INTERNATIONAL STANDARD

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Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — System and software quality models

Ingénierie des systèmes et du logiciel — Exigences de qualité et évaluation des systèmes et du logiciel (SQuaRE) — Modèles de qualité du système et du logiciel

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Foreword

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

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 25010 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*.

This first edition of ISO/IEC 25010 cancels and replaces ISO/IEC 9126-1:2001, which has been technically revised.

ISO/IEC 25010 is a part of the SQuaRE series of International Standards, which consists of the following divisions:

- Quality Management Division (ISO/IEC 2500n),

- Quality Model Division (ISO/IEC 2501n),

- Quality Measurement Division (ISO/IEC 2502n),

- Quality Requirements Division (ISO/IEC 2503n),

- Quality Evaluation Division (ISO/IEC 2504n),

- SQuaRE Extension Division (ISO/IEC 25050 – ISO/IEC 25099).

Introduction

Software products and software-intensive computer systems are increasingly used to perform a wide variety of business and personal functions. Realization of goals and objectives for personal satisfaction, business success and/or human safety relies on high-quality software and systems. High-quality software products and software-intensive computer systems are essential to provide value, and avoid potential negative consequences, for the stakeholders.

Software products and software-intensive computer systems have many stakeholders including those who develop, acquire, use, or who are customers of businesses using software-intensive computer systems. Comprehensive specification and evaluation of the quality of software and software-intensive computer systems is a key factor in ensuring value to stakeholders. This can be achieved by defining the necessary and desired quality characteristics associated with the stakeholders' goals and objectives for the system. This includes quality characteristics related to the software system and data as well as the impact the system has on its stakeholders. It is important that the quality characteristics are specified, measured, and evaluated whenever possible using validated or widely accepted measures and measurement methods. The quality models in this International Standard can be used to identify relevant quality characteristics that can be further used to establish requirements, their criteria for satisfaction and the corresponding measures.

This International Standard is derived from ISO/IEC 9126:1991, *Software engineering — Product quality*, which was developed to support these needs. It defined six quality characteristics and described a software product evaluation process model.

ISO/IEC 9126:1991 was replaced by two related multipart standards: ISO/IEC 9126, *Software engineering — Product quality* and ISO/IEC 14598, *Software engineering — Product evaluation*.

This International Standard revises ISO/IEC 9126-1:2001, and incorporates the same software quality characteristics with some amendments.

- The scope of the quality models has been extended to include computer systems, and quality in use from a system perspective.

- Context coverage has been added as a quality in use characteristic, with subcharacteristics *context completeness* and *flexibility*.

- *Security* has been added as a characteristic, rather than a subcharacteristic of functionality, with subcharacteristics *confidentiality*, *integrity*, *non-repudiation*, *accountability* and *authenticity*.

- *Compatibility* (including *interoperability* and *co-existence)* has been added as a characteristic.

- The following subcharacteristics have been added: *functional completeness, capacity, user error protection, accessibility, availability, modularity* and *reusability*.

- The compliance subcharacteristics have been removed, as compliance with laws and regulations is part of overall system requirements, rather than specifically part of quality.

- The internal and external quality models have been combined as the product quality model.

- When appropriate, generic definitions have been adopted, rather than using software-specific definitions.

- Several characteristics and subcharacteristics have been given more accurate names.

Full details of the changes are in Annex A.

This International Standard is intended to be used in conjunction with the other parts of the SQuaRE series of International Standards (ISO/IEC 25000 to ISO/IEC 25099), and with ISO/IEC 14598 until superseded by the ISO/IEC 2504n series of International Standards.

Figure 1 (adapted from ISO/IEC 25000) illustrates the organization of the SQuaRE series representing families of standards, further called divisions.
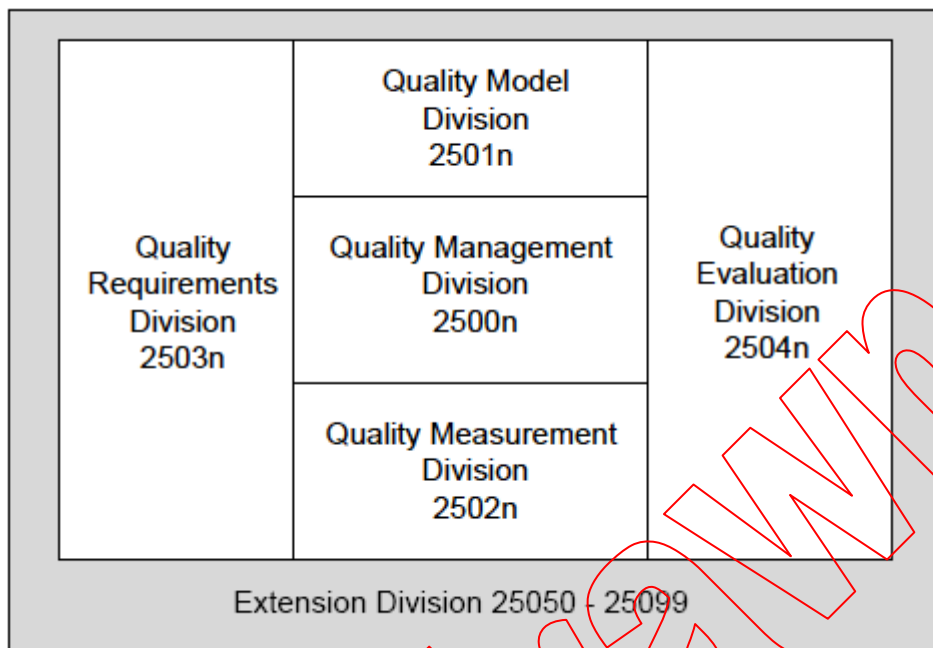

Figure 1 — Organization of SQuaRE series of International Standards

The divisions within the SQuaRE series are:

- **ISO/IEC 2500n - Quality Management Division**. The International Standards that form this division define all common models, terms and definitions further referred to by all other International Standards from the SQuaRE series. The 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.

- **ISO/IEC 2501n - Quality Model Division**. The International Standards that form this division present detailed quality models for computer systems and software products, quality in use, and data. Practical guidance on the use of the quality models is also provided.

- **ISO/IEC 2502n - Quality Measurement Division**. The International Standards that form this division include a software product quality measurement reference model, mathematical definitions of quality measures, and practical guidance for their application. Examples are given of internal and external measures for software quality, and measures for quality in use. Quality Measure Elements (QME) forming foundations for these measures 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 quality requirements elicitation for a software product 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 software product evaluation, whether performed by evaluators, acquirers or developers. The support for documenting a measure as an Evaluation Module is also present.

- **ISO/IEC 25050 – 25099 SQuaRE Extension Division**. These International Standards currently include requirements for quality of Commercial Off-The-Shelf software and Common Industry Formats for usability reports.

The quality models in this International Standard can be used in conjunction with ISO/IEC 12207 and ISO/IEC 15288, particularly the processes associated with requirements definition, verification and validation with a specific focus on the specification and evaluation of quality requirements. ISO/IEC 25030 describes how the quality models can be used for software quality requirements, and ISO/IEC 25040 describes how the quality models can be used for the software quality evaluation process.

This International Standard can also be used in conjunction with ISO/IEC 15504 (which is concerned with software process assessment) to provide:

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

- support for review, verification and validation, and a framework for quantitative quality evaluation, in the support process;

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

This International Standard can be used in conjunction with ISO 9001 (which is concerned with quality assurance processes) to provide:

- support for setting quality goals;

- support for design review, verification and validation.

Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — System and software quality models

1 Scope

This International Standard defines:

a) A quality in use model composed of five characteristics (some of which are further subdivided into subcharacteristics) that relate to the outcome of interaction when a product is used in a particular context of use. This system model is applicable to the complete human-computer system, including both computer systems in use and software products in use.

b) A product quality model composed of eight characteristics (which are further subdivided into subcharacteristics) that relate to static properties of software and dynamic properties of the computer system. The model is applicable to both computer systems and software products.

The characteristics defined by both models are relevant to all software products and computer systems. The characteristics and subcharacteristics provide consistent terminology for specifying, measuring and evaluating system and software product quality. They also provide a set of quality characteristics against which stated quality requirements can be compared for completeness.

NOTE   Although the scope of the product quality model is intended to be software and computer systems, many of the characteristics are also relevant to wider systems and services.

ISO/IEC 25012 contains a model for data quality that is complementary to this model.

The scope of the models excludes purely functional properties (see C.6), but it does include functional suitability (see 4.2.1).

The scope of application of the quality models includes supporting specification and evaluation of software and software-intensive computer systems from different perspectives by those associated with their acquisition, requirements, development, use, evaluation, support, maintenance, quality assurance and control, and audit. The models can, for example, be used by developers, acquirers, quality assurance and control staff and independent evaluators, particularly those responsible for specifying and evaluating software product quality. Activities during product development that can benefit from the use of the quality models include:

- identifying software and system requirements;

- validating the comprehensiveness of a requirements definition;

- identifying software and system design objectives;

- identifying software and system testing objectives;

- identifying quality control criteria as part of quality assurance;

- identifying acceptance criteria for a software product and/or software-intensive computer system;

- establishing measures of quality characteristics in support of these activities.