
*Ingénierie du logiciel — Évaluation du produit —
Partie 4: Procédé pour les acquéreurs*
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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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.

Attention is drawn to the possibility that some of the elements of this part of ISO/IEC 14598 may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 14598-4 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software engineering*.

ISO/IEC 14598 consists of the following parts under the general title *Software engineering — Product evaluation*:

— *Part 1: General overview*

— *Part 2: Planning and management*

— *Part 3: Process for developers*

— *Part 4: Process for acquirers*

— *Part 5: Process for evaluators*

— *Part 6: Documentation of evaluation modules*

Annexes A to E of this part of ISO/IEC 14598 are for information only.

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Introduction

Software has become increasingly pervasive. The demand for added software functionality and faultless software products has grown as more processes are automated to take advantage of the power of the computer. Today's modern systems are so complex, that they are unable to perform their functions without software. The use of commercially available "off-the-shelf" software products is accelerating as the variety of available products grows and the rapid evolution of software engineering technology reduces reliance on custom-coded software. The object-oriented development approach, which is based on the development of an application system through the extension of existing libraries of self-contained units, has also reduced requirements for custom-coded software. This has led to intense focus on concomitant software product quality or self-contained software unit quality.

Development of custom software is prone to rework as a result of failure to meet user requirements. The use of custom software may also require a larger than anticipated effort with respect to deployment, implementation, training, and maintenance support activities. Acquisition of commercial "off-the-shelf" software products, or, reuse of in-house existing software products, is also not without risk. Problems can be encountered because the "off-the-shelf" software products may require customizing; testing and analysis requirements may be large; product maintenance and support is doubtful when the product becomes obsolete or revised; it may be difficult to integrate software products into larger systems; and the quality of the product may not be consistent with the required quality of the target system.

Commercial "off-the-shelf" software products are extremely varied. They can be:

- a) used as stand-alone products (i.e., payroll, accounting software, consumer software or 'shrink-wrapped software' [i.e., word-processing software, spreadsheets]);
- b) integrated as components into a larger system which consists of other software and hardware components (i.e., operating system, relational data base management system, graphical users interface [GUI]);
- c) embedded in hardware (i.e., communication data link, programmable array logic [PAL]);
- d) embedded as part of a configurable software/hardware system that can be used for the development of a specific application (i.e., distributed control system);
- e) CASE tools used to support the software development and maintenance process (i.e., compilers, configuration management tools).

Errors in stand-alone software products can impact productivity, cause financial loss, or cause unnecessary rework. Software components can be difficult to integrate, affect the reliability of the overall system, or be incompatible with system objectives. CASE tools may introduce an error into a product under development or be difficult to use.

It is therefore essential to be able to evaluate the quality of software products during acquisition, or when making a decision on reusing an existing software product or component. Evaluation may be used to accept or reject a single product, or to select one product, from among alternative products, that meets the quality requirements established for the target application. The level of rigor of the evaluation process is necessarily commensurate with the integrity requirements for the product. The highest level of rigor is required when performing evaluation of software products that are mission critical.

Software engineering — Product evaluation — Part 4: Process for acquirers

1 Scope

This part of ISO/IEC 14598 contains requirements, recommendations and guidelines for the systematic measurement, assessment and evaluation of software product quality during acquisition of “off-the-shelf” software products, custom software products, or modifications to existing software products. It uses the software quality model described in ISO/IEC 9126-1; expands on the general process for evaluating software quality that is defined in ISO/IEC 14598-1; and uses the process for acquisition that is defined in ISO/IEC 12207. It can be used in conjunction with ISO/IEC 12119, ISO/IEC 14598-2 (new), ISO/IEC 14598-3 (new) and ISO/IEC 14598-6. The steps of the evaluation process are similar between this part of ISO/IEC 14598 and ISO/IEC 14598-5, but the context of use is quite different. In the case that acquirers entrust second or third parties with evaluations, ISO/IEC 14598-5 is required to be applied. In the case that acquirers require third party testing of software packages against the quality requirements for the package, ISO/IEC 12119 may be applied.

The evaluation process described in this part of ISO/IEC 14598 also helps to meet the objectives of deciding on the acceptance of a single product, or for selecting a product from among alternate products. The evaluation process may be tailored to the nature and integrity level of the application. It is also sufficiently flexible to accommodate the wide range of forms and uses of software products in a cost-effective manner.

This part of ISO/IEC 14598 is intended for, but not limited to, project managers, system engineers, development and maintenance software engineering staff and end users who plan to acquire software products, and also suppliers who provide such products.

The target software products of the evaluation process in this part of ISO/IEC 14598 can be integrated into a larger system as components or can be used stand-alone. They are classified as:

- a) Commercial off-the-shelf software products;
- b) Existing software products developed or acquired for other applications, or for a wide range of common applications;
- c) Custom software products or modifications to existing software products.

The evaluation process that is defined in this part is also applicable to CASE tools. Because evaluation of CASE tools is specifically addressed in ISO/IEC 14102, CASE tools are considered out of scope of this part of ISO/IEC 14598.

ISO/IEC 14598-4 is designed to work in partnership with other standards. For systems with high integrity requirements, additional requirements may be included in the evaluation process described in ISO/IEC 14598-4, that are derived from sector-specific standards, e.g., IEC 880, DOA-167A, MOD-55, etc.

2 Conformance

Because of the freedom of choice afforded to the user by the general nature of its recommendations, a simple claim of compliance with this part of ISO/IEC 14598 is not valid. Any organization imposing this part of ISO/IEC 14598 as a condition of trade is responsible for specifying and making public the evaluation process that meets the mandatory objectives specified in 6.1.1. The specified evaluation process constitutes the terms for compliance for a given application of this part of ISO/IEC 14598. All activities of clauses 6 and 7 shall be considered for applicability.

Requirements on the evaluation process can also be established contractually during execution of the acquisition process. Compliance with the evaluation process described in this part of ISO/IEC 14598 is then easily established.

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 9126-1, *Information technology - Software quality characteristics and metrics – Part 1: Quality characteristics and subcharacteristics*.¹⁾

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

ISO/IEC 14598-1:1999, *Information technology – Software product evaluation - Part 1: General overview*.

ISO/IEC 14598-5:1998, *Information technology – Software product evaluation - Part 5: Process for evaluators*.

ISO/IEC 15026:1998, *Information technology – System and software integrity levels*.

4 Terms and definitions

For the purposes of this part of ISO/IEC 14598, the following definitions apply. Key definitions from other standards used in this part of ISO/IEC 14598 are reproduced in Annex A for convenient reference.

4.1

commercial-off-the-shelf software (COTS)

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

NOTE See also definition in IEEE Std 1062-1993.

4.2

custom software

software developed for a specific application from a user requirements specification

4.3

existing software

software that is already developed and available; is usable either “as is” or with modifications; and which is provided by the supplier, acquirer, or a third party

NOTE See also definition of “off-the-shelf product” [ISO/IEC 12207: 1995].

5 Software product evaluation - General considerations

5.1 Correlation between evaluation and acquisition processes

The acquisition process activities (defined in ISO/IEC 12207) summarized below, are combined with the general evaluation process activities (defined in ISO/IEC 14598-1) in Clauses 6 and 7. Clause 6 focuses on the application of the evaluation of end product quality during acquisition of COTS products. Clause 7 focuses on the application of the evaluation process during acquisition of custom software or modifications to existing software.

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

- a) Initiation - identification of software requirements for the product to be acquired, the acquisition plan, and the acceptance strategy and criteria;
- b) Request-for-proposal (-tender) preparation - specification and documentation of acquisition requirements;
- c) Contract preparation and update - supplier selection, contract preparation and negotiation, and contract change control;
- d) Supplier monitoring - evaluation activities performed during contract execution leading to acceptance and delivery of the software product;
- e) Acceptance and completion - activities performed during product acceptance and delivery of the final software product.

Note, that, the general evaluation process defined in ISO/IEC 14598-1, is not defined as a process in ISO/IEC 12207, but as an elementary function equivalent to the “check” portion of the plan-do-check-act (PDCA) cycle that is implemented by each life-cycle process. However, the general evaluation process may be implemented in any ISO/IEC 12207 process (i.e., development, maintenance, acquisition, validation); it is therefore at a different level of abstraction from the sense of “process” used in ISO/IEC 12207.

This distinction is important when implementing the general evaluation process. The acquirer needs to define both the evaluation process and the acquisition process that he/she will follow to achieve the evaluation requirements during acquisition. In the context of larger system development, the acquisition and evaluation activities to be followed need to be integrated with other development and integration activities, and identified in a project measurement plan as specified in ISO/IEC 14598-2 (in preparation); i.e., specific acquisition implementation considerations for evaluation include the following considerations:

- a software requirements specification required for evaluation can form the basis for acquisition requirements required for the request-for-proposal (-tender);
- separate preliminary evaluation activities may be needed to preselect software products and suppliers;
- supplier and product information requirements for evaluation need to be specified in the acquisition requirements or during contract preparation;
- evaluation activities can be executed as part of proposal evaluation, during monitoring of contract execution, as part of product development, as part of formal product acceptance, or after product delivery.

5.2 Inputs to the evaluation process

5.2.1 System requirements

The starting point for determining evaluation requirements for target software begins with the overall system requirements. The system requirements identify the user, user goals, tasks and characteristics, including the environment in which the product is to be used, in addition to functional and other requirements for the product or system. They form the basis for subsequent system architecture design, specification of software requirements, and software architecture design. Relevant legal and regulatory requirements need to be identified at this stage as they impact on the rigor and formality of the acquisition and evaluation processes.

During system requirements decomposition and design, system requirements are allocated to hardware and software configuration items, and to user operations including system procedures. Design activities during a system development life-cycle result in subsequent decisions to acquire or reuse “off-the-shelf” software products. Some of the evaluation work is actually a part of these design activities, since it plays a role in the decision making process. Evaluation of software products to be acquired is performed separately. During system integration and testing of the end product, software configuration items are integrated with other software, and with the hardware configuration items (Refer to ISO/IEC 12207). Figure 1 shows the larger systems engineering context for evaluation and acquisition.

Candidates for use and acquisition in this part of ISO/IEC 14598 are software products which can be integrated into a larger system as components or which can be used stand-alone. They are classified as:

- a) Commercial-off-the-shelf software products;
- b) Existing software products developed or acquired for other applications, or for a wide range of common applications;
- c) Custom software products or modifications to existing software products.

In the case of software configuration items that are to be integrated into a larger system, software requirements need to be defined for each item. In other cases, the system and the software configuration items coincide, and may be considered equivalent.

Hardware configuration items to be acquired may contain software such as an operating system resident in firmware (i.e. ROM, PROM). When the existing software forms an integral part of the hardware in this fashion it usually needs to be evaluated with the hardware configuration item.

The image is a black rectangular graphic with white text and circles. At the top center, it says "iTeh STANDARD PREVIEW (standards.iteh.ai)". Below this, there is a URL: "https://standards.iteh.ai/catalog/standards/sist/ea9f1dc0-856e-4a81-76-a369c6ef8ee5/iso-iec-14598-4-1999". To the right of the URL, there are three overlapping white circles. The top circle contains the text "Non-Computer Subsystems Engineering". The middle circle contains "Subsystem Integration & System Validation". The bottom circle contains "System Operation".

model. This model defines six broad categories of characteristics of software in use: functionality, reliability, usability, efficiency, maintainability and portability. These can be further broken down into subcharacteristics which have measurable or assessable attributes.

Requirements should be defined in terms of external metrics (external metrics are defined in ISO/IEC 9126-2) which directly relate to user needs and should be documented in a requirements specification. Documenting the user needs can vary from producing an informal list of required functional and performance requirements to preparing a complete requirements specification for the product (or system if the product is embedded). The requirements specification may then form the basis for acquisition requirements used during the tendering step in the acquisition process and the basis against which subsequent product evaluation is performed.

5.2.4 Evaluations performed by others

The scope of the present evaluation process can be reduced through access to the results of evaluation activities performed by second or third parties as long as the results are trustworthy. Such evaluation activities can comprise preexisting certifications, product evaluations and/or process assessments. For example:

- software engineering processes for product development may be standardized to meet the requirements of ISO/IEC 12207, ISO 9000-3, or other sector-specific standards;
- the supplier's quality system under which the software is developed may be certified to ISO 9001 requirements by a third party;
- the software product may be evaluated by second or third parties to ISO/IEC 14598-5 or ISO/IEC 12119 requirements;
- the supplier's software process capability for acceptable product development may be assessed by third parties to ISO/IEC 15504-8 (in preparation);
- the software may be functionally evaluated as part of a larger system development phase;
- the software product may have been previously evaluated for another application with different integrity requirements;
- evaluations on the product may have been performed by other parties within the organization through informal or formal evaluation activities.

The additional costs and time required to obtain and interpret external evaluation results for the target application may affect the feasibility of this method. It may still be necessary to consult the with the evaluator or supplier in order to attain adequate confidence in the results of others.

NOTE Evaluation results of the supplier software engineering process, supplier quality system, or supplier capability alone are not sufficient criteria to demonstrate that a software product contains the required quality characteristics. Other product evaluation methods [e.g., such as those that specifically measure factors and attributes of quality that are appropriate to the requirements of the end-user] need to be executed.

5.3 Tailoring

The evaluation process can be applied to a wide range of acquisition requirements, integrity requirements, and evaluator objectives. For example:

- acquirers of software packages may wish to evaluate a software package using only ISO/IEC 12119;
- acquirers of software products may use ISO/IEC 14598-5 for independent evaluation;
- a small or sole acquirer may require a less formal evaluation process with minimum documentation of the evaluation;
- for consumer software the evaluation process objective may simply be to select, test and acquire one product from among a number of similar products. The formal acquisition process is then reduced to outright purchase, and does not include contract preparation.

The evaluation process should have the flexibility to accommodate the uniqueness of each application, to avoid unnecessary work or work that adds no value, and to provide a practical means of establishing the requisite confidence in the software. The required integrity level of the software largely determines the rigor and formality of the evaluation process.

The acquisition process can also be tailored as for the evaluation process using the tailoring guidance given in ISO/IEC 12207 and the required integrity level for the specific software product to be acquired. Acquisition of complete software systems with high integrity requirements will usually invoke the full set of acquisition activities and tasks, along with corresponding supply process activities and tasks, that are specified in ISO/IEC 12207. Generally, as the integrity level increases, so should the amount of rigor, and the number of activities and tasks associated with the acquisition process.

Table B.1 in Annex B shows an example of tailoring of integrated acquisition and evaluation process activities according to the target software integrity level requirements.

6 Evaluation during acquisition of “off-the-shelf” software products

The general software product evaluation process defined in ISO/IEC 14598-1 consists of four major steps, which are specifically implemented and refined to focus on the evaluation of end product quality during acquisition of “off-the-shelf” products in this part of ISO/IEC 14598. However, this does not preclude evaluation of intermediate products for specific quality characteristics. Hence, the details in the implementation of the steps differ, but are not inconsistent, with the details described in ISO/IEC 14598-1. The evaluation process is summarized in Table 1 below in terms of its steps and key tasks, as well as inputs and outputs.

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Table 1 — Evaluation Process During Acquisition of “Off-the-Shelf” Products

Inputs	Evaluation Step	Key Tasks	Outputs
System/ Software requirements	Establish evaluation requirements (subclause 6.1)	Specify objectives, purpose, and scope. Specify rigor of evaluation. Identify inputs to evaluation. Identify evaluation performed, or to be performed by others. Identify the acquisition process to be followed and how evaluation input requirements are to be communicated to the supplier.	Evaluation Requirements Specification
Evaluation Requirements	Specify the evaluation (subclause 6.2)	Select metrics that correlate to the characteristics of the software product. Establish rating levels. Select the most effective set of evaluation methods. Establish procedures for summarizing the results of the evaluation of different quality characteristics and other aspects that contribute to the assessment of quality of a software product in a particular environment.	Evaluation Specification
Evaluation Specification	Design the evaluation (subclause 6.3)	Prepare an evaluation plan describing the evaluation methods, and the schedule for evaluation. Identify the tie points between evaluation activities and acquisition activities.	Evaluation Plan
Evaluation Plan	Execute the evaluation (subclause 6.4)	Conduct the selected evaluation activities, and analyze and record the results to determine the suitability of the software product(s). Analyze the impact of identified deficiencies and options to regulate the use of the product. Draw conclusions with respect to the acceptability of the product and the ultimate decision to buy or not to buy.	Evaluation Records and Results

6.1 Step 1 - Establish evaluation requirements

6.1.1 Establish the purpose and scope of the evaluation

The evaluation process *shall*

NOTE Figure 2 provides an overview of the software product evaluation process. It shows the different views of the inputs to the evaluation process and resulting outputs from the evaluation process, from an acquirer's perspective.

- d) the acquisition process to be followed and how evaluation input requirements are to be communicated to the supplier;

NOTE See example of a combined evaluation and acquisition process in Figure C.1 in Annex C.