International Standard

ISO/IEC 25040

Second edition
2024-09

Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — Quality evaluation framework

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

Reference number
ISO/IEC 25040:2024(en)

© ISO/IEC 2024

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2024

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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

Contents

Page

Foreword ..... **iv**
Introduction ..... **v**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Concepts of quality evaluation **2**
4.1 Quality evaluation definition 2
4.2 Quality model and quality measures for quality evaluation 2
4.3 Measurement source 4
4.4 Tasks of quality evaluation 4
4.5 Quality rating module 4
4.6 Assessment using evaluation 5
5 Quality evaluation process reference model **5**
5.1 Overview 5
5.2 Define the evaluation 7
5.2.1 Purpose 7
5.2.2 Outcomes 7
5.2.3 Activities 7
5.3 Design the evaluation 10
5.3.1 Purpose 10
5.3.2 Outcomes 10
5.3.3 Activities 11
5.4 Plan the evaluation 12
5.4.1 Purpose 12
5.4.2 Outcomes 12
5.4.3 Activities 13
5.5 Execute the evaluation 14
5.5.1 Purpose 14
5.5.2 Outcomes 14
5.5.3 Activities 14
5.6 Conclude the evaluation 14
5.6.1 Purpose 14
5.6.2 Outcomes 14
5.6.3 Activities 15
Annex A (informative) **Measurement source** **17**
Annex B (informative) **Examples of four types of quality evaluations** **20**
Annex C (informative) **Quality evaluation process implementation through system/software life cycle processes** **24**
Bibliography **29**

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved

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.

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).

ISO and IEC draw attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO and IEC take no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO and IEC had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents and https://patents.iec.ch. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

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

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html. In the IEC, see www.iec.ch/understanding-standards.

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

This second edition cancels and replaces the first edition (ISO/IEC 25040:2011), which has been technically revised.

The main changes are as follows:

— alignment with the other SQuaRE divisions: quality management, model, measurement, and requirements;

— alignment with other standards for system/software life cycle processes and requirements engineering processes;

— expansion of its target entities from software to ICT products, data, and IT services;

— expansion of types of quality evaluation from only requirements conformity to four types: quality evaluation for suitability to a specific use, for qualification to quality standard, for conformity checking to requirements, and for suitability to the market;

— clarification of concepts relating to quality evaluation;

— provision of more practical guidelines for planning a quality evaluation.

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.

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved

Introduction

Many systems and services are now deeply embedded into social infrastructures used in daily life. This requires them to achieve much higher quality; for example, connected systems need to be interoperable, secure, reliable, maintainable, and usable. Therefore, quality evaluation becomes ever more important.

The result of quality evaluation is used to objectively judge the value of the target entity in various business situations, including:

— outsourcers judging whether the target entity satisfies their quality requirements, in the case of outsourcing it;

— consumers or acquirers determining which product or service to be selected for their application, in the case of acquisition.

This document provides requirements and recommendations for quality evaluation, as well as guidance for its tasks.

Target entities for quality evaluation include ICT (information and communication technology) products (systems, software products, etc.), data, and IT services. The quality model defined by ISO/IEC 2501n provides comprehensive quality characteristics and subcharacteristics according to the types of target entities. ISO/IEC 2502n defines quality measures corresponding to those quality models.

This document is one of the standards on SQuaRE developed by ISO/IEC JTC 1/SC 7 (ISO/IEC 25000 to ISO/IEC 25099). Figure 1 (adapted from ISO/IEC 25000) illustrates the organization of the standards on SQuaRE developed by ISO/IEC JTC 1/SC 7. Similar standards are grouped into divisions. Each division provides guidance and resources for performing a different function in ensuring system and software product quality.

— ISO/IEC 2500n - quality management division. The International Standards that form this division define all common models, terms, and definitions referred to by all other International Standards on SQuaRE developed by ISO/IEC JTC 1/SC 7. This division also provides requirements and guidance for a supporting function that is responsible for the management of the requirements, specification, and evaluation of software product quality. Practical guidance on the use of the quality models is also provided.

— ISO/IEC 2501n - quality model division. The International Standards that form this division present detailed quality models for computer systems and software products, data, IT services and quality-in-use.

— ISO/IEC 2502n - quality measurement division. The International Standards that form this division include a quality measurement framework, mathematical definitions of quality measures, and practical guidance for their application. Examples are given of quality measures for internal and external property of product, data, IT services and quality-in-use. Quality measure elements (QME) forming foundations for quality measures for internal and external property of product are defined and presented.

— ISO/IEC 2503n - quality requirements division. The International Standards that form this division help specify quality requirements based on quality models and quality measures. These quality requirements can be used in the process of eliciting quality requirements for information systems and IT services to be developed or as input for an evaluation process.

— ISO/IEC 2504n - quality evaluation division. The International Standards that form this division provide requirements, recommendations and guidelines for quality evaluation for information systems and IT services.

— ISO/IEC 25050 to ISO/IEC 25099 - SQuaRE extension division. These International Standards currently include requirements for quality of ready-to-use software product (RUSP), common industry formats for usability reports, and quality models and measures for new technologies such as cloud services and artificial intelligence.

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved

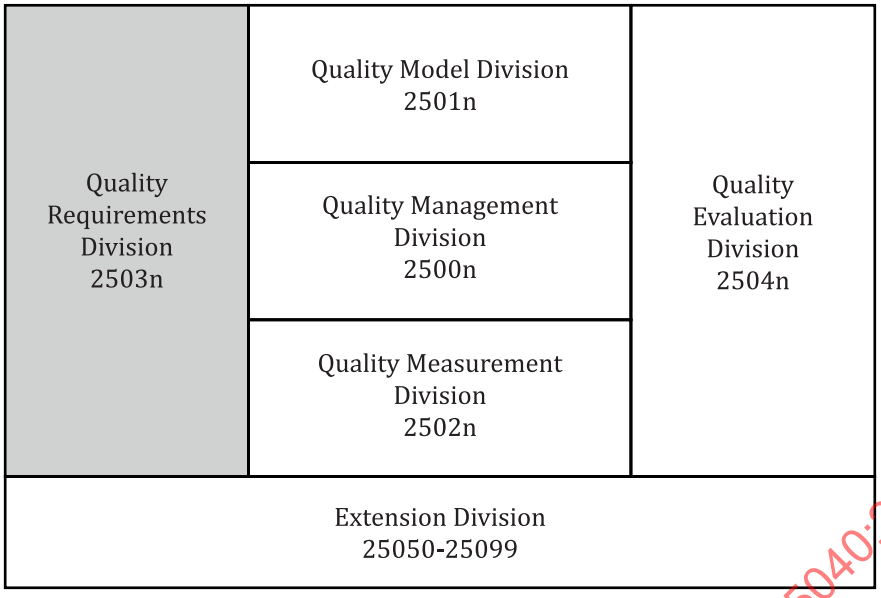

Figure 1 — Organization of standards on SQuaRE developed by ISO/IEC JTC 1/SC 7

The SQuaRE standards can be used in conjunction with ISO/IEC/IEEE 12207 and ISO/IEC/IEEE 15288, particularly the processes for the specification and evaluation of quality requirements. ISO/IEC 25030 describes how quality models and measures can be used for systems and software quality requirements, and ISO/IEC 25040 describes how the quality models and measures can be used for systems and software quality evaluation.

The SQuaRE standards can also be used in conjunction with standards on software process assessment developed by ISO/IEC JTC 1/SC 7, which provide:

— a framework for software product quality definition in the customer-supplier process;

— support for quality review, verification, and validation, as well as a framework for establishing quantitative quality characteristics;

— support for setting organizational quality goals in the management process.

The SQuaRE standards can be used in conjunction with ISO 9001 (which is concerned with quality management system) to provide:

— support for setting quality goals;

— support for design review, verification, and validation.

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved

Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — Quality evaluation framework

1 Scope

This document provides the framework for quality evaluation of ICT (information and communication technology) products (including software products), data, and IT services, which includes its concepts, and requirements, and recommendations for its processes to be implemented and enhanced.

This document is applicable for those who need to perform quality evaluations on target entities, including development organization (integrators, developers, and quality assurance group), acquirers, IT service providers, and independent evaluators.

This document does not provide specific test methods for quality evaluation or guidance on utilizing evaluation results.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 25000, *Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — Guide to SQuaRE*

ISO/IEC 25030, *Systems and software engineering — Systems and software quality requirements and evaluation (SQuaRE) — Quality requirements framework*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 25000 and the following 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/

3.1
assessment
action of comprehensively evaluating the target entity based on documented criteria for a specific purpose

Note 1 to entry: Such purposes can include determining acceptance or release of the target entity.

3.2
implementation rating module
quality rating module (3.8) that can be directly applied to target entity

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved

3.3
information need
insight necessary to manage objectives, goals, risks and problems

[SOURCE: ISO/IEC/IEEE 15939:2017, 3.12]

3.4
integrity level
degree of confidence that the system-of-interest meets the associated integrity level claim

[SOURCE: ISO/IEC/IEEE 15026-3:2023, 3.1, modified — Notes to entry have been removed.]

3.5
measurement source
set of artefacts used for quality measures when performing a *quality evaluation* (3.7)

3.6
quality analysis
analysis of rating results for multiple quality properties to determine the objective score or acceptability for the quality of the target entity

3.7
quality evaluation
systematic examination of the extent to which an entity is capable of fulfilling specified requirements

[SOURCE: ISO/IEC/IEEE 24765:2017, 3.3267, modified — Note 1 to entry has been removed.]

3.8
quality rating module
set of quality measures, operational environment, and methods for conducting quality measurements and quality ratings on a specific category of target entities

3.9
template rating module
quality rating module (3.8) in which the measurement environment and rating method are parameterized for future use

4 Concepts of quality evaluation

4.1 Quality evaluation definition

A quality evaluation involves performing a series of tasks to generate objective and quantitative data regarding the quality of the target entity. This is achieved by measuring, rating, and interpreting the quality attributes of the target entities using established quality models and measures. The ultimate objective of a quality evaluation is to offer crucial and unbiased information that supports comprehensive decision-making during the planning, development, delivery, acceptance, maintenance, and procurement stages of the target entities.

4.2 Quality model and quality measures for quality evaluation

The SQuaRE standards offer quality models and measures, as presented in Table 1, specifically designed for these three types of target entities which are ICT products, data, and IT services.

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved

Table 1 — Target entity types and their associated quality models and measures

Target entity type	Quality to be evaluated	Quality model	Quality measures
IT service / ICT product	Quality-in-use	ISO/IEC 25019 Quality-in-use model	ISO/IEC 25022 Measurement of quality-in-use
IT service	IT service quality	ISO/IEC TS 25011 IT service quality models	ISO/IEC TS 25025 Measurement of IT service quality
ICT product	Product quality	ISO/IEC 25010 Product quality model	ISO/IEC 25023 Measurement of system and software product quality
Data	Data quality	ISO/IEC 25012 Data quality model	ISO/IEC 25024 Measurement of data quality

The quality model presents a framework that outlines the essential quality characteristics that the target entity should possess. Quality measurement serves as a method for quantifying these quality characteristics based on the established quality model. In the case of an ICT product or IT service as the target entity, the quality-in-use model can be utilized to evaluate the impact of the target entity during usage.

NOTE 1 When evaluating ICT products (or IT services), the quality-in-use model or the product quality model (or IT service quality model) can be selected depending on the purpose of the quality evaluation. When evaluating data quality, the data quality model is the only option.

When evaluating a particular target entity, the important quality (sub)characteristics vary by its category.

NOTE 2 ISO/IEC TR 12182 provides a framework for categorizations of IT systems and software, and a guide for its application.

EXAMPLE In the case of a server device as the target entity, usability is not a significant factor as there are no direct user interactions involved. When evaluating the time behaviour of the server, the relevant information requirement shifts from response time to the throughput of requests handled by the server.

Quality properties represent the information needs pertaining to the quality of the target entity. These properties are measured and quantified using quality measures. It is worth noting that in certain cases, multiple measures can correspond to a single quality property. Various measurement methods, including testing, inspection, static analysis, and document survey, are utilized. See Figure 2.

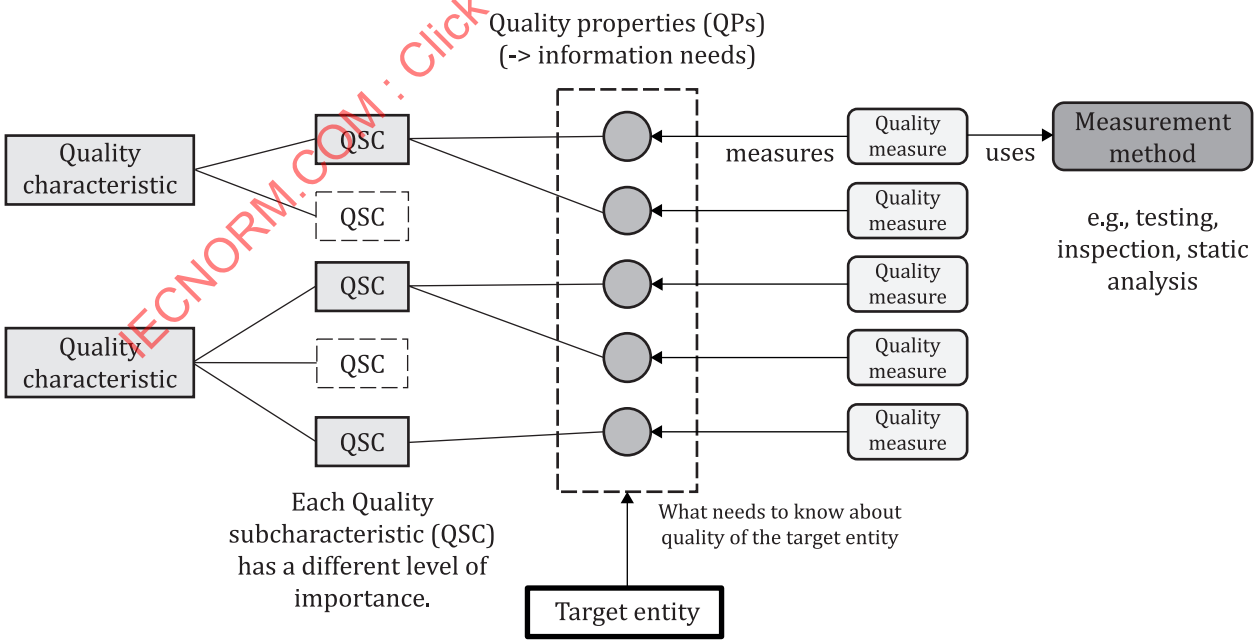

Figure 2 — Relationship among quality characteristics, quality properties and quality measures

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

4.3 Measurement source

A measurement source is a set of artefacts used for quality measurement when conducting a quality evaluation. The measurement source depends on what is available at the time of the evaluation. Design artefacts (design specifications, prototypes, inspection-related documents, test specifications, etc.) are available even when the target entities themselves do not yet exist. On the other hand, final products (executable objects, source code, data, usage manuals, maintenance manuals, results of inspection and/or testing, etc.) are available near their delivery. The measurement source determines the applicable quality measures.

NOTE Annex A shows a list of artefacts that can be included in measurement sources, what can be measured from them, and information on how to measure them.

4.4 Tasks of quality evaluation

Quality evaluation consists of the following three tasks (see Figure 3).

— Quality measurement: quantitatively measuring the quality property of the target entity using specific quality measure. Its objective is to obtain objective and quantitative information about the quality properties of the target entity.

— Quality rating: comparing the measured values obtained from quality measurement against predetermined quality rating levels to determine the appropriate quality level for each quality property of the target entity. For instance, the measured response time is classified as the level of "excellent" if it falls within the range corresponding to the level.

— Quality analysis: analysing the quality rating results obtained from multiple quality properties. The focus is on assessing the acceptability of the target entity, taking into account each individual quality characteristic or subcharacteristic, as well as the overall quality. This analysis also includes identifying strengths and weaknesses for each quality attribute and generating recommendations based on the assessment findings.

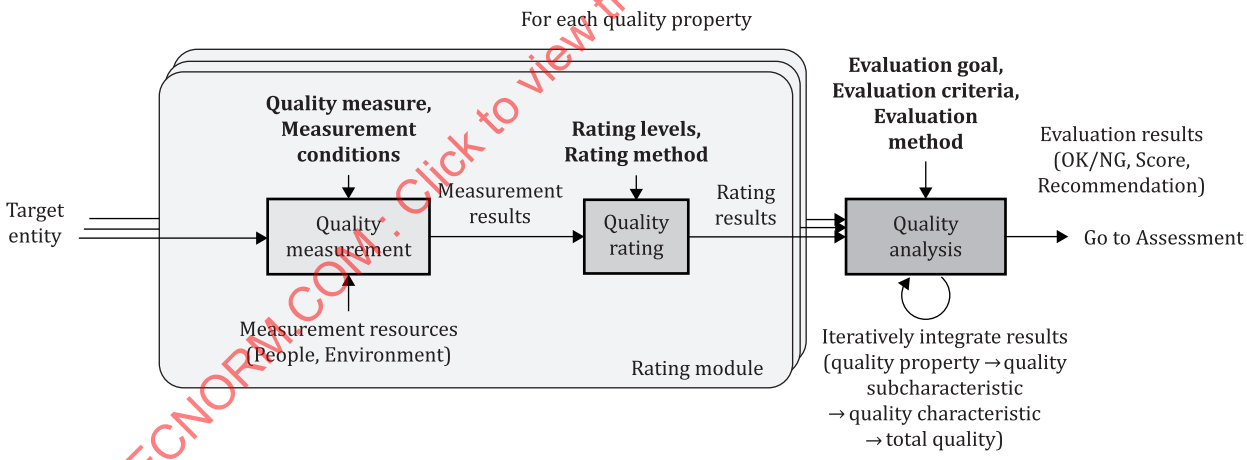

Figure 3 — Tasks of quality evaluation

4.5 Quality rating module

A quality rating module is a cohesive collection of measures, operational environment, and rating methods for performing quality measurements and ratings on a category of target entities. By utilizing the quality rating module, one can obtain quality rating results that align with the specified information needs.

The following are elements that a quality rating module can encompass:

— quality (sub)characteristics to be evaluated;

— categories of target entities eligible for evaluation;

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved

— quality measures employed for evaluation;

— measurement conditions and operational environment, including relevant parameters;

— defined quality rating levels;

— resource requirements;

— assumptions and constraints applicable to the quality rating module (e.g. this module does not need to consider potential interaction problems arising from inexperienced or untrained users; this is because the users interacting with the target entity are supposed to be trained adequately.)

An implementation rating module is a quality rating module that can be directly applied to existing target entities. On the other hand, a template rating module is a parameterized quality rating module that allows for flexibility in the measurement environment and rating method, making it suitable for future use. To create an implementation rating module, the parameters of a template rating module are applied and customized.

NOTE The category of the target entity plays a significant role in determining the quality (sub)characteristics to evaluate, their relative significance, the applicable quality rating modules (including rating level setting and range of acceptance), and the pass/fail criteria for quality analysis. ISO/IEC TR 12182 offers an example of categorization for ICT products that can be referenced in this context.

4.6 Assessment using evaluation

An assessment is a type of decision-making process that occurs during various stages, such as planning, development, shipping, acceptance, maintenance, or purchase of the target entity. It involves evaluating the quality of target entity based on specific criteria or requirements.

A quality evaluation can provide objective information about the quality of the target entities for assessment purposes. The rigor of the quality evaluation largely depends on the type of assessment being conducted.

For example, in industries such as aviation or healthcare, safety assessments are critical, involving analysing safety protocols, equipment performance, and adherence to regulatory standards. The rigor of the quality evaluation for such assessment must be high to ensure the safety of individuals and prevent potential hazards. On the other hands, in the early stages of product development or project planning, there is a case that preliminary assessments are conducted to gather initial insights or make rough estimates as a starting point for further evaluation and decision-making. In this case, the rigor of the quality evaluation can be low because the data is not as accurate as in later stages.

Assessments can be involved with various activities such as identifying target entities for acquisition, making acceptance decisions, determining delivery schedules, deciding on phase transitions, evaluating market value at the end of each phase.

NOTE While the results of a quality evaluation can be used as input for certain assessments, quality evaluation itself is conducted independently from any specific assessment.

5 Quality evaluation process reference model

5.1 Overview

The quality evaluation process reference model intends to present the general quality evaluation process. It consists of the five steps:

a) define the evaluation;

b) design the evaluation;

c) plan the evaluation;

d) execute the evaluation;

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved

e) conclude the evaluation.

Figure 4 illustrates the activities to be performed in each step and the expected outputs.

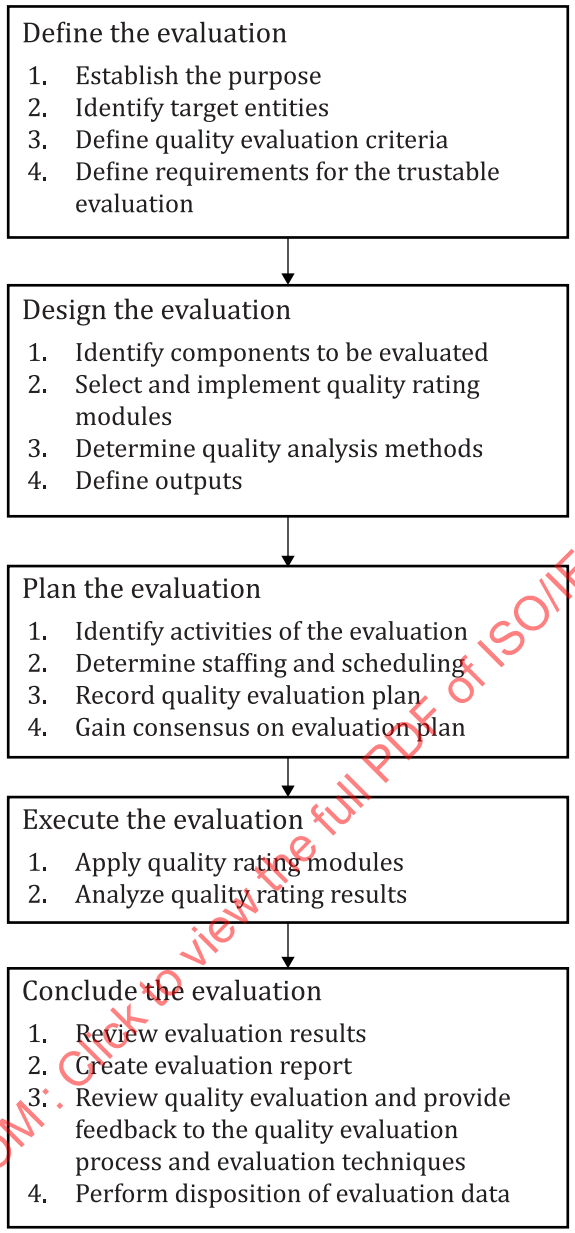

Figure 4 — Quality evaluation process reference model

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

When the organization that needs the evaluation proactively performs the "define evaluation" step, the remaining steps can be outsourced. "Define the evaluation" and “Plan the evaluation” should be considered as parallel steps.

NOTE 1 This evaluation process places “Plan the evaluation” in the third step, because only after the "Define the evaluation" and "Design the evaluation," the tasks, schedule, and costs of the quality evaluation can be determined accurately. However, since the "Define the evaluation " and "Design the evaluation " also require the allocation of skilled resources, planning for them is necessary in the first step of the evaluation process. Therefore, it is appropriate to think of “Plan the evaluation " as a parallel process with "Define the evaluation" and “Design the evaluation”.

NOTE 2 An example of quality evaluation process implementation through system/software life cycle processes is shown in Annex C.

© ISO/IEC 2024 – All rights reserved

5.2 Define the evaluation

5.2.1 Purpose

This step aims to define the scope of the evaluation by establishing the purpose, evaluation criteria, target entities, and other relevant factors from a business and organizational perspective.

5.2.2 Outcomes

As a result of the successful implementation of the step “Define the evaluation”.

a) Purpose of quality evaluation is defined, in order to elaborate quality evaluation activities and tasks to meet the requirements to evaluation from stakeholders.

b) Quality evaluation criteria, needed for determination of quality of target entities through evaluation, are defined.

c) Target entities needed for quality evaluation are identified, accessible and available.

d) Requirements for rigor of the evaluation are defined to be a basis of considering enable approaches of the evaluation.

5.2.3 Activities

5.2.3.1 Establish the purpose

The purpose of the quality evaluation shall be defined. Generally, the quality evaluation is conducted with the following objectives (four types of quality evaluation):

(T1) Quality evaluation for suitability to a specific context of use:

- Purpose: obtaining information for IT service/ ICT product/ data selection for a certain decision making
- What to determine:
  - whether the candidate entities meet some specific requirements;
  - which entities of them are better overall;
  - the strengths and weaknesses of each entity.
- Quality criteria used: a defined set of quality requirements

(T2) Quality evaluation for qualification to quality standard:

- Purpose: obtaining quality information to improve the quality of the target entity based on the quality standards
- What to determine:
  - whether the entity complies with established standards;
  - its strengths and weaknesses of the target entity from a quality standpoint.
- Quality criteria used: the governmental/industrial standards

(T3) Quality evaluation for checking requirements satisfaction:

- Purpose: verifying the fulfilment of the agreed requirements

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved

- What to determine:
  - whether the target entity meets the quality requirements.
- Quality criteria used: the agreed requirements

(T4) Quality evaluation for suitability to the market

- Purpose: gathering information for management decisions
- What to determine:
  - how well the target entity meets the needs of the target market.
- Quality criteria used: the requirements derived from the potential stakeholder needs (in some cases, incrementally developed)

When different types of quality evaluations are mixed and conducted as a single evaluation, the requirements for each of them shall be defined separately.

EXAMPLE The supplier can combine the T2 and T3 evaluations when it is not possible to establish the evaluation criteria for the T3 evaluation solely based on the quality requirements agreed upon by both parties.

5.2.3.2 Identify target entities

All entities needed for the evaluation shall be identified or defined.

The user of the quality evaluation is either the acquirer or the supplier of the target entities. From the viewpoints of the user, the target entities can be either ordered, commercially available, or existing.

NOTE An existing ICT product or IT service can also be a target entity (e.g. to determine whether an existing ICT product or IT service needs to be replaced or not, based on the quality evaluation results for it).

EXAMPLE When an ICT product under development is in acceptant testing, the product itself will be the target entity. When an ICT product is acquired among several candidates of commercially available products, the candidate products will be the target entities. When data or software components are to be acquired, which are suitable to use in the ICT product under development, these components can be the target entities.

5.2.3.3 Define quality evaluation criteria

The quality evaluation criteria shall be defined or identified.

Quality evaluation criteria are a set of specific quality requirements used to evaluate the quality of the target entities. They can include factors such as functional suitability, reliability, performance efficiency, compatibility, interaction capability, maintainability, flexibility, security, safety and compliance with relevant standards or regulations. These criteria help in objectively evaluating and determining the level of quality achieved by the entity.

A quality requirement shall have the following items in accordance with ISO/IEC 25030:

- target entity;
- selected characteristic;
- user and task (only for quality-in-use requirements);
- quality goal with conditions;
- quality measure;
- target value;
- acceptable range of values.

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved

The above items can be used as quality evaluation criteria.

Sometimes given requirements specifications do not provide a sufficient set of quality requirements for quality evaluations or some quality requirements in them lack the above items. It is required to supplement them because they are necessary to choose the right skills, tools, and techniques for quality evaluation in the evaluation design and planning.

In particular, the following factors should be considered to establish quality evaluation criteria.

a) Criticality and integrity level

Quality evaluation criteria can vary depending on the context and nature of the entity being evaluated. When the evaluation is related to a system integrity level, the degree required for the quality characteristics and subcharacteristics of the target entity must fulfil the criticality of its expected use.

NOTE 1 ISO/IEC/IEEE 15026-3 defines system and software integrity levels. The required integrity level of the software largely determines the rigor and formality of the evaluation.

EXAMPLE 1 Evaluation techniques to be applied to the functionality characteristic according to different evaluation levels requirements, from less demanding levels to more demanding levels includes:

— functional or black box testing;

— inspection of development documentation guided by checklists;

— unit testing with test coverage criteria.

b) Source of quality evaluation criteria

Quality evaluation criteria can be established using predefined sources. There are two types of sources of quality evaluation criteria:

1) diagnostic model, which is predefined quality evaluation criteria for a specific category of target entities in a specific domain, including a set of prioritized quality requirements sufficient for evaluating the entities;

2) requirements specification, which consists of a set of quality requirements for a specific target entity to develop or acquire.

EXAMPLE 2 Diagnostic models can include government-established standards, industry group standards, and commonly used standards within specific organizations or projects.

EXAMPLE 3 Requirements specification can include mutually agreed-upon requirements specifications between the acquirer and supplier, and dedicated requirements specifications developed specifically for the evaluation process.

NOTE 2 Quality evaluations using requirements specifications are not suitable for scoring the quality of the entity since they can only indicate whether the entity to be evaluated meets the requirements. In case the development organization has some diagnostic model for a specific domain, it is possible to conduct the quality evaluation using a combination of the requirements specification and the diagnostic model for a more objective and comprehensive quality evaluation.

The evaluation type (except T4) determines available sources of quality evaluation criteria, as outlined in Table 2. For T4, both diagnostic models and requirement specifications can be available.

When establishing quality evaluation criteria, the following aspects should be clarified:

— source for the quality evaluation criteria, including how they are obtained and derived;

— the expected quality outlined in the source, including reasons for its importance and what needs to be demonstrated.

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved

Table 2 — Type of quality evaluation and available source of quality evaluation criteria

Type of quality evaluation		Available source of quality evaluation criteria
T1	Quality evaluation for suitability to a specific use	Requirements specification
T2	Quality evaluation for qualification to quality standard	Diagnostic model
T3	Quality evaluation for checking requirements satisfaction	Requirements specification
T4	Quality evaluation for suitability to the market	Requirements specification / Diagnostic model

NOTE 3 Annex B shows how to determine quality criteria for several business contexts.

5.2.3.4 Define requirements for the rigor of evaluation

The requirements for the rigor of the quality evaluation shall be defined. The term "rigor" in evaluation refers to the level of thoroughness, precision, and strictness applied during the evaluation process to ensure the accuracy, reliability (e.g., repeatability and reproducibility of measurement), and validity of the measurement and evaluation results.

NOTE 1 Further information on reliability of measurement can be found in ISO/IEC 25020:2019, Annex B.

The rigor of the evaluation becomes crucial when the evaluation results are directly utilized in judgments, such as determining whether the contract conditions have been met. Especially when the evaluation results are employed as objective data for making significant managerial decisions, the rigor of the evaluation should be carefully considered.

In order to establish these requirements, the following factors should be taken into consideration:

a) coverage of information needs;

b) objectivity and accuracy of measured values (how strictly the measurements need to be conducted);

c) acceptability of the rating levels;

d) acceptability of weighting for scoring;

e) transparency of the quality evaluation.

The extent of factors a) and b) significantly influences the evaluation cost.

NOTE 2 To define the rigor of the evaluation, Annex B lists considerations for each type of quality evaluation.

5.3 Design the evaluation

5.3.1 Purpose

The purpose of this process is to design the quality evaluation, including its target entities and their components that need to undergo individual evaluation, methods to be applied for quality measurement, rating, and analysis, and its output.

5.3.2 Outcomes

As a result of the successful implementation of the step “Design the evaluation”.

a) Components needed for quality evaluation are identified.

b) Applicable quality rating modules are selected for measuring and rating quality of target entities.

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved

c) Applicable quality analysis methods are selected to analyse quality from the results of quality rating.

d) Outputs of quality evaluation, needed for intended use of stakeholders, are defined.

5.3.3 Activities

5.3.3.1 Identify components to be evaluated

In quality evaluation, the entities and components that need to undergo individual evaluation shall be identified. These evaluations are then integrated to produce a comprehensive quality evaluation result through quality analysis.

When evaluating an IT service, the components can be various ICT products and data. ICT products can also have their own set of components, including other ICT products and data.

When an ICT product consists of components belonging to different system categories, certain rating modules can only be applied to specific categories of components based on the specified information needs (quality properties).

EXAMPLE In case of an ICT product comprising terminal devices with user interfaces and server devices responsible for handling a large volume of processing requests, two components can be identified, and it is important to determine the appropriate rating modules to be applied to each component.

5.3.3.2 Select and implement quality rating modules

Quality rating modules for the target entities (or their components) shall be selected and implemented.

The following procedures should be used to prepare a quality rating module.

a) Select quality (sub)characteristics important for the target entities.

b) Specify information needs on each of the (sub)characteristics, i.e., what are wanted to know about quality of the target entities from the views of the selected quality (sub)characteristics.

c) Select and conduct one of the following ways to prepare the module:

   1) find the appropriate one from the available template rating modules;

   2) find an applicable quality measure from the existing quality measures (by reading their description);

   3) set information needs and define new measures.

NOTE 1 A template rating module is considered suitable if the items described in 4.5 align with the evaluation requirements of the target entity.

NOTE 2 Existing quality measures can be sourced from ISO/IEC 25022, ISO/IEC 25023, ISO/IEC 25024, and ISO/IEC TS 25025.

The number of information needs for a (sub)characteristic can be one or more. For each information need, at least one implementation rating module shall be implemented. In case of c) 1), an implementation rating module can be prepared by defining parameters of the template module, whereas in case of c) 2) and c) 3), it is necessary to create it from available or newly defined quality measures.

NOTE 3 Some quality measures or template rating modules cannot be applied if the measurement sources required for them are not available.

5.3.3.3 Determine quality analysis methods

The quality analysis method for generating the output of the quality evaluation shall be determined. When a quality rating module is applied to the target entity or its components, it produces a rating result indicating a certain level of quality for the specified quality property.

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved

To determine the quality analysis method, the following aspects should be considered:

a) approach to integrating and interpreting the rating results;

b) method for generating the necessary output.

5.3.3.4 Define outputs

The outputs for the quality evaluation shall be defined, considering the purpose of the quality evaluation and the assessment using the evaluation.

Table 3 presents an example of quality evaluation outputs and the applicable source of quality criteria. It should be noted that relying solely on requirements specifications does not provide objective scores or indicate strengths and weaknesses, so the diagnostic model should also be considered.

Table 3 — Example of quality evaluation outputs and their applicable source of quality criteria

Outputs of quality evaluation		Applicability	
Category	**Output item**	**Diagnostic model**	**Requirements specifications**
Total evaluation	Pass/Fail	V	V
	Score with standard value (comparison in case of multiple targets)	V	
Evaluation for each quality (sub)characteristic	Pass/Fail	V	V
	Evaluation score (to compare multiple targets)	V	
	Strength and weakness	V	
	Unsatisfied quality requirements	V	V
Comparison	Candidates (that satisfy the given conditions) with score	V	V
Quality prediction	Expectation of pass/fail at the end of the development	V	V
Pointing out improvements	Corrective matters	V	V
	Recommendations (with priorities)	V	V
Key V applicable			

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

5.4 Plan the evaluation

5.4.1 Purpose

The purpose of this process is to develop, agree, record and communicate to relevant stakeholders the scope and approach that will be taken to the quality evaluation.

5.4.2 Outcomes

As a result of the successful implementation of the step “Plan the evaluation”.

a) All the activities required to implement the defined quality evaluation are identified.

b) Quality evaluation plan is available to be carried out.

c) Quality evaluation plan is available to monitor, assess, and control quality evaluation performance.

d) Quality evaluation plan is agreed upon by all stakeholders.

NOTE Such tracking and oversight of quality evaluation can be conducted with comparisons of planned and actual things, including involvements of stakeholders, organizations, schedule, activities, outputs of quality evaluation.

© ISO/IEC 2024 – All rights reserved

5.4.3 Activities

5.4.3.1 Identify activities of the evaluation

Activities required to implement the quality evaluation defined in the previous step shall be identified.

5.4.3.2 Determine staffing and scheduling

Staffing and scheduling shall be determined for establishing a well-structured organization, identifying the appropriate roles and skills, and creating an efficient schedule that enables the smooth execution of the evaluation process.

This activity encompasses the following tasks:

a) defining the organization's structure and responsibilities related to the evaluation process;

b) identifying the roles and skills necessary for the staff members involved in carrying out the evaluation;

c) scheduling each required activity based on estimates, dependencies, and staff availability.

5.4.3.3 Record quality evaluation plan

To conduct a quality evaluation, an appropriate quality evaluation plan shall be recorded. The plan shall include, but not limited to, these items:

— scope (scope and target entities of evaluation);

— purpose of evaluation;

— evaluation activities and their schedule (including milestone):

  — preparation of quality evaluation criteria, measurement sources, and quality rating modules (including tools and environment for them);

  — execution of quality measurement, quality rating, and quality analysis;

  — documentation and reporting;

— evaluation method, tools, and techniques;

— organization (structure, roles, and responsibilities);

— resources for the evaluation (human resource, budget, facilities, etc.).

NOTE 1 ISO/IEC/IEEE 16326 provides further guidance on developing a project plan.

NOTE 2 Quality evaluation does not need to be completed in a single instance. It can be divided into multiple phases, where different sets of quality characteristics are evaluated, or the same set of characteristics are evaluated repeatedly for the developing target entity.

NOTE 3 Various groups of evaluators can be involved, such as system integrators, developers, quality assurance, and independent evaluators.

NOTE 4 The evaluation method includes the quality rating modules and quality analysis methods to be utilized.

EXAMPLE The roles involved in quality evaluation can include the evaluation owner, evaluator, and related organizations.

5.4.3.4 Gain consensus on evaluation plan

By actively involving stakeholders, the evaluation plan shall gain consensus among all relevant parties, fostering a collaborative and cooperative approach to the evaluation process.

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved

This activity consists of the following tasks:

a) gathering opinions from the perspectives of stakeholders regarding the evaluation plan;

b) resolving any conflicts or discrepancies between the evaluation plan and stakeholders' views;

c) revising the evaluation plan to reflect stakeholders' feedback;

d) obtaining approval of the evaluation plan from the relevant stakeholders.

5.5 Execute the evaluation

5.5.1 Purpose

The purpose of this process is to carry out the evaluation plan to produce the expected output and evidence.

5.5.2 Outcomes

As a result of the successful implementation of the step "Execution the evaluation":

a) Quality rating results are produced by applying the planned quality rating modules to the target entities.

b) Degree of achievement of quality (sub) characteristics are described through analysis of the rated results.

c) Logs of quality evaluation are recorded to be available to prove the validity of the quality evaluation.

5.5.3 Activities

5.5.3.1 Apply quality rating modules

The chosen quality rating modules shall be implemented and applied to evaluating the target entities and their components, in accordance with the evaluation plan. This application produces quality rating results for the entities. The measurement results of the quality measures used in the quality rating modules shall be recorded.

5.5.3.2 Analyse quality rating results

The obtained set of rating results shall be analysed to derive evaluation results for subcharacteristics and characteristics. This analysis aims to summarize the results that reflects the degree to which the entity satisfies the quality evaluation criteria.

5.6 Conclude the evaluation

5.6.1 Purpose

The purpose of this process is to generate quality evaluation results that are justifiable and meet all stakeholder needs for their intended use, in a manner that ensures their validity and usefulness.

5.6.2 Outcomes

As a result of the successful implementation of the step "Conclude the evaluation".

a) Quality evaluation results are reviewed, and their justification and suitability are verified and validated against to specified stakeholder requirements to evaluation and their intended use.

b) Justification and suitability of quality evaluation results are ensured through verification and validation against to specified stakeholder requirements to evaluation and their intended use of results.

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved

c) Quality evaluation results are available for involved stakeholders or organizations to take necessary actions.

d) Quality evaluation results are provided to feedback to evaluation techniques of quality rating modules for their improvements.

e) Evaluation data are disposed of as required.

5.6.3 Activities

5.6.3.1 Review evaluation results

The evaluator and the requester shall conduct a collaborative review of the evaluation results to verify and validate their justification and suitability.

NOTE The requester refers to a representative of a specific stakeholder party, organization, or community that initiates and undergoes the quality evaluation process.

5.6.3.2 Create evaluation report

The evaluation report shall be created, encompassing the following elements, based on its intended use:

a) quality evaluation requirements;

b) quality evaluation plan;

c) results from the measurements and analyses conducted;

d) intermediate results or interpretation decisions, when specified by the evaluation plan;

e) any limitations, constraints, deficiencies, or exclusions encountered during the evaluation activity;

f) information about the evaluators and their qualifications;

g) resolutions or workarounds in the event of a deficiency;

h) any other information necessary to be able to repeat or reproduce the evaluation;

i) result of the evaluation.

Review comments on the evaluation report shall be collected, addressed, resolved, and then they are reflected appropriately in the final version of the report.

5.6.3.3 Review quality evaluation process

The evaluator shall conduct a thorough review the validity of the evaluation process, indicators, and measures utilized. The feedback obtained from this review should be utilized to enhance the overall evaluation process and improve the effectiveness of the evaluation techniques, particularly the rating modules. When necessary, additional data collection can be explored to enhance the existing indicators, ensuring their improvement and validation for future use.

5.6.3.4 Manage disposition of evaluation data

Once the evaluation is completed, the evaluation data and related items shall be managed and disposed of in accordance with the requester's requirements.

When evaluation data are disposed, one of the following approaches shall be applied, depending on the type of data.

— For documents submitted for evaluation, they are returned to the requester or archived for a specified duration. Alternatively, they can be securely destroyed to ensure confidentiality.

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved

— The evaluation report and evaluation records are archived for a specified duration, ensuring their availability for future reference or audit purposes.

— All other data not covered by the above categories are archived for a specified duration or securely destroyed, based on the sensitivity and relevance of the data.

When the specified archiving duration expires for certain data, a decision shall be made considering the ongoing need for data continuity, as well as changes in requirements or circumstances. The data can be either archived for an extended duration or securely destroyed, based on the determined course of action.

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved

Annex A
(informative)

Measurement source

Measurement sources are selected from either deliverables or design artefacts based on their availability. Measurement is conducted for the measurement sources to quantify some quality properties by using some means for the measurement.

A measurement source is applicable for measuring some, not all, quality (sub)characteristics.

Table A.1 shows a list of measurement sources and their applicability to quality (sub)characteristics for quality evaluation of ICT products or data.

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved

Table A.1 — Measurement sources and their applicability to quality (sub)characteristics

Measurement target	Measurement			Applicability to quality (sub)characteristic										
	Measurement source	Property to quantify	Means for measurement	QiU	PQ									DQ
					Fs	I	Pe	R	C	Se	Sa	M	Fl	
Deliverable	Executable program	Behaviour in runtime	Testing		F	F	F	F	F	F	F	F	F	F
		Influence on stakeholders in use	Testing	F	P	P	P	P	P	P	P	P	P	P
	Source code	Structure of program	Static analysis (alert, measure)		F			F	F	F	F	F	F	
	Data	Structure of data	Static analysis (alert, measure)		F			F						F
		Data value	Testing data (+executable program)		F			F						F
	User manual	Structure and Items in document Description of program behaviour	Reading and inspection (comprehensiveness, sufficiency)		F	F		F		P	P			
		Influence on stakeholders in use	Program execution with the manual	F		P								
		Quality on documentation	Document checker / results of inspection					F						
	Maintenance manual	Structure and Items in document Description of program behaviour	Reading and inspection (comprehensiveness, sufficiency)						F			F	F	
		Influence on stakeholders in use	Program execution with the manual	F								F	F	
		Documentation quality	Document checker / results of inspection					F				F		

Key

F fully applicable

P partially applicable

PQ product quality

DQ data quality

QiU quality-in-use

Fs functional suitability

I interaction capability

Pe performance efficiency

R reliability

C compatibility

Se security

Sa safety

M maintainability

Fl flexibility

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved

Table A.1 *(continued)*

Measurement target	Measurement			Applicability to quality (sub)characteristic										
	Measurement source	Property to quantify	Means for measurement	QiU	PQ									DQ
					Fs	I	Pe	R	C	Se	Sa	M	Fl	
Design artefacts	Design specification	Quality on documentation	Document checker, Inspection, Static analysis									F		
	Model in use (e.g. use case)	Described influence on stakeholders in use	Desktop execution / Model execution/ Automatic verification, Inspection (comprehensiveness, sufficiency)	F						F	F	F		
	Dynamic model (e.g. State diagram)	Described behaviour	Desktop execution / Model execution/ Automatic verification, Inspection (comprehensiveness, sufficiency)		F		P			P	P			
	Static model (e.g. Class diagram)	Described structure (code and data)	Static analysis, inspection (comprehensiveness, sufficiency)		P					P	P	F	P	F
	Prototype (same as executable)	Behaviour in runtime	Demonstration / Testing		F	F	F	F	F	F	F	F	F	F
		Influence on stakeholders in use	Demonstration / Testing	F		P				P	P	P	P	P
Common to both	Inspection related documents (including guidelines, checklists)	Viewpoints and items of Inspection, Its results	Inspection (comprehensiveness, sufficiency)	F	F	F	F	F	F	F	F	F	F	F
	Test documents	Viewpoints and items of testing, Its results	Inspection (comprehensiveness, sufficiency)	F	F	F	F	F	F	F	F	F	F	F

Key

F fully applicable

P partially applicable

PQ product quality

DQ data quality

QiU quality-in-use

Fs functional suitability

I interaction capability

Pe performance efficiency

R reliability

C compatibility

Se security

Sa safety

M maintainability

Fl flexibility

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved

Annex B
(informative)

Examples of four types of quality evaluations

Table B.1 gives the typical patterns for four types of quality evaluations, which provide some guidelines on how to define the business context for a quality evaluation.

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved

Table B.1 — Examples of four types of quality evaluations

Evaluation type		Evaluation purpose	User of evaluation results	Type of target entity		Number	Quality model		Quality criteria		Who conduct the evaluation	Requisites for evaluation results		
				Ordered	Commercial		QiU	SQ/PQ/DQ	Type	Source to obtain		Output	Required level	Assessment that uses evaluation results
T1	Evaluation for suitability to a specific context of use	Clarify which target entities are best fit as component of an IT service or ICT product under planning / development / maintenance from quality point of view.	Acquirer	V (Proposal)	V	≧1	F	F	Requirements specification	Acquirer's needs	Integrator (Developer)	- Candidates (that satisfy the given conditions) with score	M	Selection judgement before acquisition (+Cost, Delivery, Maintenance risk and cost)
T2	Evaluation for qualification to quality standard	Determine if the target entity meets the quality standards set by some authority.	Supplier/ Acquirer		V	1		F	Diagnostic model	Government/ Industry group	Independent evaluator	- Total Pass/Fail - Evaluation per QC * Pass / Fail * Unsatisfied quality requirements	H	Official certification
		Determine if the target entity meets a certain level of quality standards.	Supplier	V	V	1		F	Diagnostic model	Industry group/ Development organization	Quality assurance		L	(voluntary) self-statement of compliance
													M	(voluntary) independent-statement of compliance

Key

V applicable

F fully applicable

P partially applicable

H high

M medium

L low

SQ IT service quality

QC quality characteristic

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved

Table B.1 *(continued)*

Evaluation type		Evaluation purpose	User of evaluation results	Type of target entity		Number	Quality model		Quality criteria		Who conduct the evaluation	Requisites for evaluation results		
				Ordered	Commercial		QiU	SQ/PQ/DQ	Type	Source to obtain		Output	Required level	Assessment that uses evaluation results
T3	Evaluation for checking requirements satisfaction	Check if the target entity achieves the specified quality goal.	Acquirer	V		1	F		Requirements specification	Agreement between acquirer and supplier	Procurement section/ Quality assurance	- Total Pass/Fail - Evaluation per QC * Strength and weakness * Unsatisfied quality requirements	H	Acceptance judgment (+Additional cost, business schedule)
			Supplier	V		1		F	Requirements specification	Agreement between acquirer and supplier	Quality assurance			Shipping decision (+Cost, delivery)
			Supplier		V	1	F	F	Requirements specification	Product owner	Quality assurance	- Total Pass/Fail - Evaluation per QC * Strength and weakness * Unsatisfied quality requirements	M	Shipping decision (+Cost, market situation)
		Evaluate the target entities at the current development phase and determine the likelihood that the deliverable will achieve the specified quality goal.	Supplier	V (artefacts in-process)	V (artefacts in-process)	1	P	F	Requirements specification	Agreement between acquirer and supplier / Product owner	Developer/ Quality assurance	- Future expectation - Evaluation per QC * Strength and weakness * Recommendation with priority	M	Phase transition decision (+Development cost, influence on delivery)

Key

V applicable

F fully applicable

P partially applicable

H high

M medium

L low

SQ IT service quality

QC quality characteristic

IECNORM.COM : Click to view the full PDF of ISO/IEC 25040:2024

© ISO/IEC 2024 – All rights reserved