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First edition
2011-03-01

Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — Evaluation process

*Ingénierie des systèmes et du logiciel — Exigences de qualité et
évaluation des systèmes et du logiciel (SQuaRE) — Modèle de
référence d'évaluation et guide*

Reference number
ISO/IEC 25040:2011(E)



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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electro technical 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 25040 is part of the SQuaRE series of standards and was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*.

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Introduction

As the use of information technology grows, the number of critical computer systems also grows. Such systems include, for example, security critical, life critical, economically critical and safety critical systems. The quality of software in these systems is particularly important because software faults can lead to serious consequences.

Evaluation is the systematic determination of the extent to which an entity meets its specified criteria. The evaluation of software product quality is vital to both the acquisition and development of software. The relative importance of the various characteristics of software quality depends on the intended usage or objectives of the system of which the software is a part; software products need to be evaluated to decide whether relevant quality characteristics meet the requirements of the system.

This document is part of the SQuaRE series of standards and contains general requirements for software product quality evaluation as well as clarifies the associated general concepts.

The general goal of creating the SQuaRE set of standards is to move to a logically organized, enriched and unified series covering two main processes: software quality requirements specification and software quality evaluation, supported by a software quality measurement process. The purpose of the SQuaRE set of standards is to assist those developing and acquiring software products with the specification and evaluation of quality requirements. It establishes criteria for the specification of software product quality requirements, their measurement, and evaluation. It includes a quality model for aligning customer definitions of quality with attributes of the development process. In addition, the series provides recommended measures of software product quality attributes that can be used by developers, acquirers, and evaluators.

SQuaRE provides

- terms and definitions,
- reference models,
- general guide,
- individual division guides, and
- standards for requirements specification, planning and management, measurement and evaluation purposes.

SQuaRE includes International Standards on quality model and measures, as well as on quality requirements and evaluation.

SQuaRE replaces the current ISO/IEC 9126 series and the ISO/IEC 14598 series.

This International Standard is intended to be used in conjunction with the other parts of the SQuaRE series of standards, and with the ISO/IEC 14598 series and the ISO/IEC 9126 series until superseded by the ISO/IEC 25000 series of standards.

The SQuaRE series of standards consists of the following divisions under the general title *Systems and software product Quality Requirements and Evaluation*:

- ISO/IEC 2500n - *Quality Management Division*,
- ISO/IEC 2501n - *Quality Model Division*,

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- ISO/IEC 2502n - *Quality Measurement Division*,
- ISO/IEC 2503n - *Quality Requirements Division*, and
- ISO/IEC 2504n - *Quality Evaluation Division*.

Annex A provides an explanation on levels of evaluation, aspects to be considered when defining evaluation levels and suggestions on evaluation techniques to be applied according to the rank of evaluation level.

Annex B provides examples of evaluation methods.

Annex C provides a table showing relationships between some evaluation methods, possible cost rank and effectiveness per software quality characteristics.

Annex D provides relationships between the software product quality evaluation process reference model and the software and system life cycle processes.

Annex E provides an example template of an evaluation report.

Annex F provides the diagrams of inputs, outcomes, constraints and resources for each evaluation activity.

Figure 1 illustrates the organization of the SQuaRE series representing families of standards, further called Divisions.

Quality Requirements Division 2503n	Quality Model Division 2501n	Quality Evaluation Division 2504n
	Quality Management Division 2500n	
	Quality Measurement Division 2502n	
Extension Division 25050 - 25099		

Figure 1 — Organization of the SQuaRE series of International Standards

The Divisions within the SQuaRE model are as follows.

- **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 standards from the SQuaRE series. Referring paths (guidance through SQuaRE documents) and high-level practical suggestions in applying proper standards to specific application cases offer help to all types of users. The division also provides requirements and guidance for a supporting function which is responsible for the management of software product requirements, specification and evaluation.

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- **ISO/IEC 2501n - Quality Model Division.** The International Standard that forms this division presents detailed quality models for software, quality in use and data. Practical guidance on the use of the quality model 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. This division presents internal measures of software quality, external measures of software quality and quality in use measures. Quality measure elements (QME) forming foundations for the latter measures are defined and presented.
- **ISO/IEC 2503n - Quality Requirements Division.** The International Standard that forms this division helps specifying quality requirements. These quality requirements can be used in the process of quality requirements, elicitation for a software product to be developed or as inputs for an evaluation process. The requirements definition process is mapped to technical processes defined in ISO/IEC 15288.
- **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 independent evaluators, acquirers or developers. The support for documenting a measure as an evaluation module is also presented.

ISO/IEC 25050 to ISO/IEC 25099 are reserved to be used for SQuaRE extension International Standards and/or Technical Reports.

This International Standard is part of the 2504n series on quality evaluation division that currently consists of the following International Standards:

- **ISO/IEC 25040 - Evaluation process:** contains general requirements for specification and evaluation of software quality and clarifies the general concepts. Provides a process description for evaluating quality of software product and states the requirements for the application of this process. The evaluation process is the basis for software product quality evaluation for different purposes and approaches. Therefore, the process can be used for the evaluation of quality in use, external measure of software quality and internal measure of software quality and can be applied to evaluate the quality of pre-developed software or custom software during its development process. The software product quality evaluation can be conducted, for instance, by an acquirer, a developer organization, or an independent evaluator.
- **ISO/IEC 25041 - Evaluation guides for developers, acquirers and evaluators:** contains specific requirements and recommendations for developers, acquirers and evaluators.
- **ISO/IEC 25042 - Evaluation modules:** defines the structure and content of the documentation to be used to describe an evaluation module. These evaluation modules contain the specification of the quality model (i.e. characteristics, subcharacteristics and corresponding internal, external or quality in use measures), the associated data and information about the planned application of the model and the information about its actual application. Appropriate evaluation modules are selected for each evaluation. In some cases it may be necessary to develop new evaluation modules. Guidance for developing new evaluation modules is found in ISO/IEC 25042. This International Standard can also be used by organizations producing new evaluation modules.
- **ISO/IEC 25045 - Evaluation module for recoverability:** provides the specification to evaluate the subcharacteristic of recoverability defined under the characteristic of reliability of the quality model. It determines the external measures of software quality of resiliency and autonomic recovery index when the information system composed of one or more software products' execution transactions is subjected to a series of disturbances. A disturbance could be an operational fault (e.g. an abrupt shutdown of an OS process that brings down a system) or an event (e.g. a significant increase of users to the system).

ISO/IEC 25040 is a revised version and replaces the current ISO/IEC 14598-1.