

Australian/New Zealand Standard™

**Information technology—Process
assessment—Requirements for process
measurement frameworks**



AS/NZS ISO/IEC 33003:2016

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Australian/New Zealand Standard™

Information technology—Process assessment—Requirements for process measurement frameworks

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee IT-015, Software and Systems Engineering, to supersede AS/NZS ISO/IEC 15504.2:2004, *Information technology—Process assessment, Part 2: Performing an assessment*.

The objective of this Standard is to set out the requirements for process measurement frameworks for use in process assessment.

This Standard is identical with, and has been reproduced from ISO/IEC 33003:2015, *Information technology—Process assessment—Requirements for process measurement frameworks*.

As this Standard is reproduced from an International Standard, the following applies:

- (a) In the source text ‘this International Standard’ should read ‘this Australian/New Zealand Standard’.
- (b) A full point substitutes for a comma when referring to a decimal marker.

References to International Standards should be replaced by references to Australian or Australian/New Zealand Standards, as follows:

<i>Reference to International Standard</i>		<i>Australian/New Zealand Standard</i>	
ISO/IEC		AS/NZS ISO/IEC	
15939	Systems and software engineering—Measurement process	15939	Systems and software engineering—Measurement process
33001	Information technology—Process assessment—Concepts and terminology	33001	Information technology—Process assessment—Concepts and terminology

The term ‘informative’ has been used in this Standard to define the application of the annexes to which it applies. An ‘informative’ annex is only for information and guidance.

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INTRODUCTION

This International Standard provides requirements for process measurement frameworks that support and enable the assessment of process quality characteristics, from conceptualization to empirical validation. In process measurement frameworks, measurement of a process quality characteristic produces a composite measure (e.g. process capability levels of ordinal scale in ISO/IEC 33020). Examples of process quality characteristics that are constructs (theoretical concepts) include process capability, process security, process agility, and process safety. The main users of this International Standard are developers of process measurement frameworks and process assessment models. Conformity to this International Standard ensures that any process measurement framework is developed with reliable structures or elements which will generate quality composite measures.

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.

This International Standard provides requirements for the development of process measurement frameworks, such as ISO/IEC 33020. These can then be used to define process assessment models, conformant to ISO/IEC 33004, that can be employed for process assessments conformant with ISO/IEC 33002. The overall architecture and content of the series is described in ISO/IEC 33001.

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. ISO/IEC 33001, Annex A provides a detailed record of the relationship between the ISO/IEC 330xx family and the ISO/IEC 15504 series.

AUSTRALIAN/NEW ZEALAND STANDARD

Information technology—Process assessment—Requirements for process measurement frameworks**1 Scope**

This International Standard sets out the requirements for process measurement frameworks for use in process assessment. The requirements defined in this International Standard form a structure which

- a) establish the requirements for process measurement frameworks in the context of process assessment,
- b) establish the requirements for the validation of process measurement frameworks for use in process assessment, and
- c) establish requirements that are applicable to any process measurement frameworks to develop composite measures across domains.

This International Standard is applicable to the development of process measurement frameworks for any process quality characteristic across all application domains.

[Annex A](#) presents a map of terminologies used in this International Standard. [Annex B](#) provides an explanation of construct specifications. [Annex C](#) reviews statistical validation methods. [Annex D](#) provides some methods including references that can be utilized in implementing the requirements for process measurement frameworks. These Annexes will be moved to a guide for constructing process measurement frameworks to be developed as part of the set of International Standards.

NOTE ISO/IEC 33020 is a process measurement framework for assessment of process capability based on this International Standard.

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 15939:2007, *Systems and software engineering — Measurement process*

ISO/IEC 33001:2015, *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, ISO/IEC 15939, and the following apply:

3.1**aggregation method**

method that combines a set of measurement values to create a composite value

Note 1 to entry: Aggregation methods are based on compensatory or non-compensatory models.

3.2

compensatory model

MCDM model in which a composite measure is composed of individually weighted terms and where criteria (also refer to attribute terms) with a high value can compensate for those of a low value in proportion to each weight

Note 1 to entry: A compensatory model suggests that improving the more important measures (those with a higher weighting) is more likely to increase or improve the overall composite value than improving the less important ones. This model assumes that the weight (influence level) of criteria remains the same regardless of the measured level of the criteria.

3.3

composite measure

variable derived from a set of operations of a construct's multi-item measures defined according to construct specification (either reflective or formative) that is the way in which the latent variable representing the construct of interest is linked to its measures

3.4

composite value

value from a composite measure

Note 1 to entry: A composite value can be from an ordinal, interval, or ratio scale.

3.5

construct

concept such as the abstract idea, image, underlying theme, or subject matter that one wishes to measure using process assessments

Note 1 to entry: In process measurement frameworks, constructs (also refers to latent constructs) are theoretical concepts such as the process quality characteristics and process attributes.

Note 2 to entry: The meaning that one assigns to a construct is called theoretical definition, which should explain its meaning, as well as discuss its distinct dimensions (facets).

3.6

dimension

distinct components that a multidimensional construct encompasses

3.7

formative construct

construct that is formed from its observed measures in the relationship between a construct and its measures

Note 1 to entry: The construct is a consequence of its measures and each measure is a determinant of the construct.

3.8

latent variable

variable representing a unidimensional construct

Note 1 to entry: There should be a separate latent variable for each dimension of a construct and a minimum of one measure per latent variable.

3.9

MCDM

Multiple-Criteria Decision Making or Multi-Attribute Decision Making

making preference decisions (e.g., evaluation, prioritization, and selection) of available alternatives characterized by multiple criteria

Note 1 to entry: A criterion in MCDM corresponds to measure.

Note 2 to entry: An MCDM with one alternative is the same as the development of a composite measure.

3.10 measurement model

the implicit or explicit relationship between a latent variable and its (multi-item) measures

Note 1 to entry: The relationship between a reflective (formative) construct and its measure(s) is called a reflective (formative) measurement model.

3.11 multidimensional construct

construct that consists of a number of unidimensional constructs.

Note 1 to entry: Each dimension of a multidimensional construct is called unidimensional and is represented by one latent variable. Each dimension can have multiple measures. In a multidimensional construct, for example, the meaning of capability when it is defined as the common factor underlying its process attributes is different from the case when capability is defined as a simple sum of its process attributes. The former is called a reflective multidimensional construct and the latter is formative. A multidimensional construct can span an indeterminate number of levels.

3.12 non-compensatory model

MCDM model that does not allow criteria to compensate for each other in proportion to their weights

Note 1 to entry: Strongly positive or negative terms influence the overall composite value disproportionately, although the weight stays the same. There are various non-compensatory models depending on the evaluation policy, the purpose of the composite measure, and/or the measurement scale.

3.13 reflective construct

construct that is viewed as the cause of measures in the relationship between a construct and its measures

Note 1 to entry: Reflective construct is an underlying factor of the variation of its measures.

3.14 scale

ordered set of values, continuous, or discrete, or a set of categories to which the attribute is mapped

Note 1 to entry: The type of scale depends on the nature of the relationship between values on the scale. Four types of scales are commonly defined:

Nominal — the measurement values are categorical. For example, the classification of defects by their type does not imply order among the categories.

Ordinal — the measurement values are rankings. For example, the assignment of defects to a severity level is a ranking.

Interval — the measurement values have equal distances corresponding to equal quantities of the attribute. For example, cyclomatic complexity has the minimum value of one, but each increment represents an additional path. The value of zero is not possible.

Ratio — the measurement values have equal distances corresponding to equal quantities of the attribute where the value of zero corresponds to none of the attribute. For example, the size of a software component in terms of LOC is a ratio scale because the value of zero corresponds to no lines of code and each additional increments represents equal amounts of code.

[SOURCE: ISO/IEC 15939:2007]

3.15 unidimensionality

existence of a single trait or construct underlying a set of measures

4 Requirements for process measurement frameworks

This clause defines the requirements for developing process measurement frameworks. Guidance in this International Standard is limited to providing a better understanding of these requirements. [Figure A.1](#) provides a mapping of the relationships between some terms used in this Clause.

NOTE Guidance on achieving conformance to these requirements, including examples and methods, will be provided in a guide for constructing process measurement frameworks to be developed as part of the set of Standards.

4.1 Conceptualization

4.1.1 Requirements

- a) A measurement framework shall identify and address a single process quality characteristic;
- b) A process quality characteristic in a process measurement framework shall be defined on the basis of a multidimensional construct;
- c) A process quality characteristic in a process measurement framework shall be defined as a set of process attributes;
- d) Each process attribute shall define a property of the process quality characteristic;
- e) Each process attribute that is not directly measurable shall be considered as a construct;
- f) Process attributes in a process measurement framework shall be defined as either reflective or formative.
- g) The measurement framework shall document the policies and assumptions underlying its use and application;

4.1.2 Guidance

The process of identifying and clarifying concepts is called conceptualization. A concept is an idea or image that unites phenomena of interest (e.g., traits, behaviour traits) under a single term. It is a summarizing device to replace a list of specific traits. Most process quality characteristics (e.g., process capability) are not observable but are theoretical concepts called constructs.

The composite measures (e.g., process capability level) used in process measurement frameworks are defined on the basis of a construct composed of process attributes. A measurement framework may be structured into a series of levels of achievement.

When a process attribute is not directly measurable, it may also be defined as a construct. The set of process attributes for any construct may be either reflective or formative.

Participation of experts and stakeholders can increase the validity of the process quality characteristic and its process attributes; aspects of validity are discussed in [C.3](#).

A multidimensional construct can be depicted with a path diagram including a set of dimensions and their relationships. Use of a path diagram improves the understandability of model scope and structures.

4.2 Construct definition

4.2.1 Requirements

- a) The construct definition shall define the meaning of the process quality characteristic and its process attributes in a process measurement framework;
- b) The construct definition shall clarify the specification of the process quality characteristic and its process attributes as dimensions;