TECHNICAL SPECIFICATION

ISO/IEC TS 33010

First edition
2023-04

Information technology — Process assessment — Guidance for performing process assessments

Technologies de l'information — Évaluation des processus — Recommandations pour la réalisation des évaluations de processus

Reference number
ISO/IEC TS 33010:2023(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

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Foreword

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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 or www.iec.ch/members_experts/refdocs).

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This document was prepared by Joint Technical Committee ISO/IEC JTC1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

Introduction

Process assessment is a disciplined evaluation of an organizational unit's processes against a process assessment model. It is initiated as a result of a desire to determine and/or improve the performance of these processes.

The guidance in this document is primarily aimed at the lead assessor who has the responsibility for conducting the assessment, selection and use of models, documented assessment process and tools for the assessment.

The guidance may also be of use to the developers of assessment models, documented assessment processes and tools as an aid to understanding the requirements.

The assessors and other participants in an assessment may use the guidance to gain an understanding of process assessment.

Information technology — Process assessment — Guidance for performing process assessments

1 Scope

This document provides an overview of process assessment and interprets the requirements of ISO/IEC 33002 and ISO/IEC 33004 through the provision of guidance on the selection and use of assessment models, documented assessment processes, and instruments or tools for assessment.

Process assessment is applicable in the following circumstances:

a) by or on behalf of an organization with the objective of understanding the state of its own processes for process improvement;

b) by or on behalf of an organization with the objective of determining the suitability of its own processes for a particular requirement or class of requirements;

c) by or on behalf of one organization with the objective of determining the suitability of another organization's processes for a particular contract or class of contracts.

2 Normative reference

The following referenced 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, *Information technology — Process assessment — Concepts and terminology*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Overview of process assessment

4.1 Process assessment

Process assessment is undertaken to understand the process quality characteristic of an organizational unit's current processes.

Process assessment deals with the processes (e.g. management, development, maintenance, support) used by an organization. This is accomplished by assessing the organizational unit's processes against a process assessment model conformant with the requirements for processes described in ISO/IEC 33004.

A process reference model defines the set of processes that are fundamental to good business practices in a selected domain. Building upon the foundation of a process reference model, a process assessment model includes a set of process attributes, applicable to any processes, that characterize the selected process quality characteristic of a measurement framework.

Processes in a process reference model are grouped according to the type of activity they address. Each process has a defined purpose describing the high-level objectives that the process should achieve. The purpose statements describe what to do, but do not prescribe how the process should achieve its objectives.

Each process attribute in a measurement framework, as described in ISO/IEC 33003, enables the process quality characteristic to effectively achieve its purpose and contribute to meeting the business goals of the organizational unit.

Although a process reference model selected according to the requirements in ISO/IEC 33004 may cover a range of processes, in many cases a subset of these processes may be selected for assessment. For instance, the sponsor may wish to focus attention on one or more critical processes or on processes which are candidates for improvement actions.

The sophistication and complexity of the implemented process depend upon the context of that process within the organizational unit. For instance, the planning required for a five-person project team is likely to be much less than for a fifty-person team. This process context, recorded in the assessment input, influences how a lead assessor should judge and rate the process attributes for an implemented process. The process context also influences the degree of comparability between process attribute and/or process quality level ratings.

In some circumstances, it may be desirable to compare the outputs of the assessment of two or more organizational units, or for the same organizational unit at different times. A number of factors should be taken into account when comparing assessment results. These include but are not limited to:

— the sample size used to generate the ratings which influences the precision with which results may be compared;

— the purposes of the assessments that generated the assessment outputs - it may not be meaningful, for example, to compare an assessment whose purpose was to identify best (or worst) practice with one whose purpose was to identify representative practice;

— the documented assessment process or model(s) used;

— the competency of the assessors;

— the candour of the participants;

— the time spent on the assessment;

— the motivation of the assessor (i.e. internal assessor with incentives based on the assessment results or a consultant with a long-term relationship with the organization);

— the motivation of the assessment participants to be frank and forthcoming.

4.2 Process attribute rating scheme

A process assessment measurement framework is based on assessing processes. The guidance in Clause 6 on information collection helps to increase the level of repeatability by different assessors.

Each process has a set of process attribute ratings that constitute the process profile.

For the assessment of process capability, process attribute ratings may be expressed using a process attribute rating scale as defined in ISO/IEC 33020.

NOTE The process capability level model defined in ISO/IEC 33020 defines a six-point ordinal scale of increasing process capability ranging from a process which is not capable of achieving its purpose (process capability level zero) to a process which optimizes its performance (process capability level 5). The process capability level model is described in terms of the process attribute ratings associated with a particular process capability level.

When more than one instance of a process is assessed, the assessor should use the recorded assessment information collected on all of the instances to make a judgment on the rating of each of the process attributes assessed for that process.

If there is a need for aggregation of ratings, the approach to the aggregation of ratings should be specified.

4.3 Process assessment classes

Three classes of assessment are identified, resulting in different level of confidence in the ratings of the selected organizational process quality characteristic. Specific requirements relating to each class are described in ISO/IEC 33002:2015, 4.6.

The classes of assessment are:

— Class 1 assessment: The goal of this class is to provide a level of confidence in the results of the assessment such that the results are suited for comparisons across different organizations.

— Class 2 assessment: The goal of this class is to provide a level of confidence in the assessment results that may indicate the overall level of performance of the key processes in the organization unit, which are suitable for comparisons of the results of an assessment across an organizational or product line scope.

— Class 3 assessment: The goal of this class is to generate results that may indicate critical opportunities for improvement and key areas of process related risk.

4.4 Process assessment approaches

As described in ISO/IEC 33002:2015, Annex A, the degree of independence of different types of bodies and the make-up of the assessment team performing an assessment can be categorised as follows.

— Category A: This typically represents an organization providing fully independent 3rd party services.

— Category B: This typically represents an organization providing 2nd or 3rd party services where the assessment team is led by a lead assessor from the independent organization and where the other assessment team members may be from the organization being assessed. Such an approach may be used where data is collected by internal team members and then verified by the lead assessor.

— Category C: This typically represents an internal but independent process group or quality assurance group within the organization being assessed but where there is a separate reporting line. This approach may be used in a large organization that has a separate functional group responsible for performing assessments.

— Category D: This typically represents an internal consultant that is assisting an organization in implementing process improvement which then assesses their capabilities. Many small organizations may follow such an approach where there is no customer pressure for an independent assessment to be performed. This may also be a team internal to the organization conducting a self-assessment to identify opportunities for improvement. There is no pressure to provide the result to any group outside the organization.

4.5 Assessment process

Irrespective of the type of assessment or the approach adopted, an assessment should be conducted according to a documented process. Some of the key elements of a documented assessment process are briefly described below. Note, however, that the guidance provided does not constitute a complete, documented process. Its role is to provide help in interpreting the requirements in ISO/IEC 33002 and ISO/IEC 33004, and to provide a starting point for selecting or creating a documented process.

NOTE An exemplar document assessment process is described in ISO/IEC TS 33030.

Depending upon the approach, a documented assessment process provides guidance on the following topics:

— assessment activities, including:
  — assessment planning;
  — data collection;
  — data validation;
  — determination of results;
  — assessment reporting;
— roles, responsibilities and competence;
— tools and instruments;
— aggregation approach;
— assessment inputs;
— assessment record.

4.6 Process assessment model

A process assessment model is one that meets the requirements specified in ISO/IEC 33004. In summary, a process assessment model is one:

— that is suitable for the purpose of process assessment;
— whose fundamental elements can be mapped to a process reference model;
— that is equipped with sets of indicators for use during an assessment to gather the information about processes and process attributes;
— that has a formal mechanism for translating the information gathered using the model into process attribute ratings as defined in ISO/IEC 33004.

Clause 5 provides guidance on the selection and use of a process assessment model.

NOTE The model in ISO/IEC TS 33061 is an example of the process assessment model applicable to the domain of software engineering.

4.7 Supporting instruments and tools

In all assessments, information needs to be collected, recorded, stored, collated, processed, analysed, retrieved and presented. In general, a documented assessment process should be supported by various instruments and tools for information gathering, processing and presentation. For some assessments, the support tools and instruments may be manual, i.e. paper-based (forms, questionnaires, checklists, etc.). In some cases, the volume and complexity of the assessment information is likely to be considerable, resulting in the need for automated support tools.

Regardless of the form of the supporting instruments and tools, their objectives are to help an assessor perform an assessment in a consistent and reliable manner, reducing assessor subjectivity and helping to ensure the validity, usability and comparability of assessment results. In order to achieve these objectives, the instruments and tools need to make the assessment model and its indicators accessible to the assessors.

4.8 Success factors for process assessment

4.8.1 General

The following factors should be considered essential to a successful process assessment.

4.8.2 Commitment

The sponsor should commit to the objectives established for an assessment to provide the authority to undertake the assessment within an organization. This commitment requires that the necessary resources, time and personnel are available to undertake the assessment. The commitment of the sponsor and the assessors is fundamentally important to ensuring that the objectives are met.

4.8.3 Motivation

The attitude of the organization's management, and the documented assessment process by which the information is collected, has a significant influence on the outcome of an assessment. The organizational unit's management, therefore, needs to motivate participants to be open and constructive. Process assessments focus on the process, not on the behaviour of organizational unit members implementing the process. The intent is to make the processes more effective in supporting the defined business goals, not to allocate blame to individuals.

Providing feedback and maintaining an atmosphere that encourages open discussion about preliminary findings during the assessment helps to ensure that the assessment output is meaningful to the organizational unit. The organization needs to recognise that the participants are a principal source of knowledge and experience about the process and that they are in a good position to identify potential weaknesses.

4.8.4 Confidentiality

Respect for the confidentiality of the sources of information and documentation gathered during assessment is essential in order to secure that information. If discussion techniques are utilized, consideration should be given to ensuring that participants do not feel threatened or have any concerns regarding confidentiality. Some of the information provided can be proprietary to the organization. It is therefore important that adequate controls are in place to handle such information.

4.8.5 Relevance

The organizational unit members should believe that the assessment will result in some benefits that will accrue to them directly or indirectly.

4.8.6 Credibility

The sponsor and the management and staff of the organizational unit should all believe that the assessment will deliver a result which is objective and is representative of the assessment scope. It is important that all parties can be confident that the assessors have adequate experience of assessment, are sufficiently impartial and have an adequate understanding of the organizational unit and its business to conduct the assessment.

5 Selection and use of a process assessment model

5.1 General

This clause provides guidance on the selection and use of a process assessment model as the basis for performing a processes assessment. The guidance is intended for use by the assessors and sponsors of assessments. It is not directed specifically at the developers of process assessment models, though it may be of use to them.

In performing a process assessment, the practices observed in the organization unit being assessed are compared against those defined in an assessment model of good practice, to determine the extent to which the performance of the practices results in achievement of the selected process quality characteristic representing the attributes of a process and its performance at a specific level of capability.

In order to achieve this, the model should contain descriptions of the practices to be observed, and indicators of the performance of these practices, so that the judgments of the selected process quality characteristic may be made reliably and consistently.

5.2 Compatibility with the process reference model

5.2.1 General

The identity of the process assessment model used within the assessment should be a process assessment model of good practice that meet the requirements defined in ISO/IEC 33004:2015, 6.3.

An important criterion for selecting a process assessment model is the ability to verify its conformance to the provisions of ISO/IEC 33004:2015, 6.4.

Conformance is essential in order to provide a degree of comparability between the results of different assessments by maximizing the reliability of different approaches and achieving a greater degree of uniformity in the reporting of results.

5.2.2 Process assessment model purpose

A process assessment model should be based on good practices and be suitable for the purpose of assessing the selected process quality characteristic.

There are many different types of modelling techniques available for describing, specifying and enacting processes.

Models that have not been specifically developed for the purpose of process assessment may not yield reliable results, and their suitability for purpose should be validated before selection.

5.2.3 Process assessment model scope

A process assessment model should encompass all, or a non-empty subset, of the set of processes in the selected process reference model.

A process assessment model should address all or a continuous subset of the levels (starting at level 1) of the chosen quality characteristic for all of the processes within its scope.

The process reference model should define a set of processes that cover best practices. Any assessment model, to be compatible with the process reference model, should contain at least a part of this scope. The scope of the model is normally directly equivalent to the process reference model. Alternatively, the model may be a sub-set, or a superset of the process reference model, covering all of the defined processes together with additional process descriptions outside the standard scope. A process assessment model may also include processes outside the process reference model providing it, such that the process assessment model encompasses at least one process from it.

For the dimension of the chosen process quality characteristic, a model should cover all of the processes in its scope, as indicated in ISO/IEC 33004:2015, 6.3.5.

In selecting a process assessment model, the assessor should ensure that the scope of the model covers the intended area of interest for the process assessment.

5.2.4 Model elements and indicators

A process assessment model should be based on a set of elements that explicitly address the purposes, as defined in the selected reference model, of all the processes within the scope of the model, and that demonstrate the achievement of the process attributes within the scope of the model.

A process assessment model should address the purposes of the processes as defined in the process reference model, and the achievement of the process attributes that constitute the vertical (or quality) dimension. In order to meet the requirements of ISO/IEC 33004, it should also document a set of indicators of process performance and process quality that enable judgements of the selected process quality characteristic to be soundly based on objective evidence.

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.

In selecting a process assessment model, careful attention should be paid to the use of indicators in the model, and the comprehensiveness, and applicability of the indicator set.

NOTE 1 ISO/IEC 33020 comprises a model with a comprehensive set of indicators that can serve as a guide to the extent of coverage to be expected, for the quality dimension of process capability.

NOTE 2 This clause and Clause 6 quote requirements from ISO/IEC 33002 and ISO/IEC 33004 and provide guidance for satisfying these requirements in the text following the quotations.

5.2.5 Mapping

"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." [ISO/IEC 33004:2015,6.3.9]

NOTE A figure showing a mapping of process model relationships can be found in ISO/IEC 33004:2015, Figure 1.

It is essential that the assessor have access to the details of the mapping of the elements of the process assessment model to the process reference model. The mapping may be simple, as is the case in the measurement framework defined in ISO/IEC 33020. Where the structure of the process assessment model is significantly different from the process reference model, however, the mapping may be quite complex.

An assessor should confirm that the mapping is meaningful, for example by sampling some of the lowest level components in the process assessment model, and locating them in the process reference model, either as elements of a process or as contributors to a process attribute. Mappings that result in elements being identified as components of more than one process attribute may indicate problems with the model structure, which can result in ambiguous translation of results.

5.2.6 Conversion

A process assessment model should provide a formal and verifiable mechanism for converting data collected against the process assessment model into a set of process attribute ratings for each process reference model process directly or indirectly assessed.

The output from a process assessment is a set of process profiles. A process profile is a set of ratings, one for each process attribute. Assessment results from any process assessment model should be converted into this form to provide a common basis for comparisons.

The mechanism for translation may be manual, or computer based. It may require the inclusion of additional information collected during the assessment and may involve further judgement on the part of the assessor. The rules for translating the results however, should be clear and unambiguous, and should be provided by either the model developer or method provider.

5.3 Criteria for selecting a process assessment model

The process assessment model may be selected by the assessor or may be stipulated by the sponsor of the assessment (in which case, this should be documented as a constraint). In either case, there are criteria that help ensure that the selection is appropriate for the use envisaged.

The major consideration in selecting a model, given that any process assessment model selected is compatible with the process reference model, is its suitability for the context of the assessment. The principal factors affecting the selection of a model are:

— the planned scope of the process assessment;

— the industry sector of the organization being assessed;

— the application domain of the product/service components that are the focus of the process assessment;

— the inclusion of an improvement path for increasing the process quality level of an organization;

— specific requirements for strong comparability with other assessments or organizations.

Where models exist that have been specifically developed for use in particular industry sectors (e.g. telecommunications, defence, aerospace) or for particular application domains (e.g. high security systems, safety critical systems, real time embedded software) then, when applicable, these should be considered.

When an organization wishes to conduct a process assessment in an area that is not representative of its normal domain, it should take care that the model chosen is suitable. For example, it is possible that an aerospace organization that wishes to assess the processes responsible for maintenance of its internal management systems finds that an industry specific model is not the most suitable for the task.

NOTE The measurement framework provided in ISO/IEC 33020 is a generic measurement framework for the process quality characteristic of process capability. It is designed to be applicable across all industry sectors and application domains.

5.4 Using a process assessment model

A process assessment model provides the basic definitions of processes and process measurement framework that are the reference points against which judgements of process quality characteristics in the organizational unit are made. As such, the use of a single process assessment model throughout a process assessment is essential.

It therefore follows that a lead assessor should be highly knowledgeable about the specific process assessment model being used for the assessment - its structure, the basic elements of the model, and its relationship to the process reference model.

Because the process assessment model also embeds a comprehensive set of indicators of process performance and the selected process quality characteristic, it is also an important reference point for the assessor in meeting the requirement to document the indicators referenced, and the justification for the ratings. Clause 7 gives guidance on the selection and use of process assessment instruments.

6 Selection and use of a documented assessment process

6.1 General

This clause provides guidance on the selection and use of a suitable documented assessment process as the basis for performing a processes assessment. This guidance is intended for use by the assessors and sponsors of assessments. It is not directed specifically at the developers of documented assessment processes, though it may be of use to them.

In performing a process assessment, the documented assessment process used should ensure that the requirements defined in ISO/IEC 33002 are met. In order to achieve this, the documented assessment process should contain descriptions of the activities to be performed, the responsibilities of key individuals and the documentary evidence that should be recorded. It may also define specific assessment models and tools that should be used with the documented assessment process.

NOTE A documented assessment process is described in ISO/IEC TS 33030.

6.2 Compatibility with the requirements

To achieve a greater degree of uniformity in the approach to process assessment, any documented assessment process used should ensure that assessments performed are conformant with the requirements defined in ISO/IEC 33002. This maximizes the reliability of different approaches and provides a degree of comparability between the results of different assessments.

It can make sense to verify the requirements prior to and during the course of the process assessment so that corrective actions can occur.

The documented assessment process should define the process for all required supporting activities, such as document control, quality assurance, project management, as well as for the key activities associated with the documented assessment process itself. This can be in the form of guidance material, procedures, standards etc. on how lead assessors are to attain the required competencies to use the documented assessment process correctly, for example by specifying the training courses and experience levels. The documented assessment process should provide all the necessary guidance including guidance on all activities to be performed in conducting an assessment as described in ISO/IEC 33002.

NOTE A documented assessment process is described in ISO/IEC TS 33030.

6.3 Process assessment input

6.3.1 Process assessment purpose including alignment with business goals

Different types of process assessments have different purposes. The purposes may vary depending upon the business needs such as facilitating internal process improvement and for the selection of suppliers (either internal or external).

6.3.2 The process assessment scope

"At minimum, the assessment inputs shall specify the: d) assessment scope as it applies to the business, including a defined and declared organization scope." [ISO/IEC 33002:2015, 4.4 d)].

The process assessment process scope may include one or more processes together with those process attributes which are to be included in the assessment. Limiting the number of processes and process attributes used in the assessment has the effect of focussing the investigation. The factors that should be included in the assessment scope are the relationship between the assessment scope and the ability to provide ratings, the current process quality level and constraints of a process assessment duration.

The selection of the organisational unit should reflect the sponsor's intended use of the assessment output. For example, if the output is to be used for process improvement then the organisational unit

scope should match that of the intended improvement effort. An organisational unit scope can be anything from one project to the entire organisation.

6.3.3 The process assessment constraints

"At minimum, the assessment inputs shall specify the: g) assessment constraints." [ISO/IEC 33002:2015, 4.4 g)].

The success of the assessment may be affected if the key resources are not available. Consideration needs to be given to minimise the disruption of assessees who may be constrained through project pressures.

The process and scope may be tailored to accommodate the available time.

It may be necessary to exclude certain parts of an organisational unit due to the life cycle phase, etc.

"At minimum, the assessment inputs shall specify the: e) identity of the model(s) and process measurement framework used." [ISO/IEC 33002:2015, 4.4 e)].

For ease of application one may wish to use a single process assessment model; however, depending on the purpose of the assessment, selected parts of supporting models may be used.

"At minimum, the assessment inputs shall specify the: h) identity and roles of assessees, the assessment team and assessment support staff with specific responsibilities for the assessment." [ISO/IEC 33002:2015, 4.4 h)].

The number of assessors engaged in the assessment task may vary, however the combined knowledge and experience of the assessors fosters the confidence in the assessment results. Participation of assessors from the organisational unit can help to provide process context and supports ownership and buy-in of the results.

The selection of assessees should be representative of the organisational unit being assessed. If the assessees are representative of the organisational unit then the assessment results are more likely to provide an accurate view of the selected process quality characteristic.

"At minimum, the assessment inputs shall specify the: i) criteria for competence of the lead assessor." [ISO/IEC 33002:2015, 4.4 i)].

The documented assessment process should provide specific criteria related to who is eligible to be the lead assessor.

NOTE ISO/IEC TR 33018 provides guidance to the sponsor regarding assessor competence.

6.4 The process assessment process

6.4.1 General

"The assessment shall be conducted according to a documented assessment process." [ISO/IEC 33002:2015, 4.1].

A documented process should support repeatability of an assessment approach and provides the basis for continuous improvement.

6.4.2 Planning

"A plan for the assessment shall be developed and documented." [ISO/IEC 33002:2015, 4.2.1].

The documented assessment process should describe how all of the information required for the assessment input is collated, reviewed, approved and documented. It may be appropriate for the documented assessment process to require tool support to collect and store this information. The assessment input, together with other information and analyses, forms the assessment output.

The documented assessment process should provide support for recording or transferring the assessment input to a suitable form to become part of the assessment output.

The documented assessment process should provide guidance on:

— obtaining the sponsor's commitment;

— defining ownership and distribution of the assessment output;

— assessment planning;

— suitable confidentiality statements and how these are fulfilled;

— classifying the process context;

— verifying the requirements for the assessment.

The documented assessment process should define mechanisms to:

— enable the assessment to be performed effectively within the constraints defined, or how the constraints and/or scope can be re-negotiated and approved if this is not possible;

— support the collection of any other information defined by the assessment sponsor.

The documented assessment process should:

— provide mechanisms to allow the sponsor to ensure that the nominated lead assessor has the competencies to undertake the assessment and mechanisms to validate them; guidance on assessor competency is provided in ISO/IEC TR 33018;

— define the other roles and responsibilities within the assessment and what competencies are required for each role;

— provide mechanisms to ensure that the assessment is conformant with the requirements set out in ISO/IEC 33002 and ISO/IEC 33004;

— define how this conformance is achieved and provide mechanisms to validate conformity with the requirements, where this is the mechanism by which conformance is achieved, identify the form of certification of conformity with the requirements.

6.4.3 Data collection

"The data collected shall be sufficient to provide coverage of the organization scope and the process scope for the assessment, as specified for the selected class of the assessment." [ISO/IEC 33002:2015,4.2.2].

The documented assessment process should provide guidance on data collection mechanisms such as interview techniques, document reviewing instruments. It should also provide guidance on identifying how the organizational unit's processes are mapped to the processes defined within the assessment model. This will normally require guidance on translating the process assessment model profiles back to representations of the organizational unit's process quality characteristic.

The documented assessment process should provide guidance on sampling to ensure that the set of processes selected are appropriate to the assessment purpose. The documented assessment process should provide mechanisms to retain the sampling information and rationale.

The information gathering may be organized as part of a regular manual monitoring or reporting mechanism used by one or more projects. Alternatively, information collection may be automated or semi-automated through the support of an instrument or tool. An instrument can be used continuously throughout the software development life cycle, for example, at defined milestones to measure adherence to the process, to measure process improvement progress, or to gather information to facilitate a future assessment.

For a class 1 assessment, a minimum of four process instances should be identified for each process within the scope of the assessment.

For a class 2 assessment, a minimum of two process instances should be identified for each process within the scope of the assessment. If there is fewer than the required number of process instances available in the organization, all process instances should be selected.

There is no minimum number of processes for class 3 assessments.

In the collection of data from the identified process instances, the following criteria should be satisfied:

a) Objective evidence from work product evaluations and from testimony of performers should be collected for each process attribute of each process in the scope of the assessment.

b) Objective evidence from work products and from testimony of performers of the process should be collected for each process instance, of each process within the scope of the assessment.

Table 1 shows the process attributes of all process instances that should be assessed, and the assessment of each process instance (columns) should include both work product evaluations and testimony, and that the assessment of each process attribute (rows) should include both work product evaluations and testimony.

Table 1 — Data collection for an example assessment of four process instances and process attributes up to capability level 3

Process attribute	Process instance 1	Process instance 2	Process instance 3	Process instance 4	
PA 1.1	Work product	Testimony	Work product	Testimony	For each process attribute there are both work product evaluation and testimony
PA 2.1	Testimony	Work product & Testimony	Work product	Testimony	
PA 2.2	Work product	Testimony	Testimony	Testimony	
PA 3.1	Work product	Work product	Testimony	Testimony	
PA 3.2	Work product	Work product	Work product & Testimony	Work product	
	Each process instance includes both work product evaluation and testimony				

Note that for any specific process attribute for a specific process instance data may be gathered through both work product evaluation and testimony.

6.4.4 Data validation

"The data validation approach for the assessment shall ensure that the requirements of this standard are met in respect of every process instance identified in the assessment scope, and that the coverage requirements are satisfied." [ISO/IEC 33002:2015,4.2.3].

The documented assessment process should provide guidance on information validation which covers at a minimum, information from first hand, independent sources; how to use past assessment results; and feedback sessions to validate the information collected.

6.4.5 Process attribute rating

6.4.5.1 General guidance

"The process attribute ratings shall be expressed in terms that are consistent with the process measurement framework." [ISO/IEC 33002:2015, 4.2.4].

The documented assessment process should provide mechanisms to assign ratings to the defined rating components in the model selected to support the documented assessment process. Where these rating

components are different from the process attributes defined in ISO/IEC 33004, then the documented assessment process should provide guidance on the use of the mechanisms defined in the process assessment model to translate the rating components to the defined process attribute ratings.

The documented assessment process should define mechanisms to:

— validate the ratings assigned for the processes assessed;

— record the ratings for all the processes assessed, ensuring that each rating record can be uniquely identified to the process to which it relates.

The documented assessment process should provide mechanisms to represent the process profiles in forms that allow straightforward interpretation of their meaning and value. This should support the representation of aggregated ratings.

"The defined set of assessment indicators in the process assessment model shall be used to support the assessors' judgement when analysing the validated data." [ISO/IEC 33002:2015, 4.2.4].

The requirements for constructing a process assessment model ensure that the indicators are traceable to the statements of process purpose or the process attributes in the process reference model in ISO/IEC 33004. Although information about the indicators does not form part of the process profile, it provides the essential evidence that supports an assessor's judgement of the ratings assigned. The characteristics defined by the indicator data provide a detailed record of what was found in the organizational unit. The information collected is, therefore, significant both for assessor's evaluation and for subsequent analysis and planning for process improvement. For guidance on indicators see Annex A.

6.4.5.2 Specific guidance – class 1 assessments

For a class 1 assessment, the approach to process attribute rating satisfies the following conditions.

a) The achievement of each outcome of every process within the scope of the assessment is characterised for each process instance, based on validated data.

b) The extent of achievement of each attribute achievement for every process attribute within the scope of the assessment is characterised for each process instance, based on validated data.

c) Where a process outcome or attribute achievement cannot be characterised as "fully achieved" for any process instance, the issue resulting in the lack of achievement is documented as a gap in performance.

d) Prior to rating the overall achievement of the process attribute, the assessment team makes a judgement whether the set of performance gaps identified for the process instances examined represent an overall weakness in performance, and the extent of the weakness. The individual gaps in performance, and any resulting weakness statements, are documented and retained in the assessment record.

e) The extent of achievement of each process attribute within the scope of the assessment is rated, using the approach defined in ISO/IEC 33002. In order for a process attribute to be rated as "fully achieved" or "largely achieved", there are two sources of objective evidence available from each selected process instance.

f) Following the completion of rating of all of the processes within the assessment scope, the assessment team reviews the process profiles and determines the level rating, based on the requirements of the selected process assessment model.

6.4.5.3 Specific guidance – class 2 assessments

For a class 2 assessment, the approach to process attribute rating satisfies the following conditions.

a) The extent of achievement of each process attribute within the scope of the assessment is rated, using the approach defined in ISO/IEC 33002. In order for a process attribute to be rated as "fully achieved" or "largely achieved", there are two sources of objective evidence available from each selected process instance.

b) Where a process attribute cannot be rated as "fully achieved", the issue resulting in the lack of achievement is documented as a weakness and retained in the assessment record.

c) Following the completion of rating of all of the processes within the assessment scope, the assessment team will review the process profiles and determine the level rating, based on the requirements of the selected process assessment model.

6.4.6 Reporting

6.4.6.1 General guidance

"Information which is relevant to the assessment and supports understanding of the output of the assessment shall be compiled." [ISO/IEC 33002:2015, 4.2.5].

The documented assessment process:

— provides mechanisms to record information and/or ratings associated with the indicators defined in the assessment model selected;

— specifies the format that the results are to be relayed to the sponsor, assessees, managers etc.; presentation and/or report;

— defines how the records are to be retained - they may be paper-based or electronic depending upon the circumstances and tools used to support the assessment;

— defines the records retained by the sponsor, the assessor, the assessed organization, or another person or body depending upon any confidentiality agreement or access restrictions identified in the assessment input;

— provides mechanisms to record and retain the assessment output. These mechanisms should ensure that all confidentiality requirements are met.

6.4.6.2 Specific guidance – class 1 and 2 assessments

In addition to the elements specified above, the weaknesses established during process attribute rating should be documented and reported to the assessment sponsor.

6.4.7 Roles and responsibilities

The sponsor of the assessment, the lead assessor and the assessor(s) have the roles and responsibilities as defined in ISO/IEC 33002:2015, 4.3.

In addition to these requirements, the following minimum sizes of the assessment team apply:

a) for a class 1 or 2 assessment, at least two members, including the lead assessor; the lead assessor is independent of the organization unit being assessed;

b) for a class 3 assessment, at least one member, who is the lead assessor.

For class 1 assessment, a team size greater than two may be required to address workload for data collection and validation.

6.5 Selecting a documented assessment process

The documented assessment process for an assessment may be selected by the assessor, or may be stipulated by the sponsor of the assessment (in which case, this should be documented as a constraint). In either case, there are criteria that help ensure that the selection is appropriate for the use envisaged. Particular documented assessment processes may be appropriate to particular process contexts, particular assessment approaches and to particular processes. All of these factors may influence the decision to select a particular documented assessment process. Organizations may also be constrained to use a particular documented assessment process if it has been chosen as the standard to ensure the most effective use of resources.

The documented assessment process should provide guidance and models that assist in estimating the resource requirements that are needed to perform an assessment of the scope defined.

The documented assessment process should provide support to ensure that each defined role can attain the required competencies, such as training and experience requirements.

The major consideration in selecting a documented assessment process is its suitability for the context and scope of the assessment.

The principal factors affecting its selection are:

— the planned purpose of the assessment;

— the planned scope of the assessment;

— the assessment approach selected;

— the process context of the selected processes.

Where documented assessment processes exist that have been specifically developed to support a particular assessment approach or approaches, then these should be used if at all possible. Larger, more complex organizations may also be constrained to select documented assessment processes that have the ability to cover the range of their business activities to ensure consistency of approach, reuse of competencies, etc.

The assessment process selected significantly influence how the assessment is conducted and its usefulness to the organizational unit assessed.

The lead assessor is responsible for ensuring that the assessment achieves its purpose and that it is conformant with the requirements of ISO/IEC 33002 and ISO/IEC 33004. It is therefore imperative that the lead assessor selects an appropriate documented assessment process. Where the documented assessment process is selected by the assessment sponsor, then it is the responsibility of the lead assessor to ensure that assessors or users are competent in its use.

7 Selection of instruments and tools

7.1 The purpose and use of instruments and tools

In any process assessment, information should be collected, recorded, stored, collated, processed, analysed, retrieved and presented. Instruments and tools can provide valuable support in collating the evidence used by the assessor to assign ratings to the process attributes for each process assessed, and in recording the ratings as the set of process profiles.

There are two basic types of instrument, paper-based manual instruments and automated computer-based instruments, which have different characteristics. The appropriateness of an instrument depends on the planned mode of use and assessment methodology. To ensure optimum performance (effectiveness and efficiency), instruments and tools should be selected or designed to match the assessment process.

Instruments and tools may be used in a number of ways to support assessments.

Examples of modes of use within an assessment include:

— by assessors capturing information by a paper-based instrument, or a computer;

— by process owners and/or organizational unit representatives during preparation for and prior to an assessment capturing information for subsequent processing;

— by organizational unit representatives continuously throughout the product/service development life cycle, and at defined milestones to measure process adherence, process improvement progress or to gather information to facilitate a future assessment;

— after the assessment to retrieve or organize the assessment information to facilitate process improvement planning or analysis for process risk determination;

— in a distributed approach for self-assessment throughout an organization;

— when sampled work-products and process information are collected incrementally and reviewed prior to the commencement of on-site assessment activities, such as interviews;

— to assist the assessor with the processing of the assessment information collected;

— to store and retrieve assessment results, making the results more useable for process improvement planning or process risk analysis;

— to assist the assessor with post-assessment analysis of the results such as the analysis of process improvement results against past performance history, or of a supplier profile against an established target profile;

— to collect information incrementally and in a distributed manner, to collect information incrementally at set milestone check points in the performance of a process or when a number of organizational units are to be assessed incrementally;

— to generate result profiles or help in the performance of gap analysis.

Competence to use the selected instruments and tools is a key factor in ensuring that information is collected, recorded, processed and analysed in a reliable, repeatable and appropriate way. The assessors and other participants who will use the instruments and tools should be appropriately trained and have the necessary experience in the use of the instruments and tools. In addition to competence in operating the instruments or tools, training and/or experience should provide a good theoretical understanding of the underlying principles related to the assessment model, indicators, and rating.

7.2 Selecting instruments and tools

Particular tools may be specified as part of the documented assessment process. Alternatively, the intending user may need to select appropriate tools. The guidance presented here is intended to highlight some of the considerations in selecting instruments and tools for use throughout the assessment. It does not address issues related to general support tools such as word processors, although the ability of assessment instruments and tools to integrate together and to integrate with word processing/presentation tools can prove of considerable assistance in preparing reports and presentations of the outputs of the assessment.

The selection criteria for the type of instrument and tool may be influenced by the:

— scope and purpose of assessment;

— need for assistance in collecting and storing information including assembling the assessment input and recording it in a suitable form for transfer to the assessment output;

— availability of the assessment model through the defined set of indicators, at least for the scope of the assessment;

— ability to capture the information required to be used in the production of ratings as defined in ISO/IEC 33004;

— ability to capture and maintain supporting information as defined in the assessment input;

— support of the rating process and aggregation of the results according to the rating scheme defined in ISO/IEC 33020;

— support of representation of process profiles in forms that allow straightforward interpretation of their meaning and value;

— ability to store and retrieve assessment results for subsequent use in process improvement or process risk determination;

— provision of appropriate segregation of different classes of information and data to enable the information and/or data to be used or distributed in different ways;

— ability to keep the captured information secure to meet confidentiality constraints;

— ability to perform dynamic scoping and tailoring to support specific cultural, organizational, sponsor, or assessment needs;

— provision of adequate configuration control of the instrument and the results collected;

— ability to split by process and job function;

— ability to tailor the assessment model as required;

— portability considerations (usability for interviews, distributed inputs, simultaneous inputs);

— ability to handle multiple assessors' inputs;

— usability for interviews, self-assessment;

— ability to integrate with other tools (metrics, case, etc.);

— ability to maintain an audit trail of access to information input;

— real-time performance required, and the speed of information input and retrieval;

— ability to call up practices required for specific interviews.

NOTE Guidance regarding the requirements for computer-based tool evaluation and testing is available in ISO/IEC 25051.

Annex A
(informative)

Guidance on indicators

A.1 Overview

A.1.1 General

An assessment model in ISO/IEC 33004 is defined in two dimensions: the process dimension and the process quality dimension which are characterized respectively by the statements of process purpose and process attributes. The process purposes and process attributes are the criteria against which an assessment is performed.

The process purpose statements and attributes represent good practice, but in order to make them applicable to all application domains, they are defined as abstract, high level concepts without constraining the ways in which they may be implemented. Consequently, these purpose statements and attributes can be subject to wide interpretation, which can have an adverse effect on the repeatability and reliability of assessment results.

In order to reduce the level of subjectivity and variation of interpretation, an assessment model elaborates through a set of indicators of process performance related to the process purpose, and a set of indicators of process quality related to the process attributes. Indicators are used during an assessment to support the collection of objective evidence about the achievement of a particular process purpose or process attribute. As implied by the name, indicators do not represent requirements on a process. They represent a common starting point for assessment, which increases the consistency of assessor judgement and enhances the repeatability of the results. Since organizations use different techniques to create product, the absence of some indicators in some situations may not be significant.

The output of the assessment, in the form of a set of process profiles, shows the ratings of the process attributes for each process assessed, but it does not show why a particular rating was assigned. Indicators help to identify what is present or missing from a process or work product and provide guidance to the assessor when assigning a rating to a process or attribute. The detailed information captured during the assessment about the presence or absence of specific indicators provides the valuable input into analysis and process improvement planning.

The indicators provide a framework for assessment that helps to ensure that:

— assessors have the ability to interpret the organization's instantiation of a process consistently against the assessment model;

— the information is captured for subsequent analysis;

— the information needed for the organizational unit to plan and perform process improvement is captured;

— assessment results are representative, reliable and repeatable.

A.1.2 Indicators of process performance

Indicators of process performance provide guidance to the assessor on how to judge how well a process is meeting its purpose as defined in the process assessment model. These indicators are practices that are performed within a specific process, as well as the work products and the characteristics of the work products produced by the practices.