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**Software engineering — Software
product Quality Requirements and
Evaluation (SQuaRE) — Guide to SQuaRE**

*Ingénierie du logiciel — Exigences de qualité du produit logiciel et
évaluation (SQuaRE) — Guide de SQuaRE*

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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 25000 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and system engineering*.

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Introduction

Computers are being used in an increasingly wide variety of application areas, and their intended and correct operation is often critical for business success and/or human safety. Developing or selecting high quality software products is therefore of prime importance. Comprehensive specification and evaluation of software product quality is a key factor in ensuring adequate quality. This can be achieved by defining appropriate quality characteristics, while taking account of the intended use of the software product. It is important that every relevant software product quality characteristic is specified and evaluated, whenever possible using validated or widely accepted measures.

As quality characteristics and associated measures can be useful not only for evaluating a software product but also for defining quality requirements, the predecessor of SQuaRE, ISO/IEC 9126:1991 has been replaced by two related multipart International Standards: ISO/IEC 9126 (Software product quality) and ISO/IEC 14598 (Software product evaluation). The following points derived from practical use of both series gave the logical impulse for creating the new SQuaRE series of International Standards:

- Both ISO/IEC 9126 and ISO/IEC 14598 have common normative, referential and functional roots,
- ISO/IEC 9126 and ISO/IEC 14598 form a complementary set of standards,
- The independent life cycles of both series have created inconsistencies between them.

The general goal of creating the SQuaRE set of International 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 International 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 two-part 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.

It has to be stressed that the SQuaRE series of International Standards is dedicated to software product quality only. SQuaRE ISO/IEC 25000n — Quality Management Division addresses software product quality requirements specification, measurement and evaluation, and is separate and distinct from the "Quality Management" of processes, which is defined in the ISO 9000 family of standards.

The major benefits of the SQuaRE series over its predecessor standards include:

- the coordination of guidance on software product quality measurement and evaluation,
- guidance for the specification of software product quality requirements, and
- harmonization with ISO/IEC 15939 in the form of Software product Quality Measurement Reference Model presented in ISO/IEC 25020 - Software engineering - Software product Quality Requirements and Evaluation (SQuaRE) Measurement reference model and guide.

The major differences between ISO/IEC 9126, ISO/IEC 14598 and SQuaRE series of International Standards are:

- the introduction of the new general reference model,
- the introduction of dedicated, detailed guides for each division,

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- the introduction of Quality Measure elements within Quality Measurement Division,
- the introduction of the Quality Requirements Division,
- incorporation and revision of the evaluation processes,
- the introduction of guidance of practical use in form of examples,
- coordination and harmonization of the content with ISO/IEC 15939.

SQuaRE consists of the following five divisions:

- ISO/IEC 2500n - Quality Management Division,
- ISO/IEC 2501n - Quality Model Division,
- ISO/IEC 2502n - Quality Measurement Division,
- ISO/IEC 2503n - Quality Requirements Division, and
- ISO/IEC 2504n - Quality Evaluation Division,

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

SQuaRE provides:

- Terms and definitions,
- Reference models, <https://standards.iteh.ai/catalog/standards/sist/2ea87b99-c43c-4555-98de-0de19fdbd6a8/iso-iec-25000-2005>
- General guide,
- Individual division guides, and
- International Standards for requirements specification, planning and management, measurement and evaluation purposes.

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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 14598 series.

This part of SQuaRE series of standards is a new International Standard with the goal of providing a common set of reference models, terminology, definitions and guidance for practical use of the associated standards and technical reports.

Software engineering — Software product Quality Requirements and Evaluation (SQuaRE) — Guide to SQuaRE

1 Scope

This International Standard provides guidance for the use of the new series of International Standards named Software product Quality Requirements and Evaluation (SQuaRE). The purpose of this Guide is to provide a general overview of SQuaRE contents, common reference models and definitions, as well as the relationship among the documents, allowing users of the Guide a good understanding of those series of standards, according to their purpose of use. This document contains an explanation of the transition process between the old ISO/IEC 9126 and the 14598 series and SQuaRE and also presents information on how to use the ISO/IEC 9126 and 14598 series in their previous form.

SQuaRE series of standards is intended for, but not limited to, developers, acquirers and independent evaluators of software products, particularly those responsible for defining software quality requirements and for software product evaluation. It is recommended that users of the SQuaRE as well as ISO/IEC 14598 and 9126 series of standards also use this International Standard as a guide to execute their tasks.

2 Conformance

There is no particular conformance clause for this document. Users, for their intended use of SQuaRE series of Standards should follow individual conformance clauses stated in each document of the series.

3 Normative references

This International Standard does not require any normative references. All informative references are presented in the Bibliography.

4 Terms and definitions

For the purposes of this document, the following definitions apply.

NOTE The definitions are common to all parts of SQuaRE series of standards.

4.1

acquirer

individual or organisation that acquires or procures a system, software product or software service from a supplier

NOTE Based on the definition in ISO/IEC 12207:1995.

4.2

analysis model

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

**4.3
attribute**

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

NOTE 1 Based on ISO/IEC 15939:2002.

NOTE 2 ISO 9000 distinguishes two types of attributes: a permanent characteristic existing inherently in something; and an assigned characteristic of a product, process or system (e.g. the price of a product, the owner of a product). The assigned characteristic is not an inherent quality characteristic of that product, process or system.

**4.4
attribute for quality measure**

attribute that relates to software product itself, to the use of the software product or to its development process

NOTE Attributes for quality measure are used in order to obtain quality measure elements.

**4.5
base measure**

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

NOTE A base measure is functionally independent of other measures.

[ISO/IEC 15939:2002, based on the definition in International Vocabulary of Basic and General Terms in Metrology, 1993].

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**4.6
commercial-off-the-shelf software product**

software product defined by a market-driven need, commercially available, and whose fitness for use has been demonstrated by a broad spectrum of commercial users

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**4.7
context of use**

users, tasks, equipment (hardware, software and materials), and the physical and social environments in which a product is used

[ISO 9241-11:1998]

**4.8
custom software**

software product developed for a specific application from a user requirements specification

**4.9
data**

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

[ISO/IEC 15939:2002]

**4.10
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

[ISO/IEC 15939:2002]

4.11**derived measure**

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

[ISO/IEC 15939:2002, based on the definition in International Vocabulary of Basic and General Terms in Metrology, 1993].

NOTE A transformation of a base measure using a mathematical function can also be considered as a derived measure.

4.12**developer**

individual or organisation that performs development activities (including requirements analysis, design, testing through acceptance) during the software life cycle process

NOTE Based on the definition in ISO/IEC 12207:1995.

4.13**division of standards**

division forms a family of standards serving complementary purposes

4.14**end user**

individual person who ultimately benefits from the outcomes of the system

NOTE The end user may be a regular operator of the software product or a casual user such as a member of the public.

4.15**entity**

object that is to be characterised by measuring its attributes

EXAMPLE An object can be a process, product, project, or resource.

[ISO/IEC 15939:2002]

4.16**evaluation method**

procedure describing actions to be performed by the evaluator in order to obtain results for the specified measurement applied to the specified product components or on the product as a whole

4.17**evaluation module**

package of evaluation technology for measuring software quality characteristics, subcharacteristics or attributes

NOTE The package includes evaluation methods and techniques, inputs to be evaluated, data to be measured and collected and supporting procedures and tools.

4.18**evaluator**

individual or organisation that performs an evaluation

4.19**external software quality**

capability of a software product to enable the behaviour of a system to satisfy stated and implied needs when the system is used under specified conditions

NOTE Attributes of the behaviour can be verified and/or validated by executing the software product during testing and operation.

EXAMPLE The number of failures found during testing is an external software quality measure related to the number of faults present in the program. The two measures are not necessarily identical since testing may not find all faults, and a fault may give rise to apparently different failures in different circumstances.

**4.20
failure**

termination of the ability of a product to perform a required function or its inability to perform within previously specified limits

NOTE Based on the definition in IEEE 610.12-1990.

**4.21
fault**

incorrect step, process or data definition in a computer program

[IEEE 610.12-1990]

**4.22
functional requirement**

requirement that specifies a function that a system or system component must be able to perform

[IEEE 610.12-1990]

NOTE The software quality characteristic “functionality” can be used to specify or evaluate the suitability, accuracy, interoperability, security and compliance of a function (see ISO/IEC 9126-1 [ISO/IEC 25010]).

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**4.23
implied needs**

needs that may not have been stated but are actual needs

NOTE Some implied needs only become evident when the software or product is used in particular conditions.

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EXAMPLE Implied needs include: needs not stated but implied by other stated needs and needs not stated because they are considered to be evident or obvious.

**4.24
indicator**

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

[ISO/IEC 15939:2002]

NOTE In ISO/IEC 14598 this definition was: "a measure that can be used to estimate or predict another measure".

**4.25
information need**

insight necessary to manage objectives, goals, risks, and problems

[ISO/IEC 15939:2002]

**4.26
information product**

one or more indicators and their associated interpretations that address 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.

[ISO/IEC 15939:2002]

4.27**information system needs**

needs that can be specified as quality requirements by external measures and sometimes by internal measures

4.28**intermediate software product**

product of the software development process that is used as input to another stage of the software development process

EXAMPLE Intermediate software products can include static and dynamic models, other documents and source code.

4.29**intermediate software product needs**

needs that can be specified as quality requirements by internal measures

4.30**internal software quality**

capability of a set of static attributes of a software product to satisfy stated and implied needs when the software product is used under specified conditions

NOTE 1 Static attributes include those that relate to the software architecture, structure and its components.

NOTE 2 Static attributes can be verified by review, inspection and/or automated tools.

EXAMPLE The number of lines of code, complexity measures and the number of faults found in a walk through are all internal software quality measures made on the product itself.

4.31**maintainer**

individual or organisation that performs maintenance activities

NOTE Based on the definition in ISO/IEC 12207:1995.

4.32**measure (noun)**

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

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

[ISO/IEC 15939:2002]

4.33**measure (verb)**

make a measurement

[ISO/IEC 14598-1:1999]

4.34**measurement**

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

[ISO/IEC 15939:2002, based on the definition in International Vocabulary of Basic and General Terms in Metrology, 1993]

NOTE Measurement can include assigning a qualitative category such as the language of a source program (ADA, C, COBOL, etc.).

4.35

measurement function

algorithm or calculation performed to combine two or more base measures

[ISO/IEC 15939:2002]

4.36

measurement method

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

[ISO/IEC 15939:2002, based on the definition in International Vocabulary of Basic and General Terms in Metrology, 1993].

4.37

measurement procedure

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

[ISO/IEC 15939:2002, based on the definition in International Vocabulary of Basic and General Terms in Metrology, 1993]

4.38

measurement process

process for establishing, planning, performing and evaluating software measurement within an overall project or organisational measurement structure

[ISO/IEC 15939:2002]

4.39

observation

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

[ISO/IEC 15939:2002]

4.40

operator

individual or organisation that operates the system

NOTE Based on the definition in ISO/IEC 12207:1995.

4.41

process

system of activities, which use resources to transform inputs into outputs

[ISO 9000:2000]

4.42

quality in use (measure)

the extent to which a product used by specific users meets their needs to achieve specific goals with effectiveness, productivity, safety and satisfaction in specific contexts of use

4.43

quality measure elements

measure, which is either a base measure or a derived measure, that is used for constructing software quality measures

NOTE The software quality characteristic or subcharacteristic of the entity is derived afterwards by calculating a software quality measure.

4.44 quality model

defined set of characteristics, and of relationships between them, which provides a framework for specifying quality requirements and evaluating quality

4.45 rating

action of mapping the measured value to the appropriate rating level. Used to determine the rating level associated with the software product for a specific quality characteristic

4.46 rating level

scale point on an ordinal scale, which is used to categorise a measurement scale

NOTE 1 The rating level enables software product to be classified (rated) in accordance with the stated or implied needs.

NOTE 2 Appropriate rating levels may be associated with the different views of quality i.e. Users', Managers' or Developers'.

4.47 requirements

expression of a perceived need that something be accomplished or realized

NOTE The requirements may be specified as part of a contract, or specified by the development organisation, as when a product is developed for unspecified users, such as consumer software, or the requirements may be more general, as when a user evaluates products for comparison and selection purpose.

4.48 scale

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

[ISO/IEC 15939:2002, based on the definition in International Vocabulary of Basic and General Terms in Metrology, 1993]

EXAMPLE Types of scales are: a nominal scale which corresponds to a set of categories; an ordinal scale which corresponds to an ordered set of scale points; an interval scale which corresponds to an ordered scale with equidistant scale points; and a ratio scale which not only has equidistant scale point but also possesses an absolute zero. Measures using nominal or ordinal scales produce qualitative data, and measures using interval and ratio scales produce quantitative data.

4.49 software product

set of computer programs, procedures, and possibly associated documentation and data

[ISO/IEC 12207:1995]

NOTE 1 Products include intermediate products, and products intended for users such as developers and maintainers.

NOTE 2 In SQuaRE standards software quality has the same meaning as software product quality.

4.50 software product evaluation

technical operation that consists of producing an assessment of one or more characteristics of a software product according to a specified procedure

4.51 software quality

capability of software product to satisfy stated and implied needs when used under specified conditions