
**Information technology — Software product
evaluation —**

**Part 1:
General overview**

*Technologies de l'information — Évaluation de produits logiciels —
Partie 1: Aperçu général*
**iTeh STANDARD PREVIEW
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ISO/IEC 14598-1:1999

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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. 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.

International Standard ISO/IEC 14598-1 was prepared by Joint Technical Committee ISO/IEC JTC 1 *Information technology*, Subcommittee SC 7, *Software engineering*.

ISO/IEC 14598-1 is intended for use in conjunction with ISO/IEC 9126-1 (in preparation) which will replace ISO/IEC 9126 (1991).

ISO/IEC 14598 consists of the following parts under the general title *Information technology — Software product evaluation*:

- iTeh STANDARD PREVIEW**
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- *Part 1: General overview*
 - *Part 2: Planning and management* <https://standards.iteh.ai/catalog/standards/sist/c2ba7d60-5124-4b9b-8c1b-1d6a335d9a28/iso-iec-14598-1-1999>
 - *Part 3: Process for developers*
 - *Part 4: Process for acquirers*
 - *Part 5: Process for evaluators*
 - *Part 6: Documentation of evaluation modules*

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 may lead to serious consequences.

Throughout the history of software engineering, software quality improvement has been a most important goal. The evaluation of software product quality is vital to both the acquisition and development of software which meets quality requirements. The relative importance of the various characteristics of software quality depends on the mission or objectives of the system of which it is a part; software products need to be evaluated to decide whether relevant quality characteristics meet the requirements of the system.

The essential parts of software quality evaluation are a quality model, the method of evaluation, software measurement, and supporting tools. To develop good software, quality requirements should be specified, the software quality assurance process should be planned, implemented and controlled, and both intermediate products and end products should be evaluated. To achieve objective software quality evaluations, the quality attributes of the software should be measured using validated metrics.

The term "metric" has been used in many senses in software engineering publications. In this international standard it is defined as a quantitative scale and method which can be used for measurement. The word "measure" is used to refer to the result of a measurement.

The ISO/IEC 14598 series of standards give methods for measurement, assessment and evaluation of software product quality. They describe neither methods for evaluating software production processes nor methods for cost prediction (software product quality measurements may, of course, be used for both these purposes).

Information technology — Software product evaluation — Part 1: General overview

1 Scope

This part of ISO/IEC 14598 introduces the other parts. It provides an overview of the other parts and explains the relationship between ISO/IEC 14598 and the quality model in ISO/IEC 9126. This part of ISO/IEC 14598 defines the technical terms used in the other parts, contains general requirements for specification and evaluation of software quality and clarifies the general concepts. Additionally, it provides a framework for evaluating the quality of all types of software product and states the requirements for methods of software product measurement and evaluation.

ISO/IEC 14598 is intended for use by developers, acquirers and independent evaluators, particularly those responsible for software product evaluation. The evaluation results produced from the application of ISO/IEC 14598 can be used by managers and developers/maintainers to measure compliance to requirements and to make improvements where necessary. The evaluation results can also be used by analysts to establish the relationships between the internal and external metrics. Process improvement personnel can use the evaluation results to determine how processes can be improved through study and examination of the project's product quality information.

NOTE Much of the guidance in ISO/IEC 14598 is not specific to software, but is also applicable to other complex products.

2 Conformance

Specification and evaluation of software conforms to this part of ISO/IEC 14598 if it uses the process in clause 6 and a quality model as required in 8.3. Conformance to ISO/IEC 14598 as a whole shall mean conformance to all applicable published parts of ISO/IEC 14598.

3 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 14598. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO/IEC 14598 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 2382-1:1993, *Information technology — Vocabulary — Part 1: Fundamental terms*.

ISO 8402:1994, *Quality management and quality assurance — Vocabulary*.

ISO/IEC 9126-1:—1), *Information technology — Software quality characteristics and metrics — Part 1: Quality characteristics and sub-characteristics*.

ISO/IEC 12207:1995, *Information technology — Software life cycle processes*.

1 To be published. Until this part is published ISO/IEC 9126:1991 should be used.

4 Terms and definitions

For the purposes of all parts of ISO/IEC 14598, the following definitions apply.

4.1

acquirer

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

[ISO/IEC 12207:1995]

4.2

attribute

a measurable physical or abstract property of an entity

NOTE Attributes can be internal or external.

4.3

developer

an organisation that performs development activities (including requirements analysis, design, testing through acceptance) during the software lifecycle process

[ISO/IEC 12207:1995]

4.4

direct measure

a measure of an attribute that does not depend upon a measure of any other attribute

4.5

evaluation module

a package of evaluation technology for a specific software quality characteristic or subcharacteristic

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

4.6

external measure

an indirect measure of a product derived from measures of the behaviour of the system of which it is a part

NOTE 1 The system includes any associated hardware, software (either custom software or off-the-shelf software) and users.

NOTE 2 The number of failures found during testing is an external measure of the number of faults in the program because the number of failures are counted during the operation of a computer system running the program.

NOTE 3 External measures can be used to evaluate quality attributes closer to the ultimate objectives of the design.

4.7

external quality

the extent to which a product satisfies stated and implied needs when used under specified conditions

4.8

failure

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

4.9

fault

an incorrect step, process or data definition in a computer program

NOTE This definition is taken from IEE 610.12-1990.

4.10**implied needs**

needs that may not have been stated but are actual needs when the entity is used in particular conditions

NOTE Implied needs are real needs which may not have been documented.

4.11**indicator**

a measure that can be used to estimate or predict another measure

NOTE 1 The predicted measure may be of the same or a different software quality characteristic.

NOTE 2 Indicators may be used both to estimate software quality attributes and to estimate attributes of the development process. They are imprecise indirect measures of the attributes.

4.12**indirect measure**

a measure of an attribute that is derived from measures of one or more other attributes

NOTE An external measure of an attribute of a computing system (such as the response time to user input) is an indirect measure of attributes of the software as the measure will be influenced by attributes of the computing environment as well as attributes of the software.

4.13**intermediate software product**

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

NOTE In some cases an intermediate product may also be an end product.

4.14**internal measure**

a measure of the product itself, either direct or indirect

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

4.15**internal quality**

the totality of attributes of a product that determine its ability to satisfy stated and implied needs when used under specified conditions

NOTE 1 The term "internal quality", used in ISO/IEC 14598 to contrast with "external quality", has essentially the same meaning as "quality" in ISO 8402.

NOTE 2 The term "attribute" is used with the same meaning as the term "characteristic" used in 4.21, as the term "characteristic" is used in a more specific sense in ISO/IEC 9126.

4.16**maintainer**

an organisation that performs maintenance activities

[ISO/IEC 12207:1995]

4.17**measure (verb)**

make a measurement

4.18**measure (noun)**

the number or category assigned to an attribute of an entity by making a measurement

4.19**measurement**

the use of a metric to assign a value (which may be a number or category) from a scale to an attribute of an entity

NOTE Measurement can be qualitative when using categories. For example, some important attributes of software products, e.g. the language of a source program (ADA, C, COBOL, etc.) are qualitative categories.

4.20**metric**

the defined measurement method and the measurement scale

NOTE 1 Metrics can be internal or external, and direct or indirect.

NOTE 2 Metrics include methods for categorising qualitative data.

4.21**quality**

the totality of characteristics of an entity that bear on its ability to satisfy stated and implied needs

NOTE 1 In a contractual environment, or in a regulated environment, such as the nuclear safety field, needs are specified, whereas in other environments, implied needs should be identified and defined (ISO 8402 :1994, note 1).

NOTE 2 In ISO/IEC 14598 the relevant entity is a software product.

[ISO 8402:1994]

4.22**quality evaluation**

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

NOTE The requirements may be formally specified, as when a product is developed for a specific user under 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.

[ISO 8402:1994]

4.23**quality in use**

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

NOTE This definition of quality in use is similar to the definition of usability in ISO 9241-11. In ISO/IEC 14598 the term usability is used to refer to the software quality characteristic described in ISO/IEC 9126-1.

4.24**quality model**

the set of characteristics and the relationships between them which provide the basis for specifying quality requirements and evaluating quality

4.25**rating**

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

4.26**rating level**

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

NOTE 1 The rating level enables software to be classified (rated) in accordance with the stated or implied needs (see 10.2).

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

4.27**scale**

a set of values with defined properties

NOTE Examples of 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 possess an absolute zero. Metrics using nominal or ordinal scales produce qualitative data, and metrics using interval and ratio scales produce quantitative data.

4.28**software**

all or part of the programs, procedures, rules, and associated documentation of an information processing system

NOTE Software is an intellectual creation that is independent of the medium on which it is recorded.

[ISO/IEC 2382.1:1993]

4.29**software product**

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

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

[ISO/IEC 12207:1995]

4.30**supplier**

an organisation that enters into a contract with the acquirer for the supply of a system, software product or software service under the terms of the contract

[ISO/IEC 12207:1995]

4.31**system**

an integrated composite that consists of one or more of the processes, hardware, software, facilities and people, that provides a capability to satisfy a stated need or objective

[ISO/IEC 12207:1995]

4.32**user**

an individual that uses the software product to perform a specific function

NOTE Users may include operators, recipients of the results of the software, or developers or maintainers of software.

4.33**validation**

confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled

NOTE 1 In design and development, validation concerns the process of examining a product to determine conformity with user needs.

NOTE 2 Validation is normally performed on the final product under defined operating conditions. It may be necessary in earlier stages.

NOTE 3 "Validated" is used to designate the corresponding status.

NOTE 4 Multiple validations may be carried out if there are different intended uses.

[ISO 8402:1994]

4.34**verification**

confirmation by examination and provision of objective evidence that specified requirements have been fulfilled

NOTE 1 In design and development, verification concerns the process of examining the result of a given activity to determine conformity with the stated requirement for that activity.

NOTE 2 "Verified" is used to designate the corresponding status.

[ISO 8402:1994]

5 Overview of ISO/IEC 14598 and ISO/IEC 9126

5.1 Structure of ISO/IEC 14598 and ISO/IEC 9126

The ISO/IEC 9126 series defines a general purpose quality model, quality characteristics and gives examples of metrics. The ISO/IEC 14598 series gives an overview of software product evaluation processes and provides guidance and requirements for evaluation. ISO/IEC 14598-2 and ISO/IEC 14598-6 relate to corporate or department level evaluation management and support, while ISO/IEC 14598-3, ISO/IEC 14598-4 and ISO/IEC 14598-5 give requirements and guidance for evaluation at the project level. Figures 1 and 2 show the relationships between these standards and technical reports.

5.2 Evaluation process

The ISO/IEC 14598 series of International Standards provides guidance and requirements for the evaluation process in three different situations:

- development (enhancement) (ISO/IEC 14598-3);
- acquisition (ISO/IEC 14598-4);
- independent evaluation (including third-party evaluation) (ISO/IEC 14598-5).

5.2.1 Process for developers

ISO/IEC 14598-3 should be used by organisations that are planning to develop a new product or enhance an existing product and intending to perform product evaluation using members of its own technical staff. It focuses on the use of those indicators that can predict end product quality by measuring intermediate products developed during the life-cycle.

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5.2.2 Process for acquirers

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ISO/IEC 14598-4 should be used by organisations that are planning to acquire or reuse an existing or pre-developed software product. It can be applied for the purposes of deciding on the acceptance of the product or for selecting a product from among alternative products. (A product may be self contained, a part of system, or it may be part of larger product.)

5.2.3 Process for evaluators

ISO/IEC 14598-5 should be used by evaluators carrying out an independent assessment of a software product. This evaluation could be performed at the request of either a developer, acquirer or some other party. This part is intended for those who perform independent evaluation. Often they work for third party organisations.

5.3 Support for evaluation

Each of the evaluation process standards can be used in conjunction with ISO/IEC 14598-2 (Planning and Management) and ISO/IEC 14598-6 (Documentation of evaluation modules) (Figure 1).

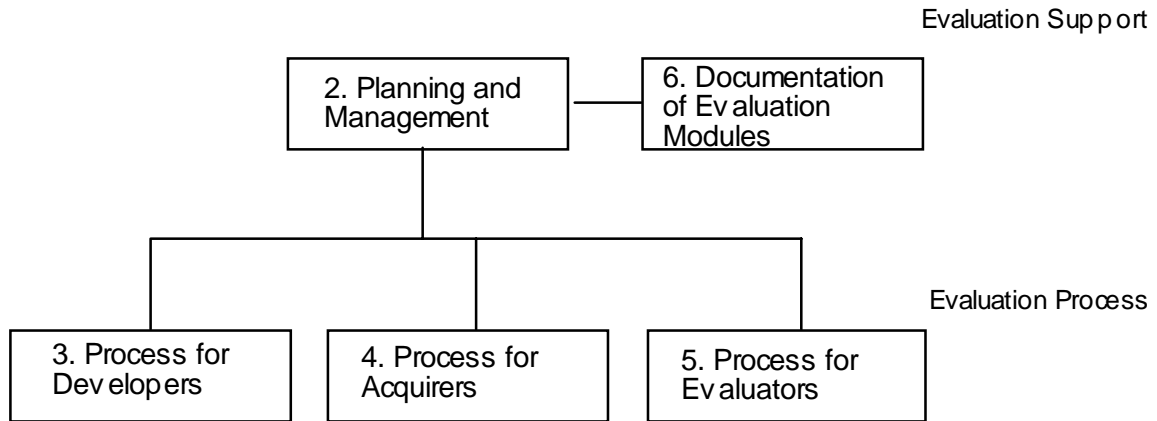


Figure 1 - Relationship of evaluation process to evaluation support standards

5.3.1 Planning and management

ISO/IEC 14598-2 Planning and Management contains requirements and guidance for supporting functions for software product evaluation. The support is related to planning and management of a software evaluation process and associated activities, including development, acquisition, standardisation, control, transfer and feedback of evaluation expertise within the organisation. This part of ISO/IEC 14598 can be used by managers to produce a quantitative evaluation plan.

5.3.2 Evaluation modules standards.iteh.ai

ISO/IEC 14598-6 provides guidance for documenting evaluation modules. These modules contain the specification of the quality model (i.e. characteristics, subcharacteristics and corresponding internal or external metrics), the associated data and information about the planned application of the model and the information about its actual application. For each evaluation appropriate evaluation modules are selected. In some cases it may be necessary to develop new evaluation modules. This part of ISO/IEC 14598 can be used by organisations producing new evaluation modules.

5.4 Software quality characteristics and metrics

Each of the parts of ISO/IEC 14598 should be used in conjunction with the planned parts of ISO/IEC 9126 describing software quality characteristics and metrics:

- Quality Characteristics and Subcharacteristics (ISO/IEC 9126-1);
- External Metrics (ISO/IEC 9126-2);
- Internal Metrics (ISO/IEC 9126-3).

ISO/IEC 9126-1 defines quality characteristics, associated subcharacteristics and the relations between the top three levels of the ISO/IEC 9126 quality model. ISO/IEC 9126-2 and ISO/IEC 9126-3 identify the relationships of each metric (internal and external) to their corresponding characteristics and subcharacteristics (see Figure 2). Note that some internal metrics have corresponding external metrics.