

Second edition
2007-08-01

Corrected version
2008-10-01

**Systems and software engineering —
Measurement process**

Ingénierie des systèmes et du logiciel — Processus de mesure

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO/IEC 15939:2007](https://standards.iteh.ai/catalog/standards/sist/3035e6c4-834a-4810-b2f5-20953fc34ec9/iso-iec-15939-2007)

<https://standards.iteh.ai/catalog/standards/sist/3035e6c4-834a-4810-b2f5-20953fc34ec9/iso-iec-15939-2007>

Reference number
ISO/IEC 15939:2007(E)



PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO/IEC 15939:2007](https://standards.iteh.ai/catalog/standards/sist/3035e6c4-834a-4810-b2f5-20953fc34ec9/iso-iec-15939-2007)

<https://standards.iteh.ai/catalog/standards/sist/3035e6c4-834a-4810-b2f5-20953fc34ec9/iso-iec-15939-2007>



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2007

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword.....	iv
Introduction	v
1 Scope	1
1.1 Purpose.....	1
1.2 Field of application	1
1.3 Tailoring this International Standard	1
1.4 Conformance.....	1
1.5 Limitations.....	2
2 Terms and definitions.....	2
3 Application of this International Standard	7
3.1 Purpose and outcomes of the measurement process.....	7
3.2 Overview of this International Standard.....	7
3.3 Organization of this International Standard.....	10
4 Description of the activities.....	11
4.1 Establish and sustain measurement commitment.....	11
4.2 Plan the measurement process.....	12
4.3 Perform the measurement process	16
4.4 Evaluate measurement.....	18
Annex A (informative) The measurement information model.....	20
Annex B (informative) Measurement process work products	28
Annex C (informative) Example criteria for selecting measures	30
Annex D (informative) Example criteria for evaluating an information product.....	32
Annex E (informative) Example criteria for evaluating the performance of the measurement process	35
Annex F (informative) Example elements of measurement planning	36
Annex G (informative) Guidelines for reporting information products	37
Bibliography	38

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

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.

ISO/IEC 15939 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 the first edition (ISO/IEC 15939:2002), which has been technically revised.

This corrected version of ISO/IEC 15939:2007 contains new cross-reference numbering in Figure 1, 3.3 and Figure B.1, which was incorrect in the original version. It also updates all references to ISO/IEC 15288 and ISO/IEC 12207 to the second editions, which have now been published.

Introduction

Measurement supports the management and improvement of processes and products. Measurement is a primary tool for managing system and software life cycle activities, assessing the feasibility of project plans, and monitoring the adherence of project activities to those plans. System and software measurement is also a key discipline in evaluating the quality of products and the capability of organizational processes. It is becoming increasingly important in two-party business agreements, where it provides a basis for specification, management, and acceptance criteria.

Continual improvement requires change within the organization. Evaluation of change requires measurement. Measurement itself does not initiate change. Measurement should lead to action and not be employed purely to accumulate data. Measurements should have a clearly defined purpose.

This International Standard defines a measurement process applicable to system and software engineering and management disciplines. The process is described through a model that defines the activities of the measurement process that are required to adequately specify what measurement information is required, how the measures and analysis results are to be applied, and how to determine if the analysis results are valid. The measurement process is flexible, tailorable, and adaptable to the needs of different users.

The measurement process defined in this International Standard, while written for system and software domains, can be applied in other domains.

ITEH STANDARD PREVIEW
(standards.iteh.ai)

[ISO/IEC 15939:2007](https://standards.iteh.ai/catalog/standards/sist/3035e6c4-834a-4810-b2f5-20953fc34ec9/iso-iec-15939-2007)

<https://standards.iteh.ai/catalog/standards/sist/3035e6c4-834a-4810-b2f5-20953fc34ec9/iso-iec-15939-2007>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO/IEC 15939:2007](#)

<https://standards.iteh.ai/catalog/standards/sist/3035e6c4-834a-4810-b2f5-20953fc34ec9/iso-iec-15939-2007>

Systems and software engineering — Measurement process

1 Scope

1.1 Purpose

This International Standard identifies the activities and tasks that are necessary to successfully identify, define, select, apply and improve measurement within an overall project or organizational measurement structure. It also provides definitions for measurement terms commonly used within the system and software industries.

This International Standard does not catalogue measures, nor does it provide a recommended set of measures to apply on projects. It does identify a process that supports defining a suitable set of measures that address specific information needs.

1.2 Field of application

This International Standard is intended to be used by suppliers and acquirers. Suppliers include personnel performing management, technical and quality management functions in system and software development, maintenance, integration and product support organizations. Acquirers include personnel performing management, technical and quality management functions in procurement and user organizations.

The following are examples of how this International Standard can be used:

- by a supplier to implement a measurement process to address specific project or organizational information requirements;
- by an acquirer (or third-party agents) for evaluating conformance of the supplier's measurement process to this International Standard;
- by an acquirer (or third-party agents) to implement a measurement process to address specific technical and project management information requirements related to the acquisition;
- in a contract between an acquirer and a supplier as a method for defining the process and product measurement information to be exchanged.

1.3 Tailoring this International Standard

This International Standard contains a set of activities and tasks that comprise a measurement process that meets the specific needs of organizations, enterprises and projects. The tailoring process consists of modifying the non-normative descriptions of the tasks to achieve the purpose and outcomes of the measurement process. All normative clauses need to be satisfied. New activities and tasks not defined in this International Standard may be added as part of tailoring.

1.4 Conformance

Conformance to this International Standard is defined as satisfying the purpose and outcomes of the measurement process and all of the normative clauses within the tasks in Clause 4. Any organization imposing this International Standard as a condition of trade is responsible for specifying and making public all task-specific criteria to be imposed in conjunction with this International Standard.

Throughout this International Standard, “shall” is used to express a provision that is binding on the party that is applying this International Standard, “should” to express a recommendation among other possibilities, and “may” to indicate a course of action permissible within the limits of the International Standard.

It is the responsibility of the organization to maintain appropriate evidence of satisfaction of the normative clauses for the purposes of demonstrating conformance.

1.5 Limitations

This International Standard does not assume or prescribe an organizational model for measurement. The user of this International Standard should decide, for example, whether a separate measurement function is necessary within the organization and whether the measurement function should be integrated within individual projects or across projects, based on the current organizational structure, culture and prevailing constraints.

This International Standard is not intended to prescribe the name, format or explicit content of the documentation to be produced. This International Standard does not imply that documents be packaged or combined in some fashion. These decisions are left to the user of this International Standard.

The measurement process should be appropriately integrated with the organizational quality system. Not all aspects of internal audits and non-compliance reporting are covered explicitly in this International Standard as they are assumed to be in the domain of the quality system.

This International Standard is not intended to conflict with any organizational policies, standards or procedures that are already in place. However, any conflict should be resolved and any overriding conditions and situations need to be cited in writing as exceptions to the application of this International Standard.

iteh STANDARD PREVIEW
(standards.iteh.ai)

2 Terms and definitions

ISO/IEC 15939:2007

For the purposes of this document, the following terms and definitions apply.
<https://standards.iteh.ai/catalog/standards/sis/3025e6e4-834a-4810-b2f5-20953fc34ec9/iso-iec-15939-2007>

2.1

acquirer

stakeholder that acquires or procures a product or service from a supplier

[ISO/IEC 15288:2008]

NOTE Other terms commonly used for an acquirer are buyer, customer, owner and purchaser.

2.2

attribute

property or characteristic of an entity that can be distinguished quantitatively or qualitatively by human or automated means

2.3

base measure

measure defined in terms of an attribute and the method for quantifying it

NOTE 1 A base measure is functionally independent of other measures.

NOTE 2 Based on the definition of “base quantity” in the International Vocabulary of Basic and General Terms in Metrology, 1993.

2.4

data

collection of values assigned to base measures, derived measures and/or indicators

2.5**data provider**

individual or organization that is a source of data

2.6**data store**

organized and persistent collection of data and information that allows for its retrieval

2.7**decision criteria**

thresholds, targets, or patterns used to determine the need for action or further investigation, or to describe the level of confidence in a given result

2.8**derived measure**

measure that is defined as a function of two or more values of base measures

NOTE Adapted from the definition of “derived quantity” in the International Vocabulary of Basic and General Terms in Metrology, 1993.

2.9**entity**

object that is to be characterized by measuring its attributes

NOTE An entity can be a process, product, project or resource.

2.10**indicator**

measure that provides an estimate or evaluation of specified attributes derived from a model with respect to defined information needs

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO/IEC 15939:2007](https://standards.iteh.ai/catalog/standards/sist/3035e6c4-834a-4810-b2f5-20953fc34ec9/iso-iec-15939-2007)

2.11**indicator value**

numerical or categorical result assigned to an indicator

<https://standards.iteh.ai/catalog/standards/sist/3035e6c4-834a-4810-b2f5-20953fc34ec9/iso-iec-15939-2007>

2.12**information need**

insight necessary to manage objectives, goals, risks and problems

2.13**information product**

one or more indicators and their associated interpretations that address an information need

EXAMPLE A comparison of a measured defect rate to planned defect rate along with an assessment of whether or not the difference indicates a problem.

2.14**measurable concept**

abstract relationship between attributes of entities and information needs

2.15**measure, noun**

variable to which a value is assigned as the result of measurement

NOTE The plural form “measures” is used to refer collectively to base measures, derived measures and indicators.

2.16**measure, verb**

make a measurement

[ISO/IEC 14598-1:1999]

2.17
measurement

set of operations having the object of determining a value of a measure

NOTE Adapted from the International Vocabulary of Basic and General Terms in Metrology, 1993.

2.18
measurement analyst

individual or organization that is responsible for the planning, performance, evaluation and improvement of measurement

2.19
measurement experience base

data store that contains the evaluation of the information products and the measurement process as well as any lessons learned during the measurement process

2.20
measurement function

algorithm or calculation performed to combine two or more base measures

2.21
measurement librarian

individual or organization that is responsible for managing the measurement data store(s)

2.22
measurement method

logical sequence of operations, described generically, used in quantifying an attribute with respect to a specified scale

iTeh STANDARD PREVIEW
(standards.iteh.ai)

NOTE 1 The type of measurement method depends on the nature of the operations used to quantify an attribute. Two types can be distinguished:

- subjective: quantification involving human judgment;
<https://standards.iteh.ai/catalog/standards/sist/3035e6c4-834a-4810-b2f5-29991b34ec9/iso-iec-15939-2007>
- objective: quantification based on numerical rules.

NOTE 2 Based on the definition of “method of measurement” in the International Vocabulary of Basic and General Terms in Metrology, 1993.

2.23
measurement procedure

set of operations, described specifically, used in the performance of a particular measurement according to a given method

[International Vocabulary of Basic and General Terms in Metrology, 1993]

2.24
measurement process

process for establishing, planning, performing and evaluating measurement within an overall project, enterprise or organizational measurement structure

2.25
measurement process owner

individual or organization responsible for the measurement process

2.26
measurement sponsor

individual or organization that authorizes and supports the establishment of the measurement process

2.27**measurement user**

individual or organization that uses the information products

2.28**model**

algorithm or calculation combining one or more base and/or derived measures with associated decision criteria

2.29**observation**

instance of applying a measurement procedure to produce a value for a base measure

2.30**operator**

entity that performs the operation of a system

2.31**organizational unit**

part of an organization that is the subject of measurement

NOTE Adapted from ISO/IEC 15504-1:2004.

2.32**process**

set of interrelated or interacting activities which transforms inputs into outputs

[ISO 9000:2005]

2.33**product**

result of a process <https://standards.iteh.ai/catalog/standards/sist/3035e6c4-834a-4810-b2f5-20953fc34ec9/iso-iec-15939-2007>

[ISO 9000:2005]

NOTE There are four agreed generic product categories: hardware (e.g. engine mechanical part), software (e.g. computer program), services (e.g. transport), and processed materials (e.g. lubricant). Hardware and processed materials are generally tangible products, while software or services are generally intangible. Most products comprise elements belonging to different generic product categories. Whether the product is then called hardware, processed material, software or service depends on the dominant element.

2.34**project**

endeavour with defined start and finish dates undertaken to create a product or service in accordance with specified resources and requirements

NOTE 1 Adapted from ISO 9000:2005.

NOTE 2 A project may be viewed as a unique process comprising coordinated and controlled activities and may be composed of activities from the Project Processes and Technical Processes defined in this International Standard.

2.35**scale**

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

NOTE 1 The type of scale depends on the nature of the relationship between values on the scale. Four types of scale are commonly defined:

- nominal: the measurement values are categorical;
- ordinal: the measurement values are rankings;

- interval: the measurement values have equal distances corresponding to equal quantities of the attribute;
- 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.

These are just examples of the types of scale. Roberts [15] defines more types of scale. Annex A contains examples of each type of scale.

NOTE 2 Based on the definition of “scale (of a measuring instrument)” in the International Vocabulary of Basic and General Terms in Metrology, 1993.

**2.36
service**

performance of activities, work or duties associated with a product

**2.37
stakeholder**

individual or organization having a right, share, claim or interest in a system or in its possession of characteristics that meet their needs and expectations

NOTE Within this International Standard, an individual or organization that sponsors measurement, provides data, is a user of the measurement results or otherwise participates in the measurement process.

**2.38
supplier**

organization or individual that enters into an agreement with the acquirer for the supply of a product or service

NOTE 1 Other terms commonly used for supplier are contractor, producer, seller and vendor.

NOTE 2 The acquirer and the supplier may be part of the same organization.

**2.39
system**

combination of interacting elements organized to achieve one or more stated purposes

NOTE A system may be considered as a product or as the services it provides.

**2.40
unit of measurement**

particular quantity, defined and adopted by convention, with which other quantities of the same kind are compared in order to express their magnitude relative to that quantity

[International Vocabulary of Basic and General Terms in Metrology, 1993]

**2.41
user**

individual or group that benefits from a system during its utilization

**2.42
value**

numerical or categorical result assigned to a base measure, derived measure or indicator

3 Application of this International Standard

This clause presents an overview of the measurement process. The objective is to orient the users of this International Standard so that they can apply it properly within context.

3.1 Purpose and outcomes of the measurement process

The purpose of the measurement process defined in this International Standard is to collect, analyze, and report data relating to the products developed and processes implemented within the organizational unit, to support effective management of the processes, and to objectively demonstrate the quality of the products. As a result of successful implementation of the measurement process:

- organizational commitment for measurement is established and sustained;
- the information needs of technical and management processes are identified;
- an appropriate set of measures, driven by the information needs are identified and/or developed;
- measurement activities are identified;
- identified measurement activities are planned;
- the required data is collected, stored, analyzed, and the results interpreted;
- information products are used to support decisions and provide an objective basis for communication;
- the measurement process and measures are evaluated; and
- improvements are communicated to the measurement process owner.

3.2 Overview of this International Standard

This International Standard defines the activities and tasks necessary to implement a measurement process. An activity is a set of related tasks that contributes towards achieving the purpose and outcomes of the measurement process (see Clause 3.1). A task is a well-defined segment of work. Each activity is comprised of one or more tasks. This International Standard does not specify the details of *how* to perform the tasks included in the activities.

The properties of the activities of the measurement process that are defined in this International Standard are the same properties defined in ISO/IEC 15288:2008 and ISO/IEC 12207:2008. This means that other properties such as entry and exit criteria for each of the activities are *not* defined in this International Standard.

NOTE 1 This measurement process supports the measurement requirement defined in ISO 9001:2000, 8.2.

NOTE 2 This International Standard provides an elaboration of the measurement process from ISO/IEC 15288:2008 and ISO/IEC 12207:2008. More detail is provided via additional activities and tasks. As part of this elaboration, one additional outcome (commitment is established and sustained) is added, with associated activities and tasks. This outcome is addressed in ISO/IEC 15288:2008 and ISO/IEC 12207:2008 at the enterprise level.

The measurement process consists of four activities as illustrated in the process model in Figure 1. The activities are sequenced in an iterative cycle allowing for continuous feedback and improvement of the measurement process. The measurement process model in Figure 1 is an adaptation of the Plan-Do-Check-Act cycle commonly used as the basis for quality improvement. Within activities, the tasks are also iterative.

The “Technical and Management Processes” of an organizational unit or project are not within the scope of this International Standard, although they are an important external interface to the measurement activities that are included in this International Standard.