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Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — Quality model overview and usage

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Foreword

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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).

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

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.

Introduction

A wide variety of organizational functions and personal activities are increasingly performed by information systems and IT services. Therefore, high-quality information systems and IT services are essential to providing value and avoiding potential negative consequences for their stakeholders. Unfortunately, quality assurance has traditionally focused primarily on functional requirements, giving far less attention to the non-functional attributes of a system/product. Comprehensive specification, design, and evaluation of all quality attributes of information systems and IT services are critical to optimizing the value of information systems to their stakeholders.

The comprehensive specification of quality characteristics associated with a specific type of information system is represented in a quality model. A quality model can be used as an objective reference supporting requirements definition, evaluation, and validation/verification. By establishing an international agreement on quality characteristics and their measurement, the SQuaRE family of standards provides a framework for reliable world-wide development and delivery of information systems and IT services.

This document is intended to provide guidelines for interpreting and using ISO/IEC 25010, ISO/IEC TS 25011, ISO/IEC 25012, ISO/IEC 25019, and other SQuaRE quality models to be published in the future. Quality models in the SQuaRE family can guide the development of quality measures and evaluation processes used to provide evidence that information systems, ICT products, data, and IT services have the capability to perform their role in achieving the sustainable development goals of SDGs 4, 9, and 11.

This document introduces the structure of SQuaRE quality models and provides requirements for developing them. This document describes how SQuaRE quality models in the quality model division (ISO/IEC 2501n) can be used in conjunction with other SQuaRE standards to guide quality-related activities across the information system lifecycle. These quality models can guide the development of measures for evaluating the quality of information systems and IT services to meet the requirements of their stakeholders. These models provide a common language for describing quality characteristics that can be understood by all stakeholders and should be considered in defining product requirements. They also provide a basis for defining standard quantitative measures of quality characteristics for evaluating the quality properties of a target entity.

The complexity of information systems has grown exponentially with the advent of modern digital technologies. This complexity elevates the importance of non-functional requirements and qualities. SQuaRE quality models can help guide the development of modern digital technologies that are trustworthy and that delight their users.

This document is a part of the SQuaRE series of International Standards, which consists of the following divisions:

— quality management division;

— quality model division;

— quality measurement division;

— quality requirements division;

— quality evaluation division;

— SQuaRE extension division.

Figure 1 (adapted from ISO/IEC 25000) illustrates the organization of the SQuaRE family of International Standards. Similar standards are grouped into divisions. Each division provides guidance and resources for performing a different function in ensuring system and software product quality.

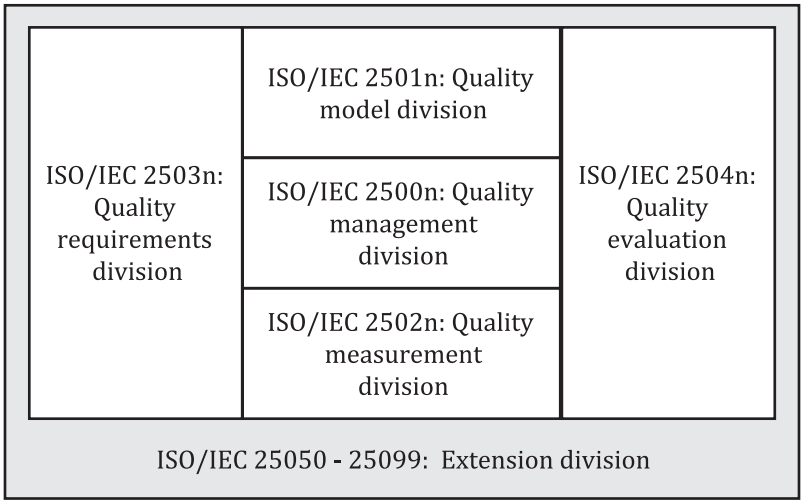

Figure 1 — Organization of SQuaRE family of International Standards

The divisions within the SQuaRE family are:

— ISO/IEC 25000 to ISO/IEC 25009 - quality management division. The International Standards that form this division define all common models, terms, and definitions referred to by all other International Standards from the SQuaRE family. 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 25000: Guide to SQuaRE

  — ISO/IEC 25001: Planning and management

  — ISO/IEC 25002: Quality models overview and usage

— ISO/IEC 25010 to ISO/IEC 25019 - 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 25010: Product quality model

  — ISO/IEC TS 25011: IT service quality model

  — ISO/IEC 25012: Data quality model

  — ISO/IEC 25019: Quality-in-use model

— ISO/IEC 25020 to ISO/IEC 25029 - 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 properties of products, data, IT services and quality-in-use. Quality measure elements (QME) forming foundations for quality measures for internal and external properties of products are defined and presented.

— ISO/IEC 25030 to ISO/IEC 25039 - 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 25040 to ISO/IEC 25049 - 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 guideline for documenting a measure as an evaluation module is also provided.

— 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.

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

The SQuaRE standards can also be used in conjunction with ISO/IEC 33000 family of International Standards which are concerned with software process assessment to 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 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) — Quality model overview and usage

1 Scope

This document establishes a framework for defining quality models which are composed of quality characteristics and sub-characteristics. In particular, this document provides:

— the concept of a quality model;

— the structure and semantics of quality models;

— the relationship between quality models and the other concepts, including measurement, requirement definition, and evaluation;

— guidelines, requirements and examples for using quality models.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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
attribute
inherent property or characteristic of an entity that can be distinguished quantitatively or qualitatively by human or automated means

[SOURCE: ISO/IEC 25000:2014, 4.1, modified — Notes to entry have been removed.]

3.2
component
entity with discrete structure, such as an assembly or software module, within a *system* (3.29) considered at a particular level of analysis

Note 1 to entry: *ICT products* (3.8) are composed from multiple entities including sub-ICT products, hardware, firmware, communication infrastructure, software, software components, and data

[SOURCE: ISO/IEC 19770-5:2015, modified — The term has been changed from "software component" to "component"; the original note 1 to entry has been replaced by a new one.]

3.3
context of use
users (3.31), tasks, equipment (hardware, software and materials), and the physical and social environments in which a *product* (3.15) is used

[SOURCE: ISO/IEC 25000:2014, 4.2]

3.4
data quality
capability of the characteristics of data to satisfy stated and implied needs when used under specified conditions

[SOURCE: ISO/IEC 25000:2014, 4.5, modified— "degree to which the characteristics of data satisfy" has been changed to "capability of the characteristics of data to satisfy".]

3.5
developer
individual or organization that performs development activities [including *requirements* (3.25) analysis, design, testing through acceptance] during the *system* (3.29) or software life cycle process

[SOURCE: ISO/IEC 25000:2014, 4.6]

3.6
direct user
person who interacts with the *product* (3.15)

Note 1 to entry: This includes primary *users* (3.31) who use the *system* (3.29) to achieve their goals and secondary users like content providers, system managers, administrators, operators and installers.

3.7
evaluator
individual or organization that performs an evaluation

[SOURCE: ISO/IEC 25000:2014, 4.10]

3.8
ICT product
product (3.15) which uses information and communication technologies (ICTs) and can be a part of *information system* (3.10)

Note 1 to entry: ICT product can constitute other ICT products (sub-products) and sometimes a *component* (3.2) of an ICT product can also be considered as ICT products by themselves. Examples of ICT products includes computer hardware, software *products* (3.15), and data.

Note 2 to entry: ICT product refers to combination of one or more technology components (e.g. cloud, internet, data, multimedia, communication, hardware, firmware, software, and middleware) that enables modern computing and allows people and organizations to interact and operate in the digital world.

Note 3 to entry: ICT product does not include people, machines, infrastructure, and other facilities which are independent from communication and data. ICT product includes hardware with embedded computer, such as sensors and communicators, but not the *users* (3.31).

Note 4 to entry: While many artefacts like data sheets, user manuals, installation manuals, operations guides, and configuration guides contribute to the quality of an ICT product and the information system that constitutes it, they are not ICT products by themselves.

[SOURCE: ISO/IEC 25030:2019, 3.8, modified — The original note 1 to entry has been removed; 4 new notes to entry have been added.]

3.9
indirect user
person who receives output from a *system* (3.29), but does not interact with the system

EXAMPLE business managers, acquirers, product managers