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Information technology — Process assessment — Requirements for process reference, process assessment and maturity models

*Technologies de l'information — Évaluation du processus —
Exigences relatives au modèle de référence du processus, au modèle
d'évaluation du processus et au modèle de maturité*

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*.

This second edition cancels and replaces clauses of ISO/IEC 15504-2:2003 and ISO/IEC 15504-7:2008, which have been technically revised.

This corrected edition cancels and replaces the edition ISO/IEC 33304:2015 which has been editorially revised. The main changes compared to the previous edition are as follows:

- duplicated clauses in 6.3 have been corrected; and
- minor editorial changes have been made to the foreword to align it with current editorial rules.

Introduction

This International Standard provides requirements for the construction and verification of process reference models, process assessment models, and maturity models.

This International Standard is part of a set of International Standards designed to provide a consistent and coherent framework for the assessment of process quality characteristics, based on objective evidence resulting from implementation of the processes. The framework for assessment covers processes employed in the development, maintenance, and use of systems across the information technology domain and those employed in the design, transition, delivery and improvement of services. The set of International Standards, as a whole, addresses process quality characteristics of any type. Results of assessment can be applied for improving process performance, or for identifying and addressing risks associated with application of processes.

The set of International Standards ISO/IEC 33001:2015 to ISO/IEC 33099, termed the ISO/IEC 330xx family, defines the requirements and resources needed for process assessment. The overall architecture and content of the series is described in this International Standard. General issues relating to the application of conformity assessment to the assessment of process quality characteristics and organizational process maturity are addressed in ISO/IEC 29169.

Several International Standards in the ISO/IEC 330xx family of standards for process assessment are intended to replace and extend parts of the ISO/IEC 15504 series of Standards. Annex A in ISO/IEC 33001 provides a detailed record of the relationship between the ISO/IEC 330xx family and the ISO/IEC 15504 series.

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Information technology — Process assessment — Requirements for process reference, process assessment and maturity models

1 Scope

This International Standard sets out the requirements for process reference models, process assessment models, and maturity models. The requirements defined in this International Standard form a structure which specifies

- a) the relationship between the classes of process model associated with the performance of process assessment,
- b) the relationship between process reference models and prescriptive/normative models of process performance, as constituted by, for example, the activities and tasks defined in ISO/IEC 12207^[1] and ISO/IEC 15288^[2],
- c) the integration of process reference models and process measurement frameworks to establish process assessment models,
- d) the use of common sets of assessment indicators of process performance and process quality in process assessment models, and
- e) the relationship between maturity models and process assessment models and the extent to which a maturity model can be constructed using elements from different process assessment models.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 33001:2015, *Information technology — Process assessment — Concepts and terminology*

ISO/IEC 33003, *Information technology — Process assessment — Requirements for process measurement frameworks*

3 Term(s) and definition(s)

For the purposes of this document, the terms and definitions given in ISO/IEC 33001 apply.

4 Requirements for process models

This International Standard sets out the requirements that shall be met by process models used to support process assessment. A process assessment model shall be based upon a suitable reference source of process definitions based on one or more process reference model(s) as described in [Clause 5](#). The requirements to be met by a process assessment model in order to claim conformance through its relationship with specific process reference model(s) are defined in [Clause 6](#). A maturity model shall be based on a suitable process assessment model(s); requirements for a maturity model are set out in [Clause 7](#).

The requirements for conformance of process assessment models enable comparison of outputs from assessments using different process assessment models based upon the same process reference model(s).

5 Process reference models

5.1 Introduction

[Clause 5](#) sets out the requirements for a process reference model.

5.2 Process reference model purpose and scope

The purpose of a process reference model is to define a set of processes that collectively can support the primary aims of a community of interest. A process reference model provides the basis for one or more process assessment models.

In order to assure that assessment results are translatable into a set of process profiles in a repeatable and reliable manner, process reference models shall adhere to certain requirements.

5.3 Requirements for process reference models

5.3.1 A process reference model shall contain:

- a) a declaration of the domain of the process reference model;
- b) a description of the relationship between the process reference model and its intended context of use;
- c) descriptions, meeting the requirements of [5.4](#), of the processes within the scope of the process reference model;
- d) a description of the relationship between the processes defined within the process reference model.

5.3.2 The process reference model shall document the community of interest of the model and the actions taken to achieve consensus within that community of interest:

- a) the relevant community of interest shall be characterized or specified;
- b) the extent of achievement of consensus shall be documented;
- c) if no actions are taken to achieve consensus, a statement to this effect shall be documented.

5.3.3 The processes defined within a process reference model shall have unique process descriptions and identification.

NOTE Any elements contained in a process reference model that are not included in this Clause are to be considered informative.

5.4 Process descriptions

The fundamental elements of a process reference model are the descriptions of the processes within the scope of the model.

The process descriptions in the process reference model incorporate a statement of the purpose of the process which describes at a high level the overall objectives of performing the process, together with the set of outcomes which demonstrate successful achievement of the process purpose.

A process description shall meet the following requirements:

- a) a process shall be described in terms of its purpose and process outcomes;
- b) the set of process outcomes shall be necessary and sufficient to achieve the purpose of the process;
- c) process descriptions shall not contain or imply aspects of the process quality characteristic beyond the basic level of any relevant process measurement framework conformant with ISO/IEC 33003.

A process outcome describes one of the following:

- production of an artifact;
- a significant change of state;
- meeting of specified constraints, e.g. requirements, goals etc.

NOTE 1 Achievement of the process outcomes, without any management or control factors related to the selected process quality characteristic, demonstrates basic satisfaction of the process purpose; this level of achievement is typically recognized as satisfying an important process attribute in any process measurement framework. Where the process measurement framework is structured as an ordinal scale, this process attribute constitutes process quality level 1.

NOTE 2 For detailed guidance on the content and definition of process descriptions, refer to ISO/IEC 24774^[3]. An increasing number of international, national and industry standards describe process models. These models are developed for a range of purposes including process implementation and assessment. The terms and descriptions used in such models vary in format, content and level of prescription. ISO/IEC/TR 24774 presents guidelines for the elements used most frequently in describing a process: the title, purpose statement, outcomes, activities and tasks. The primary purpose of ISO/IEC/TR 24774 is to encourage encourage uniformity in the description of processes, and following these guidelines allows the combination of processes from different process reference models.

NOTE 3 As defined in ISO/IEC/TR 24774, an outcome is an observable result of the successful achievement of the process purpose, and thus it is assessable.

5.5 Verifying conformity of process reference models

Since a process reference model may be developed by a community of interest, or a relevant International or National Standard, or Publicly Available Specification, verification of the extent to which a process reference model meets the requirements of this International Standard may be through either demonstration of conformity or demonstration of compliance. The party performing verification of conformity shall obtain objective evidence that the process reference model fulfils the requirements set forth in 5.3. Objective evidence of conformance shall be retained.

NOTE Conformity is fulfillment by a product, process or service of specified requirements. Compliance is adherence to those requirements contained in International Standards and Technical Specifications which specify requirements to be fulfilled by other International Standards, Technical Specifications or International Standardized Profiles (ISPs).

6 Process assessment models

6.1 Introduction

A process assessment model is related to one or more process reference models. It forms the basis for the collection of evidence and rating of a process quality characteristic.

A process assessment model provides a two-dimensional view of a process quality characteristic. In one dimension, it describes a set of processes defined in the related process reference model(s); this is termed the process dimension. In the other dimension, the process assessment model describes the process attributes and the process quality levels defined in the selected process measurement framework; this

is defined as the process quality dimension. The relationship is shown diagrammatically in [Figure 1](#) (process dimension on the X axis, and process quality dimension on the Y axis).

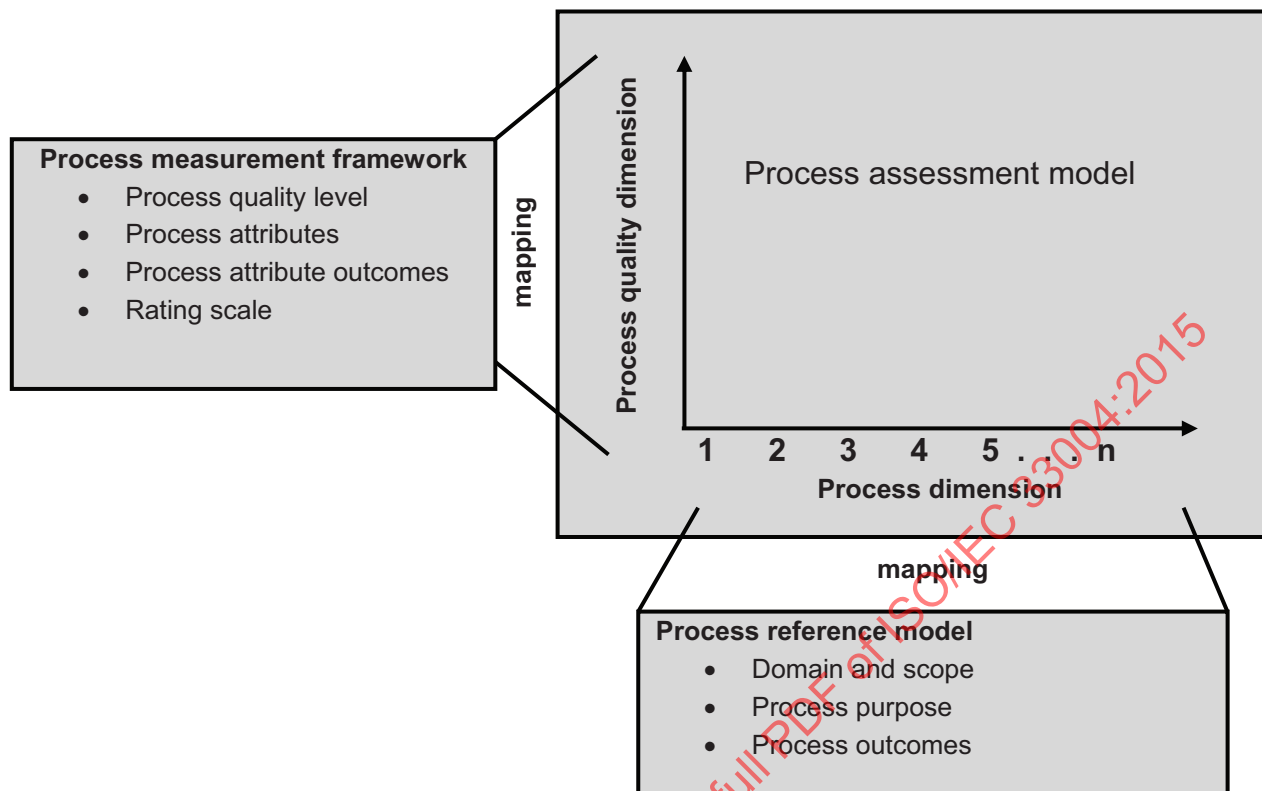


Figure 1 — Process assessment model relationships

6.2 Process assessment model scope

Processes in a process assessment model are based on the process descriptions provided in process reference model(s); process attributes and process quality levels (if applicable) are based on the process measurement framework.

In order to assure that assessment results are translatable into a set of process profiles in a repeatable and reliable manner, process assessment models shall adhere to certain requirements.

6.3 Requirements for process assessment models

6.3.1 A process assessment model shall relate to a single process quality characteristic.

6.3.2 A process assessment model shall incorporate a single process measurement framework, conformant with ISO/IEC 33003:2015, based on the selected process quality characteristic.

6.3.3 A process assessment model shall be based on one or more process reference models and a process measurement framework.

6.3.4 A process assessment model shall relate to at least one process from the selected process reference model(s).

6.3.5 A process assessment model shall declare its scope of coverage in the terms of:

- a) the selected process quality characteristic;

- b) the selected process measurement framework;
- c) the selected process reference model(s);
- d) the selected processes from the process reference model(s);
- e) the process attributes and (if relevant) the process quality levels of the process quality characteristic selected from the process measurement framework.

6.3.6 If the selected process measurement framework provides a nominal scale, then the process assessment model shall, for a given process, address all of the defined process attributes, including the process performance attribute.

6.3.7 If the process measurement framework provides an ordinal or interval scale, then the process assessment model shall address, for a given process, all, or a continuous subset, of the levels (starting at process quality level 1) of the process measurement framework for the process quality characteristic for each of the processes within its scope.

NOTE It would be permissible for a model, for example, to address solely process quality level 1, or to address process quality levels 1, 2 and 3, but it would not be permissible to address process quality levels 2 and 3 without process quality level 1.

6.3.8 Assessment Indicators

A process assessment model shall be based on a set of assessment indicators that:

- a) explicitly address the purpose and process outcomes, as defined in the selected process reference model, of each of the processes within the scope of the process assessment model;
- b) demonstrate the achievement of the process attributes within the scope of the process assessment model;
- c) demonstrate the achievement (where relevant) of the process quality levels within the scope of the process assessment model.

The assessment indicators generally fall into three types:

- a) practices that support achievement of either the process purpose or the specific process attribute.
- b) information items and their characteristics that demonstrate the respective achievements.
- c) resources and infrastructure that support the respective achievements.

6.3.9 Mapping process assessment models

A process assessment model shall provide explicit mapping from the relevant elements of the process assessment model to the processes of the selected process reference model(s), and to the relevant process attributes of the selected process measurement framework. The mappings shall be complete, clear and unambiguous.

This enables process assessment models that are structurally different to be related to the same process reference model(s) and the process measurement framework.

6.3.9.1 Mapping to process reference models

The mapping of the assessment indicators within the process assessment model shall be to the purpose and process outcomes of the processes in the selected process reference model;

6.3.9.2 Mapping to process measurement framework

The mapping of the assessment indicators within the process assessment model shall be to the process attributes (including all the process attribute outcomes listed for each process attribute) in the process measurement framework.

6.3.10 Expression of assessment results

A process assessment model shall provide a formal and verifiable mechanism for representing the results of an assessment as a set of process attribute ratings for each assessed process (the process profiles) selected from the process reference model(s).

NOTE The expression of results may involve a direct translation of process assessment model ratings into a process profile as defined in this International Standard, or the conversion of the data collected during the assessment (with the possible inclusion of additional information) through further judgment on the part of the assessor.

6.4 Verifying conformity of process assessment models

Since a process assessment model may be developed by a community of interest, or a relevant International or National Standard, or Publicly Available Specification, verification of the extent to which a process assessment model meets the requirements of this International Standard may be through either demonstration of conformity or demonstration of compliance. The party performing verification of conformity shall obtain objective evidence that the process assessment model fulfils the requirements set forth in 6.3. Objective evidence of conformance shall be retained.

NOTE Conformity is fulfillment by a product, process or service of specified requirements. Compliance is adherence to those requirements contained in International Standards and Technical Specifications which specify requirements to be fulfilled by other International Standards, Technical Specifications or International Standardized Profiles (ISPs).

7 Maturity models

7.1 Introduction

A maturity model is derived from one or more specified process assessment model(s) that identifies the process sets associated with each of the levels in a scale of organizational process maturity, and relates to the growing ability of an organization to achieve higher levels of a specific process quality characteristic.

7.2 Maturity model scope

The scope of a maturity model is dependent on the existence of one or more process assessment model(s) that include basic and extended processes appropriate to the target businesses and organizations. If appropriate process assessment model(s) (and process reference model(s)) are not available, these need to be constructed or adapted from those identified, prior to completing the maturity model.

The declaration of scope for a maturity model may take the form of a description of the domain of application and the specific aspects of that domain that are addressed. For example, a maturity model might be developed for software industry which addresses software life cycle processes defined in ISO/IEC 12207:2008. In addition the maturity model may identify sub-domains of application by excluding or including the applicability of some processes. For example, maturity model for software industry may address some aspects of systems development where ISO/IEC 15288:2008 can be referred to. The scope declaration shall include the identification of the specified process assessment model(s) and an itemization of the processes comprising the maturity model. The processes covered by the maturity model shall be grouped according to the maturity level to which they belong.