Technical Report
CMU/SEI-96-TR-007
ESC-TR-96-007

Carnegie Mellon University
Software Engineering Institute

CMM[SM]-Based Appraisal for Internal Process Improvement (CBA IPI): Method Description

Donna K. Dunaway
Steve Masters

April 1996

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Software Process Program

19960509 051

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This report was prepared for the

SEI Joint Program Office
HQ ESC/ENS
5 Eglin Street
Hanscom AFB, MA 01731-2116

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FOR THE COMMANDER

Thomas R. Miller, Lt Col, USAF
SEI Joint Program Office

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Acknowledgments

We would like to thank the reviewers of the various revisions of this document who provided helpful comments and suggestions: Bill Peterson and George Winters. Many thanks to Suzanne Couturiaux and Barbara White for their editorial support.

The Software Process Program would like to thank the users of the CBA IPI method for returning assessment data to the SEI along with their feedback, comments, suggestions, and change requests. Your continued feedback relative to your experiences using the CBA IPI method enables us to pursue continuous improvement of the method and its associated documentation.

To the Reader

This document provides a high-level overview of the CMM[SM]-Based Appraisal[1] for Internal Process Improvement (CBA IPI) V1.1 assessment method. It is primarily intended for a sponsor or an opinion leader in an organization who is considering an assessment. Additional audiences for the document include potential team members, assessment participants, and individuals who are involved in or may be interested in process improvement.

The document addresses things that must be considered when planning a CBA IPI. Also discussed are software process improvement benefits that organizations have realized where assessments were key components. In addition, resources required to conduct a CBA IPI are discussed. This document is intended to provide an overview of the method, not specific information on how to conduct a CBA IPI. Persons wishing to conduct a CBA IPI in their organization should contact the SEI to ensure that the assessment is performed by an authorized Lead Assessor. Appendix A describes the experience, training, and qualifications required of Lead Assessors.

1. [SM]Capability Maturity Model, CMM, and IDEAL are service marks of Carnegie Mellon University.

CMM[SM]-Based Appraisal for Internal Process Improvement (CBA IPI): Method Description

Abstract: This document is a high-level overview of the CMM[SM]-Based Appraisal for Internal Process Improvement (CBA IPI) V1.1 assessment method. It provides a brief history of SEI appraisal methods, as well as establishing appraisals in the context of the IDEAL[SM] approach to software process improvement. CBA IPI is a diagnostic tool that supports, enables, and encourages an organization's commitment to process improvement. The method helps an organization gain insight into its software development capability by identifying strengths and weaknesses of its current processes related to the Capability Maturity Model[SM] for Software V1.1. The method focuses on identifying software improvements that are most beneficial, given an organization's business goals and current maturity level. Brief descriptions of the method activities, roles, and responsibilities are provided. In addition, guidelines are provided for establishing resource requirements for conducting a CBA IPI. The SEI Appraiser Program is discussed, detailing the requirements for persons qualified to lead CBA IPIs.

1 Why Was CBA IPI Created?

Using the Capability Maturity Model[SM] for Software V.1.1 (CMM) as a reference model [Paulk 93a, Paulk 93b], the Software Engineering Institute (SEI) developed the CBA IPI V1.0 in 1995 for assessing an organization's software process capability. CBA IPI V1.1 was released in 1996 containing modifications for clarification and simplification. In-depth documentation and guidance on the CBA IPI method [Dunaway 96] is available through CBA Lead Assessor Training.

1.1 History of SEI Appraisal Methods

In accordance with the SEI's mission to provide leadership in advancing the state of the practice of software engineering by improving the quality of systems that depend on software, there has been strong emphasis within the SEI on treating software development tasks as processes that can be defined, practiced, measured, and improved. In early software process publications, a software maturity framework [Humphrey 87a] and questionnaire [Humphrey 87b] were developed to help organizations characterize the current state of their software practices, set goals for process improvement, and set priorities.

Software process is defined to mean the system of all tasks and the supporting tools, standards, methods, and practices involved in the production and evolution of a software product throughout the software life cycle. It has become widely accepted that the quality of a

(software) system is largely governed by the quality of the process used to develop and maintain it [Crosby 79, Deming 86, Humphrey 90, Juran 88].

The SEI assisted a number of organizations in performing assessments [Olson 89] based largely on the maturity questionnaire. This early questionnaire provided a scoring mechanism for determining a project's maturity level. In 1988-91, the SEI provided training to organizations who wished to perform self-assessments of their software processes.

In 1990 the SEI commercialized the software process assessment (SPA) to more broadly disseminate the technology, since the SEI was not equipped to handle the demand for assessment services. Industry and government licensees were selected as vendors to market assessment services. During 1991-1993, SEI self-assessment training was gradually phased out and replaced by vendor training. Data from these assessments have been collected by the SEI, and periodic reports are delivered on the state of the practice. The initial state of the practice reported on assessment data largely from project-based questionnaire data from 10 sites [Humphrey 89]. The follow-up report included the first site-based software process maturity profile and provided an analysis of assessment findings from 59 sites showing the frequency with which key process deficiencies were identified by assessment teams [Kitson 92]. A recent report presents an analysis of assessment results from 48 organizations that have performed 2 or more assessments and focuses on the time required to increase process maturity [Hayes 95]. Updates on the process maturity profile of the software community are published twice a year with the latest profile containing data on 515 assessments representing 440 distinct sites [Zubrow 95].

Based on the success and widespread use of the maturity framework and software process assessments, Version 1.0 of the CMM for Software was published in 1991 [Paulk 91a, Paulk 91b]. In 1993 the CMM was revised, and Version 1.1 was published. Various organizations modified SEI appraisals to reflect the CMM; however, the CBA IPI method is the first CMM-based assessment method released by the SEI. CBA IPI uses an updated maturity questionnaire consistent with CMM V1.1. Unlike the maturity questionnaire released in 1987, the current maturity questionnaire does not include a mechanism for scoring maturity levels [Zubrow 94].

The SEI has published reports that show a relationship between CMM-based improvement and organizational performance. One report [Herbsleb 94] documents process improvement efforts in 13 organizations by showing improvements in cycle time, defect density, and productivity. Benefit-to-cost ratios presented range from 4.0:1 to 8.8:1. In a more comprehensive report on the impact of CMM-based appraisals on subsequent software process improvement and organizational performance [Goldenson 95], survey results from 138 appraisal participants representing 56 appraisals are presented. The results show that, in general, increased process maturity results in better product quality, ability to meet schedule commitments, and other indicators of organizational performance.

1.2 IDEAL^{SM} Approach to Process Improvement

The CBA IPI method is a diagnostic tool used to appraise and characterize an organization's software processes and is used in the larger context of software process improvement.The SEI's recommended framework for software process improvement is the IDEAL^{SM} model, shown in Figure 1 [Peterson 95, Radice 94]. The IDEAL approach consists of five phases: initiating, diagnosing, acting, establishing, and leveraging. Appraisals are an integral part of the diagnosing phase of the IDEAL approach.

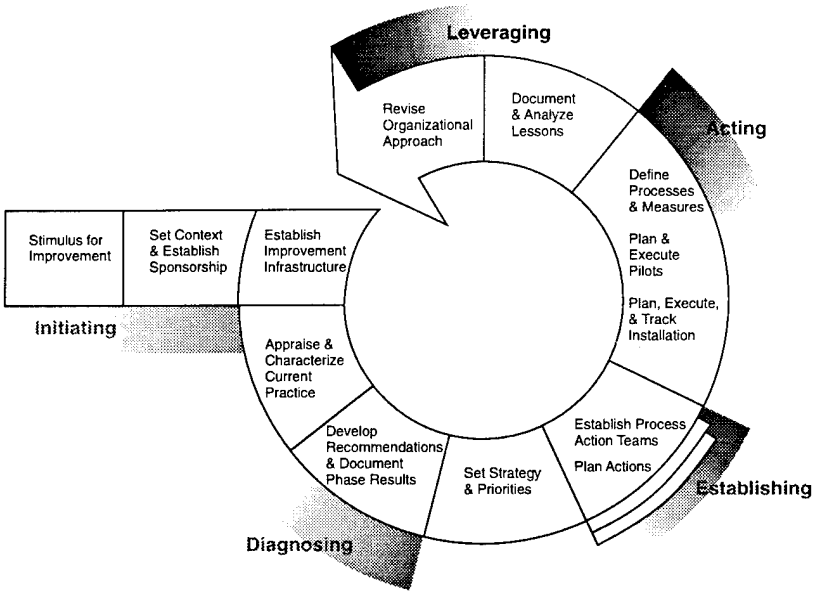

Figure 1: IDEAL^{SM} Model for Software Process Improvement

The initiating phase of process improvement should be successfully undertaken before the appraisal start-up. First, some outside stimulus for improvement needs to occur. Then sponsorship is established with the site's senior management, and efforts toward building an improvement infrastructure are committed. An organization could be appraised for the first time or could be reappraising their processes in preparation for the next process improvement cycle. The IDEAL approach assumes that the appraisal will be followed by a thorough documentation of the appraisal results and the development of recommendations. The software process baseline established by the appraisal and the recommendations and priorities that come from the appraisal form a basis for follow-on activities. These activities are typically documented in an action plan for furthering process improvement activities.

1.3 Current SEI Appraisal Methods

To provide a framework for rating an organization's process capability against the CMM and to provide a basis for comparing assessment and evaluation results, the SEI published the

CMM Appraisal Framework (CAF) [Masters 95]. The CAF identifies the requirements and desired characteristics of a CMM-based appraisal method in order to improve consistency and reliability of methods and their results. An appraisal method is CAF compliant when it meets all of the CAF requirements. The term appraisal as used at the SEI includes multiple methods, such as assessments and evaluations, all of which focus on an organization's software development process.

Both CBA IPI and Software Capability Evaluation (SCE) V3.0 were designed to be CAF compliant. The following subsections briefly describe the primary SEI appraisal methods, CBA IPI and SCE, and the differences between them. Interim Profile [Whitney 94] is a method to rapidly measure the status of an organization's software engineering process improvements between organizational assessments and was not intended to comply with the CAF; therefore, it is not included in our discussion of current SEI appraisal methods.

1.3.1 CMM-Based Appraisal for Internal Process Improvement (CBA IPI)

The CBA IPI method was created in response to user needs for a CMM-based assessment method. The SPA method, which has become so familiar in the software community, pre-dated the CMM. Although many organizations have modified the SPA to reflect the CMM, there was a wide range of approaches and results.

The CBA IPI method was developed and field tested in 1994. After factoring in lessons learned from the community feedback, the SEI released CBA IPI V1.0 in May 1995. The method and documentation were upgraded to CBA IPI V1.1 in March 1996. The CBA IPI method explicitly uses CMM V1.1 as a reference model. The data collection is based on key process areas (KPAs) of the CMM as well as non-CMM issues. CBA IPI is intended to establish consistency among CMM-based assessments so that results from one assessment can be compared to those of another. The CBA IPI method complies with the CAF, so results from a CBA IPI are intended to be consistent with results from other CAF-compliant methods. The CBA IPI method is described in more detail in the following sections of this report. Appendix B contains descriptions of the method roles and responsibilities, while Appendix C contains a glossary of terms commonly used in a CBA IPI.

1.3.2 Software Capability Evaluation (SCE)

SCEs are used for software acquisition as a discriminator to select suppliers, for contract monitoring, and for incentives. They can also be used for evaluation of internal processes. SCE V2.0 [CBA Project 94] was updated to reflect CMM V1.1. SCE V3.0 [Byrnes 96] is CAF compliant. Therefore, results from a SCE V3.0 should be consistent with a CBA IPI V1.1 if the areas of investigation are the same and in relatively the same time frame. SCE is used to gain insight into the software process capability of a supplier organization and is intended to help decision makers make better acquisition decisions, improve subcontractor performance, and provide insight to a purchasing organization.

1.3.3 Differences Between Assessments and Evaluations

The basic difference between an assessment and an evaluation is that an assessment is an appraisal that an organization does to and for itself, and an evaluation is an appraisal where an external group comes into an organization and looks at the organization's process capability in order to make a decision regarding future business.The scope of an assessment is determined relative to the organization's needs and the business goals of the sponsor, who is usually the senior manager of the assessed organization. In contrast, the scope of an evaluation is determined relative to the needs of the sponsor, who is the individual or individuals responsible for deciding to conduct the evaluation of the organization(s) with whom the sponsor is currently or considering doing business.

After an assessment, the senior manager of the assessed organization owns the assessment findings and results and generally uses the results to formulate an action plan for the process improvement program. After an evaluation, the sponsor owns the evaluation results and uses the results to make decisions regarding the recipient organization(s), such as source selection, incentive fee awards, performance monitoring, risk management, and measurement of internal improvement; these results may or may not be shared with the evaluated organization.

Assessments are intended to motivate organizations to initiate or continue software process improvement programs. Evaluations are externally imposed motivation for organizations to undertake process improvement. Assessment teams represent a collaboration among team members, many of whom are from the organization being assessed. Evaluation teams, on the other hand, take more of an audit-oriented approach with a more formal interface between team members and organization representatives; evaluation teams rarely include representatives from the evaluated organization.

2 What Is the CBA IPI Method?

The CBA IPI method is a diagnostic tool that enables an organization to gain insight into its software development capability by identifying strengths and weaknesses of its current processes, to relate these strengths and weaknesses to the CMM, to prioritize software improvement plans, and to focus on software improvements that are most beneficial, given its current level of maturity and the business goals.

The method is an assessment of an organization's software process capability by a trained group of professionals who work as a team to generate findings and ratings relative to the CMM key process areas within the assessment scope. The findings are generated from data collected from questionnaires, document review, presentations, and in-depth interviews with middle managers, project leaders, and software practitioners.

The CBA IPI method has two primary goals:

- to support, enable, and encourage an organization's commitment to software process improvement
- to provide an accurate picture of the strengths and weaknesses of the organization's current software process, using the CMM as a reference model, and to identify key process areas for improvement.

The approach of the CBA IPI method is to assemble and train a competent assessment team under the leadership of a Lead Assessor and to conduct a structured series of activities with key people in the organization to understand their problems, concerns, and ideas for improvement. The method is based on the following key assessment principles:

- Use the Capability Maturity Model for Software V1.1 as a process reference model.
- Use a formalized assessment process that complies with the CMM Appraisal Framework.
- Involve senior management as the assessment sponsor.
- Base the assessment on the sponsor's business goals and needs.
- Observe strict confidentiality by guaranteeing that no information will be attributed to an individual or project.
- Approach the assessment as a collaboration between the assessment team and the organizational participants.

2.1 What Can This Method Accomplish?

The business needs for process improvement drive the requirements for an assessment. The business needs for process improvement generally include one or more of three closely related factors: reducing costs, improving quality, and decreasing time to market. The fundamental assumption is that these factors are largely determined by the development processes.

Since the CBA IPI method is designed to support a variety of assessment needs, the results of a CBA IPI can support a variety of activities that require detailed knowledge about the strengths and weaknesses of the software process, such as

- establishing software process action plans
- measuring actual progress against action plans
- identifying best (most effective) practices within the organization for transition elsewhere in the organization

The CBA IPI method must build on an organization's commitment established during previous phase(s) of the software process improvement cycle. To support the goal of enabling and supporting an organization's commitment to process improvement, the assessment team and assessment participants must understand the sponsor's business goals and allow for a collaborative shaping of the assessment scope. It is important that the organization owns and "buys in" to the assessment results, identifying the most critical issues (CMM and non-CMM) that need to be addressed in order to sustain momentum for the follow-on activities.

The other primary goal of the CBA IPI is to provide an accurate picture of existing software processes. To accomplish this, the assessment team will

- provide the organization with the data needed to baseline the organization's software capability
- identify major non-CMM issues that have an impact on process improvement efforts
- identify strengths and weaknesses using the CMM as a reference model
- provide findings to the sponsor and the organization that are sufficiently complete to guide the organization in planning and prioritizing future process improvement activities

2.2 Minimum Requirements for a CBA IPI

For an assessment to be considered a CBA IPI, the assessment must meet the following minimum requirements concerning the assessment team, assessment plan, data collection, data validation, rating, and reporting of assessment results. Permissible tailoring options are provided with the requirements.

2.2.1 Assessment Team

The assessment team must satisfy the following requirements:

- The assessment team must be led by an authorized SEI Lead Assessor.
- The team shall consist of a minimum of 4 and a maximum of 10 team members. At least one team member must be from the organization being assessed.

- All team members must receive the SEI's Introduction to the CMM course, or its equivalent, and the SEI's CBA IPI team training course.
- Team members must meet the selection guidelines relative to software engineering and management experience.

Tailoring options are as follows:

- the size of the assessment team, as long as the team consists of between 4 and 10 qualified individuals
- the composition of the team as to whether they are internal or external to the organization, as long as one team member is from the organization being assessed

2.2.2 Assessment Plan

An assessment plan must be created that at a minimum contains the following:

- the goals for the assessment
- the CMM scope (KPAs to be examined) and the organization scope for the assessment including selected projects and assessment participants
- a schedule for assessment activities and identification of the resources to perform the activities
- the assessment outputs and any anticipated follow-on activities
- planned tailoring of the assessment method
- risks and constraints associated with execution of the assessment
- the sponsor's authorization for the assessment to be conducted

Tailoring options are as follows:

- weighting of the assessment goals. Depending upon the organization's motivation for having an assessment, more emphasis may be placed on one goal than the other, e.g., more focus toward supporting an organization's software process improvement than precise conformance relative to the CMM.
- the specific organizational entities that comprise the organization's scope for the assessment
- the specific KPAs selected that comprise the CMM scope for the assessment
- the number of projects and their particular characteristics
- the length of time for the assessment

2.2.3 Data Collection

Assessment data must be classified with respect to four data collection categories (instruments, presentations, interviews, and documents) and at a minimum contain the following:

- instrument data (maturity questionnaire responses) from at least the project leaders from the selected projects

- interview data from project leaders from selected projects via individual interviews
- interview data from functional area representatives (practitioners) and middle managers via group interviews
- document data for each of the KPA goals within the CMM scope of the assessment
- presentation data via a review of the draft findings with the assessment participants

In addition, confidentiality of data sources must be protected.

Tailoring options are as follows:

- Collect instrument data from more respondents than the project leaders.
- Collect the site information packet.
- Conduct a project leader interview with more than one project representative.
- Conduct part of a group interview "free form" where interviewees are asked to discuss anything they feel the assessment team should know.
- Increase the emphasis on collecting document data.
- Vary the number of draft finding sessions that are held.

2.2.4 Data Validation

Data must be validated using the rules of corroboration and must sufficiently cover the CMM components within the assessment scope, the organization, and the software development life cycle.

The rules of corroboration are as follows:

- Observations[1] are based on data from at least two independent sources, e.g., two separate people or a person and a document.
- Observations are based on data obtained during at least two different data gathering sessions.
- Observations are confirmed by at least one data source reflecting work actually being done, e.g., an implementation level document or an interview with a person who is performing the work.

Tailoring options are as follows:

- use of individuals or mini-teams for data gathering and consolidation tasks
- extent of documentation that is collected

1. Observations are based on information extracted from data collection sessions.

2.2.5 Rating

Ratings must be based on the CAF criteria for rating the process maturity of an organization against the CMM.

Tailoring options are as follows:

- Add a "partially satisfied" rating which would translate to "unsatisfied" for maturity level rating.
- Extend ratings to common features and/or key practices.
- Rate the organization's maturity level.

2.2.6 Reporting of Assessment Results

A final findings briefing must be given to the sponsor that presents the strengths and weaknesses of each KPA within the assessment scope, as well as a KPA profile that indicates whether KPAs are satisfied, unsatisfied, not rated, or not applicable. These data must be reported back to the SEI.

Tailoring options are as follows:

- Include consequences and/or recommendations with the assessment findings.
- Generate a written final assessment report that details the assessment findings.
- Produce project-specific reports (this will require modification of the confidentiality agreement).

3 Who Participates in a CBA IPI?

In order to ensure that a CBA IPI has a successful impact on the assessed organization, many factors need careful consideration. Foremost, the person who leads the assessment team must be well qualified and trained. In addition, members of the assessment team must meet certain criteria for the team composition. Furthermore, the selection of the assessment participants must adequately cover the scope of the assessed organization.

3.1 Who Is Qualified to Lead a CBA IPI?

A CBA IPI must be led by an authorized Lead Assessor in the SEI Appraiser Program. Experience in performing various assessments has proven that it is critical for assessments to be led by qualified and well-trained individuals in order to achieve accurate results in a reasonable amount of time and achieve a successful organization intervention. These individuals must have software development experience, CMM knowledge and experience, and training in assessment technology.

By having well-trained and qualified assessors, different assessors should get similar results in organizations of similar maturity. The SEI Appraiser Program is designed to maintain the quality of appraisal leaders within the software community. The SEI strives to ensure the continued confidence of the U.S. software community in the quality of SEI appraisal technologies. Lead Assessors are authorized within the program to perform CBA IPIs, using SEI copyrighted materials. Lead Assessors are authorized to market and perform assessments either for third-party organizations or for their own organizations' internal use.The SEI publishes the *SEI Appraiser Directory* semi-annually listing the authorized Lead Assessors. A copy of this directory and the detailed requirements for a person to qualify as a Lead Assessor are available from the SEI Customer Relations Office and through the SEI's world wide web page (http://www.sei.cmu.edu). Appendix A describes the SEI Appraiser Program.

3.2 What Are the Requirements for Assessment Team Members?

The size and qualifications of the assessment team, along with any potential biases of site team members, may affect the confidence the sponsor has in the assessment results. This is particularly true if the team member has been responsible for implementing process improvements.

Selection of the assessment team takes into account the knowledge, skills, and abilities of the assessment team as a whole as well as each individual team member. The team as a whole must have the collective knowledge, skills, and ability to conduct a CBA IPI assessment for the particular organization being assessed. Team members are selected so that their combined experience and skills match what is required for this assessment. Note that an assess-

ment team size of 8 individuals is recommended (not less than 4 nor more than 10) for several reasons. Smaller teams may have difficulty performing extensive document review and achieving accuracy in interviewing activities. Larger teams require more coordination and time in order to come to consensus on the judgments that need to be made by the team as a whole.

Factors to be considered in selecting assessment team members include the following:

- knowledge of the CMM. All team members must have successfully completed CMM training prior to CBA IPI team training. Team members must have knowledge of each of the KPAs within the anticipated maturity level and lower maturity levels. This knowledge includes the ability to explain the KPA and its intent, and to provide examples relevant to the appraised entity.
- knowledge of process assessments. All team members must complete CBA IPI team training prior to the assessment. Team members with previous experience in assessments will provide additional strength to the team.
- knowledge of software process improvement concepts. All team members must be knowledgeable in software process improvement concepts.
- software engineering field experience. The team must have a minimum of 25 years of combined field experience. The average experience for individual team members must be at least six years, with no team member having less than three years of software field experience.
- management experience. The team must have a minimum of 10 years of combined management experience, and at least one team member must have 6 years of management experience.
- life-cycle phases and functional activities experience. Seventy-five percent of the team members must have experience in at least one-third of the organization's software life-cycle phases and their associated functional activities. At least two team members must have had experience in each life-cycle activity.
- organizational environment, applications, and existing software process knowledge. At least one team member must be knowledgeable in both the organization's environment and application domain. Site team members are important to the team; however, these team members must not have a vested interest in the assessment results.
- team skills. Each team member must have good written and oral communication skills, the ability to facilitate free flow of information, and the ability to perform as team players and negotiate consensus.
- credibility. Each team member must have credibility with senior management, respect within the organization, and the ability to influence people.
- motivation and commitment. Each team member must demonstrate the motivation to improve the software process, the commitment to act as change agent, and the willingness to do what it takes to achieve assessment goals.

Note also that team members should not be managers of one of the selected assessment projects or within the direct supervisory chain of any of the anticipated interviewees.

3.3 Who Are Appropriate Assessment Participants?

Selecting assessment participants includes selection of projects and project leaders, questionnaire respondents, and functional area representative (FAR) interviewees.

The number and characteristics of selected projects, respondents, and interviewees must be a representative sample of the appraised entity.

3.3.1 Selecting Projects and Project Leaders

Projects are selected for the assessment where detailed investigation will be focused. If a project is selected for the assessment, then the project leader and selected members of the project staff will participate in project leader and FAR interviews. Projects should be selected in such a manner that they are representative of the organizational entity being appraised.

Factors to be considered in project selection include how closely the selected projects represent variations in the assessed entity's projects in the following areas: application type and domain, technology employed, and scope in terms of product size, staff size, duration, and life-cycle phases. Normally the projects selected should not have durations less than six months. Selected projects should be at varying points in the life cycle with emphasis on later stages. In addition, project selection should take into account the impact of the project on the business in terms of revenue, profit, or strategic value.

The portion of the appraised entity represented by the projects both in terms of number of projects and number of staff affect the confidence of the results. The recommendation is to select four projects.

The goal of selecting project leader interviewees is to select a group of people that is a representative sample of the appraised entity's management staff at the project level and, in some instances, below. The assumption is that this goal is achieved by selecting projects that are representative of the organization and interviewing their management staff.

Selected project leaders must be committed to the assessment goals and the software process improvement initiative.

Generally the project leader interviewees will include individual leaders of the projects selected for the assessment. However, in certain cases, the project leader may be removed from the day-to-day management of software development with software development responsibilities distributed between several lower level managers. In such cases, the project leader may be selected in addition to a combination of functional managers, such as the software manager, the configuration manager, the test manager, etc.

The leader of each project is interviewed individually. If more than one individual from the project's management chain is involved in the interview, then none of the individuals should be in the reporting chain of any of the others.

3.3.2 Selecting Questionnaire Respondents

Selection of maturity questionnaire respondents must be balanced against the value of the questionnaire data versus the interruption to the organization. The questionnaire will be used primarily for the purpose of refining the data-gathering strategy for the on-site activities. Questionnaire data will be corroborated through document review and interviews: it is not the sole basis for making judgments concerning software process capability. Given these facts, widespread administration of the questionnaire may not be advantageous. The recommended number of questionnaire respondents is between 4 and 10.

Additional factors to consider in selecting respondents include the extent to which they represent the selected project leaders and lead technical staff. At a minimum the project leaders of the selected projects should provide answers to the questionnaire. In addition, key technical personnel or functional managers for the organization may be selected to answer the questionnaire. Inclusion of such additional respondents may be of value in organizations where the project leaders are not involved in day-to-day software development activities or where these activities are the responsibility of multiple functional managers.

3.3.3 Selecting Functional Area Representatives (FARs)

The goal of selecting FAR interviewees is to select a group of people that forms a representative sample of the appraised entity's technical staff. FAR interviewees should be practitioners, not managers or staff. They should include opinion leaders, and their managers should be committed to software process improvement. It is desirable to have FARs who have the interpersonal skills required to facilitate a free flow of information during the FAR interview sessions. The FARs as a group must have characteristics or attributes (e.g., experience) that closely resemble those of the appraised entity's population. The FAR interview sessions should include persons from each of the projects that were selected for specific investigation, as well as persons from other projects.

No two individuals who have a reporting relationship to each other should be in a FAR interview session together. Generally each FAR session should have four to eight participants.

4 CBA IPI Method Activities

The CBA IPI method consists of three phases. The first phase includes the activities necessary to plan and prepare for the assessment. The second phase consists of on-site activities for conducting the assessment, including techniques for gathering, organizing, and consolidating data. The final phase is to report the results. Each phase is described in the following sections.

4.1 Plan and Prepare the Assessment

This section describes the activities that take place before the on-site period. These activities are shown in Figure 2.

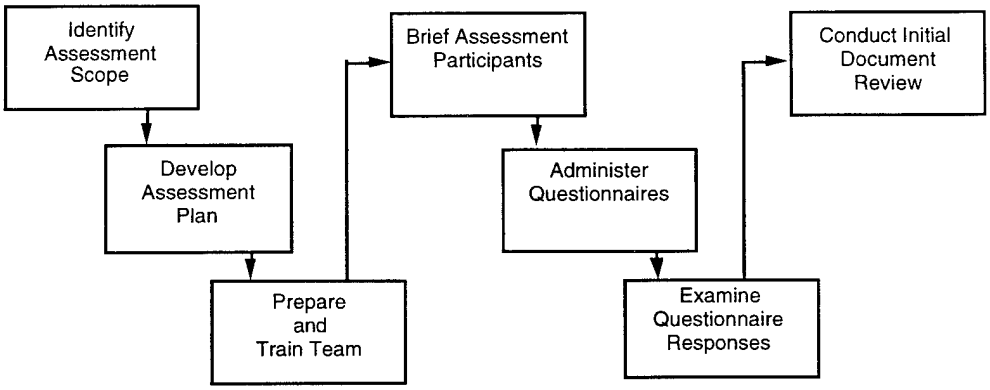

Figure 2: Pre-Onsite Activities

4.1.1 Identify Assessment Scope

The purpose of this activity is to develop a common understanding between the assessment team leader and the sponsor concerning the assessment goals, scope, constraints, roles, responsibilities, and outputs and to obtain commitments to proceed with the assessment.

4.1.2 Develop Assessment Plan

A plan for conducting the assessment is developed based on the assessment goals identified by the sponsor. Included in the plan are detailed schedules for the assessment as well as any risks identified with execution of the assessment. During this activity, a site information packet can be developed that will assist the assessment team in understanding the assessed organization. Assessment team members, projects, and assessment participants are selected according to defined criteria. Documents are identified for initial review, and the logistics for the on-site visit are identified and planned.

4.1.3 Prepare and Train Team

During this activity, the assessment team leader must ensure that each assessment team member has received adequate CMM training (at least equivalent to the three-day SEI Introduction to the CMM course) prior to being trained in the CBA IPI method. The team leader then conducts the three-day CBA IPI Team Training so that each team member understands the assessment process, its underlying principles, the tasks necessary to execute it, and each person's role in performing the tasks. Team training is followed by planning sessions that include establishing ground rules for the assessment, discussion of the details of the assessment, and the scripting of interview questions.

4.1.4 Brief Assessment Participants

The purpose of this activity is to ensure that the assessment participants understand the assessment process and have a clear set of expectations regarding its outcomes.

4.1.5 Administer Questionnaire

Information about the organization's software processes is collected from selected members of the organization using the SEI maturity questionnaire. This information is used to provide team members an overview of the organization's process capability; often, comments on the questions provide more value to the team than the yes/no responses.

4.1.6 Examine Questionnaire Responses

The assessment team members examine the pattern and nature of responses on the maturity questionnaires completed by site personnel. Observations are not made based on questionnaire responses alone. Rather, the responses provide probing points for later activities such as interviews and document reviews. The responses assist the team in focusing their investigations.

4.1.7 Conduct Initial Document Review

An initial set of documents about the organization's software processes are reviewed to find additional areas for probing, to understand the life cycle(s) in use by the organization, and to map organization data to the CMM.

4.2 Conduct the Assessment

This section describes the activities that take place during the on-site period. These activities are illustrated in Figure 3.

4.2.1 Conduct Opening Meeting

This activity kicks off the on-site visit and sets participants' expectations concerning the assessment activities. The sponsor of the assessment opens the presentation to show visible support and urge participants to be forthcoming in interview sessions.

4.2.2 Interviews

The purposes of interviewing are to identify areas that people believe can and should be improved in the organization, to understand how the work is performed, to understand the processes in use, to understand the relationships among the organization-level processes and the project-level processes, and to ensure coverage of the CMM within the scope of the assessment across the organization, as defined in the scope.

- **Project leaders** are individually interviewed by the assessment team. Typically, four representative projects are selected, and their project leaders participate in these in-depth interviews. These interviews generally address issues associated with project management and the processes in use on the project.
- **Middle managers** are interviewed as a group to understand the middle management perspective of how the work is performed in the organization, any problem areas of which they are aware, and improvements that they feel need to be made.
- **Functional area representatives** are interviewed to collect data within the scope of the assessment and to identify areas that the software practitioners believe can and should be improved in the organization. Typical functional area representative sessions would include 6-12 persons grouped by areas such as software engineering process group (SEPG), requirements, design, code and unit test, integration, and system test activities.

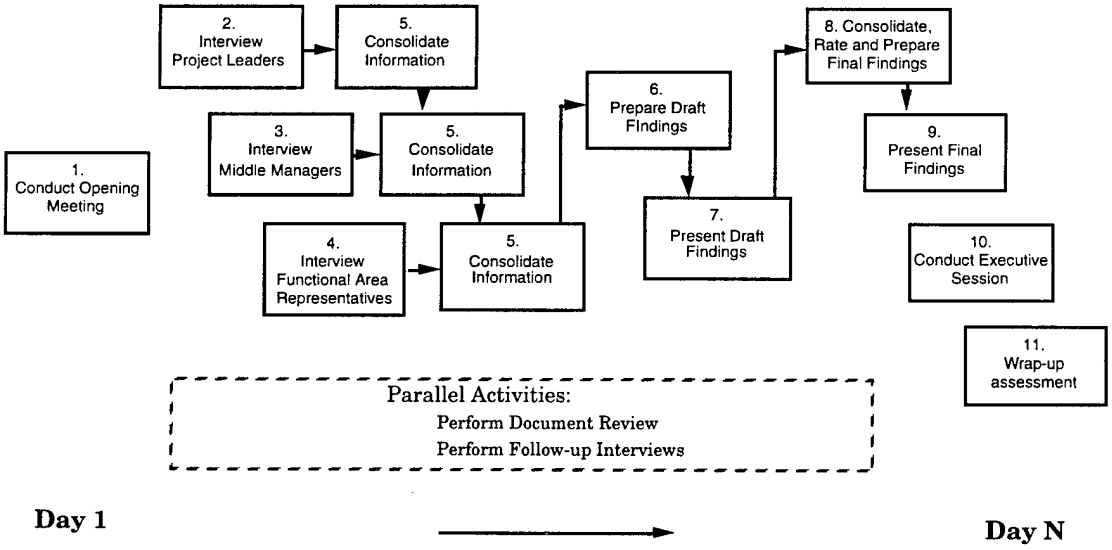

Figure 3: Chronology of On-Site Activities

4.2.3 Consolidate Information

The purpose of this activity is to summarize and consolidate information into a manageable set of observations which are categorized with reference to the KPAs of the CMM. All observations must be validated using the rules of corroboration. The team must reach consensus on the validity of observations and whether sufficient data in the areas being investigated have been collected. It is the team's responsibility to obtain sufficient information to cover the organization, the software development life cycle, and the CMM components within the assessment scope before any rating can be done. The responsibilities for guiding the consolidation efforts for individual KPAs are usually divided among team members.

4.2.4 Prepare Draft Findings Presentation

Draft findings are generated from the observations in preparation for obtaining feedback from the assessment participants who have provided the information through interviews. Ratings are not considered until after the draft findings presentations, as the assessment team is still collecting data.

4.2.5 Present Draft Findings

The purpose of this activity is to obtain feedback from the assessment participants on the assessment team's draft findings. Feedback is recorded for the team to consider at the conclusion of all of the draft findings presentations. Draft findings are presented in multiple sessions in order to protect the confidentiality of the assessment participants.

4.2.6 Consolidate, Rate, and Prepare Final Findings

The assessment team consolidates additional data obtained during the draft findings presentations and any follow-up interviews and document review. When the team has achieved full coverage of the CMM, the organization, and the software life cycle, the rating process may begin by rating each goal for each key process area (KPA) within the assessment scope. Ratings are always established based on consensus of the entire assessment team. For each goal, the team reviews all weaknesses that relate to that goal and asks: "Is there a weakness significant enough to have a negative impact on the goal?" If so, the goal is rated unsatisfied. If the team decides that there are no significant weaknesses that have an impact on a goal, it is rated satisfied. For a KPA to be rated satisfied, all goals for the KPA must be rated satisfied. A KPA may be rated satisfied, unsatisfied, not applicable, or not rated. Assignment of a maturity level rating is optional at the discretion of the sponsor. For a particular maturity level rating to be achieved, all key process areas within and below a given maturity level must be satisfied. For example, for an organization to be rated at maturity level 3, all KPAs at level 3 and at level 2 must have been investigated during the assessment, and all KPAs must have been rated satisfied by the assessment team. The final findings presentation is developed by the team to present to the sponsor and the organization the strengths and weaknesses observed for each KPA within the assessment scope, the ratings of each KPA, and the maturity level rating if desired by sponsor.

4.3 Report Results

4.3.1 Present Final Findings

The team leader, or designated presenter, presents the assessment results to the sponsor. The sponsor owns the assessment results and is free to use them as he or she sees fit. During the final findings presentation, the presenter must ensure that the organization understands the issues that were discovered during the assessment and the key software process issues that it faces. Organizational strengths are presented to validate what the organization is doing well. Strengths and weaknesses are presented for each key process area within the assessment scope as well as any non-CMM issues that affect process. A KPA profile is presented showing the individual KPA ratings.

4.3.2 Conduct Executive Session

The purpose of this activity is to allow the senior site manager to clarify any issues with the assessment team, to confirm his or her understanding of the software process issues, and to get guidance regarding the focus, timing, and priorities of the recommendations report and follow-on activities.

4.3.3 Wrap-Up of the Assessment

The team leader collects feedback from the assessment participants and the assessment team on the assessment process, collects information that needs to be reported to the SEI, and assigns responsibilities for follow-on activities.

5 Time Frame and Resource Requirements

In order to identify the resources that are needed to perform an assessment, a typical time frame along with people required are discussed in the following subsections.

5.1 Assessment Time Frame

A typical assessment time frame is shown in Table 1.

Months 1-2	Assessment planning and team training
Month 3	On-site assessment
Month 4	Final report delivery and recommendations briefing
Month 5	Action plan development
Months 6-24	Action plan implementation
Months 18-30	Re-assessment

Table 1: Typical Assessment Time Frame

5.2 Resource Requirements

Resources required for an organization to perform a CBA IPI vary according to the scope of the assessment. The numbers in Table 2 may be used as guidelines in planning the resource requirements for an assessment. These figures were gathered from early implementations of CBA IPI assessments. However, subsequent assessments have shown that the assessments can be done more efficiently, so we consider these estimates to be conservative and on the high end. For a typical assessment team consisting of 8 team members plus the assessment team leader, investigating 4 representative projects, and interviewing 40 functional area representatives, a CBA IPI is estimated to require approximately 200 person-days, beginning with assessment planning through writing the final report and hand-off to the team who will plan the actions for continuing process improvement activities.

Assessment Phase	Resource Required	Full-time Equivalent
Planning	Assessment team leader	10-20 days
	Sponsor	3-5 days
	Site coordinator	10-20 days
Pre-Onsite Activities	Assessment team leader	10-14 days
	Site coordinator	10-14 days
	Assessment team members	6-8 days each
On-Site Activities	Assessment team leader	6-10 days
	Sponsor	4-5 hours
	Site coordinator	6-10 days
	Assessment team members	5-10 days each
	Assessment participants (project leaders, middle managers, and functional area representatives)	1.5 days each
Post-Assessment Activities	Assessment team leader	4-8 days
	Sponsor	1 day
	Site coordinator	2 days
	Assessment team members	1-2 days each
Totals	Assessment team leader	30-52 days
	Sponsor	8-11 days
	Site coordinator	28-46 days
	Assessment team members	12-20 days each
	Assessment participants (project leaders, middle managers, and functional area representatives)	1.5 days each

Table 2: Resource Requirements for CBA IPI

6 Follow-On Activities

To benefit from the assessment, the organization must have an improvement infrastructure in place. This infrastructure would be in the form of sponsorship, establishment of a software engineering process group (SEPG), CMM training for the organization, etc.

The assessment team will develop recommendations and document the assessment results immediately following the final findings briefing. Although a final report is optional but recommended, if a final report is not required by the sponsor, one of the team members should be responsible for collecting the assessment details, removing all attribution, and making them available to the action planning team. These assessment details are critical for prioritizing issues, developing the action plan, and implementing the establishing phase. There are several benefits to the establishing phase: it provides an organized and planned approach to software process improvement; a clear understanding of costs, schedules, and resources; and the opportunity to plan for actions that the organization has the capability to achieve. It is important to move into the establishing phase as soon as possible after completion of the assessment so that momentum from the assessment can be maintained and the staff's expectations can be managed. An assessment provides expectations for improvement in an organization; follow-on activities are very important to avoid disappointment or disillusionment by the assessment participants.

7 Future Improvement of the Method

There are many feedback mechanisms in place to enable the SEI to continuously improve the method. The SEI requires Lead Assessors to provide feedback following each assessment that they lead. In addition, each sponsor and each assessment team member is asked to provide feedback to the SEI at the conclusion of an assessment. Change requests are accepted by the SEI from anyone who wishes to send one in.

There is no major change anticipated to this assessment method until after CMM V2.0 is released. However, minor modifications will be made from time to time through notices to the Lead Assessors.

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Appendix A SEI Appraiser Program

SEI Appraiser Program

The SEI Appraiser Program is designed to maintain the quality of participants in appraisal technology within the software community. The goals of the program are

- to maximize the value and use of SEI appraisal methods, designed and facilitated by qualified, trained individuals, as part of a systematic improvement program within organizations that produce software
- to transition appraisal technology to SEI clients in an effective manner, maintaining consistency and quality in the process.

The SEI strives to ensure the continued confidence of the software community in the quality of SEI process appraisal technologies. The SEI Appraiser Program selects and trains the highest quality candidates to lead appraisals. Persons meeting the requirements of the program have credentials that distinguish them. They have access to SEI appraisal methods, training materials, technical support, and upgrade training. Through their participation in appraisals and through feedback mechanisms built into appraisal methodologies, they participate in the advancement of appraisal technologies. The Appraiser Program is intended in time to encompass multiple appraisal methods, specifically, assessments and evaluations. Lead Assessors are authorized within the program to perform assessments. Lead Evaluators may become authorized in the future to conduct evaluations.

Lead Assessors

Lead Assessors are authorized to market and perform assessments either for third-party organizations or for their own organizations' internal use. Current Lead Assessors are trained in the CMM-Based Appraisal for Internal Process Improvement (CBA IPI). The CBA IPI method is an SEI product that provides the software community a reliable assessment of an organization's software process and provides guidance for improving the process.

Lead Assessors commit to

- sign a letter of agreement with the SEI that identifies Lead Assessor responsibilities
- verify that assessment team members have met the CMM training requirement
- conduct CBA IPI Team Training for assessment teams. Training teams to conduct independent assessments without a Lead Assessor is not permitted.

- lead or participate in at least two CBA IPI assessments within each 24-month authorization period and, for each completed assessment, file a complete assessment report with the SEI
- obtain and use SEI copyrighted materials for CBA assessments
- use a new Lead Assessor's kit for each assessment or purchase a Lead Assessor multi-assessment kit according to a quantity price (with permission to reproduce these materials for a designated period of time)
- complete successfully any required upgrade courses and examinations, and accept and use upgraded materials when available
- cooperate in random audits of assessments by the SEI and take any recommended remedial action as a result of the audit

Lead Assessors are encouraged to

- present educational assessment awareness classes
- observe candidate Lead Assessors and complete observations reports

Becoming a Lead Assessor

To participate in the SEI Appraiser Program and become an authorized Lead Assessor, applicants must meet certain prerequisites:

- verified participation as an assessment team member in at least 2 CBA IPIs within the prior 24-month period (SEI verifies from the Process Appraisal Information System)
- minimum of 10 years of software engineering experience in software development or maintenance in an appropriate technical area, e.g., software design, software quality assurance, requirements analysis, configuration management, and testing
- minimum of 2 years of experience managing software development personnel
- advanced degree or equivalent experience in an appropriate technical area
- successful completion of the SEI course *Introduction to the CMM.*

It is also recommended that applicants have

- oral and written communication skills
- the ability to interact with management and members of the technical staff
- demonstrated knowledge and appreciation of software process
- good technical and instructional presentation training skills
- the ability to work effectively in a team environment and knowledge of group

facilitation and team-building techniques

- knowledge of total quality management and quality improvement techniques.

Once the prerequisites are met, applicants must submit a SEI Appraiser Program application, a software process background resume, and a registration form to attend an offering of *CBA Lead Assessor Training* at the SEI. At the successful completion of training, the applicant is considered to be a candidate Lead Assessor.

A candidate Lead Assessor must perform as a CBA IPI team leader, under the observation of an authorized Lead Assessor, within 24 months after successful completion of training. A candidate Lead Assessor must receive a satisfactory observation report and recommendation from the observing Lead Assessor to become fully authorized.

Authorization Terms for Lead Assessors

Authorization as a Lead Assessor is valid for a two-year period. Authorization must be renewed and a renewal fee paid every two years. Renewal is not automatic. Lead Assessors must satisfactorily fulfill their responsibilities during the previous two years to be renewed for another two-year period.

The following factors are considered during the renewal process:

- reports from audits that may have taken place during the authorization period
- reports from assessment clients returned to the SEI during the authorization period
- review of the actual assessment data to determine that the prescribed process was followed.

Contact Information

If you have questions or would like more information about the SEI Appraiser Program, contact:

Customer Relations
Software Engineering Institute
Carnegie Mellon University
Pittsburgh, PA 15213-3890
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412 / 268-5800
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Appendix B Method Roles and Responsibilities

There are a number of roles associated with the various assessment tasks. Individuals may assume multiple roles during the assessment, and roles may rotate when appropriate.

Assessment team leader. Experienced individual who leads the assessment and keeps the team together and on track. The assessment team leader must be an authorized Lead Assessor in the SEI Appraiser Program. During the assessment planning phase the team leader is responsible for soliciting sponsor input, explaining the impact of the assessment scope and constraints on the assessment goals, providing cost/schedule estimates, setting expectations, and obtaining a commitment to proceed.

The team leader is also responsible for ensuring that all pre-onsite planning activities have been completed and all preparation for the assessment is complete, including training the assessment team. The team leader may have assistance from a qualified person during presentation of the team training, although the team leader has the responsibility to see that team training is performed successfully. During the conduct of the assessment, the team leader assigns responsibilities for assessment tasks, facilitates interviews, monitors team member and interviewee performance, acts as timekeeper (or assigns one), and manages adherence to the assessment process and schedule.

Assessment team members. Assessment team members are required to have taken the SEI Introduction to CMM, or an equivalent course in the team leader's judgment, and received CBA IPI Team Training from the assessment team leader. Each team member is responsible for reviewing the site information packet and identifying documents for initial review. Each team member is also responsible for asking questions during interview sessions, reviewing notes, identifying and classifying significant information obtained during interviews and document review, and identifying additional information required. Team members are responsible for coming to consensus on the assessment findings and ratings.

Functional area representatives (FARs). Site representatives who are practitioners and have technical responsibilities for certain domains. The FARs are responsible for attending the assessment participants' briefing, opening meeting, the FAR interview session to which they are assigned, the draft findings presentation, and the final findings presentation.

Middle managers. Site representatives who fall between the project leaders and the senior site manager in the organizational hierarchy. The middle managers are responsible for attending the assessment participants' briefing, the opening meeting, the middle manager interview session to which they are assigned, the draft findings presentation, and the final findings presentation.

Project leaders. Site representatives who have the leadership responsibility for the software aspect of one of the projects selected for the assessment. The project leaders are responsible for attending the assessment participant's briefing, opening meeting, the project leader's interview session to which they are assigned, the draft findings presentation, and the final findings presentation.

Questionnaire respondents. Site representatives who are selected to complete the maturity questionnaire. Usually the project leaders who have been selected for individual interviews are asked to complete the questionnaire, and there may be additional questionnaire respondents from the organization.

Senior site manager or Sponsor. The person who acts as sponsor of the assessment and gives the team leader commitment to proceed in the assessment start-up phase. The sponsor

- identifies to the team leader the business goals that bear on the organization's software development and maintenance activity
- describes to the team leader any current quality improvement initiatives in the appraised organization
- identifies the scope of the assessment and any constraints that will exist
- provides authorization to proceed and personally participates in the opening meeting by urging participants to be forthcoming and supportive of the assessment effort
- is responsible for selecting the assessment team with selection criteria and input provided by the assessment team leader (This task may be delegated to someone very familiar with the organization's staff, the organization's software process, and the assessment process.)
- is responsible for approving the assessment plan
- is the recipient of the final findings presentation and is responsible for providing resources for follow-on process improvement activities

There may be circumstances where the sponsor of the assessment represents a corporate process improvement organization, and the senior site manager is in charge of the organization being assessed. In that instance, the team leader must clarify the roles between the sponsor and the senior site manager, and both must approve the assessment plan.

Site coordinator. The individual responsible for handling the logistics of the assessment. The site coordinator is responsible for developing the schedule, notifying the assessment participants of the schedule, making sure that adequate rooms have been reserved for both the pre-onsite and onsite periods, making and distributing copies of the schedules, making sure that all necessary supplies and equipment are available when needed, scheduling contingency interviews, requesting additional documentation, and ensuring that meals are taken care of. The site coordinator needs to be a member of the assessment team.

Appendix C Glossary

appraisal A diagnostic performed by a trained team to evaluate aspects of an organization's software development process, e.g., CMM-Based Appraisal for Internal Process Improvement (CBA IPI), Software Capability Evaluation (SCE).

assessed entity The organizational units to which assessment outputs apply. An assessed 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.

assessment An appraisal by a trained team of software professionals to determine the state of an organization's current software process, to determine the high-priority software process-related issues facing an organization, and to obtain the organizational support for software process improvement, e.g., Software Process Assessment (SPA), CMM-Based Appraisal for Internal Process Improvement (CBA IPI).

assessment goals The desired outcome of an assessment process.

assessment scope The organizational entities and CMM components selected for investigation.

assessment sponsor The individual who authorizes an assessment, defines its goals and constraints, and commits to the use of the assessment outputs.

CAF compliant appraisal method
An appraisal method that conforms to appraisal method requirements defined in the CMM Appraisal Framework (CAF) [Masters 95].

Capability Maturity Model℠ for Software(CMM)
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 identifica-

tion of the issues most critical to software quality and process improvement. CMM Version 1.1 is specified in CMU/SEI-93-TR-24 and CMU/SEI-93-TR-25.

CMM Appraisal Framework (CAF)

A framework for planning, conducting, and completing CMM-based appraisals.

CMM-Based Appraisal for Internal Process Improvement (CBA IPI)

An assessment developed at the SEI to determine an organization's current state of the software development process in order to further the organization's own internal software process improvement program. CBA IPIs are based on the CMM for Software V1.1 and comply with the CAF.

CMM scope of the assessment

The portion of the CMM used as a framework for evaluating an organization's software development process during an assessment.

common feature

The subdivision categories of the CMM key process areas. The common features are attributes that indicate whether the implementation and institutionalization of a key process area is effective, repeatable, and lasting. The CMM common features are the following:

- commitment to perform
- ability to perform
- activities performed
- measurement and analysis
- verifying implementation

confidentiality

An agreement by which data will not be attributed to a particular individual, project, or organization.

consensus

A method of decision making that allows team members to develop a common basis of understanding and develop general agreement concerning a decision.

consolidation

The activity of collecting and summarizing the information provided into a manageable set of data, to determine the extent to which the data are corroborated and cover the areas being investigated, to determine the data's sufficiency for making judg-

ments, and to revise the data gathering plan as necessary to achieve this sufficiency. This activity is repeated daily following data collection activities during the on-site period.

corroboration Confirmation: all assessment observations must be confirmed by information from different sources and different data-gathering sessions prior to use as findings.

coverage The extent to which data gathered addresses CMM components, organizational units, and life-cycle phases within the scope of an assessment.

coverage criteria A CMM component is considered to be covered if the data gathered relevant to the component

- are representative of the organizational units within the scope of the assessment
- are representative of the life-cycle phases within the scope of the assessment
- address each of the key practices of the activities performed and the institutionalization common features in enough depth to determine the extent of their implementation, in the collective opinion of the assessment team

document A collection of data, regardless of the medium on which it is recorded, that generally has permanence and can be read by humans or machines.

findings The conclusions of an assessment, evaluation, audit, or review that identify the most important issues, problems, or opportunities within the area of investigation.

functional area representatives (FARs)
The assessment site representatives who are practitioners and have technical responsibilities for certain domains within the software development process.

goal A summary of the key practices of a key process area that can be used to determine whether an organization or project has ef-

fectively implemented the key process area. The goals signify the scope, boundaries, and intent of each key process area.

IDEAL approach A life-cycle approach for process improvement. IDEAL stands for the five phases of the approach: Initiating, Diagnosing, Establishing, Acting, and Leveraging.

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.

key practices The infrastructures and activities that contribute most to the effective implementation and institutionalization of a key process area.

key process area (KPA)
A cluster of related activities that, when performed collectively, achieve a set of goals considered important for establishing process capability. The key process areas have been identified by the SEI to be the principal building blocks to help determine the software process capability of an organization and understand the improvements needed to advance to higher maturity levels.

maturity level A well-defined evolutionary plateau toward achieving a mature software process. The five maturity levels in the SEI's Capability Maturity Model are initial, repeatable, defined, managed, and optimizing.

maturity questionnaire (MQ)
A set of questions about the software process that sample the key practices in each key process area of the CMM. The maturity questionnaire is used as a springboard to appraise the capability of an organization or project to execute a software process reliably.

organization A unit within a company or other entity (e.g., government agency or branch of service) within which many projects are managed as a whole. All projects within an organization share a common top-level manager and common policies.

process A sequence of steps performed for a given purpose; for example, the software development process. [IEEE 90]. A set of ac-

tivities, methods, and practices that guide people (with their software tools) in the production of software.

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 the consistency with which it is applied in projects throughout the organization.

process measurement The set of definitions, methods, and activities used to take measurements of a process and its resulting products for the purpose of characterizing and understanding the process.

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.

rating A characterization of an organization's software process relative to a component of the CMM.

requirement (1) A condition or capability needed by a user to solve a problem or achieve an objective. (2) A condition or capability that must be met or possessed by a system or system component to satisfy a contract, standard, specification, or other formally imposed documents. (3) A documented representation of a condition or capability in (1) or (2). [IEEE 90]

satisfied Rating given to a CMM component that is applicable in an organization's business environment and is performed either as defined in the CMM or with an adequate alternative.

site A geographic location of one or more of an organization's units.

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION Unclassified	1b. RESTRICTIVE MARKINGS None
2a. SECURITY CLASSIFICATION AUTHORITY N/A 2b. DECLASSIFICATION/DOWNGRADING SCHEDULE N/A	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for Public Release Distribution Unlimited
4. PERFORMING ORGANIZATION REPORT NUMBER(S) CMU/SEI-96-TR-007	5. MONITORING ORGANIZATION REPORT NUMBER(S) ESC-TR-96-007
6a. NAME OF PERFORMING ORGANIZATION Software Engineering Institute 6b. OFFICE SYMBOL (if applicable) SEI	7a. NAME OF MONITORING ORGANIZATION SEI Joint Program Office
6c. ADDRESS (city, state, and zip code) Carnegie Mellon University Pittsburgh PA 15213	7b. ADDRESS (city, state, and zip code) HQ ESC/ENS 5 Eglin Street Hanscom AFB, MA 01731-2116
8a. NAME OFFUNDING/SPONSORING ORGANIZATION SEI Joint Program Office 8b. OFFICE SYMBOL (if applicable) ESC/ENS	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER F19628-95-C-0003
8c. ADDRESS (city, state, and zip code)) Carnegie Mellon University Pittsburgh PA 15213	10. SOURCE OF FUNDING NOS. PROGRAM ELEMENT NO 63756E; PROJECT NO. N/A; TASK NO N/A; WORK UNIT NO. N/A

11. TITLE (Include Security Classification)
CMM Appraisal for Internal Process Improvement (CBA IPI): Method Description

12. PERSONAL AUTHOR(S)
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13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (year, month, day)	15. PAGE COUNT
Final	FROM TO	April 1996	43

16. SUPPLEMENTARY NOTATION

17. COSATI CODES

FIELD	GROUP	SUB. GR.

18. SUBJECT TERMS (continue on reverse of necessary and identify by block number)
Capability Maturity Model[SM] (CMM)
CMM-based appraisal
internal process improvement
software process improvement
software process assessment

19. ABSTRACT (continue on reverse if necessary and identify by block number)

Abstract: This document is a high-level overview of the CMM[SM]-Based Appraisal for Internal Process Improvement (CBA IPI) V1.1 assessment method. It provides a brief history of SEI appraisal methods, as well as establishing appraisals in the context of the IDEAL[SM] approach to software process improvement. CBA IPI is a diagnostic tool that supports, enables, and encourages an organization's commitment to process improvement. The method helps an organization gain insight into its software development capability by identifying strengths and weaknesses of its current processes related to the Capability Maturity Model[SM] for Software V1.1. The method focuses on

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20. DISTRIBUTION/AVAILABILITY OF ABSTRACT UNCLASSIFIED/UNLIMITED ■ SAME AS RPT ☐ DTIC USERS ■	21. ABSTRACT SECURITY CLASSIFICATION Unclassified, Unlimited Distribution
22a. NAME OF RESPONSIBLE INDIVIDUAL Thomas R. Miller, Lt Col, USAF	22b. TELEPHONE NUMBER (include area code) (412) 268-7631 22c. OFFICE SYMBOL ESC/ENS (SEI)

ABSTRACT — continued from page one, block 19

identifying software improvements that are most beneficial, given an organization's business goals and current maturity level. Brief descriptions of the method activities, roles, and responsibilities are provided. In addition, guidelines are provided for establishing resource requirements for conducting a CBA IPI. The SEI Appraiser Program is discussed, detailing the requirements for persons qualified to lead CBA IPIs.