Appraisal Requirements for CMMI^{SM}, Version 1.1 (ARC, V1.1)

CMMI Product Team

December 2001

TECHNICAL REPORT
CMU/SEI-2001-TR-034
ESC-TR-2001-034

Carnegie Mellon
Software Engineering Institute

Pittsburgh, PA 15213-3890

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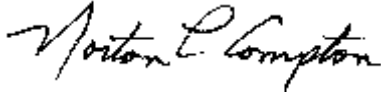
CMM Integration^{SM} Project

This report was prepared for the

The ideas and findings in this report should not be construed as an official DoD position. It is published in the interest of scientific and technical information exchange.

FOR THE COMMANDER

Norton L. Compton, Lt Col, USAF
SEI Joint Program Office

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Preface

The Capability Maturity Model® Integration (CMMI^SM) project has involved a large number of people from different organizations throughout the world. These organizations were using a CMM® or multiple CMMs and were interested in the benefits of developing an integration framework to aid in enterprise-wide process improvement and integration activities.

The CMMI Project work is sponsored by the U.S. Department of Defense (DoD), specifically the Office of the Under Secretary of Defense, Acquisition, Technology, and Logistics (OUSD/AT&L). Industry sponsorship is provided by the Systems Engineering Committee of the National Defense Industrial Association (NDIA).

Organizations from industry, government, and the Software Engineering Institute (SEI) joined together to develop the CMMI Framework, a set of integrated CMMI models, a CMMI appraisal method, and supporting products. These organizations donated the time of one or more of their people to participate in the CMMI Project.

Acknowledgments

Many talented people were involved as part of our development team for the CMMI Product Suite[1]. Three primary groups have been involved in this development: the Steering Group, Product Team, and Stakeholder/Reviewers.

The Steering Group guides and approves the plans of the Product Team, provides consultation on significant CMMI Project issues, and ensures involvement from a variety of interested communities.

The Product Team writes, reviews, revises, discusses, and agrees on the structure and technical content of the CMMI Product Suite, including the models, appraisal materials, and training materials. Development activities were based on an A-Specification provided by the Steering Group, the source models, and review comments from the Stakeholder/Reviewers and Steering Group members.

[®]   CMM, Capability Maturity Model, and Capability Maturity Modeling are registered in the U.S. Patent and Trademark Office.

[SM]   CMM Integration and CMMI are service marks of Carnegie Mellon University.

[1]   The CMMI Product Suite is the set of products produced from the CMMI Framework that includes models, appraisal materials, and training materials.

The Stakeholder/Reviewer group of organizations provided valuable insight in the early effort that was used to refine the approach to the appraisal-related elements of the Product Suite.

The CMMI Product Team has had the benefit of two distinguished leaders. Project Manager Jack Ferguson led the CMMI Product Team from the project's inception through to the release of CMMI-SE/SW V0.2. Project Manager Mike Phillips has led the Product Team from the release of CMMI-SE/SW V0.2 to the present.

Development of this appraisal requirements document was accomplished primarily through the efforts of the following groups, sponsored by the CMMI Steering Group and CMMI Product Team, and consisting of committed professionals from government, industry, and the SEI:

- Assessment Methodology Team (AMT): developed assessment documentation for version 1.0 of the CMMI Product Suite

- Assessment Method Integrated Team (AMIT): developed appraisal documentation for version 1.1 of the CMMI Product Suite

- Assessment Methodology Expert Group (AMEG): provided product development support and feedback to the AMIT for version 1.1 of the CMMI Product Suite

The contributions of these individuals are gratefully acknowledged. So, too, are those of others from the CMMI Product Team and the process improvement and capability evaluation communities who provided change requests, ideas, and best practices leading to the improvements reflected in the current set of appraisal documentation and related assets.

Both present and emeritus contributors to the CMMI Project are listed in Appendix D.

Where to Look for Additional Information

You can find additional information, such as the intended audience, background, history of the CMMI models, and the benefits of using the CMMI models, in various other sources. Many of these sources are documented on the CMMI World Wide Web site, which is located at <http://www.sei.cmu.edu/cmmi/>.

Feedback Information

We are very interested in your ideas for improving these products. You can help these products continually improve.

See the CMMI World Wide Web site for information on how to provide feedback: <http://www.sei.cmu.edu/cmmi/products/change-requests.html>.

If you have questions, send an email to cmmi-comments@sei.cmu.edu.

Abstract

The Appraisal Requirements for CMMI (ARC) V1.1 defines the requirements considered essential to appraisal methods intended for use with Capability Maturity Model® Integration (CMMI^SM) models. In addition, a set of appraisal classes is defined, based on typical applications of appraisal methods. These classes are intended primarily for developers of appraisal methods to use with CMMI capability models in the context of the CMMI Product Suite. Appraisal methods, as used in this document, may be applied for different purposes, including assessments for internal process improvement and capability evaluations for supplier selection and process monitoring. This document defines the requirements for such methods, but not necessarily the conditions or constraints under which they might be applied.

The approach employed to provide guidance to appraisal method developers is to define a set of typical applications of appraisal methods (which are based on years of experience in the process improvement community) called appraisal method classes. Requirements are then allocated to each class as appropriate based on the attributes associated with that class. Thus, a particular appraisal method may be declared to be an ARC Class A, B, or C appraisal method. This designation implies the sets of ARC requirements that the method developer has addressed when designing the method.

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1 Introduction

The Appraisal Requirements for CMMI (ARC) consists of a set of high-level design criteria for developing, defining, and using appraisal methods based on CMMI models. These requirements constitute an evolutionary progression from the CMM Appraisal Framework (CAF) V1.0 [Masters 95], which was produced originally to provide a common basis for appraisal methods employing the Capability Maturity Model for Software. With the incorporation of multiple discipline models into the CMMI architecture, the ARC has been created to accommodate these new discipline models and their staged and continuous representations. The ARC has also been influenced by the EIA/IS 731.2 Appraisal Method [EIA 98b] and the CMMI Product Suite requirement that they be consistent and compatible with ISO/IEC 15504, an emerging international standard for process assessment [ISO 98a, ISO 98b, ISO 98c]. Finally, the requirement to encompass both assessment (for internal process improvement) and capability evaluations (for source selection and/or process monitoring) [DOD 01] has influenced the ARC.

Appraisal teams use CMMI models as the basis for identifying the strengths and weaknesses of the processes examined during an appraisal. Appraisal results can be used in a number of ways:

- planning an improvement strategy for the organization
- generating maturity level or capability level ratings
- guidance for decision-making
- mitigation of risks for product acquisition, development, and monitoring

The appraisal principles for the CMMI Product Suite are similar to those for appraisals using the Capability Maturity Model for Software [Paulk 93a, Paulk 93b] and Systems Engineering Capability Model [EIA 98a]:

- Start with an appraisal reference model.
- Use a formalized appraisal process.
- Involve senior management as the appraisal sponsor.
- Focus the appraisal on the sponsor's business objectives.
- Observe strict confidentiality and non-attribution of data.
- Approach the appraisal collaboratively.
- Focus on follow-on activities and decision-making based upon the appraisal results.

2 Benefits and Features of CMMI Appraisal Methods

For organizations that wish to appraise against multiple disciplines (e.g., software engineering and systems engineering), the unified CMMI approach permits some economy of scale in model training and appraisal training. One appraisal method can provide separate or combined results for one or more disciplines. Appraisal methods can appraise a single discipline, as in the past.

The ARC requirements are designed to help improve consistency across multiple disciplines and appraisal methods and to help appraisal method developers, sponsors, and users understand the tradeoffs associated with various methods.

When a 15504-conformant appraisal is desired, certain additional requirements must be addressed in the appraisal method and appraisal reference model.[2] The ARC covers all 15504-3 appraisal method requirements. Since they may be excluded from ARC-compliant appraisal methods, these requirements are shown in italics in Section 4, "Requirements for CMMI Appraisal Methods." Appendix B shows a summary of how the 15504-3 requirements are addressed by the ARC requirements.

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[2]   Assessment reference models satisfying the relevant 15504-2 requirements are said to be 15504-compatible.

3 Requirements for CMMI Appraisal Method Class Structure

Not all CMMI appraisal methods are expected to be fully ARC-compliant (by satisfying each of the ARC requirements). CMMI appraisal methods that are not fully ARC-compliant may be appropriate for a specific set of sponsor needs, and method developers are expected to develop a variety of appraisal methods to meet these needs.

The CMMI appraisal method class structure (specified in Appendix A) identifies the requirements appropriate to appraisal methods designed specifically for three typical applications (see Table 1). There is no requirement for a CMMI appraisal method to fall exactly into one class; however, this structure is intended to provide value and utility to users of the CMMI Product Suite, and its use is encouraged.

Table 1:   Characteristics of CMMI Appraisal Method Classes

Characteristics	Class A	Class B	Class C
Amount of Objective Evidence Gathered (relative)	High	Medium	Low
Ratings Generated	Yes	No	No
Resource Needs (relative)	High	Medium	Low
Team Size (relative)	Large	Medium	Small
Appraisal Team Leader Requirements	Lead appraiser	Lead appraiser or person trained and experienced	Person trained and experienced

Key differentiating attributes for appraisal classes include

- the degree of confidence in the appraisal outcomes
- the generation of ratings
- appraisal cost and duration

Class A methods must satisfy all of the ARC requirements, and at the present time are the only methods considered suitable for providing ratings for benchmarking. Developers of

Class A methods also have the option of supporting the conduct of 15504-conformant appraisals. An example of a Class A method is the Standard CMMI Appraisal Method for Process Improvement (SCAMPI^{SM}).

Class B appraisal methods are required to comply with a subset of the ARC requirements. As indicated in Appendix A, several requirements of Class A methods are optional for Class B methods. Only two of the three data sources required for Class A methods are required for Class B methods, one of which must be interviews. Class B methods do not produce ratings. These types of appraisals are recommended for initial assessments in organizations that are just beginning to use CMMI models for process improvement activities. They also provide a cost-effective means for performing interim assessments and/or capability evaluations between Class A appraisals.

Class C appraisal methods are required to comply with a subset of the ARC requirements for Class B methods. Only one of the three data sources required for Class A methods is required for Class C methods. Validation and corroboration of observations and the provision of mechanisms for team member consensus on major appraisal decisions are also optional requirements for Class C methods. These types of appraisals would most likely be used when the need for a "quick look" arises or for periodic self-assessments by projects and organizational support groups.

The ARC requirements are based on widely used appraisal methods that have yielded accurate, consistent, and useful results. As other appraisal methods are identified and shown to have similar quality characteristics, the requirements may be modified to reflect their features.

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^{SM} SCAMPI is a service mark of Carnegie Mellon University.

4 Requirements for CMMI Appraisal Methods

The sections below define the suite of requirements for CMMI appraisal methods. Each requirement statement is preceded by an indicator of applicability to one or more of the three CMMI appraisal method classes (e.g., ABC). If the indicator for an appraisal class is not listed for a requirement, then that requirement is either optional or not applicable for that appraisal class, as shown in Appendix A.

ARC requirements are derived from a variety of sources reflecting the best practices and standards applicable to process appraisal technology. Appendix B shows a summary of how the 15504-3 requirements are addressed by the ARC requirements. If 15504 conformance is not required for a given Class A method, a small portion of these ARC requirements that are 15504-unique, such as generation of 15504 process profiles, may be considered not applicable. Those requirements are shown in italics in this section. In any case, all Class A methods must contain a statement declaring whether or not 15504-conformant appraisals are supported.

4.1 Responsibilities

4.1.1 **The method shall define the responsibilities of the appraisal sponsor, which at a minimum shall include the following activities:**

   a.   (ABC) Verify that the appraisal team leader has the appropriate experience, knowledge, and skills to take responsibility for and lead the appraisal.

   b.   (ABC) Ensure that the appropriate organizational units or subunits (e.g., projects, functional units) participate in the appraisal.

   c.   (ABC) Support appraisal method provisions for ensuring non-attribution to appraisal participants.

   d.   (ABC) Ensure that resources are made available to conduct the appraisal.

   e.   (ABC) Review and approve the appraisal input prior to the beginning of data collection by the appraisal team.

4.1.2 **The method shall define the responsibilities of the appraisal team leader, which at a minimum shall include the following activities:**

   a.   (ABC) Ensure that the appraisal is conducted in accordance with the method's documented process.

b. (ABC) Confirm the sponsor's commitment to proceed with the appraisal.

c. (ABC) Ensure that appraisal participants are briefed on the purpose, scope, and approach of the appraisal.

d. (ABC) Ensure that all appraisal team members have the appropriate experience, knowledge, and skills in the appraisal reference model and appraisal method; the necessary competence to use instruments or tools chosen to support the appraisal; and access to documented guidance on how to perform the defined appraisal activities.

e. (ABC) Verify and document that the appraisal method requirements have been met.

4.2 Appraisal Method Documentation

4.2.1   The method shall be documented and, at a minimum, include

a. (ABC) identification of the CMMI models (version, discipline, and representation [staged or continuous]) with which the method can be used

b. (ABC) identification of the ARC version upon which the appraisal method is based

c. (ABC) identification of which CMMI appraisal requirements are satisfied by the method, along with the CMMI appraisal method class membership (if applicable)

d. (ABC) activity descriptions, artifacts, and guidance that implement each of the appraisal requirements

e. (A) declaration as to whether or not the method supports 15504-conformant appraisals

4.2.2   The method documentation shall provide guidance for

a. (ABC) identifying an appraisal's purpose, objectives, and constraints

b. (ABC) determining the suitability of the appraisal method relative to the appraisal's purpose, objectives, and constraints

4.2.3   The method documentation shall provide guidance for identifying the scope of the CMMI model(s) to be used for the appraisal:

a. (ABC) process areas to be investigated (continuous and staged representations)

b. (ABC) capability levels to be investigated for each process area (continuous representation)

4.2.4   The method documentation shall provide guidance for identifying the organizational unit to be appraised:

a. (ABC) the sponsor of the appraisal and the sponsor's relationship to the organizational unit being appraised

b. (ABC) projects within the organizational unit that will participate

c. (ABC) functional elements of the organizational unit that will participate

d.   (ABC) names and affiliations (organizational units) of participants in the appraisal activities

4.2.5   The method documentation shall provide guidance for selecting appraisal team members and criteria for qualification, including

a.   (ABC) technical experience (discipline-specific)

b.   (ABC) management experience

c.   (ABC) experience, knowledge, and skills in the appraisal reference model and appraisal method

4.2.6   The method documentation shall provide guidance for an appraisal team leader's qualification criteria, including

a.   (ABC) training and experience using the appraisal reference model

b.   (ABC) training and experience using the appraisal method

c.   (ABC) experience in delivering training, managing teams, facilitating group discussions, and making presentations

4.2.7   (ABC) The method documentation shall provide guidance for determining the appropriate size of the appraisal team.

4.2.8   (ABC) The method documentation shall provide guidance on the roles and responsibilities of appraisal team members.

4.2.9   (ABC) The method documentation shall provide guidance addressing the responsibilities of the appraisal sponsor.

4.2.10   (ABC) The method documentation shall provide guidance addressing the responsibilities of the appraisal team leader.

4.2.11   (ABC) The method documentation shall provide guidance for estimating the resources required to conduct the appraisal (including the amount of time required to conduct an appraisal).

4.2.12   (ABC) The method documentation shall provide guidance for appraisal logistics.

4.2.13   (ABC) The method documentation shall provide guidance for collecting relevant data on the organizational unit and associating the data to the specific and generic practices of the appraisal reference model.

4.2.14   (ABC) The method documentation shall provide guidance for creating findings, including both strengths and weaknesses relative to the appraisal reference model.

4.2.15   (ABC) The method documentation shall provide guidance for protecting the confidentiality of appraisal data and ensuring non-attribution of data contributed by appraisal participants.

4.2.16 **The method documentation shall provide guidance for (1) recording traceability between the data collected during the appraisal and the findings and/or ratings, (2) the retention and safekeeping of appraisal records, and (3) compiling and maintaining an appraisal record that supports the appraisal team's findings and/or ratings and that contains the following minimum content:**

 a. (ABC) dates of appraisal

 b. (ABC) appraisal input

 c. (A) objective evidence, or identification thereof, sufficient to substantiate goal rating judgments

 d. (ABC) identification of appraisal method (and version) used, along with any tailoring options

 e. (ABC) findings

 f. (A) any ratings rendered during the appraisal (goals, process areas, and maturity or capability levels)

 g. *(A) the set of 15504 process profiles resulting from the appraisal, if requested by the appraisal sponsor*

4.3 Planning and Preparing for the Appraisal

4.3.1 **The method shall provide for the preparation of appraisal participants by addressing, at a minimum,**

 a. (ABC) the purpose of the appraisal

 b. (ABC) the scope of the appraisal

 c. (ABC) the appraisal approach

 d. (ABC) the roles and responsibilities of participants in the appraisal

 e. (ABC) the schedule of appraisal activities

4.3.2 **(ABC) The method shall provide for the development of the appraisal input prior to the beginning of data collection by the appraisal team.**

4.3.3 **At a minimum, the appraisal input shall specify**

 a. (ABC) the identity of the sponsor of the appraisal, and the sponsor's relationship to the organizational unit being appraised

 b. (ABC) the appraisal purpose, including alignment with business objectives

 c. (ABC) the appraisal reference model scope, including

 1. the process areas to be investigated within the organizational unit

 2. the highest maturity level and/or capability level to be investigated for each process area within the appraisal scope

 d. (ABC) the organizational unit that is the subject of the appraisal

 e. (ABC) the process context, which, at a minimum, shall include

1. the size of the organizational unit

2. the demographics of the organizational unit

3. the application domain of the products or services of the organizational unit

4. the size, criticality, and complexity of the products or services

5. *the quality characteristics of the products or services (e.g., defect density, reliability)*

f. (ABC) the appraisal constraints, which, at a minimum, shall include

1. availability of key resources (e.g., staffing, funding, tools, facilities)

2. schedule constraints

3. the maximum amount of time to be used for the appraisal

4. specific process areas or organizational entities to be excluded from the appraisal

5. the minimum, maximum, or specific sample size or coverage that is desired for the appraisal

6. the ownership of the appraisal outputs and any restrictions on their use

7. controls on information resulting from a confidentiality agreement

8. non-attribution of appraisal data to associated sources

g. (ABC) the identity of the CMMI models used, including the version, discipline, and representation (staged or continuous)

h. (ABC) the criteria for experience, knowledge, and skills of the appraisal team leader who is responsible for the appraisal

i. (ABC) the identity and affiliation of the appraisal team members, including the appraisal team leader, with their specific appraisal responsibilities

j. (ABC) the identity (name and organizational affiliation) of appraisal participants and support staff, with specific responsibilities for the appraisal

k. (ABC) any additional information to be collected during the appraisal to support achievement of the appraisal objectives

l. (ABC) a description of the planned appraisal outputs, including ratings to be generated (process areas, maturity level)

m. (ABC) anticipated follow-on activities (e.g., reports, appraisal action plans, re-appraisal)

n. (ABC) planned tailoring of the appraisal method and associated tradeoffs, including the sample size or coverage of the organizational unit

4.3.4 **(ABC) The method shall require that the appraisal input, and any changes to the appraisal input, shall be agreed to by the sponsor (or the delegated authority) and documented in the appraisal record.**

4.3.5 **The method shall require the development of an appraisal plan that, at a minimum, specifies**

  a. (ABC) the appraisal input

  b. (ABC) the activities to be performed in conducting the appraisal

  c. (ABC) resources and schedule assigned to appraisal activities

  d. (ABC) appraisal logistics

  e. (ABC) mitigation steps to address risks associated with appraisal execution

  f. *(A) the criteria to verify that the requirements of ISO/IEC 15504 have been met, if requested by the appraisal sponsor*

4.4 Appraisal Data Collection

Appraisal teams base their findings on observations that, in turn, are based on objective evidence gathered from one or more sources. The requirements in this section identify the sources of objective evidence recognized by CMMI appraisal methods. As indicated in Appendix A, all three sources of objective evidence identified below are required for Class A appraisal methods. At least two sources are required for Class B methods, one of which must be interviews. At least one source is required for Class C methods.

4.4.1 **The method shall collect data by administering instruments (e.g., questionnaires, surveys).**

4.4.2 **The method shall collect data by conducting interviews (e.g., with project leaders, managers, practitioners).**

4.4.3 **The method shall collect data by reviewing documentation (e.g., organizational policies, project procedures, and implementation-level work products).**

4.5 Data Consolidation and Validation

4.5.1 **(AB) The method shall require appraisal team consensus in decisions when determining the validity of observations, creating findings, and establishing ratings.**

4.5.2 **The method shall require a mechanism for consolidating the data collected during an appraisal into accurate observations according to the following criteria:**

  a. (ABC) The observation was derived from objective evidence seen or heard during data collection sessions.

b. (ABC) The observation is clearly worded, phrased without attribution, and expressed in terminology used at the organizational unit.

c. (ABC) The observation is relevant to the appraisal reference model and can be associated with a specific model component.

4.5.3 The method shall require a mechanism for validating each accurate observation according to the following criteria:

a. (AB) The observation is corroborated.

b. (AB) The observation is consistent with other validated observations. (Validated observations cannot be both true and mutually inconsistent; in aggregate, they constitute a set of truths about the organizational unit that must be consistent.)

4.5.4 The method shall require the following minimum set of criteria to be satisfied in order for an observation to be considered "corroborated":

a. (AB) The observation is based on data from at least two different sources (i.e., the data should originate from at least two different individuals).

b. (AB) The observation is based on data from at least two different data-gathering sessions.

c. (AB) At least one of the two data points must reflect work actually being done (e.g., process area implementation).

4.5.5 The method shall require a mechanism for determining that sufficient data has been collected to cover the scope of the appraisal, according to the following minimum set of rules:

a. (A) A specific or generic practice has sufficient data coverage if validated observations exist for the practice and

1. are adequate to understand the extent of implementation of the practice

2. are representative of the organizational unit

3. are representative of the life-cycle phases in use within the organizational unit

b. (A) In a staged representation, a process area has sufficient data coverage if all of its specific and generic practices have sufficient data coverage.

c. (A) In a continuous representation, a process area has sufficient data coverage if all of its specific practices and the generic practices within the appraisal scope have sufficient data coverage up through the capability level being investigated for the process area (e.g., the target capability level).

4.5.6 **(A) The method shall require a mechanism for consolidating observations into draft findings of strengths and weaknesses relative to the appraisal reference model.**

4.5.7 **(A) The method shall require that the appraisal participants be presented with the draft findings in order to solicit their responses for verification of the findings' accuracy and clarity.**

4.6 Rating

4.6.1 **The method shall define a rating process that specifies, at a minimum, the following:**

   a. (A) An appraisal team can rate a specific or generic goal when valid observations for each practice related to the goal meet the method's defined data coverage criteria.

   b. (A) An appraisal team can rate a process area when it has rated each of the process area's specific goals and generic goals within the appraisal scope.

   c. (A) An appraisal team can determine a maturity level rating once it has rated all of the process areas within that level and each level below.[3]

   d. (A) An appraisal team can determine the capability level of a process area when it has rated each of the generic goals at or below the target capability level.

4.6.2 **(A) The method shall require that maturity level ratings and/or capability level ratings be based on the definitions of capability levels and maturity levels in the CMMI models.**

4.6.3 **The method shall rate each specific and generic goal (provided the prerequisites of rating have been completed) within the appraisal scope in accordance with the following rules:**

   a. (A) Rate the goal "satisfied" when the associated generic or specific practices (or acceptable alternative practices) are judged to be implemented and the aggregate of weaknesses does not have a significant negative impact on goal achievement.

   b. (A) Rate the goal "unsatisfied" otherwise.

4.6.4 **The method shall rate each process area within the appraisal scope, if requested by the appraisal sponsor, in accordance with the following rules:**

   a. (A) For a staged representation, the process area is "satisfied" if and only if all of its specific and generic goals are rated "satisfied."

   b. (A) For a continuous representation, the process area is given a capability level rating based upon the highest level for which all of its specific goals and generic goals have been satisfied.

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[3] See 4.6.5b for how a maturity level rating can be determined when using the continuous representation.

c. (A) When a process area is determined to be outside of the organizational unit's scope of work, the process area is designated as "not applicable" and is not rated.

d. (A) When a process area is outside of the appraisal scope, or if the associated findings do not meet the method's defined criteria for data coverage, the process area is designated as "not rated" and is not rated.

4.6.5 The method shall rate the maturity level, if requested by the appraisal sponsor, in accordance with the following rules:

a. (A) A maturity level for a staged representation is achieved if all process areas within the level and within each lower level are either "satisfied" or "not applicable."

b. (A) A maturity level for a continuous representation is achieved if the capability level profile is at or above the target profile for all process areas for that maturity level and all lower maturity levels in the equivalent staging, excepting those process areas that are designated as "not applicable."

4.7 Reporting Results

4.7.1 (ABC) The method shall require documenting and reporting the appraisal findings and/or ratings to the appraisal sponsor and to the appraised organization.

4.7.2 (A) If ISO/IEC 15504 conformance is desired, the method shall define a mechanism for converting objective evidence used by the appraisal team as the basis for goal ratings into associated process attribute outcomes in accordance with the translation requirement of ISO/IEC TR 15504-2 (clause 7.6).[4]

4.7.3 (A) The method shall require the submission of appraisal data required by the CMMI Steward for the purpose of reporting aggregated appraisal information to the constituent community.[5]

4.7.4 (ABC) The method shall require that the appraisal record be provided to the appraisal sponsor for retention.

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[4] This requirement addresses the means by which 15504 process profiles (which are derived from process attribute outcomes) may be derived from the objective evidence available to the appraisal team.

[5] The CMMI Steward defines the specific data required for submission at the completion of an appraisal. This data is used for quality control and for the collection of appraisal measures that are reported to the appraisal community; however, non-attribution and confidentiality of data will be ensured. The content, format, and mechanisms for submission of this data are established by the CMMI Steward, and are required as part of Lead Appraiser authorization.

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Appendix A   CMMI Appraisal Method Class Specification

The following table shows the applicability of the ARC requirements to the three classes of appraisal methods. In the cases where a requirement is applicable to a particular appraisal method class, "yes" is denoted. In some cases, a requirement has been specified as "not applicable" or "optional" for one or more appraisal methods. Requirements identified as not applicable are not relevant to the indicated method class; optional requirements, however, may still be performed. In the cases where "partial" is denoted, one or more subelements of the associated requirement are not applicable or are optional for the specified appraisal method class, while the rest of the subelements of that requirement are applicable to the class, as indicated.

Table 2:   Applicability of ARC Requirements to Appraisal Method Classes

Requirements	Class A (15504 conformant)	Class A (not 15504 conformant)	Class B	Class C
Responsibilities				
4.1.1 – Appraisal Sponsor	yes	yes	yes	yes
4.1.2 – Appraisal Team Leader	yes	yes	yes	yes
Appraisal Method Documentation				
4.2.1 – Documentation of method	yes	yes	partial (a-d only)	partial (a-d only)
4.2.2 – Guidance for identifying appraisal purpose and objectives	yes	yes	yes	yes
4.2.3 – Guidance for CMMI model scope	yes	yes	yes	yes
4.2.4 – Guidance for identifying organizational unit	yes	yes	yes	yes
4.2.5 – Guidance for team member selection	yes	yes	yes	yes
4.2.6 – Guidance for team leader qualification criteria	yes	yes	yes	yes
4.2.7 – Guidance for size of team	yes	yes	yes	yes
4.2.8 – Guidance for team member roles and responsibilities	yes	yes	yes	yes
4.2.9 – Guidance for appraisal sponsor responsibilities	yes	yes	yes	yes
4.2.10 – Guidance for team leader responsibilities	yes	yes	yes	yes
4.2.11 – Guidance for estimating appraisal resources	yes	yes	yes	yes
4.2.12 – Guidance for logistics	yes	yes	yes	yes
4.2.13 – Guidance for collecting and mapping data to appraisal reference model	yes	yes	yes	yes
4.2.14 – Guidance for creation of findings	yes	yes	yes	yes

Requirements	Class A (15504 conformant)	Class A (not 15504 conformant)	Class B	Class C
4.2.15 – Guidance for assuring confidentiality and non-attribution	yes	yes	yes	yes
4.2.16 – Guidance for appraisal record	yes	partial (a-f only)	partial (a,b,d,e only)	partial (a,b,d,e only)
Planning and Preparing for the Appraisal				
4.3.1 – Preparation of participants	yes	yes	yes	yes
4.3.2 – Development of appraisal input	yes	yes	yes	yes
4.3.3 – Content of appraisal input	yes	partial (all except e.5)	partial (all except e.5)	partial (all except e.5)
4.3.4 – Sponsor approval of appraisal input	yes	yes	yes	yes
4.3.5 – Development of appraisal plan	yes	partial (a-e only)	partial a-e only	partial (a-e only)
Appraisal Data Collection				
4.4.1 – Data from instruments	yes	yes	At least two sources of data, one of which must be interviews	At least one source of data
4.4.2 – Data from interviews	yes	yes		
4.4.3 – Data from documents	yes	yes		
Data Consolidation and Validation				
4.5.1 – Consensus of team members	yes	yes	yes	optional
4.5.2 – Accuracy of observations	yes	yes	yes	yes
4.5.3 – Validation of observations	yes	yes	yes	optional
4.5.4 – Corroboration of observations	yes	yes	yes	optional
4.5.5 – Sufficiency of data	yes	yes	optional	optional
4.5.6 – Draft findings preparation	yes	yes	optional	optional
4.5.7 – Draft findings presentations	yes	yes	optional	optional
Rating				
4.6.1 – Define a rating process	yes	yes	N/A	N/A
4.6.2– Basis for maturity level and capability level rating	yes	yes	N/A	N/A
4.6.3– Rules for goal rating	yes	yes	N/A	N/A
4.6.4 – Rules for process area rating	yes	yes	N/A	N/A
4.6.5 – Rules for maturity level rating	yes	yes	N/A	N/A
Reporting Results				
4.7.1 – Report results to sponsor and appraised organization	yes	yes	yes	yes
4.7.2 – Translation for 15504	yes	N/A	N/A	N/A
4.7.3 – Appraisal results to CMMI Steward	yes	yes	optional	optional
4.7.4 - Retention of appraisal record	yes	yes	yes	yes

Appendix B   ARC Coverage of 15504-3 Requirements

The table below shows how ARC requirements address the intent of assessment requirements levied by ISO/IEC TR 15504-3 [ISO 98b].

Note that ISO/IEC TR 15504-3 is copyright protected and cannot be freely reproduced; accordingly, only clause references are provided herein. Interested readers should obtain their own copy of the document for additional information on the details of the 15504-3 requirements.

Table 3:   ARC Requirements that Address 15504-3 Requirements

15504-3 Requirement	ARC Requirement (s)	Remarks
4.2 Defining the assessment input		
4.2.1	4.1.1e, 4.3.2, 4.3.4	
4.2.2	4.3.3	
4.2.2a	4.3.3a	
4.2.2b	4.3.3b	
4.2.2c	4.3.3c, d, e	
4.2.2c.1	4.3.3c.1	
4.2.2c.2	4.3.3c.2	
4.2.2c.3	4.3.3d	
4.2.2c.4	4.3.3e	
4.2.2d	4.3.3f	
4.2.2e	4.3.3g	The reference to software engineering practice in the 15504-3 requirement (4.2.2e) has been removed from the 15504 developmental baseline being progressed to international standard status. Satisfaction of this 15504 requirement depends also on satisfaction of relevant requirements for model compatibility in 15504-2 (clause 7).
4.2.2f	4.3.3j	
4.2.2g	4.3.3h	
4.2.2h	4.3.3k	
4.2.2i	4.3.3l	
4.2.3	4.3.4	
4.3 Responsibilities:	(see below)	
4.3.1	4.1.1a	
4.3.2	4.1.1d	
4.3.3	4.1.2b	
4.3.4	4.1.2a	This specific ARC requirement, coupled with the allocation of all ARC requirements to Class A appraisal methods, ensures that the appraisal is conducted in accordance with the requirements of ISO/IEC TR 15504-3.

15504-3 Requirement	ARC Requirement (s)	Remarks
4.3.5	4.1.2c	
4.3.6	4.1.2d	
4.3.7	4.1.2d, 4.2.5	
4.3.8	4.1.2e	The requirements refer to those defined for the appraisal method; these will include, at a minimum, the ARC requirements that are implemented for the method.
4.4 The assessment process	(see below)	
4.4.1	4.2.1, 4.2.2	
4.4.2a	4.3.5	
4.4.2a.1	4.3.5a	
4.4.2a.2	4.3.5b	
4.4.2a.3	4.3.5c	
4.4.2a.4	4.3.5a, 4.3.3h-k	
4.4.2a.5	4.3.5f	
4.4.2a.6	4.3.3m	
4.4.2b.1	4.4 - 4.6	Collectively, these ARC requirements address the intent of this 15504-3 requirement.
4.4.2b.2	(see remarks)	Intent addressed through the satisfaction of the model compatibility requirements.
4.4.2b.3	4.5.2a	
4.4.2b.4	4.5.5	
4.4.2b.5	4.2.16c	
4.4.2c	4.5.3, 4.5.4, 4.5.7	
4.4.2d.1	(see remarks)	If the appraisal sponsor has not requested a 15504 profile, this is not relevant.
4.4.2d.2	4.5.2c, 4.5.5, 4.6.1	
4.4.2d.3	4.5.1	Note that the relationship to 15504 is indirect in that 15504 does not require that any particular form of decision-making (such as consensus) be used to derive rating judgments, only that the decision-making process be recorded.
4.4.2e	4.7.1, 4.7.4	
4.5 Recording the assessment output	(see below)	
4.5.1	4.7.4	
4.5.2	4.2.16	Note that 4.5.2f is covered by 4.3.3l and that 4.2.16e does not relate to 4.5.2.

Appendix C   Glossary

The ARC glossary defines many, but not all, terms used in this document. The model glossary and terminology should be considered supplementary to the ARC glossary. Terms that are particularly significant to this document are duplicated from the model document for convenience.

accurate observation An observation extracted from data collected during an appraisal that has been determined by the appraisal team to be (a) worded appropriately, (b) based on information seen or heard, (c) relevant to the appraisal reference model being used, (d) significant, such that it can be classified as a strength, weakness, or alternative practice, and (e) not redundant with other observations. [ARC v1.0]

alternative practice A practice that is a substitute for one or more generic or specific practices contained in the CMMI model that achieves an equivalent effect toward satisfying the goal associated with the model practices. Alternative practices are not necessarily one-for-one replacements for the generic or specific practices. [ARC v1.0 and CMMI model glossary]

appraisal An examination of one or more processes by a trained team of professionals using an appraisal reference model as the basis for determining, at a minimum, strengths and weaknesses. [ARC v1.0]

appraisal action plan A detailed plan to address an appraisal finding.

appraisal findings (See "findings.")

appraisal input The collection of appraisal information required before data collection can commence. [ISO 98C]

appraisal method class Designation assigned to an appraisal method that satisfies a defined subset of requirements in the ARC. The three classes defined in the ARC align with typical applications of appraisal methods.

typical applications of appraisal methods. [derived from ARC v1.0]

appraisal objectives The desired outcome(s) established for an appraisal as derived from the business objectives of the appraisal sponsor. [ARC v1.0]

appraisal output All of the tangible results from an appraisal. (See "appraisal record.") [ISO 98C]

appraisal participants Members of the organizational unit who participate in providing information during the appraisal. [CMMI model glossary]

appraisal rating The value assigned by an appraisal team to (1) a CMMI goal or process area, (2) the capability level of a process area, or (3) the maturity level of an organizational unit. The rating is determined by enacting the defined rating process for the appraisal method being employed. [CMMI model glossary]

appraisal record An orderly, documented collection of information that is pertinent to the appraisal and adds to the understanding and verification of the appraisal findings and ratings generated. [derived from ISO 98C]

appraisal reference model The CMMI model to which an appraisal team correlates implemented process activities. [CMMI model glossary]

appraisal scope The definition of the boundaries of the appraisal encompassing the organizational limits and the CMMI model limits. [derived from CMMI model glossary, ISO 98C]

appraisal sponsor The individual, internal or external to the organization being appraised, who requires the appraisal to be performed, and provides financial or other resources to carry it out. [derived from ISO 98C]

appraisal tailoring Selection of options within the appraisal method for use in a specific instance. The intent of tailoring is to assist an organization in aligning application of the method with its business needs and objectives. [CMMI model glossary]

appraisal team leader The person who leads the activities of an appraisal and has satisfied the qualification criteria for experience, knowledge, and skills

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defined by the appraisal method.

assessment An appraisal that an organization does to and for itself for the purpose of process improvement.

capability evaluation An appraisal by a trained team of professionals used as a discriminator to select suppliers, for contract monitoring, or for incentives. Evaluations are used to help decision makers make better acquisition decisions, improve subcontractor performance, and provide insight to a purchasing organization. [CMMI model glossary]

consensus A method of decision making that allows team members to develop a common basis of understanding and develop general agreement concerning a decision that all team members are willing to support. [ARC v1.0]

consolidation The activity of collecting and summarizing the information provided during an appraisal into a manageable set of data to (a) determine the extent to which the data are corroborated and cover the areas being investigated, (b) determine the data's sufficiency for making judgments, and (c) revise the data-gathering plan as necessary to achieve this sufficiency. [ARC v1.0]

corroboration The extent to which enough objective evidence has been gathered to confirm that an observation is acceptable for use by an appraisal team. [ARC v1.0]

coverage The extent to which objective evidence gathered addresses both the model and organizational scope of an appraisal. [ARC v1.0]

data collection session An activity during which information that will later be used as the basis for observation formulation or corroboration is gathered. Data collection sessions (or activities) include the administration and/or analysis of instruments, document reviews, interviews, and presentations. [ARC v1.0]

draft findings Preliminary findings created by an appraisal team after consolidating and synthesizing valid observations. Draft findings are provided to appraisal participants for validation of accuracy. [ARC v1.0]

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equivalent staging	Equivalent staging is a target staging, created using the continuous representation that is defined so that the results of using the target staging can be compared to the maturity levels of the staged representation. (See "target staging," "maturity level," "capability level profile," and "target profile.")
	Such staging permits benchmarking of progress among organizations, enterprises, and projects, regardless of the CMMI representation used. The organization may implement components of CMMI models beyond those reported as part of equivalent staging. Equivalent staging is only a measure to relate how the organization is compared to other organizations in terms of maturity levels. [CMMI model glossary]
evaluation	(See "capability evaluation.")
findings	The conclusions of an appraisal that identify the most important issues, problems, or opportunities within the appraisal scope. Findings include, at a minimum, strengths and weaknesses based on valid observations. [Derived from ARC v1.0]
instruments	Artifacts used in an appraisal for the collection and presentation of data (e.g., questionnaires, organizational unit information packets). [ARC v1.0]
interviews	A meeting of appraisal team members with appraisal participants for the purpose of gathering information relative to work processes in place. [ARC v1.0]
lead appraiser	A person who has achieved recognition from an authorizing body to perform as an appraisal team leader for a particular appraisal method.
objective evidence	Qualitative or quantitative information, records, or statements of fact pertaining to the characteristics of an item or service or to the existence and implementation of a process element, which are based on observation, measurement, or test and are verifiable. [CMMI model glossary, ISO 98C]
observation	A written record that represents the appraisal team members' understanding of information either seen or heard during the appraisal data collection activities. The written record may take the

form of a statement or may take alternative forms, as long as the information content is preserved. [CMMI model glossary , ARC v1.0]

organizational unit	The part of an organization that is the subject of an appraisal (also known as the organizational scope of the appraisal). An organizational unit deploys one or more processes that have a coherent process context and operates within a coherent set of business objectives. An organizational unit is typically part of a larger organization, although in a small organization, the organizational unit may be the whole organization. [Derived from CMMI model glossary, ISO 98C]
process attribute	A measurable characteristic of process performance applicable to any process. [CMMI model glossary, ISO 98C]
process attribute outcomes	The results of achievement of a process attribute.
process context	The set of factors documented in the appraisal input that influences the judgment and comparability of appraisal ratings. These include, but are not limited to, (a) the size of the organizational unit to be appraised, (b) the demographics of the organizational unit, (c) the application domain of the products or services, (d) the size, criticality, and complexity of the products or services, and (e) the quality characteristics of the products or services. [CMMI model glossary]
process profile	The set of goal ratings assigned to the process areas in the scope of the appraisal. In CMMI, also known as the process area profile. [derived from ISO98c]
rating	(See "appraisal rating.") [CMMI model glossary]
satisfied	Rating given to a goal when the associated generic or specific practices (or acceptable alternative practices) are judged to be implemented and the aggregate of weaknesses does not have a significant negative impact on goal achievement. Rating given to a process area when all of its goals are rated "satisfied." [ARC v1.0]

strength   Exemplary or noteworthy implementation of a CMMI model practice. [CMMI model glossary]

tailoring   (See "appraisal tailoring.")

valid observation   An observation that the appraisal team members agree is (a) accurate, (b) corroborated, and (c) consistent with other accurate and corroborated observations. [ARC v1.0]

weakness   The ineffective, or lack of, implementation of one or more CMMI model practices. [CMMI model glossary]

Appendix D   CMMI Project Participants

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1. AGENCY USE ONLY (Leave Blank)	2. REPORT DATE December 2001		3. REPORT TYPE AND DATES COVERED Final
4. TITLE AND SUBTITLE ARC, V1.1 Appraisal Requirements for CMMI^{SM}, Version 1.1			5. FUNDING NUMBERS F19628-00-C-0003
6. AUTHOR(S) CMMI Product Team			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Software Engineering Institute Carnegie Mellon University Pittsburgh, PA 15213			8. PERFORMING ORGANIZATION REPORT NUMBER CMU/SEI-2001-TR-034
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) HQ ESC/XPK 5 Eglin Street Hanscom AFB, MA 01731-2116			10. SPONSORING/MONITORING AGENCY REPORT NUMBER ESC-TR-2001-034
11. SUPPLEMENTARY NOTES			
12A DISTRIBUTION/AVAILABILITY STATEMENT Unclassified/Unlimited, DTIC, NTIS			12B DISTRIBUTION CODE

13. ABSTRACT (MAXIMUM 200 WORDS)

The Appraisal Requirements for CMMI (ARC) V1.1 defines the requirements considered essential to appraisal methods intended for use with CMMI models. In addition, a set of appraisal classes is defined, based on typical applications of appraisal methods. These classes are intended primarily for developers of appraisal methods to use with CMMI capability models in the context of the CMMI Product Suite. Additional audiences for the document include lead appraisers and other individuals who are involved in or may be interested in process appraisal or improvement.

The approach employed to provide guidance to appraisal method developers is to define a class of typical applications of appraisal methods (which are based on years of experience in the process improvement community) called appraisal method classes. Requirements are then allocated to each class as appropriate based on the attributes associated with that class. Thus, a particular appraisal method may be declared to be an ARC class A, B, or C appraisal method. This designation implies the sets of ARC requirements that the method developer has addressed when designing the method.

14. SUBJECT TERMS CMMI, appraisal, requirements, classes			15. NUMBER OF PAGES 48
16. PRICE CODE			

17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL