Resource demands and time constraints, however, may prevent this from happening. When working under such constraints, it is recommended that the program office send the team to practice an SCE on a volunteer organizational office before beginning the source selection. One acquisition team practiced doing SCEs on at least three occasions to insure personnel were highly trained for the source selection.

The common denominators in discussions with individuals returning from their first SCE is their desire for more team training, preparation, and time to conduct the interviews. SCE activities are not radically different from those done in the program office on a day-to-day basis. Taken

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together, however, they are group activities requiring significant practice and preparation. Practicing as a group will reveal individuals' strengths and weaknesses, depth of required preparation, and how to manage the SCE process to capitalize on the team's strengths so that more effective and timely SCEs are conducted.

3.3.2 Recipient

Analogous to the considerations and activities that are part of the evaluation team's selection and preparation, the development organization should take stock of the personnel the SCE team is likely to interview and interact with during the onsite period. In like manner the development organization should consider the background and degree of involved personnel's:

- software experience
- interpersonal skills
- SCE and CMM knowledge
- policies, procedures, artifact familiarity

The development organization similarly must assess the degree of support it will provide its point of contact for the SCE. This includes administrative, financial, and managerial. This is particularly crucial where more than one geographical site, teaming partners, and or subcontractors are involved. Programmatic issues such as which geographical site the SCE team will actually visit, how the other geographically separated project sites, the teaming partner or subcontractor are to provide documentation for the SCE team, and security for provided documentation and data, disruption of ongoing projects etc. must be accounted for.

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3.4 Activity 4 Obtain Organization Information

Table 3-8 provides an overview of this activity.

	Generic SCE	Supplier Selection SCE
Purpose	Obtain information from the organization that allows the team to refine the plan and focus the investigation in subsequent activities.	Obtain information from the organization that allows the team to refine the plan and focus the investigation in concert with the acquisition activities.
Actions		RFP issued. SCE specific information is requested and delineated via RFP.
Outcome	Development organization information is obtained by which the team can finalize its evaluation focus, priorities, and logistics.	Same as generic SCE.

Table 3-8: Obtain Organization Information Overview

3.4.1 Evaluator

This is the third of four activities that make up the General Preparation major activity grouping. With Activity 4, obtaining organizational information begins to define the field of development organizations bidding or offering to execute the contract that is being solicited. The solicitation or RFP defines the field of action. The respondents to the solicitation become the players, and it is the solicitation sponsor's responsibility to maintain a fair and equitable evaluation or "level playing field." The discussion that follows provides typical, generic guidance and examples of a government acquisition agency's communication with the contractor community through the RFP.

3.4.1.1 Information Requested

The term "offeror" is used to denote organizations that are bidding on the solicitation. In the instance of a development organization using SCE to select, team, or subcontract an analogous term such as bidder, respondent (e.g., to memorandum for services sought) etc. could equally be substituted. The context of the discussion is unchanged. This SCE method activity remains the same regardless of the actual participants. The degree of formality with which the information is requested and submitted differentiates the application.

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The following proposed project information may be required:

- ➡**Maturity questionnaire**
- Proposed ➡**product profile**
- Annotated organizational chart (including relationship of proposed product project to the organization and also projects which show evidence of use; including description of organizational responsibilities)
- Draft SDP

Evidence of use matrix (mapping of documentation against reference model (e.g., CMM) and against proposed process documentation).

Requests for organizational information is in the form of the RFP in source selection, and is constrained by those acquisition rules.

3.4.1.2 Incorporating SCE-Related Items into the Instructions for Proposal Preparation (IFPP)

The Instructions for Proposal Preparation (IFPP, Section L) portion of the RFP informs the offerors how to prepare their proposals and comply with the source selection process. The portion of the IFPP that addresses SCE is divided into five distinct pieces:

- Organizing the SCE-related information into a separate appendix.
- Completing the Maturity Questionnaire Recording Forms (Figure 3-11).
- Completing the Product Profiles (Figure 3-12).
- Submitting the SPIP Figure 3-13.
- General SCE instructions (Figure 3-14).

Organizing SCE-Related Information into an Appendix

Each acquisition must determine the best way for their program to instruct offerors to organize their proposals. The goal is to ease proposal evaluations and obtain concise information wanted, and not to impose a burden on the offerors. Work with the government PCO or the organization's contracts/legal division to determine what is best for the acquisition and program. If it is desired that the SCE information be excluded from a technical page limit, offerors could be directed to place this information in a separate appendix.

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Completing Maturity Questionnaire Recording Forms

One of the more important SCE-related items in the IFPP is the language shown in Figure 3-11 describing how the Maturity Questionnaire Recording Forms are to be completed. The offeror is told to select eight ongoing development efforts that best correlate to the future work under the government's proposed contract, using characteristics such as application domain, software size, development language, etc. to make the best matches.

3.0 **Volume X - Technical Proposal**

3.1 **General Instructions** The Technical Proposal shall consist of the Executive Summary and <n> separate sections...

3.2 **Executive Summary**...

3.3 **Specific Instructions**...

3.3.1 **Section I - Software Engineering Capability** The offeror will provide the following information to assist the government's preparation for the Software Capability Evaluation of each offeror:

a. The offeror will complete the SEI Maturity Questionnaire (MQ) (current version) using the Recording Form for eight current projects at the site proposing on this solicitation (a project is acceptable only if it has been completed in the last year). The offeror should select those projects that best match the engineering requirements of this contract. For offerors with fewer than eight current projects at the proposing site, submit MQ responses for as many projects as are available. For each "yes" response, please note on the comment line the mechanism or documentation justifying the response. The MQ can be found in Atch XXX of the IFPP. The completed Recording Forms will be submitted with the proposal. For all responses, please note at the start of the comment line the degree of implementation of each practice using a letter identifier from the following legend:

A - Not implemented at this time.
B - Not implemented at this time, but desired.
C - Currently planning to implement. See improvement plan.
D - In the process of implementing.
E - Implemented with less than a year's experience.
F - Implemented on a project-by-project basis.
G - Implemented organizationally.
H - Not appropriate for our organization.

Figure 3-11: Instructions For Completing SEI Maturity Questionnaire

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Using the legend in Figure 3-11, the offeror must characterize the state of institutionalization of each practice. To verify each response, the offeror must cite documentation that defines each practice it has characterized. By getting this information from offerors, the SCE team will know more about what to look for to verify a particular software practice, and the offeror's view of the extent to which a practice is implemented; this will help focus on-site activities (e.g., interviews).

The SCE team wants to identify and separate software practices that are institutionalized (implemented organizationally) from those that are implemented only on a single project. The questionnaire should be attached to the RFP so that there is no confusion over which questionnaire the offeror is required to complete (*A Method for Assessing the Software Engineering Capability of Contractors* [Humphrey 87b] or the *Software Process Maturity Questionnaire, Capability Maturity Model, version 1.1* (April 1994).

Instructing Offerors to Complete Product Profiles

Figure 3-12 directs the offeror to complete a Product Profile for each of the projects selected on the Recording Form. The Product Profile provides information such as: size of the organization, application domain, product type, development team approach, development language(s), type of system, location of development, major subcontractors, and the program's current phase(s) of development. See [Byrnes 96] for a complete description of the product profile.This information helps the government to select projects for evaluation. A Product Profile template should also be included as an attachment to the IFPP.

3.31 (continued)

b. For the proposed effort and for each project, the offeror will complete a Product Profile, attach it to the respective Assessment Recording Form, and submit it with the proposal. The Product Profile template can also be found in Atch XXX of the IFPP. This document shall be no greater than one page per project and one page for the proposed effort.

Figure 3-12: Instructions For Completing Product Profiles

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Submitting the Software Process Improvement Plan

Figure 3-13 addresses the SPIP the offerors submit with their proposals. In the example provided, the offeror could not exceed 15 pages of text. This was an arbitrary limit intended to minimize the effort required by the offerors and the government during the source selection process. The government did not want the offerors to develop an SPIP for the acquisition; rather, they wanted to see plans that were already in place.

3.31 (continued)

c. The offeror will submit the proposing site's Software Process Improvement Plan (SPIP), in the format of their choosing, with the proposal. The document will be no more than 15 pages. The SPIP should communicate the offeror's current software process capability as well as their desired maturity level, specific planned improvements, dedicated resources, effort estimates, and a time phasing of those improvements to bring the offeror's software process capability to the organization's desired maturity level.

Figure 3-13: Instructions For Submitting the Software Process Improvement Plan (SPIP)

General SCE Instructions

The last set of instructions for the IFPP, found in Figure 3-14, informs the offeror of various SCE-related details that will facilitate a smoothly run SCE with minimal impact on the offeror's organization.

An Offeror Point of Contact is needed so that the SCE team leader may coordinate all activities, both before and during the SCE. Note that the offeror will be notified ten working days in advance of the site visit which projects will be evaluated. There are two reasons for this. First, this will give all the offerors the same number of days to prepare for the SCE. Second, because many organizations go to great lengths to prepare for an SCE, giving ten working days' notice will limit them from expending valuable resources and time on activities that will have little or no impact on the SCE findings.

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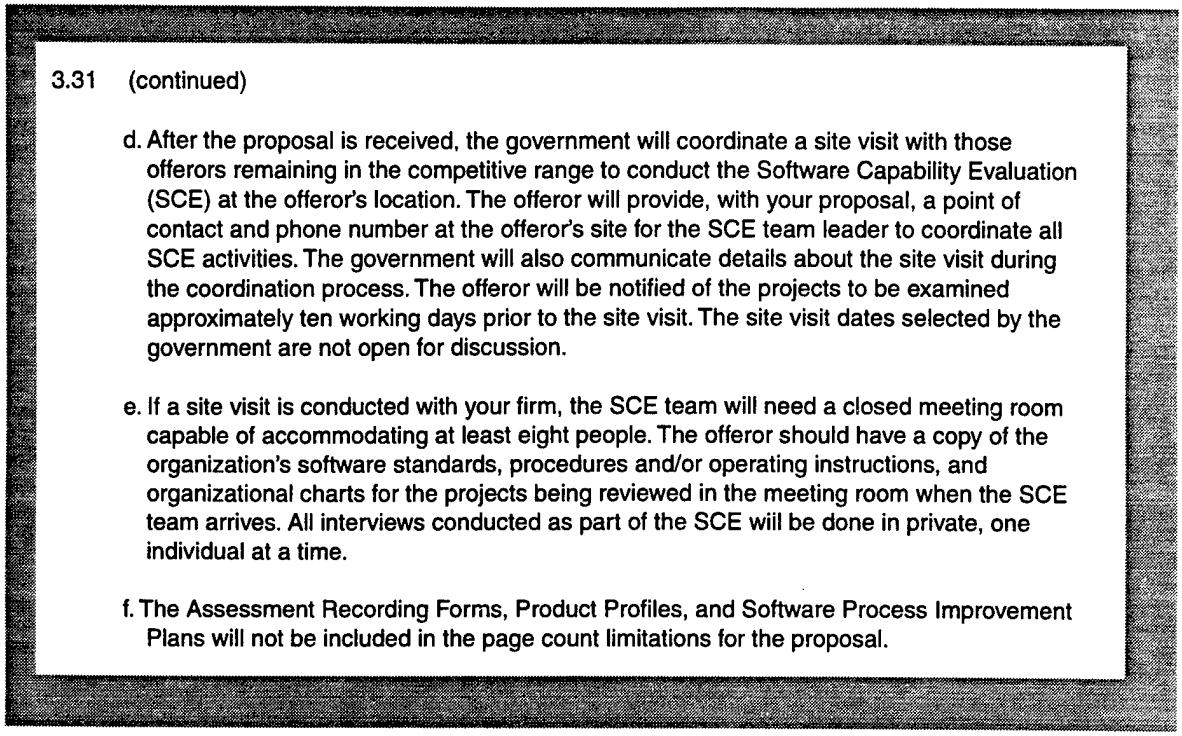

3.31 (continued)

d. After the proposal is received, the government will coordinate a site visit with those offerors remaining in the competitive range to conduct the Software Capability Evaluation (SCE) at the offeror's location. The offeror will provide, with your proposal, a point of contact and phone number at the offeror's site for the SCE team leader to coordinate all SCE activities. The government will also communicate details about the site visit during the coordination process. The offeror will be notified of the projects to be examined approximately ten working days prior to the site visit. The site visit dates selected by the government are not open for discussion.

e. If a site visit is conducted with your firm, the SCE team will need a closed meeting room capable of accommodating at least eight people. The offeror should have a copy of the organization's software standards, procedures and/or operating instructions, and organizational charts for the projects being reviewed in the meeting room when the SCE team arrives. All interviews conducted as part of the SCE will be done in private, one individual at a time.

f. The Assessment Recording Forms, Product Profiles, and Software Process Improvement Plans will not be included in the page count limitations for the proposal.

Figure 3-14: Instructions For Site Visit Coordination

Facilities and Information

The items needed by the team at the site visit are mentioned in this section (Figure 3-14).This information needs to be provided here to set expectations and ensure that the offeror is reasonably well prepared. The SCE team must maintain the confidentiality of interviews or the entire SCE process could be undermined. All data collected during the site visit will become part of the source selection file and will be maintained on all offerors until the contract is closed out.

Offeror Exit Briefing

The PCO will be the final arbiter in determining how the findings will be provided to the offerors. However, any outbriefing must advise the offeror that this may not completely resolve all issues regarding the SCE. It is important for all the offerors to realize that they have the right to and must specifically request a debriefing of the SCE findings. Debriefing the findings achieves two important goals. First, in a Total Quality Management (TQM) approach, the government desires buy-in from the offerors regarding the results, and is seeking to motivate the offerors to improve their capability. Second, the government has the opportunity for direct feedback regarding the conduct of the SCE from the offeror's perspective. This feedback can be used to refine the procedures and instructions for future acquisitions.

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Page Limitations

In most RFPs, there is a limit to the number of pages an offeror may use in the preparation of their proposal. The example provided here had such a requirement. Consequently, when the IFPP required submittal of Assessment Recording Forms, Product Profiles, and an SPIP, these document pages were excluded from the proposal page count to ensure they did not detract from the technical content of the proposal subject to the page limitations. This is an administrative detail that will allow page counts to be focused on the technical approach.

This section presented the essential elements needed to accommodate SCE in an RFP. These references should be tailored by the organization to meet the specific needs of the acquisition. The examples in the figures presented can be changed to accommodate the usage of the SCE findings as a consideration under performance risk or a variation of the specific criterion example presented here.

3.4.2 Recipient

The discussion above provides an insight into the roles and activities an SCE team plays in RFP generation. However, the overall impact of explicit instructions depicted must be assessed by the development organization expecting to undergo an SCE. Organizations that have not embarked upon a software process improvement program or have never undergone an SCE have learned that RFP release is not the time to begin. It will generally be too late to show any substantive progress and their presentation to the SCE team in the form of interview responses and documentation may be less than desired.

Third-Party SCEs

Of note is a recent trend toward third-party SCEs. On two proposed solicitations, a government agency has requested that bidding development organizations submit basic information regarding their experience of having undergone an SCE:

- SCE conducted by trained (SEI or SEI Licensee) team
- SCE conducted involving programs or projects which will be responsible for new contract work
- Name of evaluated corporation, division, projects
- Dates and location(s) of onsite portion of SCE
- Identification of organization POC and SCE team leader and organization performing SCE.

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In one instance, it appears that the agency is qualifying organizations by potentially accepting the SCE data already collected or by performing an additional SCE. In another instance, it appears the agency is attempting to enable itself to use SCE data that has been determined in the recent past (one year) for current source selection applicability.

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3.5 Activity 5 Analyze Instrument Data

Table 3-9 provides an overview of this activity.

	Generic SCE	Supplier Selection SCE
Purpose	Identify issue areas for further investigation during evaluation conduct, and to get a preliminary understanding of the organization's operations.	Same as Generic SCE with acquisition context.
Actions	Receive, summarize, and analyze instrument data. Develope profile(s) analyses.	Receipt of instrument data normally accompanies proposal receipt. Evaluation of proposals initiated. Competitive Range Determination. Offerors SCE information analyzed for establishing "general" prioritization of reference model components for all offerors.
Outcome	The team has a high level understanding of the site's operations.	The team has a high level understanding of the all the offeror's site operations.

Table 3-9: Analyze Instrument Data Overview

3.5.1 Evaluator

3.5.1.1 Maturity Questionnaire

"Instrument," in the context of SCE, is a data-collection mechanism. What distinguishes instruments from other data collection mechanisms are the formal, written nature of the information request and the fact the organization has some time to research and prepare the response. The primary instrument used by SCE is the SEI Maturity Questionnaire. The CMM-based maturity questionnaire is a highly structured instrument that was formally developed by the SEI and is rigidly validated and re-validated through empirical methods research. This allows a level of comparability and reliability beyond that of other instruments.

3.5.1.2 Site Information Packet

The other instruments SCE uses are the Product Profiles and the Site Information packet (SIP). Nominally the instructions contained in the solicitation (RFP) as depicted in the previous section dictate the content and format for completion and return of these instruments. Specification in the instructions for the Product Profile for the "proposed work" of the acquisition can be expected. This Product Profile will be compared to the sponsoring organization's (e.g., government) "profile of the product" to

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be acquired. The profile template attributes are identical and whether a Product Profile is "proposed" or of a current existing product being developed by a project depends upon the organization creating the profile and for what purpose (e.g., source selection, contract monitoring, internal evaluation).

The primary use of these instruments is to guide the data collection efforts of the SCE team. The SCE method calls for analysis in detail of the maturity questionnaire and use of the Product Profiles and SIP in planning and execution of the overall data collection effort.

Summarization of maturity questionnaire responses is an activity of no light consequence. Depending upon the number of the respondents; summarization could be simple manual tabulation or require automated support to provide timely information for use by the team. The maturity questionnaire is designed to be processed both manually and by automated means.

A recommended item for the SIP is a glossary of organizational terminology that has been specifically translated with the CMM in mind. The SCE team must recognize that terminology may appear identical, but have wholly different meanings and applications in different organizations.

A typical example is the CMM term "peer reviews." Although this is Key Process Area unto itself and encompasses the generalized activities of checking one person's or group's work in a formal or informal manner, in some organizations this term has been found to mean a highly structured personnel performance review. Alternatively, many organizations typically carry out the activities described in the CMM Peer Review KPA as "Inspections."

Note: Following the formal proposal submission due date, the SSEB's first task is to perform an initial evaluation and determine the "the proposal's responsiveness" to the solicitation's requirements. This essentially means that proposals are checked for compliance with the solicitation's (RFP's) instructions and an initial evaluation of whether the proposals are viable in meeting overall requirements and warrant further evaluation. This analysis effectively supplies the SSEB the information for establishing the competitive range. Some or none of the proposal offerors may be eliminated. This is not normally communicated to the offerors. Only offeror's whose proposals are deemed "non-responsive," and judged as not being able to become responsive in a timely manner, and are eliminated would receive notification of this event. Establishing

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the competitive range ultimately defines the number of site visits an SCE team will need to accommodate in a government source selection. In the commercial environment an analogous event would occur with much less formality.

3.5.2 Recipient

It is incumbent upon the recipient organization to complete the "instrument" requested information as accurately as is feasible. Recognize that this information is the "First Impression" that the SCE team will have of the organization it will be evaluating. The "picture" conveyed through the SIP and the MQ should be organizationally clear and coherent as is possible. Close adherence to the instructions and terminology definitions provided with the MQ will provide more accurate understanding of the correct manner to respond as well as the type of comments to add. The better the SCE team is able to grasp and understand the organizational structure and relationships the more meaningful the MQ data will become and the more accurately their data collection activities will focus on those issues that are germane to the solicitation.

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3.6 Activity 6 Select and Prepare Participants

Table 3-10 provides an overview of this activity.

	Generic SCE	Supplier Selection SCE
Purpose	Ensure the most appropriate personnel participate in the evaluation, and ensure that they understand the evaluation process and shared expectations.	Ensure that the most representative personnel, projects and sites relative to the proposed effort for the acquisition are investigated and the evaluation is appropriately focused for each offer's site.
Actions	Select sites to conduct evaluation, select projects to investigate, select participants and prepare and conduct initial briefing.	Evaluation of Proposals continues. Offerors projects are selected to undergo SCE. Specific preparation for individual offerors initiated. Logistical coordination initiated.
Outcome	Site participants understand the evaluation process and are ready to take part.	The SCE team has formulated an initial interview strategy, schedule and entry briefing for each offeror site.

Table 3-10: Select and Prepare Participants Overview

3.6.1 Evaluator:

Activity 6 (Select and Prepare Participants) and Activity 7 (Prepare for Data Collection) compose the Major Activity Grouping: Specific Preparation. These activities refine the preparation activities to a particular development organization's site. The purpose of these two activities in the Specific Preparation grouping is to prepare the SCE team for a specific site visit. Activity 6 identifies the specific organizational sites(s), project(s) and participants in the appraisal. A schedule and set of briefings describing the appraisal activities will be prepared and delivered. Activity 7 (Prepare for Data Collection) prioritizes topic areas, creates an interview strategy in consonance with the overall data collection effort and finalizes all logistical arrangements.

For acquisition, one of the essential considerations at this point is to anticipate teaming arrangements of the various offerors. These arrangements will have a bearing on actual projects and personnel selected to participate in the SCE.

3.6.1.1 Teaming Arrangements

The SCE method is designed to handle a wide range of organizational possibilities that offerors propose. Current practice on most software systems range from the simplest cases where a single, localized organization develops all the software to the most complex cases where mul-

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tiple contractors, in some interrelationship, participate in the development and integration of the software during the specified life of the contract.This section illustrates representative cases of teaming, partnering, and subcontracting, and recommends how the SCE method might be applied to each one. It should be noted that, for a given procurement, different offerors may propose different organizational arrangements. Thus, the approaches outlined below may have to be tailored and combined for application to a given source selection. For all situations, several key ground rules should be observed:

- All major software developers should be evaluated.
- Questions about unique or different processes should be answered individually by the participants.
- Even when an offeror proposes common processes, evidence should be provided by individual organizations.

Single Organization as a Single Team

In this scenario, the software is developed and integrated by a single contractor, within a single organization, and at a single site. The SCE is applied to this single organization.

Multiple Organizations as a Single Team

In this scenario, the software is developed and integrated by multiple contractors, within multiple organizations, and possibly at multiple sites. The various parties are highly merged as a team, and the contractors, organizations, and sites are all known at the time of the source selection. In this case, the SCE is applied to the whole team. The focus must be on how the team, as a cohesive unit, plans to do business, rather than on the specific individual capabilities of the various team participants. Typically, a single set of data is collected and the site is at a single location chosen by the contractor team. If the particular teaming arrangement is new, there may be no historical data on how well the combined team capabilities work. Therefore, evidence must be collected from the various team participants, and the evaluation by the SCE team will require considerable engineering judgement. As is in all cases where detailed, applicable evidence is not readily available, the offerors must be able to demonstrate why their selected approach was chosen among the alternatives.

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Single Integrator and Developer with Suppliers or Vendors

In this scenario, the major items of software are developed and integrated by a single contractor or team, but specific, relatively minor or localized items may be acquired from suppliers or vendors. The developing and integrating contractor or team is known at the time of the source selection, but some suppliers and typically all of the vendors are selected by the lead team at some later time. For this case, the SCE should be applied to the contractor or team as it is known at the time of the source selection. In addition, special emphasis must be placed on evaluating how the suppliers or vendors will be selected and on how their processes and products will be integrated into the mainline effort. For example, the lead contractor team might use the technical information of the SCE method (without the government source selection-specific items) to conduct pre-selection evaluation of its suppliers. Alternatively, the items acquired may be purchased essentially "off the shelf," and detailed evaluation of the vendor's development capability would not be cost effective.

Prime/Integrator with Multiple Subcontractors

In this scenario, the prime contractor performs the integration function, and possibly some of the development, but major portions of the software are developed by subcontractors. Some of the subcontractors may be known at the time of the source selection and some may be scheduled for later selection.The known subcontractors may be organized to work closely with the prime contractor as team participants or may plan to work somewhat independently. Some aspects of this case are analogous to the other cases described above and should be dealt with as outlined in those descriptions. However, there is a new possibility in this arrangement not covered by the previous descriptions: the known subcontractors may not be highly merged into the lead team.In this case, it is recommended that separate sets of data, focused on the technical and managerial content of their assigned portion of the whole, be obtained from each of the team participants. Separate site visits are also recommended for each site or organization involved. Arrangements for performing site visits with subcontractors must be made through the prime contractor. The prime contractor is legally entitled to be involved and must be invited to the site visit and allowed to participate in the interaction with the subcontractor. However, the prime contractor representative is not a member of the SCE team and cannot be allowed to participate in the preparation of results or in making judgements relative to the source selection.

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For teaming arrangements in which subcontractors will be developing relatively minor or localized portions of the software, it may be appropriate for the prime contractor to invite the subcontractors to participate in the site visit to the prime, in lieu of site visits to each the subcontractors. In this case, the prime contractor may wish to organize the agenda in such a way that the subcontractors can participate in the portions that are relevant to them and then be excused from proceedings that do not involve them or that may cover items that are considered proprietary to the prime contractor.

3.6.1.2 Entry Briefing

An Initial Briefing should be prepared. This briefing is used to set the offeror's expectations for the site visit. At a minimum the briefing should

- introduce the SCE team members
- delineate the on-site schedule
- describe whether findings or results will be debriefed
- set any operating rules for interviewing and document review

3.6.2 Recipient

The various alternatives outlined in the above section necessitate the offeror to clearly communicate what interrelationships exist and how the "offeror's team's" processes will facilitate successful execution of the contract if awarded. Teaming, subcontracting relationships that are incomplete and result in the offeror team being able to present incomplete data and information will correspondingly be evaluated as having incomplete processes and procedures resulting in substantial risk to the agency/organization soliciting for products and services. The engineering adage "Up Front and Early" is most appropriate in competing for contracts involving teaming, subcontracting relationships.

At a lower level of detail, the actual participants expected to be interviewed should represent the most experienced and knowledgeable individuals for their respective areas. This environment can become particularly complicated depending upon the actual situation that is expected to exist, single site, teaming, subcontractors etc. Accommodating the appraisal must be balanced with necessary logistics and resources required to bring appropriate personnel and documentation to the appraisal site versus the appraisal team visiting multiple offeror development sites.

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Preparation of participants should include at a minimum:

- identification of each participant's role, e.g.,:
  - practitioner
  - functional area representative
  - technical lead
  - program/project manager
  - software manager
- a background briefing on the SCE appraisal method and its activities
- identification of documentation appropriate for participants to be familiar with

Attendance of all participants at the Initial Briefing for the SCE Team at the beginning of the on-site period should be mandatory.

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3.7 Activity 7 Prepare for Data Collection

Table 3-11 provides an overview of this activity.

	Generic SCE	Supplier Selection SCE
Purpose	Plan the detailed site intervention to make optimum use of available site visit time to attain evaluation goals and objectives.	Plan the detailed site investigation for each offeror site to make optimum use of available site visit time to attain evaluation goals and objectives.
Actions	Prioritize Focus Areas, refining final interview, document review strategies and appraisal team roles and responsibilities.	Evaluation of Proposals continues. Prioritization of Reference Model components and data collection strategy for onsite completed. Logistical coordination finalized.
Outcome	The team has finalized all plans and logistics and is ready to conduct the site visit.	Same as Generic SCE.

Table 3-11: Prepare for Data Collection Overview

3.7.1 Evaluator

This is the second of two activities in the major activity grouping: Specific Preparation.

The primary action for this activity centers on prioritization of the reference model components ➡**process areas** (in the case of the CMM, the process areas are the KPAs) and results in the identification of ➡**topics** for each of the KPA goals of the Target Process Capability identified in Activity 1.

Prepare for Data Collection activity refines the information planned, analyzed and delineated into discrete schedules for onsite interview and document review i.e., develop a data collection plan. The data received from the offerors in Activity 5 (General Preparation) and Activity 6 (Specific Preparation) is focused upon the individual sites to be evaluated.

3.7.1.1 Develop Data Collection Plan

With this activity, discrete interview strategies that identify exactly who will be interviewed in what sequence and what is expected to be gained are developed.

Similarly, discrete document review strategies are also developed. This effort normally culminates in lists of documents to be immediately available for their arrival onsite (Initial Document Review) and a listing of the documents and/or artifacts to be solicited during the interview sched-

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ules. The document review strategy will typically request organizational /project polices, standards, procedures, directives, and project specific artifacts (e.g., minutes of meetings, test case logs, trouble reports).

SCE team roles (e.g., librarian, timekeeper, KPA monitor/mini-teams) are firmed up and schedules communicated to the offeror's site POC.

Remember that the SCE activities are not necessarily sequential in execution. Although Activity 2, Develop Appraisal Plan, is a crucial foundational activity, and provides the overall structure and schedule for the conduct of the SCE, information from Activities 3 - 6 will be used to consistently refine and update that plan.

Recognition of the logistical vagaries (e.g., time zones, availability of flights, geographical location, offeror site working hours, security concerns) in scheduling multiple SCEs with different geographical sites and time zones must accommodate the team's ability and availability to stay focused on the task at hand.

This is the culmination of the Plan and Prepare Phase of the SCE and arms the SCE team with all available information to proceed to the next phase, Conduct Appraisal or the onsite execution for each offeror to be evaluated.

Normally, government PCO's, commercial contracts or legal offices, will provide specific information regarding communication with offerors being evaluated. This can range from the very formal official letter to a simple phone call.

3.7.2 Recipient

3.7.2.1 Designate SCE Participants

Once the onsite agenda is finalized and communicated, the offeror must assemble the appropriate individuals to participate in the SCE during the site visit. The offeror's response team should include corporate and project management, members of the proposal team and members of the projects selected for evaluations, particularly the systems and software engineering leaders. This may include both functional representatives as well as appropriate project personnel and may include representatives of the projects identified in the project data. By the time the site visit is scheduled, the offeror will have submitted the SCE response data to the proposal. The individuals who prepared the SCE proposal data are the appropriate people to prepare the data required to support the site visit discussion topics, as well as any discussion on Clar-

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ification Requests (CRs) and Deficiency Reports (DRs) identified by the SCE team and communicated subsequent to the site visit. CRs and DRs would not normally be issued during an SCE onsite, but following the on-site period in the formal "Discussions" phase of the acquisition.

In preparing presentation material for the site visit, the offeror should be aware that additional consideration will not be given for elaborate briefing material. The focus should be on content. Generally, black and white transparencies-presented on one projector-are preferred. Documents referenced as substantiation for MQ responses should be appropriately referenced and identified as to content and MQ reference.

3.7.2.2 Arrange Facilities for SCE Teams

The offeror needs to make the support facility arrangements to accommodate the SCE site visit. These should include an adequately sized conference room, working tables, chairs, telephone, copying, restrooms, and refreshments nearby. Similarly, secretarial support could be provided by the offeror during the visit to help with telephone messages, schedule coordination, and document access. The objective of thorough preparation is to minimize distractions so that all on-site time is focused on the SCE data collection necessary for successful source selection.

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3.8 Activity 8 Receive Presentations

Table 3-12 provides an overview of this activity.

	Generic SCE	Supplier Selection SCE
Purpose	Refine/update the evaluation team's understanding of the organization's software process operations.	Same as Generic SCE.
Actions	SCE team receives briefing from organization.	Evaluation of Proposals continues. Same as generic SCE. SCE onsite for each offeror is executed.
Outcome	The evaluation team has a refined/updated understanding of the organization's process operations.	Same as Generic SCE.

Table 3-12: Receive Presentations Overview

3.8.1 Evaluator

This activity begins the Conduct Appraisal phase. For acquisition applications in particular, the site visit entry presentation starts the SCE team's data collection and consolidation efforts. The organization will have received instructions via the logistical preparations as to what is expected. Generally, the development organization will present overviews of:

- the organization and relationships to programs, projects, functional staff
- organization processes
- documentation
- process improvement plans

3.8.2 Recipient

Normally, the development organization will receive instructions that indicate the above type of desired presentations and what kind of presentation is *not* desired (e.g., marketing, or recitation of standard processes discernible from documentation).

Presentations that describe how the organization's processes are executed by the selected projects and/or descriptions of how the organization's alternative practices demonstrate the interrelationships of its

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various processes and procedures from a reference model (e.g., CMM) perspective will aid the SCE team in their understanding and data collection efforts.

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3.9 Activity 9 Review Documents

Table 3-13 provides an overview of this activity.

	Generic SCE	Supplier Selection SCE
Purpose	Understand processes actually implemented in the organization.	Same as Generic SCE.
Actions	Determine information needed, request documents, artifacts; review relative to reference model components, and take notes.	Evaluation of Proposals continues. Same as Generic SCE. SCE onsite for each offeror is executed.
Outcome	Understand processes actually implemented in the organization.	Same as Generic SCE.

Table 3-13: Review Documents Overview

3.9.1 Evaluator

Note that the sponsoring agency may delineate specific documents to be available for SCE team review (see Figure 3-14 on page 69). Additionally, document review becomes one of the primary indicators of "objective evidence" that allows development of observations and validation of these observations into findings of strengths, weaknesses, and improvement activities by the SCE team. As one of the four discrete data collection mechanisms (instruments, presentations, interviews, and document review), documents and artifacts (e.g., meeting minutes, trouble logs) provide the clearest path of corroboration and validation of observations leading to findings while on site.

3.9.2 Recipient

Recognizing the SCE team's need for objective evidence to support and demonstrate process capability enhances the organization's effort to place its best foot forward. Any tool (electronic or paper) that can aid in demonstrating process maturity should be made available through the site point of contact to the SCE team. As with most evaluations or appraisals, time onsite is limited so the quicker the SCE team is able to discover, grasp, and understand the organization's processes, the more the team and organization can benefit from the overall on-site period.

Experienced teams have requested that interviewees bring day-to-day operating procedures, engineer's notebooks, schedules, and other artifacts that they use in the daily performance of their jobs to the interview session. The interviewees are encouraged to use the material as appro-

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priate in answering questions and may be requested by the SCE team to leave the items for later review. The items would be reviewed and sent back in a matter of hours or the next morning. This approach, although seemingly burdensome, enhances the team's ability to understand the day to day processes as practiced and provides readily available objective evidence of what was discussed during the interview and is observed during document review sessions.

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3.10 Activity 10 Conduct Interviews

Table 3-14 provides an overview of this activity.

	Generic SCE	Supplier Selection SCE
Purpose	Understand site personnel perspective on processes implemented in the organization.	Same as Generic SCE.
Actions	Determine information needed, select, request interviewees, ask questions, take notes.	Evaluation of Proposals continues. Same as Generic SCE. SCE onsite for each offeror is executed.
Outcome	Understand site personnel perspective on processes implemented in the organization.	Same as Generic SCE.

Table 3-14: Conduct Interviews Overview

3.10.1 Evaluator

Historically, SCE interviews have been conducted as a "many on one" event (i.e., many interviewers (SCE team) on one interviewee [a single individual]). This satisfied the procurement officials' desire for "unbiased" input. However, this also provided a significant intimidation factor to junior practitioners as well as to the recipient organizations' desire for appropriate representation to avoid misunderstanding and "mistakes." This approach is no longer recommended. Simply stated, the value of single individual interviews as standard practice has been diminished significantly with advent of utilizing multiple data collection mechanisms and the development of corroboration and validation rules for observations and findings onsite.

This does not mean that "many on one" interviews are inappropriate for all occasions. "Many on one" interviews have been retained as an explicit option for the SCE team and sponsoring organization. "Many on one interviews" may be the most efficient technique in dealing with CEOs, Vice Presidents, Division level managers, and Program Managers. The type of information desired from the appropriate level of personnel provides guidance for "many on one" or "many on many" interviews. Process implementation at the practitioner level may call for a "many on many" functional area type grouping of personnel from across the selected projects. This breadth and depth of personnel may be significantly more efficient than individual "many on one" interviews whereby only a handful of individuals can be interacted with in a finite amount of time.

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3.10.2 Recipient

Regardless of the discussion and guidance provided in the above discussion, note that some sponsoring organizations may still insist on "many-on-one" style interviews for all participants. The recipient organization can and should make its desires and concerns known prior to the actual onsite if interview conduct guidance is not provided in advance. The onsite period will not be the time to make a substantive issue of the interview approach employed by the sponsor's SCE team. The key to the maintenance of cordial, professional relationships is having this issue clearly understood by all in advance of the onsite period.

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3.11 Activity 11 Consolidate Data

Table 3-15 provides an overview of this activity.

	Generic SCE	Supplier Selection SCE
Purpose	Transform the data collected into formal team observations of process strength and weaknesses relative to the reference model (e.g., the CMM).	Same as Generic SCE.
Actions	Organize and combine data, determine data coverage and sufficiency, review/revise data collection plan.	Evaluation of Proposals continues. Same as Generic SCE. SCE onsite for each offeror is executed.
Outcome	The team has an agreed to baseline of information known, information needed, and the strategy to obtain needed information.	Same as Generic SCE.

Table 3-15: Consolidate Data Overview

3.11.1 Evaluator

With the Consolidate Data activity, all data collection efforts are reviewed and "bounced" against the original data collection plan (i.e., document review strategy, interview strategy, presentation data, and instruments). In the source selection environment it is prudent to take a more conservative approach with the use of instruments (e.g., Maturity Questionnaire). The approach advocated is to use instrument data as called for in the method, but not basing validation or corroboration of observations on this same data. This is because of the nature of how these instruments are completed. In a supplier selection the natural thrust of the respondents in a development organization requested to complete a publicly available document with little or no guidance is to "put their best foot forward." This tendency will present a different picture than one in which the instrument was administered by internal personnel familiar with the organization and its workings with the ability to provide guidance with respect to the goals and objectives of the data collection effort.

This same general rationale applies to other types of data not directly controlled by the sponsoring agency (e.g., internal assessment results, past contract performance). The caution to apply in using any of this type of data is understanding its applicability, timeliness and source.

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3.11.2 Recipient

The above discussion applies conversely to the recipient that may have unrealistic expectations regarding the type of data that is solicited and will be accepted by the sponsoring organization. Much anecdotal information is available illustrating the steadfast earnestness with which development organizations use the instruments (MQs), however, the bottom line is the ability of the sponsoring organization's team to witness, understand and obtain objective evidence that provides sufficient corroboration and validation of reference model components (CMM) of the process capability claimed by these instruments.

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3.12 Activity 12 Deliver Draft Findings

Table 3-16 provides an overview of this activity.

	Generic SCE	Supplier Selection SCE
Purpose	Validate preliminary team observations, build credibility in the evaluation, and generate buy-in to the eventual results.	Same as Generic SCE if allowed.
Actions	Prepare and present draft findings. Solicit feedback, take notes.	Evaluation of Proposals continues. Same as Generic SCE if allowed. SCE onsite for each offeror is executed. A decision to conduct this activity is made during Activity 2 Develop Appraisal Plan. Typically, this activity will NOT be conducted during a Source Selection SCE.
Outcome	The quality of the evaluation data and results is improved, and credibility and buy-in to the evaluation process and its results is generated.	Same as Generic SCE if allowed.

Table 3-16: Deliver Draft Findings Overview

3.12.1 Evaluator

For the source selection application of SCE, this activity may be precluded by the sponsoring organization due to contractual and legal constraints.

However, this activity may be allowed in the general contract monitoring application. Here the immediate feedback would be conducive to process improvement in general and to clear communications between the organizations in particular. Although individual specifics of contract monitoring applications will vary (i.e., baseline SCE, award fee measurement, value engineering support) the basic premise remains the same: a consistent dialogue between the sponsoring organization and its contracted development organization regarding continuous process improvement. These "teamwork" style approaches are enhanced with this type of activity where the validation of onsite real-time process evaluation results involve the majority of the participants of the evaluation.

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3.12.2 Recipient

Although individual sponsoring agencies may not allow this specific type of onsite interaction, the recipient should aggressively pursue feedback regarding their onsite period performance.

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3.13 Activity 13 Make Rating Judgement

Table 3-17 provides an overview of this activity.

	Generic SCE	Supplier Selection SCE
Purpose	Make decisions, based on validated observations, about the organization's process capability, using the reference model components.	Same as Generic SCE.
Actions	Judge satisfaction of reference model components: Activities Performed Key Practices, Individual Process Area Goals, Activities Performed Common Feature, Institutionalization Common Features, Process Area Goals as a set, Overall Process Areas. Determine Maturity Level (if required).	Evaluation of Proposals continues. Same as Generic SCE. SCE onsite for each offeror is executed.
Outcome	A formal rating decision for each reference model component which was planned to be rated, and for which the team obtained sufficient data to meet method rules for conducting the rating.	Same as Generic SCE.

Table 3-17: Make Rating Judgement Overview

3.13.1 Evaluator

The rating judgements approach is determined with selection of the rating baseline carried out in Activity 1 Analyze Requirements and planned for in Activity 2 Develop Appraisal Plan. The basic decision rests upon which of the two rating options available is selected.

- Option 1 - Full model and organizational scope. This requires:
  - full coverage rating through maturity level
- Option 2 - Reduced scope in the model or in the organization (standard SCE). This requires full coverage and rating of model components that are:
  - specified during requirements analysis and planning (Activity 1 and 2) and
  - meet the rules of rating, such that:
  - performing a maturity level rating will not be feasible
  - full coverage of specified items is required

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3.13.2 Recipient

The recipient organization should realize that the selection of one of the three ➡**rating baseline** options is the primary driver behind the entire evaluation data collection effort. Accordingly, understanding the sponsoring organization's goals and objectives and being able to respond appropriately will enhance the recipient's ability to provide the most accurate and compelling picture regarding process capability.

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3.14 Activity 14 Deliver Final Findings Presentation

Table 3-18 provides an overview of this activity.

	Generic SCE	Supplier Selection SCE
Purpose	Provide a clear and actionable summation of the evaluation results to the organization.	Same as Generic SCE (if allowed onsite).
Actions	Prepare and present Final Findings. Close out site activities.	Evaluation of Proposals continues. Same as Generic SCE (if allowed onsite) Acquisition Sponsor may not allow this activity to be executed until after contract award. A simple "exit or close out" briefing/meeting may be done onsite instead.
Outcome	The sponsor and the evaluated organization understand and accept the team's findings.	Same as Generic SCE.

Table 3-18: Deliver Final Findings Presentation Overview

3.14.1 Evaluator

Although delivery of the final findings to the development organization is the preferred approach to facilitate process improvement, contractual and legal constraints may preclude full execution of this activity. Instead the final meeting at the conclusion of the site visit may be a "thank you" exit briefing. At a minimum, the SCE team should thank their hosts and provide some indication of when the findings results (outcomes) and information about the individual development organization's performance would be available, who to contact and how to proceed.

As discussed in Activity 12 (Deliver Draft Findings), the process monitoring application is most applicable for the delivery of final findings at the conclusion of the site visit. Award Fee determination or competitive incentives among multiple suppliers might delay delivery of final findings to some future date.

Findings should always be delivered at the earliest possible time within these constraints.

3.14.2 Recipient

During an exit brief, the development organization should find out how to obtain the results from the on-site visit they have just hosted.

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3.15 Activity 15 Produce Reports and Support Follow-On Activities

Table 3-19 provides an overview of this activity.

	Generic SCE	Supplier Selection SCE
Purpose	Produce a formal baseline of the evaluation conduct and results for the sponsor and other stakeholders, and ensure the evaluation results are used appropriately to achieve stated business objectives.	Same as Generic SCE.
Actions	Produce Reports: -Findings -Outcomes -Evaluation Data -Method Evaluation Distribute Reports, preserve and/or dispose of records. Support follow-on activities.	SCE findings/outcomes are submitted to SSEB. SCE Team consults with SSEB if requested. SCE team may act as advisor to SSAC and SSA. Source Selection Evaluation Board (SSEB) compares data collected against Evaluation Standard- assigns technical rating and risk identification. Source Selection Advisory Council compares and ranks offeror proposals submits Risk Assessment to Source Selection Authority (SSA). Source Selection Authority makes award decision.
Outcome	A formal baseline of the evaluation conduct and results is established and reports are delivered to stakeholders. The evaluation results are used to support business objectives.	A formal baseline of the evaluation conduct and results is established and reports are made part of the acquisition files. Delivery of results in what format is at the option of the sponsor agency. Same as Generic SCE. The evaluation results are used to support business objectives.

Table 3-19: Produce Reports and Support Follow-On Activities Overview

3.15.1 Evaluator

3.15.1.1 Final Findings Report

In an acquisition SCE, the results are not "confidential" in that the sponsor is an outside organization from the recipient. But the results are only known to the sponsor and the recipient. Competing organizations do not see the results.

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The findings (sometimes called "final") report is an essential item for closing out an SCE, because it documents all activities and results from the team's execution of the method. The findings report should contain the following information:

- **Development organization(s) Information -** the Product Profiles, organization charts, and other site information, and questionnaire responses.
- **All worksheets and checklists.**
- **Objective evidence** which serves as a basis for findings. This section should be a formal description of the evidence supporting the team's findings rather than the actual evidence. The team will not be allowed to take the evidence with them.
- **Findings**, including a separate sheet(s) for each key process area. The findings sheets should include references to the objective evidence which support them.
- **Ratings** (for all model components rated).

An outcomes report includes recommendations for use of the appraisal results, in accordance with the planned use of the results defined in Activities 1 and 2. In the acquisition applications (source selection and contract monitoring) this report may contain the translation of SCE findings and ratings into evaluated criteria for the SSEB or the sponsoring organization to determine award fee and/or progress on process improvement plans. (See Appendix B for examples.)

3.15.1.2 Data Disposition

Data disposition is executed in this activity in consonance with the decisions made during Activity 1 (Analyze Requirements) and Activity 2 (Develop Appraisal Plan). This may include:

- destroying all data and paper with the exception of that listed above as necessary for the report, or
- collecting all paper and electronic artifacts for turnover to the PCO.

Regardless of the specificity of the disposition (e.g., most government agencies have different data disposition rules) of the development organization(s) data, it is incumbent upon the SCE team to provide information in the report that can be understood and interpreted six months to a year after the SCE site visit. Regardless of how the information is subsequently used—revisiting award fee determinations, or a protest,

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etc.—an accurate, understandable report will save countless hours of reconstruction and interpretation by individuals not part of the original SCE team.

Data disposition includes debriefing not only the winner of the source selection, but also the losers. Specific strategies for having a formal debrief and delivery of the respective development organization's (winners and losers) should be developed and executed.

3.15.2 Recipient

The recipient organization, if the sponsor agrees and if it is planned for, may always choose to make the results known outside the organization. At a high level, this might be done for marketing and public relations reasons. (This assumes the recipient organization is satisfied with the results.) On another level, not publicizing the information may be advantageous due to simultaneous bidding activities that could be jeopardized if results were published.

The recipient should anticipate being provided information of when, where, and in what form (e.g., debriefing, report) the organization will receive the results from a SCE on-site visit.

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Appendix A Glossary

Ability to perform: One of five common features in the CMM for Software. The ability to perform reflects the preconditions that must exist in the project or organization to implement the software process competently. Ability to Perform typically involves the features of resources, organization structures, and training.

Accuracy: An observation is considered to be accurate if the appraisal team agrees that it is based on what is heard and seen, is worded appropriately, and is correctly categorized and classified. [Masters 95]

Activities performed: One of five common features in the CMM for Software. Activities performed describe the roles and procedures necessary to implement a key process area. Activities performed typically involves the features of establishing plans and procedures, performing the work, tracking it, and taking corrective action.

Activity: A key practice of the activities performed common feature in the CMM for Software.

Acquisition: The cradle-to-grave life cycle of a system or product, and one of the primary applications of the SCE method. When used during the pre-contract award phase of an acquisition, may be called a source selection SCE, in reference to the U.S. Department of Defense (DoD) term for the process of selecting a supplier in an acquisition. When used during the contract execution phase, may be called a process monitoring SCE. The purpose of a supplier selection SCE is to provide input to the sponsor on the process capability of one or more development organizations. The outcome from a supplier selection SCE is the selection of the best value supplier for performance of a planned contract. SCE results are just one aspect considered in the sponsor's decision. (See acquisition agency and sponsoring organization.)

Acquisition agency: An organization responsible for developing, delivering, and supporting a system or product. Not normally the producer of the product. For purposes of this document, an acquisition agency is the appraisal sponsoring organization when applying the SCE method for the purpose of selecting a supplier. (See sponsoring organization.)

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Alternative practice: Practices which are implemented differently from those described in the reference model that may accomplish the goals of a process area.

Anomaly: A contradictory response to the same question on the questionnaire, or from other data collection mechanisms, by two (or more) projects. May indicate an issue that needs to be probed further. Related to *inconsistency.*

Applicable standards: An attribute used in SCE. This attribute indicates the government or commercial development and quality standards that are imposed on the project or organization, such as DoD-STD-2167A, DoD-STD-2168, MIL-STD-1521B, or MIL-STD-498, or ISO 9000-3.

Application of the SCE method: Synonym for *use of the SCE method.*

Application domain: An attribute used in SCE. An application domain is "a bounded set of related systems (i.e., systems that address a particular type of problem). Development and maintenance in an application domain usually require special skills and/or resources. Examples include payroll and personnel systems, command and control systems, compilers, and expert systems." [Paulk 93b] For SCE, this is an attribute used within the various profiles. The application domain attribute indicates the area of subject matter expertise needed to translate system requirements into software requirements, and indicates significant differences in the engineering practices which transform the software requirements into accepted code.

Appraisal: An expert or official valuation of something. [AHD 85] In the context of model-based process appraisals, an appraisal is an examination, by a trained team, of an organization's current practices from a process management perspective. This is a dynamic concept—the act of appraising (contrast with appraisal method).

Appraisal constraints: Constraints that affect appraisal conduct such as budget limitations, schedule limitations, and resource limitations (people and facilities). [Masters 95]

Appraisal goals: The desired outcome of an appraisal process. [Masters 95]

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Appraisal method: The documented process for conducting an evaluation or assessment of something. Specific to SCE, the sequence of steps performed for evaluating the process capability of an organization relative to a reference model. Also, a set of activities, tools, and techniques used by people to appraise the process capability of an organization at a given point in time. An appraisal method describes a process—"a sequence of steps performed for a given purpose." [IEEE] The term appraisal method typically refers to the method itself, but may also be used to connote the method and its associated documentation and training materials.

Appraisal outputs: Any lasting artifact produced by the team in executing the appraisal. In SCE, the primary output from the site visit is the set of findings. Often synonymous with appraisal results, although in the SCE context appraisal outputs is a broader term, because results only relate to the findings and ratings generated.

Appraisal reports: The set of documented artifacts created by the appraisal team as a result of conducting an appraisal. These reports include: findings briefings and reports, an outcomes report, an appraisal data report, and a method evaluation report. Collectively, they form the official record, or baseline, of the appraisal for subsequent use by the sponsor or other stakeholders in the data and/or process executed. All reports are generated after the conclusion of the site visit except for the findings briefing.

Appraisal requirements: Appraisal goals and constraints. [Master 95]

Appraisal risk: Risk is a measure of uncertainty of attaining a goal, objective, or requirement pertaining to technical performance, cost, and schedule. Risk level is categorized by the probability of occurrence and the consequences of occurrence. This includes the adverse consequences of process variability. [MIL-STD-499B] For SCE, appraisal risk has two components: technical risk inherent in the method as defined or tailored, and process risk in executing the method. Appraisal risk is manifested in the likelihood (probability) of errors in the results (i.e., that the findings and ratings are incorrect). (See *rating baseline.*)

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Appraisal scope: The boundaries of the investigation, in terms of the breadth within the organization and the depth within the reference model used. The organizational entities and CMM components selected for investigation. [Masters 95] (See *organizational scope* and *reference model scope.*)

Appraised entity: The organizational units to which appraisal outputs apply. An appraised entity may be any portion of an organization including an entire company, a selected business unit, a specific geographic site, units supporting a particular product line, units involved in a particular type of service, an individual project, or a multi-company team. [Masters 95]

Artifact: an object produced or shaped by human workmanship. [AHD 85] For model based process appraisals, artifacts are the products resulting from enacting a process.

Attributes: characteristics of a software product or project. The attributes used in SCE are defined throughout this glossary and are discussed in another appendix of the method description.

Audit: An independent examination of a work product or set of work products to determine compliance with specifications, standards, contractual agreements, or other criteria. [Paulk 93b]

Candidate findings: Synonym for observations. Candidate findings are observations for which there is not yet enough objective evidence to make a decision (an unvalidated observation). (See *observations.*)

Caucus: A meeting in which the team analyzes information they have learned while on site during appraisal conduct, including interviews, document review, and presentations, to transform data into observations and finally into findings. SCE teams routinely participate in caucuses, or team meetings, during an SCE site visit. These caucuses are designed to help achieve consensus among the team members. SCE team members analyze, share, and consolidate information in order to reach conclusions about what was seen and heard as a result of their data collection activities. (See *consolidation.*)

Capability Maturity Model[SM*] **(CMM**[SM]**):** "A description of the stages through which software organizations evolve as they define, implement, measure, control, and improve their software

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processes." [Paulk 93b] For SCE this is a model which is used to evaluate a development organization's process capability. (See *maturity model.*)

Commitment to perform: One of five common features in the CMM for Software. Commitment to perform reflects the actions that the organization must take to ensure that the process is established and will endure. Commitment to perform typically involves the features of establishing organizational policies and senior management sponsorship. A commitment is a pact that is freely assumed, visible, and expected to be kept by all parties. [Paulk 93b]

Common feature: "An attribute that indicates whether the implementation and institutionalization of a key practice is effective, repeatable, and lasting." [Paulk 93b] There are five common features defined for CMM v1.1: commitment to perform, ability to perform, activities performed, measurement and analysis, and verifying implementation.

Competitive range: Key term relating to the acquisition use of the SCE method in government source selection. By law (10U.S.C. 2304 [g]) written or oral discussions in negotiated procurements must be conducted with all responsible offerors who submit proposals within a competitive range. The determination as to which proposals are not in the competitive range, and the exclusion of offerors either before or as a result of written or oral discussions, will be made by the Contracting Officer, subject to the approval of the sponsor. The sponsor may designate the evaluation team chairperson to accomplish this function.

The competitive range must be determined after evaluation of all proposals received, on the basis of price or cost, technical, and other salient factors including proposal deficiencies and their potential for correction. The competitive range must include all proposals which have a reasonable chance of being selected. The objective is not to eliminate proposals from the competitive range, but to facilitate competition by conducting written and oral discussions with all offerors who have a reasonable chance of being selected for an award. [USAF 84]

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Consistency: The degree of uniformity, standardization, and freedom from contradiction among documents or system components. Consistency of an appraisal method refers to the ability of different appraisal teams using the same method to conduct appraisals of the same scope to produce non-conflicting results. [Masters 95]

Consolidation: The decision making activity in the iterative information gathering, organizing, and analyzing components of the SCE process. The activities conducted by the appraisal team to transform raw data collected from the recipient organization into observations and findings. Consolidation activities occur throughout the site visit.

Contract monitoring: A specific application of the SCE method. Euphemism for process monitoring. Part of the process monitoring "family" of evaluations. (See *process monitoring.*)

Corroboration: In SCE, a synonym for confirmation. All appraisal observations must be confirmed by information from different sources and different data gathering sessions prior to use as findings. This is sometimes referred to in the SCE method as rules for confirming observations.

Coverage: The extent to which data gathered fully addresses reference model components, organizational units, and life cycle phases within the scope of an appraisal. [Masters 95] For SCE, the link between coverage and rating is important. One or more validated observations that the team agrees fully cover the area of investigation and meet method rules for corroboration (multiple sources, multiple sessions, documentation, etc.) are said to be sufficient for rating the reference model items. (See *sufficiency for rating, validation, and corroboration.*)

Customer: An attribute in SCE. This attribute indicates who the development is being done for.

Data: Information, especially information organized for analysis or used as the basis for a decision. [AHD 85]

Data collection: The method activities related to obtaining information from the appraised entity for the purpose of evaluating process capability. Four data sources are used in the SCE method: interviews, document review, presentations, and instruments.

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Development organization: An organization that develops and/or maintains software products. The development organization is the recipient of an SCE.

Development organization community: All of the development organizations that are evaluated during an acquisition use of the method. In an acquisition these are the offerors (or all of the offerors remaining after a competitive range determination), and possibly their subcontractors.

Development team approach: An attribute used in SCE. It is related to how the developer organizes itself to produce the system; the degree to which various groups interact and are brought to bear on the effort.

Directive: An order or instruction describing actions that must be performed and authorizing their performance.

Document: Any lasting representation of information available to the people doing development and management work. A document can be viewed as an external memory for people. Documents can be paper or electronic. Any process artifact can be considered a "document" in an SCE.

Document review: One of four primary data collection sources used in SCE. The process of examining documents to find evidence of the processes used by a development organization. Documents can define and standardize processes, can indicate commitment to use the processes, can provide an audit trail of processes that were used, and can reflect data about process performance. Three levels of documents are reviewed during an SCE: *organization-level, project-level, and implementation-level.*

Environment: An attribute used in SCE. It refers to the hardware, software, and telecommunications environment used to develop the system.

Evidence: Data on which a judgment or conclusion can be based. [AHD 85]

Effective process: A process that can be characterized as practiced, documented, enforced, trained, measured, and capable of being improved. [Paulk 93b]

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Evolution: A gradual process in which something changes into a different and usually more complex or better form. [AHD 85]

Evaluator: Evaluate, to examine and judge carefully. [AHD 85}. In the context of SCE, evaluator is referring to the individual on a team performing an evaluation on behalf of a sponsor.

Fact: A statement whose content can be verified as true through the senses. [Masters 95]

Feature: One of a set of process attributes that provide a view of "whether the implementation and institutionalization of a key practice are effective, repeatable, and lasting." [Paulk 93b] The features used in SCE come directly from the common features of CMM v1.1. They add a level of detail that is appropriate for generating topics for investigation. Examples of features are policies, resources, and training. Features are listed within each common feature defined in this glossary. (See *common feature.*)

Fidelity: Faithfulness to obligations, duties, or observances. [AHD 85] Fidelity in an appraisal means adhering strictly to the reference model used to appraise processes. CMM fidelity refers to the use of CMM components, and CMM components alone, as the basis for rating an organization's software process maturity. [Masters 95] A method shows good fidelity if it is consistent, repeatable, accurate, and precise. Its results are thus comparable across and within organizations, and errors are minimized. Fidelity is closely related to *reliability.*

Findings: Findings are the primary output from executing the SCE method. Final findings are used to develop the findings briefing and final report. Findings are validated observations. Findings consist of strengths, weaknesses, or improvement activities in one of the reference model components within the scope of the appraisal. Findings may also be generated in non-reference model areas from data that does not directly correspond to the reference model used, but that are significant to the success of the organization's operations. (See *results.*)

An observation that has been accepted by the team as valid. Findings include strengths, weaknesses, evidence of alternative practices, and evidence of non-applicable practices. A set of findings should be accurate, corroborated, and consistent within itself. [Masters 95]

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Goal: A summary of the key practices of a key process area that can be used to determine whether an organization or project has effectively implemented the key process area. [Masters 95]

IDEAL approach: A systems approach or life cycle framework for implementing process improvement activities. IDEAL stands for the five phases of the approach: Initiating, Diagnosing, Establishing, Acting, and Leveraging. [Radice 93]

Implementation-level documents: The third of three levels of documents reviewed during an SCE. These are documents which provide an audit trail of processes that were used, and can be used by the development organization to collect data about process performance.

Improvement activity: A process improvement that is not yet institutionalized—for example, a pilot program that implements a new configuration management process. In SCE, it indicates potential mitigation of risk due to implemented process. In this sense, an improvement activity is a weakness that if institutionalized would be considered a strength.

Inconsistency: An apparently contradictory response from the same project to two (or more) questions on the questionnaire, or from other data collection mechanisms, that relate to the same process area. May indicate an issue that needs to be probed further. Related to *anomaly.*

Inference: A conclusion based on a fact. They are not facts. In SCE, strong inferences may be used as a basis for observations, in addition to facts. Strong inferences are readily verifiable by further data collection.

Institutionalization: The building of infrastructure and corporate culture that support methods, practices, and procedures so that they are the ongoing way of doing business, even after those who originally defined them are gone. [Masters 95]

Institutionalization common feature: One of four common features in the CMM for Software that are related to institutionalizing methods, practices, and procedures: commitment to perform, ability to perform, measurement and analysis, and verifying implementation. [Paulk 93b]

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Instrument: One of four primary data collection sources used in SCE. An instrument is typically a questionnaire, survey, profile, or other written item used to collect data. Instrument data is typically collected and analyzed prior to the site visit.

Internal evaluation: One SCE application type. Various internal evaluation uses are tailored applications of the SCE method. Typical internal evaluation uses include: process baselining, process improvement progress measurement, process audits, and domain, product line, or project specific appraisals. Preparing for an external, customer led evaluation is often a reason that an organization conducts an internal evaluation. Related to acquisition and process monitoring SCE applications.

Interviewing: One of four primary data collection sources used in SCE. The process of questioning personnel from the development organization to find evidence of the processes used by the development organization. Interviews provide insight into how processes are implemented and show the extent to which processes have been internalized by members of the development organization.

Judgment: The exercise of making sound and reasonable decisions (verb). [AHD 85] In SCE, judgments refer to individual and team decisions in the data transformation process from notes to observations, observations to findings, and findings to ratings. (See *notes, observations, findings, and ratings.*)

Key Practice: The infrastructures and activities that contribute most to the effective implementation and institutionalization of a key process area. [Paulk 93b]

Key process area (KPA): "A cluster of related activities that, when performed collectively, achieve a set of goals considered important for establishing process capability." [Paulk 93b] Each KPA contributes to the environment in which development organizations create software products. Within the CMM, the KPAs are organized into five basic levels of process maturity to describe the progression from an ad hoc software process to one that is well defined and can act as a stable foundation for continuous process improvement.

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Language(s): An attribute for SCE. This attribute indicates the programming languages in which the code is to be written, or in which it has been written.

Mapping: The relationship between actual practices in the software process implementation and the process areas within the reference model used.

Maturity level: "A well-defined evolutionary plateau toward achieving a mature software process." [Paulk 93b]

Maturity model: A model of organizational activity used for evaluating a development organization's process capability. The maturity model has a defined structure, and is available to the public.The maturity model used in SCE V3.0 is the Capability Maturity Model (CMM) for Software V1.1. [Paulk 93a]

Measurement and analysis: One of five common features in the CMM for Software. This common feature describes the need to measure the process and analyze the measurements. Measurement and analysis typically includes the feature of examples of the measurements that could be taken to determine the status and effectiveness of the Activities Performed.

Method: A means or manner of procedure, especially a regular and systematic way of accomplishing something. [AHD 85] An appraisal method consists of appraisal activities, processes, and rating strategies along with associated data structures, definitions, and usage instructions. (See *appraisal method.*)

Method tailoring: Making, altering, or adapting to a particular end. [AHD 85] In SCE, tailoring refers to selecting options, based on the appraisal goals, that may affect appraisal risk. The selection process, led by the team leader during appraisal planning, of refining or extending the standard, or baseline, method to best fit the needs of the sponsor and the appraisal goals defined during requirements analysis. In SCE the principal tailoring options include varying the *organizational scope, reference model scope, and rating baseline.* These options in turn drive lower level tailoring options for team size, skills and experience, and time on site. There are also numerous low level implementation options relating to forms, templates, and instruments (appraisal method *artifacts*) available for conducting the appraisal.

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Notes: The transcription of raw input data (from instruments, presentations, interviews, and documents) by an individual team member, usually in the form of written text, into information formatted such that it can later be used to form observations about processes. In SCE, the formatting is done by various means, including "tagging" notes relative to the reference model used.

Observation: An inference or judgment that is acquired from or based on observing. [AHD 85] An observation is information extracted from the notes of data collection sessions. [Masters 95] Observations are classified in terms of strengths and weaknesses, and categorized by reference model component. In SCE, observations are always based on facts or strong inferences.

Organization-level documents: The first (or top) level of three levels of documents reviewed during an SCE. These are the policies and procedures which establish the development environment for all company project activities. Organizational level documents define the process and management constraints the organization places on projects.

Organizational scope: The part of the appraisal scope that defines the breadth of the investigation within the development organization. Typically described in terms of a project or number of projects, but may also relate to a product line or domain. The organizational units that comprise the entity being appraised. [Masters 95] (See *appraisal scope.*)

Outcome: How the findings (SCE results) are used by the sponsoring organization—for example, in risk determination for an acquisition, risk management for process monitoring, or process improvement for an internal evaluation.

Policy: "A guiding principle, typically established by senior management, adopted by an organization to influence and determine decisions." [Paulk 93b]

Precedence: An attribute used in SCE. This attribute indicates whether the principal stakeholders in the system (acquirer, end user, developer) have experience with the type of system to be built. Systems that are providing a new capability tend to have more changes to the requirements than do ones that are replacing existing systems.

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Presentations: One of four primary data collection sources used in SCE. Presentations can either be delivered by the appraisal team to the recipient organization, or can be delivered by the recipient organization to the appraisal team. Usually these presentations are provided in a viewgraph, briefing format allowing interaction between the team and the participants. Presentations can delivered either for the purpose of data collection or data validation. (See *data collection* and *validation.*)

Procedure: A written description of a course of action to be taken to perform a given task. [IEEE 91]

Process: A sequence of steps performed for a given purpose. [IEEE 91]

Process capability: "The range of expected results that can be achieved by following a process." [Paulk 93b]

Process maturity: The extent to which a specific process is explicitly defined, managed, measured, controlled, and effective. Maturity implies a potential for growth in capability and indicates both the richness of an organization's software process and consistency with which it is applied in projects throughout the organization. [Paulk 93a]

Process monitoring: One of the primary applications of the SCE method. In process monitoring, SCE results can serve as an input for an incentive/award fee, as a basis for value engineering incentive payments, or can be used to help the sponsoring organization tailor its contract monitoring efforts.

Procuring Contracting Officer (PCO): The PCO is the acquisition agency person responsible for all communications with the offerors (development organizations) in an acquisition application of SCE. The PCO ensures that the entire source selection process is consistent with applicable regulations. The PCO is also responsible for advising the sponsor on the interpretation of the findings to ensure a consistent and objective award decision.

Product profile: See *Profiles.*

Product type: An attribute in SCE. The product type attribute refers to the particular aspect of the application domain which the system will support or to the type of service which the system will

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provide. For example, displays or communications could be product types in a command and control system, a weapons system, or another application domain. Although there may be similarities in the communications subsystem in the various application domains, they each have their own set of unique problems which must be addressed.

Profiles: A profile is the set of attributes (such as Application Domain, Product Type, and Size) associated with a product and the environment that supports development of the product. There are three types of product profiles used in SCE: a "target" Product Profile created by the sponsor organization, representing the customer view and reflecting a "desired" state; Product Profile(s) from the recipient reflecting attributes of a current effort(s); and a "proposed" Product Profile created by the offeror in response to an acquisition application reflecting the developer view of planned work.

Project: An undertaking requiring concerted effort, which is focused on developing and/or maintaining a specific product. The product may include hardware, software and other components. Typically a project has its own funding, cost accounting, and delivery schedule. [Masters 95]

Project-level documents: The second of three levels of documents reviewed during an SCE. These are documents which define the development processes in use for a particular project. Project level documents define the detailed processes that are used to manage, coordinate, and integrate the engineering activities required for the development.

Rating: A position assigned on a scale; standing. [AHD 85] Ratings are judgments associated with findings. A characterization of an organization's process relative to a component of the reference model used in the appraisal. Rating types in SCE include satisfied, not satisfied, not rated, or not applicable. The rating scale for maturity level is taken directly from the definition contained in the reference model (e.g., Levels 1-5 in the CMM for Software). Ratings can be applied to any component of the reference model that is planned for by the team to achieve appraisal goals and if collected data meets all method rules for *coverage* and *corroboration.* (See *appraisal goals, coverage and corroboration.*)

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Rating baseline: "Base" is the supporting part or layer; foundation. The fundamental principle or underlying concept of a system or theory; basis. The fact, observation, or premise from which a reasoning process is begun." [AHD 85] A baseline is a specification or product that has been formally reviewed and agreed upon, that thereafter serves as the basis for further development...[Paulk 93b] In SCE, choosing the rating baseline option is the fundamental *method tailoring* decision, made during *appraisal requirements* analysis. This decision drives subsequent planning and execution of the method. It specifies the choice of method "rigor" made by the *sponsor* (in consultation with the team leader or senior site manager). It reflects the *reference model scope* and *coverage* requirements enabling team *rating* judgments to be made. The SCE method provides two rating baseline options: depth oriented and breadth oriented (See Method Description for more detail.)

Recipient: The appraised entity that receives the appraisal. Synonymous with development organization. (See *appraised entity* and *development organization.*)

Reference model scope: The part of the appraisal scope that defines the depth within the reference model used that will be investigated during the SCE. Items outside the defined scope of the SCE cannot be looked at during an acquisition application of SCE. (See *appraisal scope.*)

Reliability: The ability of a system or component to perform its required functions under stated conditions for a specified period of tim. [IEEE 90] In SCE, the method is the "system." Reliability is generally used to refer to the repeatability and consistency of the appraisal method. The ability to attain appraisal results that accurately characterize an organization's software process. [Masters 95]

Repeatability: The ability to attain the same appraisal results if an appraisal of identical scope is conducted more than once in the same time period. [Masters 95]

Request for Proposal (RFP): A government acquisition document that describes characteristics of the system the sponsor wants to acquire. It is used in an acquisition application of the SCE method. This document is used to solicit proposals from commercial development organizations (offerors) and to communicate the

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characteristics of the desired system to the offerors. In source selection, this is the document that specifies that an SCE will be performed, how it will be performed, and what is expected of the offerors to respond to the customer's need. The RFP is a key artifact describing the appraisal plan in an acquisition application.

Results: A synonym for the SCE findings. This is the primary output of the SCE. In addition to findings, the results may include reference model ratings (such as maturity level), and draft recommendations, depending on the application of the method and the goals documented in the appraisal plan. Appraisal results are always provided to the sponsor, and should be provided to the appraisal recipient (development organization). (See *findings, appraisal outputs.*)

Reuse estimate: An attribute used in SCE. It indicates the development organization's approach to building the product. It is correlated to the size attribute.

Sampling: A set of elements drawn from and analyzed to estimate the characteristics of a population. During an appraisal, data collection is planned to provide a sampling of the process data related to the reference model components, organizational units, and life cycle phases within the scope of the appraisal. [Masters 95]

Site: A geographic location of one or more of an organization's units that participate in an appraisal.

Site information packet: The set of materials requested by the sponsor, and provided to the appraisal team by the recipient organization, for use in planning and preparing for the appraisal. In SCE, it includes information such as organization charts, site terminology lists, document hierarchy and model content mapping, product profiles (including the proposed product profile for an acquisition SCE), responses to instruments, etc.

Site technical coordinator: The technical focal point assigned by the recipient organization to assist and facilitate the appraisal team in conducting its activities.

Site visit: The collection of SCE activities that encompass the investigation by the SCE team at a development organization's site.

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Size: An attribute for SCE. The size attribute indicates the magnitude of the product (and hence the required project). Size is composed of three related attributes. The *contract duration* is the estimated or required length of time for the development of the product. The *team size* is the number of developers who will be involved in the project. The *estimated size* is the amount of code to be developed (in a software system).

Software Capability Evaluation (SCE): A method for evaluating the software process of an organization to gain insight into its software development capability. SCE can also be defined as a method for evaluating the processes of an organization to gain insight into its business capability. Which model processes are evaluated is determined by the sponsor during appraisal planning (e.g., software, people, acquisition).

Software development plan (SDP): "The collection of plans that describe the activities to be performed for the software project." [Paulk 93b]

Software process capability: "The range of expected results that can be achieved by following a process." [Paulk 93b] For purposes of an SCE, software process capability reflects those processes which provide an environment for development teams to produce software products. The processes evaluated include decision making processes (such as software project planning), communication processes (such as intergroup coordination) and technical processes (such as peer reviews). (See *process capability* and *process maturity.*)

Software process implementation: A tailored set of practices that defines how software development work is supposed to be done.

Source selection: The government term for a acquisition process to select a supplier. An acquisition application of the SCE method is used to provide results that are factored into the source selection decision. In source selection, the results of the SCE are used by the sponsoring organization to characterize the process-related risk of awarding a contract to an offeror. SCE is only one criterion among many used to select contractors in government acquisitions. (See *acquisition* and *acquisition agency.*)

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Source Selection Authority (SSA): The individual responsible for the conduct of the government source selection (acquisition) process. In an acquisition application of the SCE method, the SSA is the sponsor. The SSA is the final arbiter on the use of SCE, approves how the SCE results will influence the award decision, and makes the award decision. (See *acquisition, acquisition agency, source selection advisory council, and source selection advisory board.*)

Source Selection Advisory Council (SSAC): The SSAC is chartered by the sponsoring organization (acquisition agency) with collecting and analyzing the evaluations of each offeror. This group performs risk assessment activities. This is the only group permitted to compare the SCE results (strengths and weaknesses) of the offerors against one another. The SSAC may recommend to the sponsor how the SCE findings will be incorporated into the award decision at the pre-RFP release briefing.

Source Selection Evaluation Board (SSEB): This is the government group that evaluates the offerors' proposals against defined evaluation standards in an acquisition application of SCE. This group performs risk identification tasks. This group develops the evaluation standards and receives approval to use them from sponsor before the issuance of the RFP. The SSEB is usually organized into technical and cost teams important to the award decision. If the findings of an SCE are being factored into the source selection decision as an Evaluation Criterion, the SCE team leader should be a member of the SSEB. The SSEB prepares, prior to the release of the RFP, an evaluation standard that will incorporate the SCE results into the source selection process.

SSEB Chairperson: The SSEB chairperson coordinates all activities of the SSEB related to the acquisition. The chairperson will facilitate the incorporation of SCE into the source selection documentation and monitor the various evaluation teams, including the SCE team.

Sponsor: The decision maker in the organization that commissions the SCE to be performed and uses the findings (results). Evaluator results are always provided to the sponsor. The individual who authorizes an evaluation, defines its goals and constraints, and commits to use of evaluation outputs. [Masters 95]

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Sponsoring organization: The organization that commissions the SCE to be performed and uses the findings. (See *sponsor* and *acquisition agency.*)

Standard: "Mandatory requirements employed and enforced to prescribe a disciplined, uniform approach to software development." [Paulk 93b]

Strength: Indicates the team judgment of an effective implementation of a component of the reference model. In SCE, a strength further indicates a particular part of the organization's capability that is sufficiently robust to mitigate the development risks due to process.

Implementation of practices which in an appraisal team's judgment, improve an organization's software process capability. CMM related strengths are effective implementation of one or more of the CMM key practices or one or more alternative practices that contribute equivalently to the satisfaction of KPA goals. [Masters 95]

Subcontractor: A development organization that is contracted to work for another development organization to produce products.

Subcontractors: An attribute in SCE. This attribute is used to indicate whether the development organization intends to use subcontractors in the development, and is a factor if they lack experience with subcontract management.

Sufficiency for rating: The extent to which observations meet appraisal method's rules, thus satisfying the prerequisites for rating. Sufficiency judgments are composed of a series of team judgments regarding the validation, coverage, and corroboration aspects of observations.

Target: An attribute in SCE. This attribute indicates the hardware configuration that the developed software will run on when operational.

Target Process Capability: The process capability that is most appropriate for the planned development; the process capability desired by the sponsoring organization for the product to be developed. The Target Process capability consists of a set of

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process areas within the reference model used, and helps establish the boundaries of the SCE investigation—a process area is evaluated if and only if it is part of the Target Process Capability.

Topic: A topic is a focused subject matter area probed during the SCE investigation. Topics are a subset of process activities that work towards achieving a specific process area goal. Topics are intended to be detailed enough to focus the investigation on observable, documented work practices, but sufficiently abstract that they avoid prescribing how the process area is implemented. Topics are selected by considering the intersection of a process area goal and its associated reference model features.

Type of Work: An attribute for SCE. This attribute indicates the portion of the development life cycle which will be performed. As examples of different types of work, in "full software development" a development organization is required to build a product based on the system requirements, while in "code development only" the development organization is required to develop code according to the system requirements and software top level design provided by the issuing authority.

Use of the SCE method: Executing the SCE method within a particular context. The principal high-level uses of the SCE method are in acquisition, and process monitoring, and internal evaluation. This is sometimes referred to as the application of the method.

Validation: To substantiate; verify. Valid refers to producing the desired results. [AHD 85] In SCE, validation refers to the process of substantiating observations made about processes, using rules for confirming observations defined in the method. A valid observation is one that is accurate and has been agreed to by the team through a consensus process. Validated observations are equivalent to findings after the team concludes that data coverage and corroboration rules have been met. The rationale for validation is related to the data element objective of an SCE, obtaining an accurate picture of process capability at a site.

Verifying implementation: One of five common features in the CMM for Software. This common feature describes the steps to ensure that the activities are performed in compliance with the

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process that has been established. Verifying implementation typically encompasses the features of reviews and audits by management, quality assurance, and other support units.

Weakness: Indicates the team judgment that an effective implementation of a component of the reference model is not institutionalized. In SCE, a weakness indicates a particular part of the organization's capability that has characteristics that increase the risks due to process.

Ineffective implementation of or lack of practices which, in an appraisal team's judgment, interfere with effective performance of software development tasks. CMM related weaknesses are an ineffective implementation or lack of implementation of one or more CMM key practices with no acceptable alternative practices in place. [Masters 95]

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Appendix B SCE Implementation Examples

This appendix contains representative examples of RFP text and evaluation standards from the U.S. Air Force (USAF), U.S. Navy (USN) and the U.S. Army (USA). Some other excerpts from recent RFPs and published documents have also been provided. Here specific agency/organizational references have been removed. These last example excerpts are provided to illustrate the latest trends within the community of SCE implementation within acquisitions.

B.1 Using SCE Results in Air Force Source Selection

The first example explores using the findings from an SCE site visit in the final decision of a USAF source selection. The example RFP language is current, the data depicted and discussed has been edited and does not represent any particular solicitation past, present or future. Section M of the RFP notifies offerors that the use of SCE would be evaluated as a specific criterion. Included in this section will be an example using a color code scheme as the rating tool in the source selection process. The discussions that follow, while using data from real acquisitions, have been edited to eliminate source selection sensitivity or to illustrate a key point about SCE implementation. A reference to the PRAG is included at the end of this section. SCE findings would be incorporated into the performance risk assessment report/briefing if SCE is used as part of PRAG activities.

There is a significant difference between specific criteria and performance risk assessments. The source selection-related regulations, regardless of the implementing agency, require that specific criteria encompass the characteristics of the program being acquired. All acquisition agencies require the establishment of order of precedence for the various specific criteria, so that the offerors understand their relative importance and can craft their proposal accordingly.

Additionally, pre-established standards of evaluation are prepared for each criterion and the offerors' proposal is measured against those standards by the SSEB. This evaluation against the evaluation standards then forms the basis of comparison of one proposal to another, which is done in a source selection, typically by a more senior body, such as the Source Selection Advisory Council.

Note that in developing any evaluation standards (Figure B-2 and Figure B-3), the appropriate procurement regulations should be followed as well as consulting and working with the source selection staffs.

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To get the most emphasis of SCE use in source selection, SCE should be used as a specific criterion and may also be evaluated by the PRAG for performance risk. Use of SCE results as specific criterion and/or in the PRAG for performance risk will be decided by the SSA at the same time the SSP is approved, based on source selection regulations and program requirements.

B.1.1 Using SCE as a Specific Criterion for Award

Each offeror's proposal will be evaluated against the following areas listed in descending order of importance (list areas in descending order of importance or specify relative importance. Note: Areas should be limited to two [including cost/price], when feasible).

The technical area (or each of the areas [except cost/price] if more than two areas used) will be rated in three ways:

- a color/adjectival rating
- a proposal risk rating
- a performance risk rating

The color/adjectival rating depicts how well the offeror's proposal meets the evaluation standards and solicitation requirements. Proposal risk assesses the risk associated with the offeror's proposed approach as it relates to accomplishing the requirements of this solicitation. Performance risk assesses the probability of the offeror successfully accomplishing the proposed effort based on the offeror's demonstrated present and past performance. The government will conduct a performance risk assessment based on the offeror's relevant present and past performance. In assessing this risk, the government will use performance data to evaluate the areas listed above.

Offerors are to note that in conducting the performance risk assessment, the government will use both data provided by the offeror and data obtained from other sources. Within each area (other than cost/price), each of the three ratings—color/adjectival, proposal risk, and performance risk—will be considered in making an integrated source selection decision as to which proposal is most advantageous to the government.

SCE should be used as an item under an area of specific criterion such as Technical/Management and/or in the PRAG for performance risk assessments. Ultimately, how SCE findings are translated into SCE results and used in the Source Selection (SS) should be determined by the SSA based

on source selection regulations and program requirements. Figure 1 provides an illustration from an acquisition employing SCE as a technical item (software engineering capability) in the technical area.

Technical Area	Description
Software Engineering Capability Item	The acquisition organization will evaluate the offeror's software process by reviewing its Software Process Improvement Plan (SPIP) and by conducting an on-site visit using the Software Engineering Institute- (SEI) developed Software Capability Evaluation (SCE) Method.
Technical Approach Item	The government will evaluate the offeror's technical approach to accomplishing the... tasks. The evaluation will assess the extent that the approach satisfies the objective, goals, and requirements of the Statement of Work.
Management Item	The acquisition organization will evaluate the offeror's management approach to accomplish contract goals and the extent to which the approach achieves the objectives, goals, and requirements of the solicitation. The government will focus on...

Figure B-1: Sample Set of Specific Criteria or Technical Items

What follows is an example using SCE as a specific criterion in making the source selection decision. The specific needs of the acquisition should dictate the exact approach to be used. In this example, the items of the technical area are listed in descending order of importance. This example is but one approach and method for implementing SCE findings in the source selection decision.

This example continues the discussion of SCE as a specific criterion as depicted in Figure B-1. The example will illustrate the incorporation of the SCE findings into the various source selection evaluation tools/documents that are used for the source selection as well as the definitions established for the various color ratings and the identification of risk.

Color Coding the Technical Items

Applying color codes begins when the SCE team has completed all site visits and the evaluations of the offerors' Software Process Improvement Plans (SPIP). In this example the SPIP was requested to be prepared and submitted separately at the same time the proposal was submitted.

Using this approach, each technical item is assigned a color which corresponds to a rating—from "exceptional" to "unacceptable." For each item, an evaluation standard is written to define precisely what an offeror must do to be assigned a certain color.

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Figure B-2 shows how colors were used and how ratings such as "exceptional" were defined [USAF 88].

Color	Rating	Definition
Blue (B)	Exceptional	Exceeds specified performance of capability in a beneficial way to the government. Has high probability of satisfying the requirement. Has no significant weakness.
Green (G)	Acceptable	Meets evaluation standards. Has good probability of satisfying the requirement. Any weakness can be readily corrected.
Yellow (Y)	Marginal	Fails to meet evaluation standards or has low probability of meeting the requirement; or has significant but correctable deficiencies.
Red (R)	Unacceptable	Fails to meet a minimum requirement. Deficiency requires a major revision to correct.

Figure B-2: Description of Colors

Along with each color, the evaluation team assigns a risk rating which reflects the risk associated with the offeror performing on time, within budget, and within the specified performance parameters. Figure B-3 lists the ratings and their definitions. This example used the consistency between the SCE findings and the achievability of the offeror's software process improvement program to denote the risk of the item, Software Engineering Capability.

Risk	Definition
High (H)	Likely to cause significant serious disruption of schedule. Increase in cost, or degradation of performance even with special contractor emphasis and close government monitoring.
Moderate (M)	Can potentially cause some disruption of schedule, increase in cost, or degradation of performance. However, special contractor emphasis and close government monitoring will probably be able to overcome difficulties.
Low (L)	Has little potential to cause disruption of schedule, increase in cost, or degradation of performance. Normal contractor emphasis and government monitoring will probably be able to overcome difficulties.

Figure B-3: Description of Risks

A complete set of offeror findings (strengths and weaknesses) measured against the CMM KPAs should be used in assigning color codes and risks. The SCE team should provide the SSEB with these findings. See Figure

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B-4, Figure B-5, and Figure B-6 for an example. (Figure B-4 is a summary of the findings, while Figure B-5 and Figure B-6 show the details of that summary.)

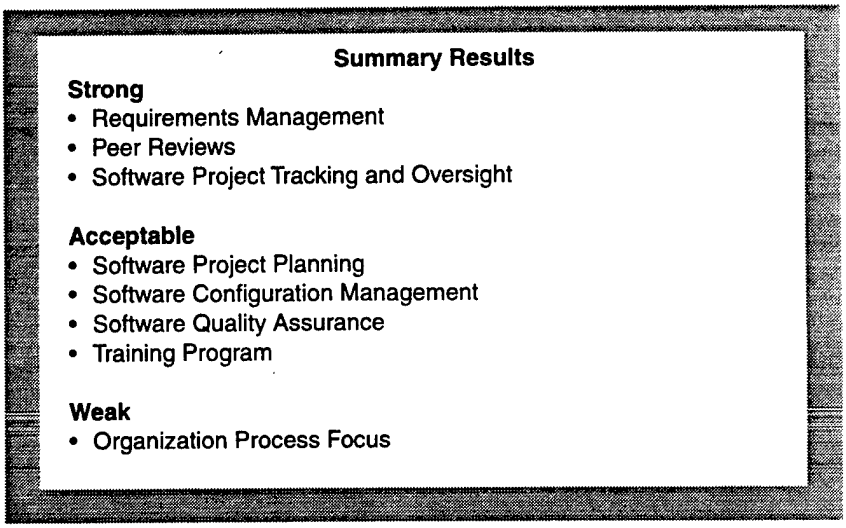

Figure B-4: Summary Findings From a Recent SCE

The source selection organization should at no time ask for or accept findings from a Software Process Assessment (SPA). As discussed in Chapter 1, SPA findings are determined for a different purpose and are inappropriate for use with SCE findings in a source selection decision.

The summary findings shown in Figure B-4 reveal that only one key process area was weak. The weaknesses contributing to that determination can be found in Figure B-5 and Figure B-6. Although there were weaknesses in other key process areas, only the Organization Process Focus weaknesses were found to be significant enough for that KPA to be included in the summary findings weak area. The details of that determination are made by the SCE team in the context of this specific acquisition. This means that the SCE team used their individual professional judgment to determine the degree of satisfaction of the goals of each KPA. The context of these determinations is critical to the findings. For example, it is possible that an organization may have a software configuration management system that most experienced personnel would consider excellent. However, the SCE team may have found that one project does not use it, another project uses it very effectively, and a third or fourth project may use it in differing levels of application. This is an example where the SCE team would be faced with determining, from the organizational standpoint,

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whether a finding for the Software Configuration Management KPA is acceptable, weak or strong. On one hand it was determined that the configuration management system in place is excellent (a strength), on the other hand the evidence suggests spotty implementation and or application (acceptable or weak?). Does this mean the finding is reported as a strength, acceptable or as a weakness? This type of dilemma is typical of those faced by the SCE team for which the various background experience in the different disciplines comes into play in providing consensus from a professional judgment standpoint on specific findings for each KPA investigated.

Requirements Management

Strengths
- Effective review/statusing mechanism in place
- Very strong, clear lines of authority
- Software engineering process represented throughout system engineering process (and vice versa)
- Action items tracked to closure by management
- Sure technical presence at managerial level

Weaknesses
none

Improvement Activities
none noted

Peer Reviews

Strengths
- Multiple, rigorous requirements, design, and code inspections conducted
- Training required to participate on peer reviews
- Experienced, senior people lead reviews
- Currently tracing defects and beginning to analyze results

Weaknesses
- Lack of organizational consistency in the reviews of each phase

Improvement Activities
none noted

Software Project Tracking and Oversight

Strengths
- Provides wide coverage of software process at a detailed level
- Extensive use of programmers' notebooks to guide staff through various phases of the process
- Emphasis on populating useful software development folders

Weaknesses
- Lack of organizational consistency

Improvement Activities
none noted

Software Quality Assurance

Strengths
- Experienced personnel
- Very good relationship with development personnel
- Independent reporting chain

Weaknesses
- Lack of sampling mechanism
- Lack of independent audit coverage and depth
- Resources lacking on some projects

Improvement Activities
- Establishing an independent reporting chain
- Interviewing for SQA personnel

Figure B-5: Detailed Findings

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Software Project Planning

Strengths

- Procedure for sizing and costing of software exists project to project
- Extensive collection of management metrics and tracking of progress
- Schedule and performance based on real progress
- Cost and schedule consistent with size

Weaknesses

- Inconsistent sizing procedure across organization
- Lack of completely written sizing procedure

Improvement Activities

none noted

S/W Configuration Management

Strengths

- Effective change control process
- Automated tool to enforce change control process
- Effective traceability between development products

Weaknesses

- Lack of mechanism insuring the adequacy of regression testing

Improvement Activities

none noted

Training Program

Strengths

- Training database by individual exists
- Many diverse courses offered
- Individualized training program updated during yearly appraisal

Weaknesses

- Training program inconsistently implemented and emphasized across the organization
- Inadequate resources to ensure timely training

Improvement Activities

none noted

Organization Process Focus

Strengths

- Organizational function exists
- Full-time resources in place
- Organizational focus for metrics collection

Weaknesses

- Lack of buy-in from the engineering staff (many unaware of existence)
- Lack of SEPG focus and record of accomplishment

Improvement Activities

none noted

Figure B-6: Detailed Findings (continued)

Another aspect of using SCE is illustrated by the use of PFNs to communicate software process weaknesses identified by SCE to the offerors within the competitive range. A Clarification Request (CR) should be used to communicate a weakness initially. A Point for Negotiation (PFN) can be used to identify those points the government wishes to discuss further. A PFN or CR will never be used to identify a deficiency. The SSEB then considers their responses with the original SCE findings before making a final determination against the evaluation standard. This approach allows the offerors the opportunity to point out any oversights on the part of the SCE team. The SCE team could prepare a PFN (or CR if appropriate) to let of-

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ferors know what weaknesses were found. Figure 7 is an example of a PFN. This example details the specific weaknesses found by the SCE team that made the KPA Organization Process Focus weak.

Source Selection Information (See FAR 3.104) For Official Use Only (when filled in)	
POINT FOR NEGOTIATION	
Government Reference: IFPP Paragraph 3.3.4	Offeror: XYZ Corporation
Offeror Reference:	Register Number: PFN-XYZ-S-001
Point for Negotiation: The key process area (KPA) found by the Software Capability Evaluation (SCE) to be weak is Organization Process Focus. The detailed findings leading to this conclusion are as follows: • Lack of buy in from the engineering staff (many unaware of existence) • Lack of SEPG focus and record of accomplishment	
SCE team Chief:	SSEB/T Chairperson:
Source Selection Information (See FAR 3.104) For Official Use Only (when filled in)	

Figure B-7: Findings Incorporated Into a Point For Negotiation

The findings that go into a PFN may vary. One acquisition organization's approach was to provide only those weaknesses in the PFN that caused an entire key process area to be evaluated as weak (as in Figure B-7). Those are significant weaknesses which, depending upon the affected key process area, may influence the evaluation standard one way or another. Alternatively, the entire findings set may be communicated in the PFN. In deciding what to include in the PFN/CR, the SCE team leader should work very closely with the PCO, SSEB chairperson, and the acquisition organization's legal advisor.

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A PFN/CR is a way to communicate an SCE weakness(es) to an offeror and allow the offeror to respond with one of the following:

- evidence showing the government's SCE team made an oversight
- a response accepting the findings
- a response accepting the findings and identifying improvement activities to remedy the weaknesses
- a combination of the above previous responses

A cover letter sent with the PFNs/CRs will explain how the offeror may respond. It is recommended that the letter include a page limitation for the offeror's response so that the SSEB is provided with only relevant evidence.

When the responses to the PFNs/CRs have been received from the offerors (typically five to seven days are allowed for responses) the SCE team leader should analyze them to see if material changes in the findings are required that would necessitate recalling the SCE team. The only time the SCE team would reverse a decision on a finding, is if the offeror shows proof that the team overlooked something.

The SCE team performs an analysis and makes any final adjustments to the findings. These findings will be factored into the technical area/item evaluation results for each offeror. The manner in which SCE findings/results are factored into the source selection results depends upon how SCE was structured into the source selection (e.g. items, factors etc.). Your PCO and procurement regulations will guide you through this step. Figure 8 and Figure 9 provide an example item summary for the set of findings shown in Figure 4, Figure 5, and Figure 6. The example assumes that no changes to the findings were made during the PFN/CR process.

The item summary contains the color rating and associated risk for the respective offer, some background on the projects the SCE evaluated, the summary and detailed findings made by the SCE team while on site, and a statement justifying the assigned risk. In order to determine the color rating, the SCE team applied the findings to the evaluation standard. Similarly, for this example, the risk was assigned based upon consistency between the offeror's communicated capability found in the SPIP and the actual SCE findings. In this example, the offeror was rated blue with a low risk. The item summary then points out the various strengths and weaknesses in their appropriate location and justifies the risk rating.

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At this level of evaluation, within the SSEB, the offerors are only compared to a pre-established standard. No offerors are compared to one another.

Source Selection Information (See FAR 3.104) — For Official Use Only (When Filled in)			
Item Summary			
Area: Technical	Item: T3/Software Engineering Capability	Offeror: XYZ Corp	Color Rating: Blue

Description of Proposal

The offeror proposed a software PIP which...

The software Process Improvement Plan was found to be consistent with the SCE findings. The offeror's program of software process improvement is genuine, with considerable emphasis on organizational standardization and removal of defects through rigorous reviews. The projects examined as part of the Software Capability Evaluation (SCE) are as follows:

- ABCD
- HAVE GOLD PLATE
- COBRA LIBRARY
- CCXYZ

Strengths

Requirements Management

- Defined review/status mechanism in place
- Very clear, strong lines of authority
- Software engineering represented throughout system engineering process (and vice versa)
- Action items tracked to closure by management
- Sure technical presence at management level

Software Project Tracking and Oversight

- Provides wide coverage of software process at a detailed level
- Extensive use of programmers notebooks to guide staff through phases of the process
- Firm emphasis on populating useful software development folders

Peer Reviews

- Multiple, rigorous requirements, design, and code inspections conducted
- Training required to participate on peer reviews
- Experienced, senior people lead reviews
- Currently tracking defects and beginning to analyze results

Item Chief Signature:	Area Chief Signature:

Figure B-8: Findings Incorporated in Item Summary

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Acceptable Points

SQA

- Experienced personnel and independent reporting chain

Software Project Planning

- Procedure for sizing and costing software exist project to project
- Extensive collection of management metrics and tracking of progress

SCM

- Effective change control process and traceability between development projects

Training Program

- Solid emphasis from management and extensive in-house software courses
- SEPG
- An organizational function exists with full-time resources in place

Weaknesses

The Key Process Area found by the Software Capability Evaluation to be weak was:

Organization Process Focus

- Lack of buy-in from the engineering staff (many unaware of existence)
- Lack of SEPG focus and record of accomplishment

Overall Risk Assessment and Evaluation Summary

Low Risk: The consistency between their SCE findings and software process improvement plan shows they understand their current maturity level and where they are going as an organization. They are very strong technically (very close to being strong in all the key process areas) and are committed to developing quality software using a continually improving development process. This contractor's commitment to process improvement was further evidenced by the process rigor in place on one of their commercial programs where no development standards were required. Their process was still the same and management exercised the same controls.

Figure B-9: Findings Incorporated in Item Summary (continued)

Item Summaries are reviewed by the SSEB/T chairperson and then an area summary is prepared which normally "rolls up" all (or most) of the strengths and weaknesses from the individual item summaries and then identifies an overall risk for that area. This information is reviewed by the PCO, legal representatives, and the SSAC. The legal and PCO review will examine everything to insure that the evaluation standards have been consistently applied and that the item and area summaries contain consistent types and levels of information. The SSEB/T will present this information to the SSAC. The SSAC members will analyze the SSEB/T's evaluation results and start the process of comparing each offerors strengths, weaknesses and risk—an activity the SSEB is not allowed to do.

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In parallel, the SSEB will make a formal presentation to the SSAC outlining the color codes, strengths, weaknesses and risks for each offeror for each item and area resulting from their evaluations. During this presentation, the SCE team leader, as a member of the SSEB, should be prepared to elaborate on any of the findings from any of the offerors. For example, the SCE team leader should be prepared to explain not only why an offeror was weak in software configuration management, but also why the SCE team found their change control process lacking. The SSAC will want to ensure that the SSEB can substantiate their findings with documented evidence.

At this point in the source selection process, the SSAC, after completing their comparative analysis of all final proposals' strengths, weaknesses and risks, may elect to assign a different color code separate from the SSEB or it may ask the SSEB to reconsider its color codes in light of information discussed in the SSAC briefing. These actions are normally done on an "exception" basis and are not common since the SSAC would have reviewed this material at the time of competitive range and before BAFOs were issued; therefore, any "disconnects" should be resolved before BAFOs are received. Unless an offeror completely changes its proposal approach, there should be no "surprises" in the BAFOs. The SSAC will ensure that the evaluation for each criterion has been consistently and fairly applied to all offerors.

Figure 10 shows one way the findings from a series of SCEs has been presented formally to a SSAC. Each offeror's technical rating, strengths and weaknesses, risk, and a summary explaining the basis for the risk are identified and placed next to the other offerors so that the SSAC may compare and discuss them during a presentation. This normally represents the lowest level of detail presented to the SSAC during the formal presentation. It is during this presentation that an SCE team leader may have to articulate why certain key process areas were a strength or weakness for a particular offeror. The expertise of the SCE team leader is needed to communicate why a KPA was strong or weak and its significance within the software process.

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	Item: T-3 Software Engineering Capability		
	Offeror A	**Offeror B**	**Offeror C**
	Blue	**Yellow**	**Yellow**
Strength	• Requirements Management • Peer Reviews • Software Project Tracking and oversight	• None	• Organization Process Focus
Weakness	• Software Engineering Process Group • Organization Process Focus	• Software Quality Assurance • Training Program	• Peer Reviews • Software Project Tracking and Oversight • Training Program
Risk	Offeror is very strong technically and is committed to developing quality software using a continuously improving development process **L**	Because of the large disparity between SCE findings and their submitted SPIP, it is highly questionable whether the software process improvement is being implemented **H**	Offer's SPIP indicated they are at the initial maturity level with their best practices being applied to all new programs **M**

Figure B-10: Findings Output From the Evaluation Standard

The SCE written report must also back up and provide substantiation or articulate reasons for the ratings' assigned since the briefing is reduced to "bullets" only and should be derived from the detailed written findings.

Figure 10 illustrates how risk was assigned to the software engineering capability technical score (color rating) in a recent source selection. Note that Offerors B and C have yellow as their technical score, but Offeror B has a high risk and Offeror C has a moderate risk; yet Offeror C has three weak Key Process Areas and Offeror B has only two. How did this occur?

Risk in this acquisition was assigned based upon the consistency of the organization's process improvement program and the SCE findings, because it was stated clearly in the RFP for this acquisition that an organization could be at the Initial maturity level and still be awarded the contract. It was also stated in the Instructions for Proposal Preparation (IFPP) that risk would be used as a measure of an organization's process improvement realism. If an organization had a realistic program of software process improvement, then they were considered low risk, regardless of their current maturity level rating. If an offeror claimed to be at the Defined

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or Managed maturity level in its SPIP, but the SCE findings showed the offeror to be at the Initial or Repeatable maturity level, then the SSEB would assign either a high or moderate risk. This assignment depended upon the magnitude of the disparity between the SPIP and the SCE findings.

Offeror B had identified itself as being at the Defined maturity level and did not have an improvement plan that would substantiate its progress through the lower maturity level. The SSEB/SCE team determined Offeror B to be closer to the Initial maturity level. In short, Offeror B was unaware of its actual lower maturity level and was consequently assigned a high risk with only two weak key process areas, while Offeror C received a moderate risk with three. Offeror C, on the other hand, had a realistic SPIP indicating it was at the Initial maturity level with its best practices being applied to all new programs. The SCE findings confirmed this and resulted in assigning a lower risk to this offeror.

		Area: Technical		
		Off-eror A	**Off-eror B**	**Off-eror C**
Software Engineering Capability	Color	Blue	Yellow	Yellow
	Risk	L	H	M
Technical App.	Color	Green	Yellow	Blue
	Risk	L	L	L
Management	Color	Green	Green	Blue
	Risk	L	L	L
SUMMARY RESULTS	**Color**	**Green**	**Yellow**	**Green**
	Risk	**L**	**H**	**M**

Figure B-11: Technical Area Summary

The last step of the process is the integration of the SCE technical rating and risk factor with those of the other technical items to produce a technical area summary, as shown in Figure 11. At this point, the SSAC will integrate the color codes and risk factors into area summaries based upon their own analysis and presents them to the SSA. The SSAC then conducts a comparative analysis of all offerors' strengths, weaknesses and risks as presented by the SSEB/T on these item and area summaries and presents it to the SSA. Note: SSAC does not make written recommenda-

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tions to the SSA. Note that in this example the items in the Technical Area, Management, Technical Approach and Software Engineering Capability are listed in descending order of importance. This illustration of risk identification and assessment is not the sole method for approaching the risk problem. Acquisitions should tailor the risk assignment to the specific needs of the acquisition.

Performance Risk Analysis Group (PRAG)

Offerors past and present performance is evaluated by the PRAG. Their results will be presented to the SSA in the form of performance risk.

Performance Risk Assessment Definitions:

High: Significant doubt exists, based on offeror's performance records, that the offeror can perform the proposed effort.

Moderate: Some doubt exists, based on the offeror's performance records, that the offeror can perform the proposed effort.

Low: Little doubt exists, based on the offeror's performance records, that the offeror can perform the proposed effort.

N/A: No performance record identifiable.

B.2 United States Navy SCE Implementation Example

The following example is *representative* of United States Navy acquisition organizations which use an algorithmic approach to source selection, where percentages are allocated to the various specific criteria and points can be earned for each criterion. Typically percentage points are distributed among the various criterion. At a high level, typical criterion of Technical, Management and Cost would have different percentages of weighting or raw points (e.g. Technical 45%, Management 30% and Cost 25%). Note that nominally these criterion are further broken down into "factors or items" that further distribute points. For example the overall evaluation criterion Technical could be subdivided into: Technical Approach, Networks, Software Engineering, and Reuse Initiative. The individual solicitation (RFP) requirements will determine the specific set of evaluation criteria. The allocated percentage/points would then be allocated among those four factors.The points are then totaled according to the algorithm. Part of the algorithm includes allocating percentages of the source selection decision to the cost and management areas.

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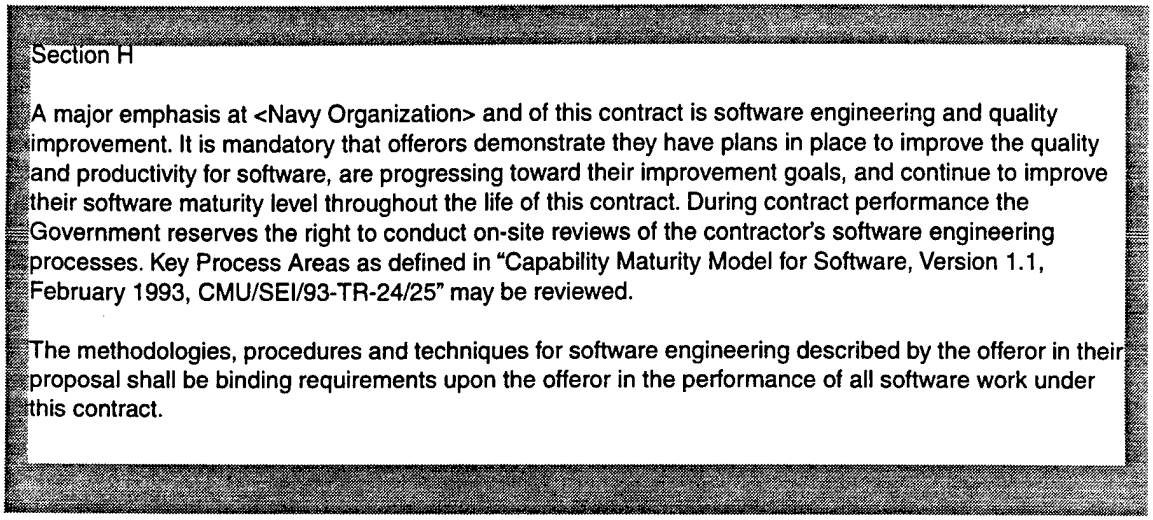
Note that the various sections of the RFP (Sections H, L, M, Figure B-12, Figure B-13, Figure B-14, Figure B-15) although slightly different in actual text from that shown in Part 2 of this document, all provide explicit reference to using the CMU/SEI-93-TR-24 "*Capability Maturity Model for Software*" and CMU/SEI-TR-25 "*Key Practices of the Capability Maturity Model*" as the reference model for use during onsite reviews (SCE conduct) at contractor sites.



Section H

A major emphasis at <Navy Organization> and of this contract is software engineering and quality improvement. It is mandatory that offerors demonstrate they have plans in place to improve the quality and productivity for software, are progressing toward their improvement goals, and continue to improve their software maturity level throughout the life of this contract. During contract performance the Government reserves the right to conduct on-site reviews of the contractor's software engineering processes. Key Process Areas as defined in "Capability Maturity Model for Software, Version 1.1, February 1993, CMU/SEI/93-TR-24/25" may be reviewed.

The methodologies, procedures and techniques for software engineering described by the offeror in their proposal shall be binding requirements upon the offeror in the performance of all software work under this contract.

Figure B-12: USN RFP Section H

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Section L

It is mandatory that offerors demonstrate they have plans in place to improve the quality and productivity for software, are progressing toward their improvement goals, and continue to improve their software maturity level throughout the life of this contract. Offerors shall submit as part of their proposal the following:

1. Software Process Improvement Plan - This plan should describe the offeror's plans and schedule for improving their current software engineering processes/practices, as they relate to the Key Process Areas.

2. Company Software Standards/Practices documentation - This documentation shall address methods in which software engineering work shall be conducted under the contract. The offeror shall provided evidence of documented standards and practices. Within the Software Standards/Practices documentation, each offeror shall detail the extend of their employment of standardized, state of the art software standards and practices. The above information will be used to evaluate the Software Engineering evaluation criterion (see Section M).

An on-site evaluation to compare the information submitted with the proposal (i.e. Software Process Improvement Plan and the Software Standards/Practices documentation) to current processes/practices may be performed (see Section M). During the on-site evaluation, information provided in the proposal will be validated through interviews with various personnel and through documentation reviews for the projects being evaluated. Offerors should have available the software managers and other key personnel for the projects as well as the documentation necessary to support the evaluation. The on-site evaluation will focus on the offeror's compliance with the Key Process Areas. The Key Process Areas along with page references to "Capability Maturity Model for Software, Version 1.1, February 1993, CMU/SEI/93-TR-24/25", which will be furnished upon request, are presented below. Page references provide the general scope of inquiry concerning the Key Process Areas.

Figure B-13: USN RFP Section L

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Section L (continued)

Key Process Areas:

Requirements Management, Pages L2-1 through L2-10
Software Project Planning, PagesL2-11 through L2-28
Software Project Tracking and Oversight, Pages L2-29 through L2-42
Software Subcontractor Management, Pages L2-43 through L2-58
Software Quality Assurance, Pages L2-59 through L2-70
Software Configuration Management, Pages L2-71 through L2-84
Organization Process Focus, Pages L3-1 through L3-10
Organization Process Definition, Pages L3-11 through L3-24
Training Program, Pages L3-25 through L3-36
Integrated Software Management, Pages L3-37 through L3-58
Software Product Engineering, Pages L3-59 through L3-82
Intergroup Coordination, Pages L3-83 through L3-92
Peer Reviews, Pages L3-93 through L3-100

Offerors shall submit with their proposal the following:

1. Project Profiles (enclosure (2))
2. Software Process Maturity Questionnaires (enclosure (1))
3. Corporate organization charts showing complete administrative and functional interfaces for the projects being evaluated.

This information will not be evaluated unless an on-site evaluation is performed. However, failure to submit this information could result in an offeror receiving a significantly reduced score in the software engineering criterion in the event an on-site evaluation is performed. This above information will be used to prepare for the on-site evaluation in the event that the evaluation is preformed. (see Section M).

The project profiles and Software Process Maturity Questionnaires shall be submitted for four projects. These projects must have been completed within the last year or are currently in progress and are similar in scope and magnitude to the proposed contract. Responses shall be submitted on the Software Process Maturity Questionnaires per instructions in enclosure (1). All questions must be answered, or documentation in the "comments" space of the Software Process Maturity Questionnaire.

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Figure B-14: USN RFP Section L (continued)

Figure B-15, Section M of the RFP, identifies for the contractor community *what* is evaluated not the specifics of exactly *how* the criteria is scored.

Figure B-16 is an example evaluation standard demonstrating a numerical approach to scoring the software engineering capability specific criterion. Note that it is an internal document that according to the organization's internal acquisition and procurement regulations would be treated as "source selection sensitive" and not published for the contractor community's information.

Section M

The technical score for the Software Engineering capability evaluation criterion shall be determined through an evaluation of the offeror's strengths and weaknesses in Key Process Areas as measured by the Software Process Improvement Plan and the Software Standards/Practices documentation that are provided with the proposal. An on-site evaluation to compare proposed processes/practices may be performed. If this on-site evaluation is performed, all acceptable offerors will be evaluated. This evaluation could result in reduced technical scores if information provided in the proposal is found to be incorrect or not verifiable with the Project Profiles, Software Process Maturity Questionnaires and corporate organization charts provided with the offeror's proposal.

Figure B-15: USN Section M Evaluation Criteria

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Description: Software Engineering Capability: Evaluation will be made of the offeror's organizational software process capability using Software Capability Evaluation (SCE), their program for software process improvement, and the extent to which their software process supports the goals, objectives, and requirements of the solicitation. A total of 28 points can be earned from this specific criterion.

Standard:

1) The Software Process Improvement Plan (SPIP) submitted with their proposal realistically portrays their current process capability and presents a realistic plan to process improvement. The offeror's plan is consistent with their SCE findings. The SPIP outlines the offeror's plan to achieve higher maturity levels and demonstrates the offeror understands software process improvement, both technically and in the effort required to increase and sustain higher maturity. The offeror, shall earn zero points if the plan is unrealistic or inconsistent with the SCE findings. The offeror shall earn up to two points if the plan is realistic and correlates with the SCE findings.

2) For each of the following key process areas, the offeror earns a point for each key process area found to be strong or acceptable in the SCE findings:

- Software Configuration Management
- Software Quality Assurance
- Software Subcontract management
- Software Project Tracking and Oversight
- Software Project Planning
- Requirements Management

3) For the offeror to earn any points for the following key process areas, the offeror must have been strong or acceptable in all the key process areas identified in (2) and have earned at least one point for criterion (1). If those criteria have been met, then the offeror earns an additional point for each of the following key process areas found to be strong or acceptable in the SCE findings:

- Peer Reviews
- Intergroup Coordination
- Software Product Engineering
- Integrated Software Management
- Training Program
- Organization Process Definition
- Organization Process Focus

Figure B-16: USN Numerical SCE Evaluation Standard

B.2.1 Applying Percentages and Points Among Evaluation Criteria

This approach integrates the SCE KPA findings numerically. In this example five representative discrete evaluation criteria could be:

1. Methodology for Providing Services Proposed
2. Technical Approach

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3. Corporate Resources/Experience/Management
4. Software Engineering
5. Cost

The score, based on 28 points out of a grand total of 100 for the entire evaluation, can be adjusted to reflect the unique needs of a particular acquisition in the same manner as the color based approach. This numerical approach is not a scoring mechanism to derive maturity levels or KPA strengths and weaknesses. Instead, it is a system for integrating findings of strengths, weaknesses, and improvement activities into a numerically-based source selection process. The numerical approach works in a sequential fashion.

1. The first item in Figure B-16 addresses an offeror's SPIP. Depending upon the SPIP realism and its consistency with the SCE findings, the offeror may earn up to two points.
2. The second item addresses the Repeatable maturity level KPAs. An offeror may earn up to 12 points for this item depending on the KPA ratings that are "Strong" or "Acceptable."
3. The third item addresses the Defined maturity level KPAs. A realistic SPIP, a "Strong" or "Acceptable" rating in each of the KPAs identified in item two, and "Strong" or "Acceptable" ratings in the Defined level KPAs may earn up to 14 points.

This approach, while somewhat stringent, captures the spirit of the CMM because it emphasizes that the lower level KPAs must be in place before optimal benefit can be attained from achieving higher level KPAs.

This section presented examples of how an evaluation standard can be written which successfully de-emphasizes maturity levels while keeping with the spirit of the CMM. Trained SCE users should be able to take these examples and tailor one of them to meet the specific needs of their acquisition. Thus, SCE can contribute effectively to the source selection decision. The findings, provided to the SSEB by the SCE Team, are a snapshot of process capability for a specific site at a particular point in time. The way those findings are used by the acquisition organization can be modified through the design of the evaluation standard.

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B.3 Using SCE, Army Source Selections

The figures below show U.S. Army Computer Electronics Communications (CECOM) RFP language. Note the reference to the Software Process Risk Evaluation and the standard being the SEI CMM in the RFP Section L Figure B-17. Further note the RFP Section M, Figure B-19, stating the SPRE methodology is consistent with the SEI's Software Capability Evaluation methodology.

SECTION L

L-XX.X SOFTWARE PROCESS RISK EVALUATION.

The Software Process Risk Evaluation (SPRE), an integral part of the source selection process, determines the risks associated with the offeror's software development process. The SPRE determines risks based upon the strengths and weaknesses of the offeror's software development process, and the offeror's initiated or planned software process improvement efforts.

Software process capability will be determined through an evaluation of the offeror's strengths and weaknesses. The standard for the evaluation will be the Capability Maturity Model, version 1.1, documented in CMU/SEI-93-TR-24 and CMU/SEI-93-TR-25. The results will be an organizational composite, based on responses to the software process maturity questionnaire, interviews with organization personnel, and review of organization documentation and artifacts. The projects to be evaluated will be selected by the government from the submitted project profiles. A risk assessment, evaluating current process practices as well as proposed processes improvements, will be performed. The SPRE shall require the following:

a. The government reserves the right to perform an SPRE on each organization involved in the development effort. The SPREs of all organizations evaluated will be considered part of the overall SPRE risk rating for the offeror. For the purposes of this a nd all the following bullets, an organization is defined as each geographically separate corporation, division, or site. Therefore, each organization should prepare for a maximum of a five day on-site evaluation period, at a time to be determined by the government.

b. Each organization should prepare to identify by name, and provide access to the following personnel for on-site evaluation:

- - A corporate officer or senior manager for the organization being evaluated
- - Project manager and software manager for each project subject to the evaluation
- - Software Quality Assurance representative for each project subject to evaluation
- - Testing representatives for each project subject to evaluation
- - Other managerial and technical representatives as requested by the government.

c. Each organization should plan to provide facilities for conducting the on-site evaluation.

Figure B-17: U.S. Army CECOM RFP SCE Text, Section L

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SECTION L (continued)

L-XX.X SOFTWARE PROCESS RISK EVALUATION.

The offeror shall provide the following information to facilitate an evaluation of the software development process using the SPRE methodology:

a. The offeror shall identify each organization that will be involved in the development effort described in the proposal, along with a brief description of the effort each organization will perform. For the purposes of this and all the following bullets, an organization is defined as each geographically separate corporation, division, or site.

b. The offeror shall provide a description of the system characteristics as it applies to the software development. In addition, the offeror shall identify the following for the proposed software development as it applies to each organization involved in the development effort:

- - Size of software effort

- - Language(s) to be used

- - Tools/methodologies to be used.

c. The offeror shall provide an overall plan for the development of software, to include software developed by all organizations on the offeror's team. This plan shall include a discussion of newly developed software, Commercial Off The Shelf (COTS) software, Non-Development Item (NDI) software, and the interfaces between them.

d. The offeror shall provide a description of the software development process to be employed for the development effort described in the proposal. This description shall include discussion of all the organizations involved in the development effort. If the described process is different from processes currently in place (i.e., process being used by each organization on the offeror's team), the offeror shall include a plan for implementing the described process.

e. Each organization identified above shall provide an organization chart t hat describes the organizational structure from upper management down to the software project leader level.

f. Each organization shall provide project profiles and questionnaire responses on six software development projects either completed during the past year or currently in progress, similar in scope and magnitude to the proposed project, and from the site and organization where the proposed project will be performed. If this number is not available, consider the submission of projects that do not match the profile as closely. The format to be used for completing the project profiles is outlined in Attachment II. The questionnaire responses shall represent the answers to the questions posed in Attachment I. The answers shall be recorded on copies of the form provided.

Attachment I - Software Process Maturity Questionnaire

Attachment II - Project Profile Form

Figure B-18: U.S.Army CECOM RFP SCE Text, SECTION L (cont'd)

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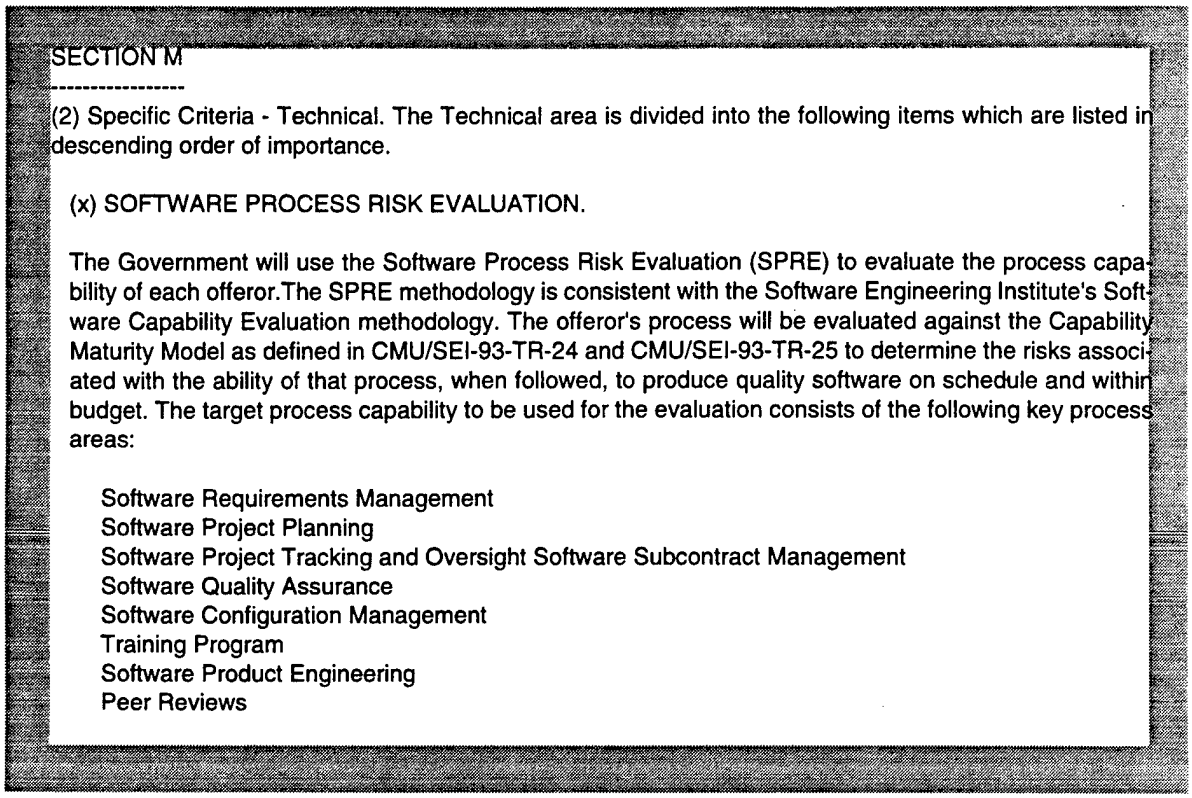

SECTION M

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(2) Specific Criteria - Technical. The Technical area is divided into the following items which are listed in descending order of importance.

(x) SOFTWARE PROCESS RISK EVALUATION.

The Government will use the Software Process Risk Evaluation (SPRE) to evaluate the process capability of each offeror.The SPRE methodology is consistent with the Software Engineering Institute's Software Capability Evaluation methodology. The offeror's process will be evaluated against the Capability Maturity Model as defined in CMU/SEI-93-TR-24 and CMU/SEI-93-TR-25 to determine the risks associated with the ability of that process, when followed, to produce quality software on schedule and within budget. The target process capability to be used for the evaluation consists of the following key process areas:

Software Requirements Management
Software Project Planning
Software Project Tracking and Oversight Software Subcontract Management
Software Quality Assurance
Software Configuration Management
Training Program
Software Product Engineering
Peer Reviews

Figure B-19: U.S.Army CECOM RFP Text, Section M

B.3.1 Other Examples

The examples below have been collected from various agencies and publications.

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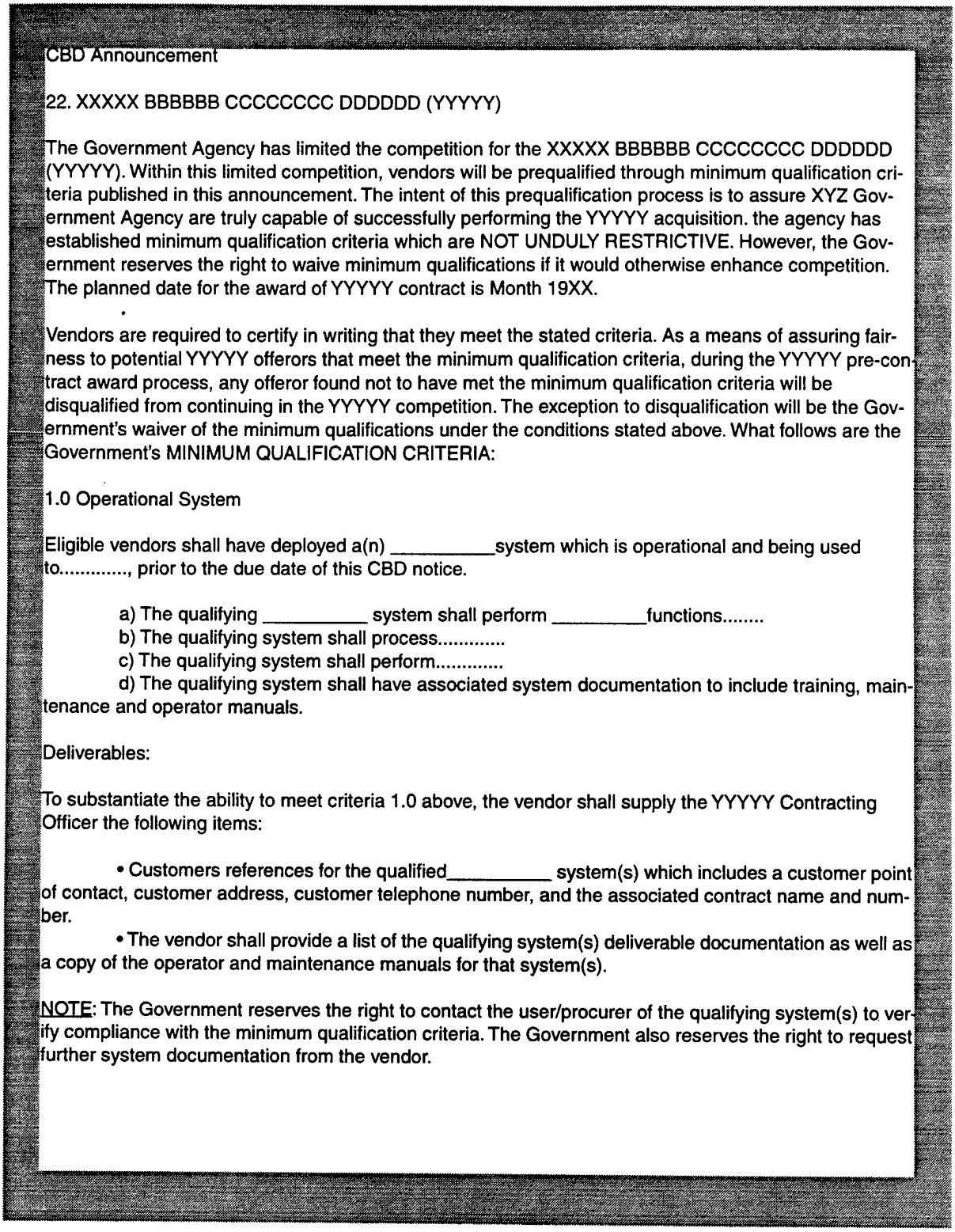

CBD Announcement

22. XXXXX BBBBBB CCCCCCCC DDDDDD (YYYYY)

The Government Agency has limited the competition for the XXXXX BBBBBB CCCCCCCC DDDDDD (YYYYY). Within this limited competition, vendors will be prequalified through minimum qualification criteria published in this announcement. The intent of this prequalification process is to assure XYZ Government Agency are truly capable of successfully performing the YYYYY acquisition. the agency has established minimum qualification criteria which are NOT UNDULY RESTRICTIVE. However, the Government reserves the right to waive minimum qualifications if it would otherwise enhance competition. The planned date for the award of YYYYY contract is Month 19XX.

Vendors are required to certify in writing that they meet the stated criteria. As a means of assuring fairness to potential YYYYY offerors that meet the minimum qualification criteria, during the YYYYY pre-contract award process, any offeror found not to have met the minimum qualification criteria will be disqualified from continuing in the YYYYY competition. The exception to disqualification will be the Government's waiver of the minimum qualifications under the conditions stated above. What follows are the Government's MINIMUM QUALIFICATION CRITERIA:

1.0 Operational System

Eligible vendors shall have deployed a(n) _____system which is operational and being used to....., prior to the due date of this CBD notice.

a) The qualifying _____ system shall perform _____functions.....
b) The qualifying system shall process.....
c) The qualifying system shall perform.....
d) The qualifying system shall have associated system documentation to include training, maintenance and operator manuals.

Deliverables:

To substantiate the ability to meet criteria 1.0 above, the vendor shall supply the YYYYY Contracting Officer the following items:

- Customers references for the qualified_____ system(s) which includes a customer point of contact, customer address, customer telephone number, and the associated contract name and number.
- The vendor shall provide a list of the qualifying system(s) deliverable documentation as well as a copy of the operator and maintenance manuals for that system(s).

NOTE: The Government reserves the right to contact the user/procurer of the qualifying system(s) to verify compliance with the minimum qualification criteria. The Government also reserves the right to request further system documentation from the vendor.

Figure B-20: Other Examples: CBD Announcement SCE

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1.1 _____Training:
The _____ system meeting criteria 1.0 above shall currently provide the capability to perform_____training.....

Deliverables:
To substantiate the ability to meet criteria 1.1 above, the vendor shall supply to the YYYY Contracting Officer the following items:

• Commercially available literature describing the _____training and.....
of the qualifying system

1.2 Second Sub-item:
The _____system meeting criteria 1.0 above shall currently_____

Deliverables:
To substantiate the ability to meet criteria 1.2 above, the vendor shall supply the YYYYY Contracting Officer the following items:

• _____diagram, of the system meeting criteria 1.0 above,.....
• A copy of the _____

2.0 Software Capability Evaluation (SCE) Experience:
Background- The contractor for the YYYYY shall perform software engineering activities including, but not limited to, requirements analysis, design, implementation, integration, test, distribution, installation, enhancement, correction, upgrade, and maintenance of software. The YYYYY contractor shall be both knowledgeable and capable in software engineering skills and practices to perform these activities. The Government Agency intends to evaluate the software engineering capabilities of offerors as part of its source selection process for YYYYY, and plans to use the results in its determination of award.

To ensure that offerors are cognizant of practices for evaluating software capabilities, offerors shall satisfy the following requirement to participate in source selection activities for YYYYY:

An independent SCE shall be performed prior to Government Agency conduct of a software capability evaluation related to the YYYYY acquisition. The SCE shall be in accordance with the conditions outlined in sections a, b, c and d below.

a) The onsite portion of the SCE was/shall be conducted after Month, Day, Year, but no later than XX calendar days after the issuance of the final version of the YYYYY Request for Proposal.

b) The SCE was/shall be performed using The Capability Maturity Model for Software, Version 1.1 as described in CMU/SEI-93-TR-24 and Key Practices of the Capability Maturity Model Version 1.1 as described in CMU?SEI-93-TR-25. Both documents were issued by the Software Engineering Institute (SEI) of Carnegie Mellon University in February 1993.

Figure B-21: Other Examples: CBD Announcement SCE (cont'd)

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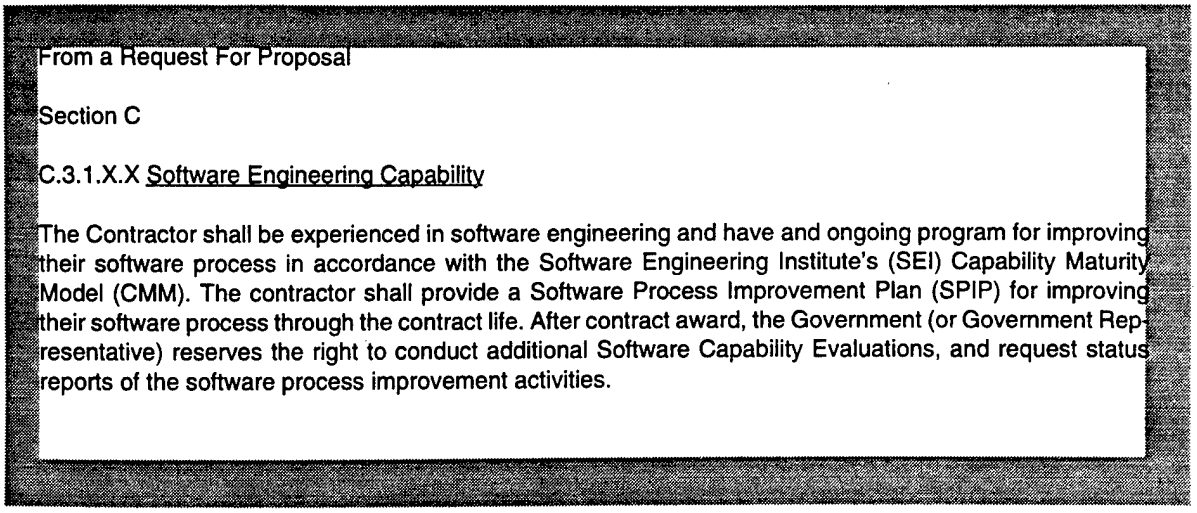


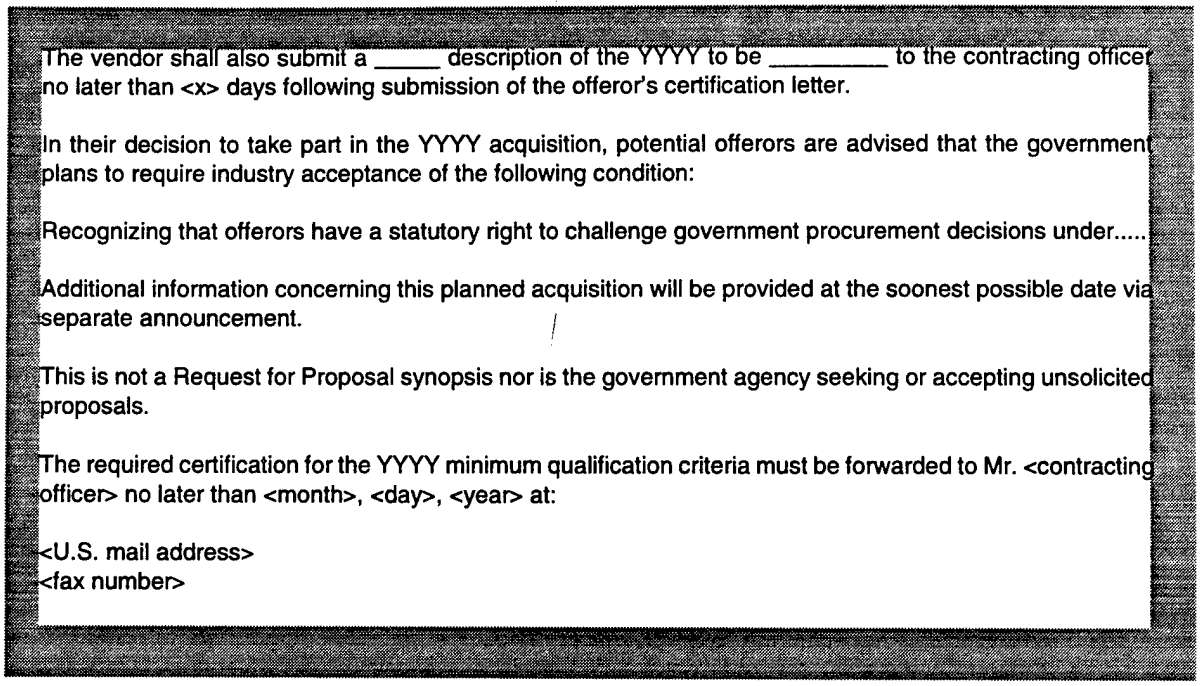
From a Request For Proposal

Section C

C.3.1.X.X Software Engineering Capability

The Contractor shall be experienced in software engineering and have and ongoing program for improving their software process in accordance with the Software Engineering Institute's (SEI) Capability Maturity Model (CMM). The contractor shall provide a Software Process Improvement Plan (SPIP) for improving their software process through the contract life. After contract award, the Government (or Government Representative) reserves the right to conduct additional Software Capability Evaluations, and request status reports of the software process improvement activities.

Figure B-22: Other Examples: CBD Announcement SCE (cont'd)



The vendor shall also submit a _____ description of the YYYY to be _____ to the contracting officer no later than <x> days following submission of the offeror's certification letter.

In their decision to take part in the YYYY acquisition, potential offerors are advised that the government plans to require industry acceptance of the following condition:

Recognizing that offerors have a statutory right to challenge government procurement decisions under.....

Additional information concerning this planned acquisition will be provided at the soonest possible date via separate announcement.

This is not a Request for Proposal synopsis nor is the government agency seeking or accepting unsolicited proposals.

The required certification for the YYYY minimum qualification criteria must be forwarded to Mr. <contracting officer> no later than <month>, <day>, <year> at:

<U.S. mail address>
<fax number>

Figure B-23: Other Examples: CBD Announcement SCE (cont'd)

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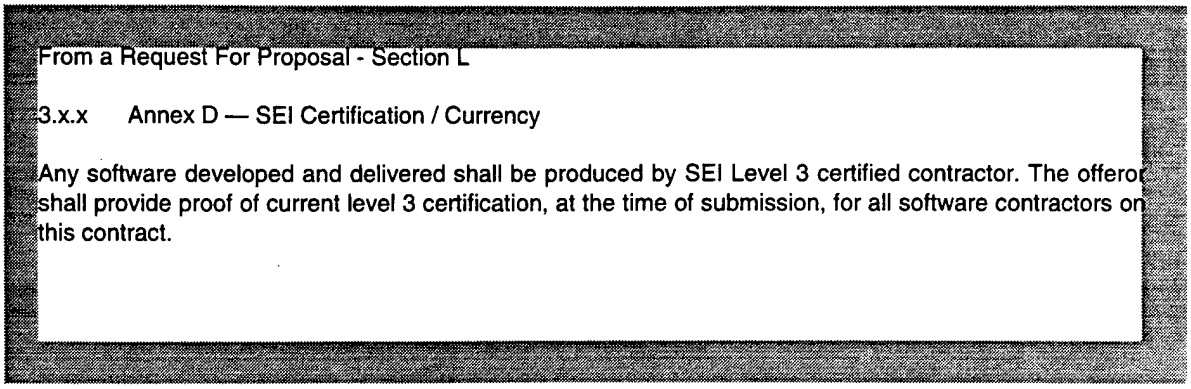

Figure B-24: Other Examples: RFP, Section L

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Appendix C Current DoD Policy Directives: SCE

This appendix contains the text of existing DoD policy documents obtained from the USA, USN, and the USAF. These documents are provided in their existing formats (e.g., USA and USN doucuments are draft). Questions regarding these documents should be addressed to the referenced organizations and points of contacts.

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(Draft) CECOM-R 11XX

Headquarters

U.S. Army Communications-Electronics Command
Fort Monmouth, New Jersey 07703-5000

CECOM Regulation **1 Dec 1991**
No. 11-XX

Army Programs
Software Capability Evaluation

Issue of changes to this regulation by other Command elements is prohibited unless specifically approved by Commander, CECOM.
ATTN: AMSEL-RD-SE-R-CRM

	Paragraph
Purpose	1
Scope	2
References	3
Terms	4
Applicability	5
Policy	6
Responsibilities	7

1. Purpose. This regulation establishes a CECOM Software Capability Evaluation (SCE) policy for software procured for Mission Critical Defense Systems (MCDSs).

2. Scope. This regulation applies to all CECOM managed MCDS. It applies to software procurements whether procured separately or in conjunction with other items or services. It applies to mission critical software procurements for development or maintenance contracts.

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3. References. Required publications are as follows:

   a. CMU (Carnegie-Mellon University)/SEI (Software Engineering Institute)-87-TR-23 (ESD-TR-87-186), A Method for Assessing the Software Engineering Capability of Contractors, Preliminary Version, September 1987. (Available from the Defense Technical Information Center as Report ADA187230).

   b. CMU/SEI-90-TR-XX, Software Capability Evaluation Implementation Handbook: Source Selection, Draft with Army Appendix B.

   c. DoD Instruction 5000,2, Defense Acquisition Program Procedures 23 Feb 91.

   d. Draft AMC Army Implementation Instructions: Use of Software Capability Evaluation in Source Selection 16 Aug 1991.

   e. CECOM-R 11- XXX, Software Acquisition and Support for Mission Critical Defense Systems (Draft).

   f. Communications-Electronics Command Management Plan for Using the Software Capability Evaluation November 1991.

4. Terms. For the purpose of this regulation, the following terms shall apply:

   a. Mission Critical Defense System (MCDS): An Army system involving Intelligence/Electronic Warfare, Command and Control, Communication, Fire Support, Maneuver Control, or other tactical weapon systems managed by or supported by CECOM, including its life-cycle support environment, that is a Theater/Tactical and/or Strategic resource and is managed in accordance with AR-70 series regulations. (Definition derived from the Under Secretary of Defense memorandum, subject: Acquisition of Computer Resources, dated 4 Mar 83.)

   b. Mission critical Software: 1) A set of computer programs, code, procedures and associated documentation concerned with the operation, maintenance and support of a MCDS's computer system. (Definition derived from JCS Pub 1-2, 1 Dec 89); 2) A combination of associated computer instructions and computer data (object) definitions required to enable the computer hardware to perform computational or control functions (for the MCDS) (Definition derived from DOD-STD-2167A).

   c. Source Lines of Code (SLOC): Code line is language independent (assembly or HOL) with declarative and executable statements included in the count, exclusive of comments, and measured at one statement per line of code.

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5. Applicability: The applicability for mandatory inclusion of SCE requirements in a Request For Proposal (RFP) are whenever any four of the following seven conditions are met:

   a. Solicitation for proposal on an Engineering-Development (ED) or Full-Scale Development (FSD) contract. Contracts for a Demonstration/Validation phase are also subject to an SCE if any portion of the software if intended for reuse during a follow-on ED or FSD contract phase. This includes contracts for Engineering Change Proposal (ECP).

   b. Any portion of the software is subcontracted. The strong likelihood of software contracting, bases on knowledge of bidder prior to receipt of proposals, is sufficient to meet this criteria.

   c. Terms of contract include mission-critical software components.

   d. Size of software to be developed, including non-operational (support and test) software when specified for delivery as a Computer Software Configuration Item (CSCI), is at least 50,000 Source Lines Of Code (SLOC), or when delivering integration software for Non-Developmental Items (NDI)/Commercial Off-The-Shelf (COTS) software where the NDI/COTS software exceeds on third of the software to be delivered.

   e. Total contract cost exceeds $10,000,000.

   f. The contract duration is specified as greater than two years.

   g. The software development schedule is a critical risk factor in the contract.

6. Policy. ON all applicable procurements:

   a. An evaluation of an offeror's software development process capability shall be performed as part of the source selection process. Software development process capability will be determined through an evaluation of the offeror's software development process maturity and extent of software process risk as measured by certification of his responses to the questionnaire in CMU/SEI-87-TR-23 as verified by on-site validation. This evaluation shall be referred to as "Software Engineering Capability Evaluation (SCE)".

   b. The evaluation will result in a report indicating the offeror's strengths and weaknesses in the Key Process Areas. The use of this report in the source selection process will be documented in the approved Source Selection Plan and in the RFP. The usage of the SCE is to be as a factor in the Source Selection Evaluation Board (SSEB). Additional guidance on preparation and use of the SCE is available in the Army Implementation Instructions.

   c. Waivers: All procurements involving the acquisition of MCDS software require the us of an SCE or an approved waiver.

      (1) Requests for Waiver will be evaluated on the basis of the relative importance of the software effort or overall cost-benefit.

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(2) Requests for Waiver will be prepared by the Requiring Activity, reviewed by the Director, CEDOM Software Engineering (SED), ATTN: AMSEL-RD-SE-D, prior to the release of the solicitation. If the waiver is not approved by the Director CECOM SED, the disapproval must be reviewed and signed by the CG, CECOM.

(3) Waiver requests should include, as a minimum, a discussion of each of the conditions under paragraph 5, "Applicability."

d. Requests for exemptions from an SCE received from individual offerors will be reviewed by the Requiring Activity and a determination made by the Director, CECOM SED as to its applicability to the current solicitation.

7. Responsibilities:

a. The Chief, Requiring Activity will:

(1) Implement the provisions of the regulation for all applicable systems, including funding for SCEs.

(2) Include the SCE requirement in acquisition plans, acquisition strategies, and solicitation documents (including evaluation plans) for the applicable procurements.

(3) Obtain a waiver of SCE application, if necessary, prior to issuance of a solicitation.

b. The Directorate for procurement will review all applicable software procurement data packages for a requirement for an SCE. Solicitations will not be issued without and SCE requirement or an approved waiver.

c. The Director, Concurrent Engineering Directorate (CED) will:

(1) Provide qualified, trained Software Test and Software Quality Assurance personnel for inclusion as CET members.

d. The Chiefs, Source Selection Authorities will ensure that applicable requirements of this regulation are included in the Source Selection Plan.

e. The Director, Software Engineering (SED) will:

(1) Review procurement data packages to determine whether SCE is applicable.

(2) Appoint a Capability Evaluation Team (CET) Leader for each project requiring an SCE.

(3) Approve the membership of the CET.

(4) Maintain an SCE competence, provide guidance, and serve as the SCE focal point within CECOM.

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(5) Review and approve Requests for Waiver or recommend disapproval to the CG, CECOM.

(6) Maintain a centralized repository of SCE data.

f. The CET Leader will:

(1) Assist the Requiring Activity in their implementation and support of SCE.

(2) Coordinate and recommend CET members from CECOM, PEO/PM, and other sources as appropriate to the Director, SED for approval.

(3) Arrange CET Team visits and prepare CET Team reports.

g. The Chief of a non-CECOM organization such as a Program Executive Officer (PEO) or non-CECOM Program/Project Manager (PM), will comply with the requirements of subparagraph 6.a above in order to have systems accepted for software maintenance and support by CECOM.

The proponent of this publication is the U.S. Army

Communications-Electronics Command. Users are invited to send comments on DA Form 2028 (Recommended Changes to Publications and Blank Forms) to Commander, CECOM, ATTN: AMSEL-RD-SE-R-CRM, Fort Monmouth, NJ 07703-5207.

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Department of the Navy

Naval Information Systems Management Center
1225 Jefferson Davis Highway
Arlington, Virginia 22202

5230
SER: 03/95/0072
Jan 24, 1995

From: Commander, Naval Information Systems Management Center

Subj: DRAFT SOFTWARE PROCESS IMPROVEMENT POLICY

Encl: (1) Draft SECNAVINST 5234, Software Process Improvement Policy

1. I request your support in reviewing the enclosed initial draft Software Process Improvement Policy. I would like to recognize Mr. Jim Stine of FMSO and his staff for the outstanding technical assistance which they provided in preparation of this document.

2. Please ensure widest distribution of this initial draft within your organization for review and comment. Please provide comments by 3 March 1995.

3. If you have questions, please feel free to call me. Ms. Margaret Powell is my point of contact for your staff. She can be reached via e-mail at powellma.ntrprs@navair navy.mil or phone at (703) 602-6906 (DSN 332). Comments may be e-mailed to Ms. Powell or faxed to her at (703) 602-4722.

J. G. Hekman
Rear Admiral, SC, USN

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DRAFT

SECNAVINST 5234
NISMC
13 January 1995

SECNAV Instruction 5234

From: Secretary of the Navy

Subj: Department of the Navy (DON) Software Process Improvement Policy

Ref:

a. DODD 5000.1 of 23 Feb 91, "Defense Acquisition" (NOTAL)

b. DODI 5000.2 Change 1 of 26 Feb 93, "Defense Acquisition Management Policies and Procedures" (NOTAL)

c. DoD 5000.2-M of 23 Feb 91, "Defense Acquisition Management Documentation and Reports" (NOTAL)

d. SECNAVINST 5000.2A of 9 Dec 92, "Implementation of Defense Acquisition Management Policies, Procedures, Documentation, and Reports" (NOTAL)

e. SECNAVINST 5200.32A of 3 May 93, "Acquisition Management Policies and Procedures for Computer Resources" (NOTAL)

f. DODD 8120.1 of 14 Jan 93, "Life-Cycle Management (LCM) of Automated Information Systems (AISs)" (NOTAL)

g. DODI 8120.2 of 14 Jan 93, "Automated In formation System (AIS)Life-Cycle Management (LCM) Process, Review, and Milestone Approval Procedures" (NOTAL)

h. SECNAVINST 5231.1C of 10 Jul 92, "Life Cycle Management Policy and Approval Requirements for Information System Projects"

Encl:

1. Definitions

2. Implementation Guidance

1. **Purpose**. To establish a Department of the Navy (DON) Software Process Improvement (SPI) policy and implement a comprehensive DON Software Process Improvement (SPI)program for systems managed under references (a) through (h).

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1. Background

a. Software has become a major part of all systems which the DON develops or acquires. Traditionally, software requires intensive management oversight to ensure a quality product. Software defects are a major cause of concern--products are not delivered when expected; software does not perform as expected; or costs are significantly greater than expected. The DON recognizes these concerns and is committed to minimizing the adverse impacts associated with inefficient, non-performant software.- Since DON obtains software either through Government Agencies or by acquisition via a contractual vehicle, we must ensure that software process improvement is addressed within both organic activities and contracted organizations

b. The Software Engineering Institute (SEI) has developed the Capability Maturity Model (CMM) which forms a framework for software process improvement.The model defines five levels of maturity, each level building on successive foundations for increased process maturity. Each level has a number of key process areas associated with it (requirements management, software project planning, software configuration management, software quality assurance, etc.) and can be used to evaluate both organic and non-organic resources. The SEI is currently evolving their program to adopt CMM-based appraisal (CBA) techniques. The Internal Process Improvement (IPI), adapted from the Software Process Assessment (SPA) methodology, can be used to evaluate organic capabilities. Because the CBA methodology is still evolving, the IPI is in field test, and other appraisal methodologies may not yet be defined, this instruction will use the terms assessment and SPA to designate an internal appraisal and evaluation and SCE to designate an external appraisal of an organization.

c. The Software Process Assessment (SPA) methodology is used to evaluate organic capabilities. To initiate an SPA, a software development activity must address risks and weaknesses associated with its software development capabilities. Once risks and weaknesses have been identified, a corrective plan of action is developed and implemented. The SPA approach encourages objective, open, and thorough analysis because results are for internal use only and may be published only as part of an aggregate reporting requirement.

d. The Software Capability Evaluation (SCE) process defines a method to evaluate a developer's software process. Based on identified strengths and weaknesses, the evaluation allows the acquirer to determine the risks associated with an organization's software development environment and the potential for repeatedly developing quality software. The SCE can be used during the solicitation phase to determine risks, or post-award to determine award fee schedules. It is envisioned that this process would become institutionalized so that it could be applied to all sources of government software acquisition, either organic or contractor.

2. **Applicability and Scope.** This policy applies to all DON organizations that acquire, develop, or maintain software or software components.

3. **Definitions.** Definitions of terms used in this instruction are contained in enclosure (1).

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4. **Policy.** The following policies govern the DON SPI Program:

a. Software Process Appraisal. All DON activities with twenty or more personnel directly involved in the development or maintenance of software or software components (subsequently referred to as the "software Organization"), or an annual software development and/or maintenance budget of at least two million dollars shall conduct an appraisal of their software processes. For consistency, this appraisal shall be based upon the Software Engineering Institute (SEI) Capability Maturity Model (CMM). Guidance for this appraisal is contained in enclosure (2).

(1) Initial CMM based appraisals shall be completed prior to 1 September 1996. Follow-on appraisals shall De performed every three years.

(2) Exemption. A software organization scheduled closure or planned to be significantly reduced within two years from the effective date of this instruction, such that on 1 January 1997, it would be under the minimum criteria established in paragraph 5a, is exempt from this policy.

b. Software Process Improvement Program. All software organizations meeting the criteria of paragraph 5a shall define, develop and implement a software process improvement program which uses a continuous improvement cycle. The improvement process shall start with the organizational appraisal. Each software organization shall develop and implement a software process improvement plan (SPI Plan) based on the findings of the initial appraisal. Additional guidance is included in enclosure (2).

c. Software Capability Evaluations (SCE). All DON organizations that contract for the design, development or maintenance of software or software components shall conduct SCEs. The SCE may be used to conduct a risk evaluation to establish a baseline of the bidding contractor's software practice, and/or as a post-award evaluation to determine fee award schedules. For consistency, the evaluations shall be based upon the Software Engineering Institute (SEI) Capability Maturity Model (CMM). Implementation Guidance is provided in enclosure (2),

(1) The SCE methodology shall be an integral part of the source selection process for any procurement that meets both the cost criteria defined in paragraph 2a, and any one of the other six criteria- defined in paragraph 2b.

(2) SCE Criteria

(a) Cost. The total value of the contract, including all options, as estimated to exceed ten million dollars.

(b) Other criteria. Various factors which may be considered high risk areas for high cost systems must be considered when determining the need for an SCE. In addition to cost, at least one of the following criteria must be met:

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(1) Criticality. The RFP includes mission critical Software.

(2) Size. The size of the software to be delivered is at least 200, 000 Source Lines of Code (SLOC).

(3) Duration. The contract duration is specified as greater than two years.

(4) New venture. A major component of the total system, including its software functionality, is considered to be unprecedented.

(5) Critical software development schedule. The software development schedule is a critical item.

(6) Subcontractors. It is anticipated that more than one-half of the software is to be subcontracted. The strong likelihood of software subcontracting, based upon knowledge or prospective offerors prior to receipt or proposals, is sufficient to meet this criteria.

d. Funding. Effective implementation of SPI is expected to accrue savings in software costs. As software organizations improve their software development capability and become more in demand, it is expected that SPI program costs will be absorbed as a mission funded cost of doing business. Centers of Excellence will be reimbursed on a fee-for-service basis.

e. Software management indicators and metrics. To ensure that software process improvement is achieved, a core set of metrics (size, effort, schedule, and quality) shall be implemented to measure software practices and products. The core set of metrics may be extended to meet specific requirements.

5. **Responsibilities.** All DON organizations shall ensure compliance with this instruction within their respective programs and projects: fund and staff implementation of SPI efforts at their SPI activities; and identify to NISMC the names and size of all qualifying software organizations within 60 days of the effective date of this policy. In addition:

a. *The Assistant Secretary of the Navy Research. Development and Acquisition (ASN (RD & A))* shall ensure the SPI policy in this instruction is implemented.

b. *The Commander, Naval Information Systems Management Center (COMNISMC)*, designated by reference (d) as the DON Software Executive Official (SEO), shall:

(1) Be responsible for implementation and maintenance of the DON SPI policy.

(2) Establish and chair the DON Software Engineering Process Working Group (SEPWG) as a subcommittee of the DON Software Executive Officials Council (SEOC).

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(3) Designate the DON representative to the DISA Center for Software's Software Process Improvement Advisory Group (SPIAG).

(4) Confirm Navy and Marine Corps nominations of Centers or Excellence for DON SPI policy support and assistance.

(5) Be responsible for implementation and maintenance of the DON Software Metrics policy.

c. *The Chief of Naval Operations (CNO)* shall:

(1) Properly resource, both with dollars and trained personnel, the SPI activities and organizations defined in this instruction.

(2) Prioritize software process improvement funding so that a continuous improvement discipline can be implemented and sustained.

d. *The Commandant of the Marine Corps (CMC)* shall:

(1) Nominate DON SPI Centers of Excellence to NISMC for review and validation.

(2) Fund and staff Marine Corps SPI Centers of Excellence and ensure personnel are fully qualified in specific procedures and policy.

e. *The DON SEPWG* shall;

(1) Function as a DON working group to develop common processes. procedures and documentation for use in implementing this policy.

(2) Include membership consisting of representatives from each DON Software Process Improvement (SPI) Center of Excellence and others as required.

f. *Each DON SPI CENTER OF EXCELLENCE* shall consist of experienced personnel who are trained and skilled in all software process improvement areas addressed by this policy. They shall be the primary source of SCE, SPA and SPI guidance, trained appraisers and evaluators within their designated functional domains. They shall use the standard processes and procedures developed by the DON SEPWG.

g. *The Commanders, Naval Systems Commands (SYSCOMs)* shall:

(1) Nominate DON SPI centers or Excellence to NISMC for review and validation.

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(2) Fund and staff their DON SPI Centers of Excellence and ensure personnel are fully qualified in specific procedures and policy.

h. *Program Executive Officers (PEOs), Direct Reporting Program Managers (DRPMs) and Program Managers (PMs)* shall:

(1) Integrate this SPI policy into their organizational responsibilities.

(2) Incorporate planning for SCEs, SPA and SPI into their acquisition strategy and program plans.

(3) Contact primary DON SPI Centers of Excellence for guidance when SCE, SPA or SPI criteria are met and coordinate with them to schedule and identify the dollar and personnel resources necessary to implement this SPI Policy.

(4) Utilize their primary DON SPI Center of Excellence for SCE, SPA and SPI support on a fee-for-service basis.

signature

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Definitions

Capability Maturity Model[SM] (CMM[SM]): The Software Engineering Institute (SEI) developed a structured method for describing the maturity of a software organization. It is a description of the stages through which software organizations evolve as they define, implement, measure, control and improve their software processes. This model provides a guide for selecting process improvement strategies by facilitating the determination of current process capabilities and the identification of the issues most critical to software quality and process improvement. It is documented in CMU/SEI-93-TR-24 "*Capability Maturity Model for Software*" and CMU/SEI-TR-25 "*Key Practices of the Capability Maturity Mode*l".

Contractor: An individual partnership, corporation, or association that contracts with another organization to design, develop and/or manufacture one or more products. This includes commercial as well as government organizations.

Critical Software Development Schedule: When completion of software is on the critical path of a project's schedule, the project is deemed to have a critical software development schedule. When such is the case, even minor slips to the software development schedule may impact system integration, testing, and final delivery of the product.

Mission Critical Software: That software which is developed to satisfy system requirements which are deemed critical by the contract or by system specifications. Mission critical software may address safety-critical, security-critical, or privacy-critical issues. The developer should develop a strategy to assure that the requirements, design, implementation, and operating procedures for the identified software minimize or eliminate the potential for violations of critical requirements; record the strategy in the software development plan; implement the strategy; and produce evidence, as part of required software products, that the assurance strategy has been carried out.

Software Process Improvement and Capability dEtermination (SPICE): Spice is a suite of standards on software process assessment being developed by the International Standards Organization (ISO). In addition to software development and maintenance practices, the standard will also be concerned with people, technology, management practices, customer support, and quality. The SPICE standard will consist of the following products: Introductory Guide; Baseline Practices Guide; Assessment instrument; Process Assessment Guide; Process Improvement Guide; Process Capability Determination Guide; and Assessor Training and Qualification Guide. The suite of proposed SPICE standards are targeted for publication as Technical Reports during 1994. A pilot testing period will follow. The proposed standards will be revised and submitted for consideration as an ISO standard during the 1997 time frame. The SEI is actively participating in the SPICE standardization effort.

Capability Maturity Model and CMM are service marks of Carnegie Mellon University.

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DON Software Executive Official (SEO): The Department of Defense, in DoD Instruction 5000.2, Part 6 Section D, Computer Resources, requires each DoD Component Acquisition Executive to designate a senior level Software Executive Official (SEO) who will monitor. support, and be the focal point for Ada usage and sound software engineering, development, and life-cycle support policy and practice. SECNAVINST 5OOO.2A designates the Commander, Naval Information Systems Management Center (NISMC) the DON SEO.

DON Software Executive Officials Council (SEOC): Chaired by DON SEO. The SEOC consists of DON Flag /SES level representatives. Their purpose is to advise DON SEO on software management and technology actions with the DON.

DON Software Engineering Process Working Group (DON SEPWG): A subcommittee of the DON SEOC. A technical working group of software professionals from each DON Software Process Improvement Center of Excellence. They are responsible for formulating Navy SPI policies, processes, and procedures to ensure standard Implementation of this policy throughout DON.

DON SPI Centers of Excellence: A group of SPI experts that have responsibility for coordinating, planning, managing, implementing and maintaining these SPI policies as appropriate for all organizations within their sphere of influence. They will be the primary source for assistance in defining and performing the software capability evaluations and software process appraisals.

Software: Computer programs and computer databases. NOTE: Although some definitions include documentation, this instruction limits the definition to computer programs and computer databases in accordance with Defense Federal Acquisition Regulation Supplement 227.401.

Software Engineering Institute (SEI): The Software Engineering Institute (SEI) is a federally funded research and development center (FFRDC) sponsored by the Department of Defense through the Advanced Research Projects Agency (ARPA). The SEI contract was competitively awarded to Carnegie Mellon University (CMU) in December 1984. It is staffed by approximately 200 technical and support people from industry, academia, and government. The SEI was established by DoD because software has become an increasingly critical component of U.S. defense systems and because the demand for quality software produced on a schedule and with budget exceeds its supply. The SEI's mission is to provide leadership in advancing the state of the practice in software engineering in order to improve the quality of systems that depend on software.

Software Capability Evaluation (SCE): An appraisal by a trained team of professionals to identify organizations who are qualified to per the software work or to monitor the state of the software process used on an existing software effort. The CE is the structured methodology

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SEI developed to conduct an evaluation of an offeror's software process capability. It is based upon the CMM. It measures a target organization against the Key Process Areas (KPAs) of the CMM. Analysis of the KPAs determines the maturity of an organization's software engineering process as an indicator of capability or risk involved if selected to deliver a quality product, at predictable cost, and in accordance with an established schedule.

DON Software Organization: A DON organization or subdivision thereof, that acquires, develops or maintains software, software products, or software work products. It includes Central Design Activities (CDAs), Software Support Activities (SSAs), Warfare and Warfare Support Systems (WWSS) activities as well as activities in which base level computing (BLC) is performed. It applies to all organizations that manage software related activities under DoD 5000.1, DoD 8000.1, DoD Instruction 5000.2, and applicable Navy directives/instructions.

Software Personnel: All personnel that are involved with software development and maintenance: managers, engineers, designers, programmers, coders, testers, software quality assurance and configuration management personnel. It does not include clerical or administrative personnel.

Software Product: Software or associated information created, modified, or incorporated to satisfy a contract. Examples include plans, requirements, design, code, databases, test information and manuals.

Software Work Product: Any artifact created as part of defining, maintaining, or using a software process, including process descriptions, plans, procedures, computer programs, and associated documentation, which may or may not be intended for delivery to customer or end user.

Source Line of Code (SLOC): All program instructions created by project personnel or other automated method which are then processed into machine code by some combination of preprocessors, compilers and assemblers. It includes declarative and executable statements as well as job control language . It does not include comments, and is measured at one statement per line of code. To estimate expected SLOC, a process/method/tool/technique which is approved by the organization should be used.

Unprecedented systems: A system is deemed unprecedented if it does not meet one or more of the following criteria;

a. the requirements are consistent and well-understood;

b. the system architecture, both hardware and software, known to be adequate f or the requirements;

c. the acquisition and development teams have previously developed a similar system.

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Implementation Guidance

1. **Background.** For the purpose of this policy. the terms assessment and SPA shall be used to designate an internal appraisal of an organization based upon the CMM. The terms evaluation and SCE shall be used to designate an external appraisal of an organization based upon the C MM . All appraisal methods will be based upon the CMM and shall be approved for use by DON. Implementation guidance for each is described in more detail below.

2. **Software Process Improvement (SPI).** Software process improvement begins with an assessment. The finding and recommendations from that assessment form the basis for an action plan/software process improvement (SPI) plan.

   a. A software organization should contact their primary DON SPI Center of Excellence to obtain information on assessments and on software process improvement. The Center of Excellence will be available to assist them in improving their software processes .

   b. It is recommended that an interim improvement progress check should be made at no more than 18 month intervals. At this time the SPI Plan should be revised if necessary.

The goal of the DON SPI program is to improve the organization's ability to develop and maintain software as measured periodically against the SEI CMM model .

3. **CMM Based Software Process Appraisals.** The Capability Maturity Model (CMM) was developed at the Software Engineering Institute (SEI) . The CMM is a structured model which describes five maturity levels of a software organization and identifies Key Process Areas (KPAs} within each level. The SEI Software Process Assessment (SPA) methodology has gained widespread industry and DoD acceptance as a method for establishing the software process maturity of an organization. Recently the SEI began the process of aligning the CMM based Software Process assessments (SPA) and the Software Capability Evaluations (SCEs). They both fall under the CMM-Based Appraisal umbrella. The new SPA method is called CMM-Based Appraisal Internal Process Improvement (CBA IPI). The SCE method is still called an SCE under the new CBA umbrella.

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a. The DON SPI Center of Excellence will be the primary source of trained assessors and of assistance for software organizations within their customer base. They will be available to assist them in determining their assessment needs.

b. Assessments will be conducted by a team composed of personnel from the assessed software organization and trained assessors. The assessment team will prepare a written report containing areas or improvement and recommendations. The report will be written so improvement areas are not attributed to any project or person associated with the project. No other agency will receive the report.

c. Small software sites (under 75 software personnel) may request a less personnel and dollar resource intensive assessment, based upon the SEI CMM.

d. The results of the assessments will be held in strictest confidence. The assessment team prepares the written report containing areas of improvement and recommendations. The report is written so improvement areas are not attributed to any project or people associated with the project. No other agency or activity receives the report without the consent of the assessed organization.

4. **Software Capability Evaluation (SCE).** The SCE is a structured methodology developed by the SEI to conduct an evaluation of an offeror's software process capability . The SCE shall serve as the basis of a software risk assessment and shall provide an objective means for assessing an offeror's software process capabilities. An SCE evaluates the

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contractor's software engineering processes, and, based on the evaluation, determines the strengths and weaknesses associated with the Key Process Areas of the CMM. The degree of risk can be determined from analysis of the strengths and weaknesses.

a. Assistance in defining and performing the SCEs, to include RFP preparation, should be obtained from the primary SPI Center of-Excellence. If the primary SPI Center of Excellence is unable to meet the schedule constraints, other activities may be used.

b. Intent to use SCEs shall be inserted in Section L or M of the Request for Proposal (RFP). The RFP should state explicitly that the SCE will be accomplished by government personnel during the source selection. It should also state that the SCE team may be separate and distinct from the proposal evaluating team.

c. The Instructions for Preparation of Proposals shall identify the documentation requested by the evaluation team, such as project profiles, organization charts, sample documentation, and a software process improvement plan. It shall also request the offeror to provide the SCE team with facilities during the site visit.

d. The SCEs shall be conducted by trained government teams. To ensure consistency in the application of the evaluation methodology, it is recommended that the same team evaluate all offerors for an acquisition. If the same team is unable to complete all the SCEs, the Program Manager will discuss the impacts of that decision with the legal counsel for the cognizant contracting office.

e. The results of the pre-award evaluations shall be used in conjunction with results of other technical evaluations performed by the source selection evaluation board (SSEB). The intent of the evaluation is to determine program risk associated with the offeror's software process capability and should not be used to limit competition to contractors that may satisfy a predefined level of software process maturity. The results should be planned to be used only in the acquisition for which they were accomplished. Use of previously accomplished SCEs is strongly discouraged but, if they are used, the Program Manager will discuss the impacts of that decision with the legal counsel for the cognizant contracting office.

f. It is recommended that an SCE be conducted on each prime contractor within the competitive range. The SCE should take place at the site where the majority of the critical software is being developed or maintained.

g. Conducting SCEs on Subcontractors. The Government shall reserve the right to conduct software process risk evaluations (SCEs) on all subcontractors. Selection of the subcontractors for evaluation should be based upon Program Manager specified criteria. This criteria shall identify subcontractors who contribute significantly to the program risk. This criteria may include not only the amount of software code or components developed but also contributions such as configuration management, software quality control, software test, software design and software documentation. If it is determined that subcontractors are to receive SCEs, then the visit should be at the invitation of

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the prime and with the participation of the prime. It is recommended that the SCE take place at the subcontractor's site. It is preferable, however, that the prime contractor conduct the SCE on the subcontractor and provide results to the government team.

h. RFP Modifications. During contract award negotiations, and based upon the results of the evaluation, the DON program manager may elect to significantly tailor the requirements for software documentation and frequency of software program reviews originally specified in the RFP. The intent to do so should be clearly stated in the RFP and is necessary to maintain a fair open competition among all contractors at various levels of the maturity model . The intent is to manage by risk assessment and not by level of maturity.

i. Broad based evaluations. The DON Program manager is expected to conduct risk evaluations that measure a full range of the offeror's software development/maintenance capabilities.

j. Contract Incentives . The DON program manager is encouraged to incentivize the contractor to establish a software process improvement program that will mitigate areas of risk identified in the evaluation .

k. Post-award SCEs. The DON program manager is encouraged to conduct periodic post award evaluations as a risk management tool to ensure the contractor maintains its software process capability and does not allow a deterioration of process that may introduce a program risk not identified during the source selection evaluation. Post-award SCEs have been used to determine an award fee based upon a SPI plan. Acquisition officials have used an SCE in conjunction with a value engineering incentive clause to provide a method for claiming cost savings. SCEs have also been used without incentive as a process improvement oversight tool.

l. DON Program Executive Officers (PEOs), Direct Reporting Program Managers (DRPMs) and program Managers (PMs) will include provisions for SCE planning in their Computer Resource Life Cycle Management Plan (CRLCMP) or Software Management Plan. During the development of the RFP and acquisition strategy, they are responsible to fully coordinate with their supporting DON SPI Center of Excellence the schedule and budget for resources necessary to implement this SPI Policy.

m. Alternative Evaluation Methodology. The SEI CMM based SCE method is required by this policy. This does not preclude the selection and utilization of comparable models and evaluation methodologies at some future time. It recognizes the dynamic evolution of software engineering technology and the existence of other models that are not specifically based upon the SEI model. These include the European Scientific Project on Information Technology's (ESPRIT) Bootstrap, SCOPE, and the draft International Standards Organization (ISO) Software Process Improvement Capability Determination (SPICE) method. The CMM based SCE method is expected to move toward the ISO SPICE method when it is released.

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Department of the Air Force

Headquarters 56th Air Base Wing (AFMC)
Hanscom Air Force Base, Massachusets

2 February 1995

Memorandum for Distribution F

From: ESC/CD

Subject: Software Capability Evaluation Policy

1. ESC is committed to developing quality software-intensive programs that meet mission needs on-time and within budget Key to the success of these acquisitions is an evaluation of the developer's software capability. SAF/AQ issued Acquisition Policy 94A-009, dated 23 Aug 94, requiring software development capability evaluations for software intensive systems.

2. This memo establishes ESC's Policy, in compliance with SAF/AQ. Software intensive MIS and C3I System acquisitions at ESC will use the Software Engineering Institute (SEI) Software Capability Evaluation (SCE). The results of these evaluations will serve as an input in the overall, source selection evaluation process.

3. The ESC Software Center (ESC/ENS) is the point of contact for all SCE team visits and team structure. Our newly established Acquisition Support Office (PKA) is the point of contact for all action pertaining to the development of evaluation criteria and standards and for documentation developed throughout the source selection process. Recognizing that today's program offices do not have sufficient expertise available to do these evaluations and source selections concurrently, ENS has established a contract to advise and assist program offices in conducting SCEs. Guidelines for implementing this policy are attached.

4. For assistance in determining whether SCE requirements should be incorporated into your RFP and in formulating an in-plant team to conduct SCE's contact ESC/ENS. Ms Kathleen McCullough 3-8493 or Ms Cathi Sparaco 3-8491 or Fax 3-8325. For assistance in structuring your source selection evaluation criteria and standards and for preparing associated reports/briefings/debriefing, contact ESC/ PKA, 3-5852, Fax 3-9959.

PHILIP P. PANZARELLA, SES
Executive Director

Attachment:
SCE Policy Implementation Plan

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Software Capability Evaluation Policy Implementation Plan

1. Purpose. This Implementation Plan provides guidelines for incorporating Software Capability Evaluations (SCE) into the source selection process at the Electronic Systems Center.

2. Objective. An SCE is an independent evaluation of an offeror's software process at the location where the offeror proposes to accomplish the predominance of the software development effort. It is a tool that can help a Program Office to determine an offeror's ability to produce a high quality product on time and within budget. The objective of the SCE is to identify the strengths, weaknesses, and existing improvement activities in an offeror's software process that best indicate the risk associated with using that offeror for a particular software acquisition. SCE results provide one input to the overall source selection evaluation process.

3. References

   a. SAF/AQ Policy Memorandum 94A-009, "Use of Software Development Capability Evaluation in Source Selections", Washington, D.C., Aug. 1994.

   b. *Capability Maturity Model for Software, Version 1.1,* CMU/SEI-93-TR-24, Software Engineering, Institute, Carnegie Mellon University, Pittsburgh, PA, Feb. 1993 (DTIC Report ADA 240603)

   c. *Software Capability Evaluation (SCE) Implementation Guide, Version* 2.0, CMU/ SEI-94-TR-05, Software Engineering Institute, Carnegie Mellon University, Pittsburgh, PA, Feb. 1994 (DTIC Report ADA 240604)

4. Background. The Software Engineering Institute (SEI) was established in 1984 to address the Nation's growing software problems: weapon system schedule slips due to software; unsatisfied system requirements; system failures due to latent software defects; and cost overruns due to software. Over the past decade, the continued rapid growth in the size, cost, complexity. and functionality of software in military systems has exacerbated the software crisis. To help alleviate the crisis, the SEI developed a process maturity framework which organizations could use to improve their software development process. The Capability Maturity Model (CMM), released in 1993, provides organizations guidance for establishing process improvement programs and is the basis for improving their overall software process. The CMM is based on the premise that the quality of a product depends upon the quality of the process used to create it. The CMM framework describes an evolutionary path from ad hoc, chaotic software processes to mature, disciplined software processes. The SCE provides a method, based upon the CMM, to evaluate an organization's software process, i.e., the strengths and weaknesses, to help determine the degree of risk associated with its software development capability. The SCE Implementation Guide provides Program Managers guidance for using the SCE method during an acquisition. In

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June 1993, SAF/AQ first directed that SCEs be used in Air Force source selections for Management Information Systems and C3I Systems.

5. Scope. Program Offices shall include SCEs in the source selection process for all software-intensive systems, or modifications to existing software- intensive systems, if any of the following conditions exist:

   a. Software is critical to the system's mission accomplishment

   b. Software constitutes a major portion of the overall development effort.

   c. A major component of the system, including its software functionality, is unprecedented.

   d. Software development costs exceed $5 Million.

   e. Software developed during a demonstration/validation phase is used in a follow-on contract phase.

6. General Procedures.

   a. Program Offices for Management Information and C3I Systems shall conduct SCEs in accordance with the SEI-developed CMM and Implementation Guide when any of the conditions in Paragraph 5 apply.

   b. Program Managers shall be responsible for developing acquisition strategies which include provisions for SCEs. The use of SCEs during source selections must be specified in the Request for Proposal (RE:P). The SCE method should not be altered: however. use of the SCE findings may be tailored for individual source selections. The source selection decision shall not be based solely on the SCE findings.

   c. Unless award, without discussions is appropriate, SCE s will be conducted on all offerors in the competitive range. Government only teams or government teams supported by an SCE Support Services Contractor. trained in the SCE method, shall conduct the evaluations at offeror locations where the predominance of software development is anticipated. To insure consistency in the application of the SCE methodology, the same SCE Team shall evaluate all offerors for an acquisition.

   d. The SCE findings shall be incorporated into the overall source selection evaluation. The findings will identify each offeror's CMM-related strengths. weaknesses, and process improvement activities. The Contracting Office should include the successful offeror's established software process and planned improvements in the contract.

7. Specific Responsibilities.

   a. ESC Program Offices:

      (1) Coordinate with ESC/ENS to determine the need for an SCE and to plan for all follow-on SCE activities.

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(2) Discuss the program's requirement for an SCE at the Strategic Round Table and the Acquisition Strategy Panel.

(3) Include provisions for the SCE in all appropriate acquisition documents: Commerce Business Daily, Acquisition Strategy Plan, Source Selection Plan, Evaluation Criteria, and RFP Sections H, M, and L (Instructions for Proposal Preparation).

(4) Determine whether to establish an all Government SCE Team or to obtain contractor support through the SCE Support Service Contract in establishing a joint Government/Contractor team. Determine SCE Team composition and training needs.

(5) Determine funding requirements for SCE Team activities to include training and travel. Coordinate with ESC/ENS to prepare Delivery Orders for SCE contractor support, if required.

(6) Coordinate SCE Team activities and site visits.

(7) Present SCE findings to the Source Selection Evaluation Board/Team, Advisory Council, and Authority.

(8) Insure that SCE findings are presented in all post award debriefings to the offerors.

b. ESC/PK:

(1) Insure that the Strategic Round Table and Acquisition Strategy Panel briefings address this SCE policy and include an SCE determination by each Program Office

(2) Assists program office in the development of appropriate RFP language. e.g. Section M evaluation criteria; Section L (IFPP), etc. in conjunction with ESC/ENS.

(3) When needed provide Software specialist to assist SCE team in conduct of SCE's at offeror locations.

(4) Insure that all source selection documentation addresses the use of SCE's and that the results are reflected in the evaluation/analysis reports/briefings and source selection decision documents, as appropriate.

c. ESC Software Center (ENS):

(1) Be the ESC advocate for SCEs.

(2) Provide SCE advice and support to ESC Program Offices in conjunction with ESC/PKA's Software Specialist.

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(3) Assist Program Offices in determining training, travel, and funding needs.

(4) Manage the SCE Support Services Contract

(5) Assist Program Offices in the preparation of Delivery Orders for SCE contractor support, when required.

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DEPARTMENT OF THE AIR FORCE
WASHINGTON DC

Acquisition Policy 94A-009

MEMORANDUM FOR DISTRIBUTION Aug 23 1994

FROM: SAF/AQ
1060 Air Force Pentagon
Washington, DC 20330-1060

Subject: Use of Software Development Capability Evaluation in Source Selections. This policy memo replaces AQ Policy Memo 93M-003

The Air Force is committed to improving the acquisition, development, and support processes associated with software-intensive systems. Critical to the success of these acquisitions is the evaluation of potential developers' capability to deliver quality software at a predictable cost and in accordance with an established schedule. Accordingly, software development capability evaluations shall be regularly used in conjunction with source selections for software intensive systems.

The two software development capability tools authorized for use in air Force source selection evaluations (with implementation guidance at Attachment 2) are:

a. For Management Information Systems and Command, Control, Computer, and Intelligence Systems, use the Carnegie-Mellon University (CMU) Software Engineering Institute (SEI) method based on the SEI Capability Maturity Model as defined in the Software Capability Evaluation, Version 2.0, Implementation Guide, CMU/SEI-94-TR-05. Assistance in defining and performing SEI method capability evaluations in conjunction with source selection activities may be obtained from the HQ Electronics Systems Center Software Center (ESC/ENS) at DSN 478-8561 or commercial (617) 377-8561.

b. For Weapon System (embedded software) applications, and wherever systems engineering is the predominate management consideration due to the interaction/integration of hardware and software environments, use the Aeronautical Systems Center (ASC) Software Development Capability Capacity Review (SDCCR) as defined in ASC Pamphlet 800-5. Assistance in defining and performing the SDCCR may be obtained form HQ ASC Embedded Computer Resource Program Office (ASC/EN(CR) at DSN 785-3656 or commercial (513) 255-3656.

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OPR for this policy memorandum is SAF/AQKS at ADSN 227-3108 or commercial (703) 697-3108.

2 Attachments
1. Distribution List
2. Implementation Guidance

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AFMC/CC/XR/XPD
ASC/CC
ESC/CC
HSC/CC
SMC/CC
OO-ALC/CC
SA-ALC/CC
SA-ALC/CC
SM-ALC/CC
WR-ALC/CC
AFMX/XPD
  Program Managers
  System Program Directors
SAF/AQC/AQK/AQL/AQP/AQQ/AQS/AQT/AQX
SAF/FMC
SA/IAO
SAV/SN/SX
PEO/C/
  /CM
  /CI
  /ST
  /SP
  /TA
  /TS
AF/IN
AF/LG/LGM
AF/PE
AF/RER
AF/SE/SEP
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AF/TE/TEP/TER
AF/XO/XOR
AFC4A/CC
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AFSPC/CC
AFSPC/DRR

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AETC/CC
AFIC/LEA
AMC/CC
ACC/CC
USAFE/LGCG
AFIA/AI
AFAA/CC/AG/QLP/QLW
AFCAA/CC
AFIT/LSY
DSMC
SCMC-DD
NAVIR/PMA 242-11C

Attachment 1
Attachment 2 - Implementation Guidance

1. The SEI method based on the SEI Capability Maturity Model defined in CMU/sEI-87-TR-23 evaluates the contractor's software engineering processes and, based on the evaluation, determines the strengths and weaknesses associated with key process areas of the Capability Maturity Model. The degree of risk can be determined from the strengths and weaknesses.

2. The Aeronautical Systems Center Software Development Capability Capacity Review (SDCCR) method defined in ASC Pamphlet 800-5 evaluates their contractors' capability and capacity to develop software within the context of the overall system development and includes coverage of the systems engineering development capability as well as other processes and disciplines related to the software development.

3. The objective of these evaluations is to provide a structured, consistent, and comprehensive approach for evaluating the software process to determine the software development capability of organization(s) with primary software development responsibilities under planned contracts.

4. One of the two software development capability evaluation methods authorized above shall be employed during the source selection process on all software-intensive systems, and major modifications to existing software-intensive systems, if any of the following condition is met:

a. The software is critical to the system's mission accomplishment.

b. Software constitutes a major portion of overall development effort.

c. A major component of the system, including its software functionality, is considered to be unprecedented.

d. Software development cost will exceed $5 Million.

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e. Software developed during a demonstration/validation effort is planned to be used during a follow-on contract phase.

5. The Program Manager will be responsible for developing an acquisition strategy which provides for use of software development capability evaluation as required above. Use of the findings in the source selection (as risk determinant, technical or management factor) may be tailored for each acquisition. The source selection decision will not be based solely on the capability evaluation findings. The findings may be used during source selection if this intention is stated in the RFP. (Note: The process for determining each offeror's capability shall conform to the ESC or ASC methods described above.)

6. Software development capability evaluations performed using the SEI method shall be conducted at one or more contractor locations/organizations where the predominance of vital software will be developed. Software development capability evaluations performed using the SDCCR shall also be conducted at one or more contractor locations/organizations where the predominance of vital software will be developed except for those cases when a contact is awarded without discussions. For those cases, the capability evaluation will be based on an assessment of the offeror's proposal response to the SDCCR requirements. All evaluations shall be conducted by trained government teams. To ensure consistency in the application of the evaluation methodology, the same team shall evaluate all offerors for an acquisition.

7. Software development capability evaluation findings will be developed by or summarized and presented to the Source Selection Evaluation Board (SSEB) or Source Selection Evaluation Team (SSET) for incorporation into the overall source selection evaluation. The findings will detail each offeror's strengths, weaknesses and risks and will also identify any process improvement activities undertaken or planned by the contractor. The results from these software development capability evaluations will be used only in the acquisition for which they were accomplished and will not be disclosed by the government for any other purpose without the offeror's permission.

8. The program office will incorporate the offeror's process, and planned improvements, into relevant portions of the model contract.

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Appendix D SCE Implementation Checklist

Acquisition Start

- ❒ Develop initial awareness
- ❒ Determine applicability to this acquisition
- ❒ Review existing SCE policies and procedures
- ❒ Review acquisition strategy
- ❒ Determine SCE needs for acquisition
- ❒ Develop SCE implementation recommendation
- ❒ Input to acquisition strategy document
- ❒ Obtain commitment to use SCE

Organize / Select SCE Team

- ❒ Review SCE team leader and team member qualification criteria
- ❒ Ensure appropriate criteria for team are applied to acquisition
- ❒ Prepare candidate SCE team member list
- ❒ Obtain commitment from candidate team member's organization
- ❒ Familiarize team with acquisition policies and procedures
- ❒ Attend SCE training

Execute Acquisition Start Phase

- ❒ Determine SCE placement within source selection documentation
- ❒ Prepare recommendation on how SCE findings will be integrated into the acquisition
- ❒ Develop Product Profile
- ❒ Determine Target Process Capability (TPC)
- ❒ Determine disposition of SCE data
- ❒ Estimate number of contractor sites to be visited
- ❒ Estimate resources and time (manpower, travel, support)
- ❒ Determine/schedule/implement preliminary SCE tasks
- ❒ Complete CBD announcement input
- ❒ Prepare Pre-proposal Conference Briefing (if applicable)

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- ❒ Insert Acquisition Plan, Source Selection Plan, RFP SCE language
- ❒ Request completion of Maturity Questionnaire and product profiles
- ❒ Instructions on how to submit material
- ❒ Prepare Evaluation Standards

Execute General and Specific Preparation Phases

- ❒ Schedule SCE team to meet and execute SCE Method pre-site visit preparation.
- ❒ Analyze product profiles
- ❒ Select contractor projects
- ❒ Prioritize process areas for all contractors
- ❒ Determine key issues for individual contractors
- ❒ Develop initial interview questions and identify initial set of documents for review
- ❒ Develop and notify contractor points of contact regarding SCE team logistical requirements (10 working days in advance)
- ❒ Arrange site logistics (room, table, chairs, documents, preliminary on-site and interview schedules, computing needs, etc.)

Conduct SCE

- ❒ Conduct SCE site data collection
- ❒ Conduct in-briefing with on-site contractor
- ❒ Analyze organizational and project documentation
- ❒ Review and modify agenda and schedule as necessary
- ❒ Conduct initial interviews
- ❒ Request additional documentation
- ❒ Validate interview responses
- ❒ Prepare draft findings
- ❒ Validate draft findings
- ❒ Conduct consolidation interviews
- ❒ Validate improvement activities
- ❒ Develop final findings

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- ❒ Conduct exit briefing (as prescribed by Procuring Contracting Officer [PCO])

Write / Submit Final Report to Acquisition Organization

- ❒ Document conduct of SCE and rationale for findings
- ❒ Document effort and resources expended
- ❒ Develop lessons learned and provide feedback to improve SCE Method

Assist Acquisition Organization's Use of SCE Findings

- ❒ Develop and deliver final SCE results briefing to SSEB (if necessary)
- ❒ Consult with SSEB and SSAC as needed (elaborate on SCE findings)
- ❒ Assist SSEB in preparing and delivering formal SCE presentation to the SSAC

Formal Feedback

- ❒ Conduct SCE findings briefing for winning contractor
- ❒ Conduct SCE findings briefing for unsuccessful offerors
- ❒ Dispose of SCE data (in accordance with acquisition guidelines)
- ❒ Disband SCE team

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Appendix F Acronyms

AMC	Army Materiel Command
AMIS	Acquisition Management Information System
BAFO	Best and Final Offer
CAO	Contract Administration Office
CBD	Commerce Business Daily
CDR	Critical Design Review
CDRL	Contract Data Requirements List
CMM	Capability Maturity Model
CPAR	Contractor Performance Analysis Report
CPEP	Contractor Performance Analysis Program
CRs	Clarification Requests
CSC	Computer Software Component
CSCI	Computer Software Configuration Item
CSU	Computer Software Unit
DCAA	Defense Contracting Audit Agency
DoD	Department of Defense
DTIC	Defense Technical Information Center
Dem/Val	Demonstration/Validation
DRs	Deficiency Reports
DSMC	Defense Systems Management College
EMD	Engineering Manufacturing Development
EP	Evaluation Plan
ESC	Electronic Systems Center
FAR	Federal Acquisition Regulation
FCA	Functional Configuration Audit

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GAO	General Accounting Office
IFPP	Instructions for Proposal Preparation
IRS	Interface Requirements Specification
JPO	Joint Program Office
JTIDS	Joint Tactical Information Distribution System
KPA	Key Process Area
KSLOC	Thousand Source Lines of Code
LTR	Letter
MCCR	Mission Critical Computer Resources
MMP/CR	Manufacturing Management Production/Capability Review
MQ	Maturity Questionnaire
NAWC	Naval Air Warfare Center
NRAD	NCCOSC (Naval Command, Control, and Ocean Surveillance Center) RDT&E (Research Development Test and Engineering) Division
NTE	Not to Exceed
PCA	Physical Configuration Audit
PCO	Procuring Contracting Officer
PDR	Preliminary Design Review
PEO	Program Executive Officer
PFN	Point For Negotiation
PM	Program Manager
POC	Point Of Contact
PRAG	Performance Risk Analysis Group
RAI	Request for Additional Information
RFP	Request For Proposal

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SCE	Software Capability Evaluation
SCM	Software Configuration Management
SDD	Software Design Document
SDP	Software Development Plan
SDIO	Space Defense Initiative Office
SDR	System Design Review
SEI	Software Engineering Institute
SEPG	Software Engineering Process Group
SOW	Statement of Work
SPIP	Software Process Improvement Plan
SPA	Software Process Assessment
SQA	Software Quality Assurance
SRR	System Requirements Review
SRS	Software Requirements Specification
SSA	Source Selection Authority
SSAC	Source Selection Advisory Council
SSDD	System/Segment Design Document
SSEB	Source Selection Evaluation Board
SSET	Source Selection Evaluation Team
SSEG	Source Selection Evaluation Guide
SSP	Source Selection Plan
USA	United States Army
USAF	United States Air Force
USN	United States Navy

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This report describes implementation guidance for Version 3.0 of the Software Capability Evaluation (SCE) method. This version of the Implementation Guide is updated to reflect the new method and provides specific guidance for selecting software product and services suppliers in an acquisition application (government or commercial) and provides suggested language and examples of usage.

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