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Software and systems engineering — Certification of software and systems engineering professionals —

Part 1: General requirements

Ingénierie du logiciel — Certification des professionnels de l'ingénierie du logiciel —

Partie 1: Exigences·générales

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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.

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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents) or the IEC list of patent declarations received (see http://patents.iec.ch).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html. This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 07, *Software and systems engineering*.

This first edition cancels and replaces ISO/IEC 24773:2008 which has been technically revised.

The main changes compared to the previous edition are as follows:

— normative reference has been made to ISO/IEC 17024, for general requirements related to certifications and the certification of persons;

— a statement of general requirements or recommendations applicable to both software and systems engineering has been added;

— a separation of software-engineering-specific requirements from the generic requirements has been made;

— additional requirements for certifications in systems engineering have been included;

— additional recommendations concerning bodies of knowledge which form one element of a certification scheme have been added; and

— additional guidance concerning the description of skills and competencies has been added.

A list of all parts in the ISO/IEC 24773 series can be found on the ISO website.

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.

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Introduction

Over the past several decades, software systems have become critical components of most aspects of life. At the same time, these systems have become increasingly complex. One response to this situation has been the recognition and codification of effective practices for systems and software development processes and products. This effort has led to the development of systems and software engineering standards by ISO and IEC, by professional societies, and by national standards bodies. It has also led to the definition of an internationally-recognized body of knowledge for software engineering[5] and systems engineering[8].

The increasing globalization of the industry implies that a systems engineering or software engineering professional is likely to work in different countries over the course of a career. Currently individuals around the world are working in these domains and they possess varying levels of knowledge and skill. However, there is no single certification which is recognized for these domains – there are many certifications and they differ in several respects.

It is therefore important to develop certifications for these domains which are more meaningful, more readily comparable, and which are recognized internationally. An International Standard which contains minimum requirements for the scope and content of certifications for professionals in these domains can increase confidence in those certifications which conform to that International Standard.

Because conforming certifications meet the requirements contained in this document, the standard can improve the recognition and acceptance of those certifications in countries and jurisdictions around the world. This increased acceptance and recognition in turn can enhance the mobility of the professionals holding a conforming certification.

This document responds to the needs of organizations that require software or systems engineers whose skills and competence are attested by a certification that conforms to an International Standard.

At present, different countries have adopted different approaches regarding the required skills and knowledge for professionals working in these domains – these may be implemented by means of regulations and laws. The establishment of certifications for professionals in these domains, and the definition for minimum requirements for such schemes are not intended to interfere with or override such national regulations and laws. A certification for professionals in these domains, as described in this document is not a licence to practice in any jurisdiction. However, licensing bodies and regulators may consider various certifications of individual persons. The intention of this document is to be open to these national approaches by providing a framework for expressing them in a common scheme that can lead to understanding between different countries.

This document is part one of ISO/IEC 24773 (all parts), a multi-part standard that revises and replaces ISO/IEC 24773:2008. The existing version of ISO/IEC 24773:2008 was intended to be used as a framework for the comparison of certifications for software engineering professionals.

Many qualifications and some certifications exist for systems and software engineering. There is currently no International Standard that defines the minimum requirements for such schemes. This new revision of ISO/IEC 24773 addresses the certification of professionals in software engineering and systems engineering.

ISO/IEC 17024 is a base standard containing general requirements for bodies performing certification of persons. The revised ISO/IEC 24773 (all parts) contains requirements specifically related to certifications for software and systems engineering professionals. ISO/IEC 24773 (all parts) also contains guidance to certification bodies regarding the definition of knowledge, skill and competence that are to be incorporated into a certification for such professionals. ISO/IEC 24773 (all parts) is intended to be used in combination with ISO/IEC 17024.

ISO/IEC 24773 (all parts) is useful to industry organizations seeking to compare various certifications for professionals in systems and/or software engineering; to individual professionals seeking to obtain certification; and to employers who may choose or recognize such certifications. Such comparison is important for the society and for various types of stakeholders, since many disparate certification

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schemes currently exist in this domain and since each scheme defines its own competence scheme. A comparison framework facilitates the comparison between certifications and thus encourages certification providers to engage in continuous improvement of a certification. An engineer or an organization can also benefit from a comparison framework, because they can choose a certification which is appropriate for their skill/career development needs and their current level of achievement.

ISO/IEC 24773 (all parts) is useful to certification bodies offering schemes in the domain of systems/software engineering, as it contains minimum requirements for the certification, and conformance to ISO/IEC 24773 (all parts) can help the conforming certification to be globally accepted and recognized. The document is useful to many stakeholder groups since it can help to promote clear consistent standards for knowledge, skill and competence that are applicable to professionals in these domains.

ISO/IEC 24773 (all parts) is also useful to bodies offering qualifications in the domain of systems/software engineering. Qualifications, as defined in ISO/IEC 24773 (all parts), cannot claim conformance to ISO/IEC 24773 (all parts) because they do not address one or more of the minimum requirements defined for certification. However, the various requirements defined in ISO/IEC 24773 (all parts) can be used as a comparison framework for certification and qualification schemes. Thus, it becomes possible for a user of ISO/IEC 24773 (all parts) to examine and clarify the differences between various certification and qualification schemes. Such comparison is important from the viewpoint of society in general and from the viewpoint of various types of stakeholders, since many certification and qualification schemes exist in this domain. In addition, such a comparison framework can facilitate comparisons by both certification bodies and their customers. So, the existence of a comparison framework can encourage competition and continuous improvement of a qualification scheme. Using ISO/IEC 24773 (all parts) as a comparison framework, an engineer or an organization can more readily select certifications or qualifications that are appropriate to their needs.

ISO/IEC 24773 (all parts) consists of the following parts:

— ISO/IEC 24773-1, *Software and Systems Engineering — Certification of Software and Systems Engineering Professionals — Part I: General Requirements*

  — ISO/IEC 24773-1 serves as the basis for the revised multipart 24773 standard. It contains terminology, concepts and requirements that are common to the remaining parts.

— ISO/IEC 24773-2, *Software and Systems Engineering — Certification of Software and Systems Engineering Professionals — Part II: Guidance Regarding Description of Knowledge, Skill and Competence in Certification and Qualification Schemes.*

  — ISO/IEC 24773-2 (under preparation) provides guidance and recommendations that may be used by certification or qualification bodies regarding the description of knowledge, skill and competence within their particular schemes.

— ISO/IEC 24773-3, *Software and Systems Engineering — Certification of Software and Systems Engineering Professionals — Part III: Systems Engineering*

  — ISO/IEC 24773-3 (under preparation) provides specific requirements for certification schemes and certification bodies in systems engineering.

— ISO/IEC 24773-4, *Software and Systems Engineering — Certification of Software and Systems Engineering Professionals — Part IV: Software Engineering*

  — ISO/IEC 24773-4 (under preparation) provides specific requirements for certification schemes and certification bodies in software engineering.

ISO/IEC 24773 (all parts) is applicable across all organizations and is useful to certification or qualification bodies and consumers (potential certificants, employers and IT service users) who are comparing or evaluating various certification or qualification schemes.

ISO/IEC 24773 (all parts) references and uses as a normative base the general concepts and basic requirements related to the certification and qualification of persons. ISO/IEC 17024 is used and referenced by ISO/IEC 24773 (all parts) with respect to the general requirements of establishing

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and managing a certification or a qualification scheme. ISO/IEC 24773 (all parts) is intended to provide additional requirements and guidance that are specific to schemes in the domains of systems engineering and software engineering.

When published, ISO/IEC 24773-3 and ISO/IEC 24773-4 will incorporate by reference the requirements defined in ISO/IEC 24773-1. This relationship is depicted in Figure 1.

NOTE When published, conformance of a certification scheme in systems engineering will be claimed with respect to the requirements contained in ISO/IEC 24773-3, and by reference, the general requirements contained in ISO/IEC 24773-1. Similarly, when published, conformance of a certification scheme in software engineering will be claimed with respect to the requirements contained in ISO/IEC 24773-4 and ISO/IEC 24773-1. A certification scheme can only claim conformance to ISO/IEC 24773 (all parts) if it satisfies all requirements contained in ISO/IEC 24773-1 and either of ISO/IEC 24773-3 or ISO/IEC 24773-4.

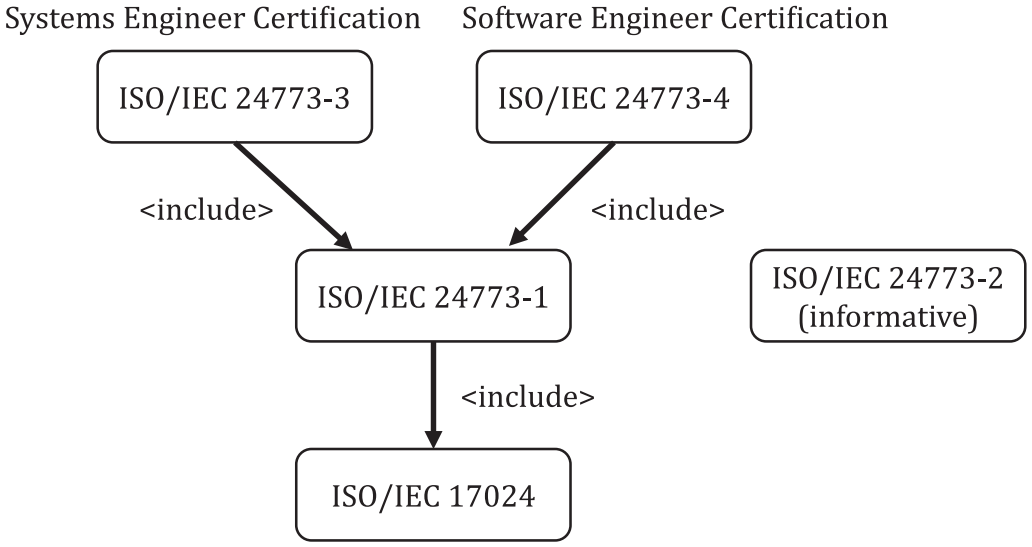


Figure 1 — ISO/IEC 24773 Structure and normative references

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Software and systems engineering — Certification of software and systems engineering professionals —

Part 1: General requirements

1 Scope

This document is part one of the ISO/IEC 24773 series. It contains the requirements which will be common to all other parts of the ISO/IEC 24773 series, for certifications (schemes and bodies) in the domain of software and systems engineering.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 17024, *Conformity assessment — General requirements for bodies operating certification of persons*

ISO/IEC TS 17027, *Conformity assessment — Vocabulary related to competence of persons used for certification of persons*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 17024, ISO/IEC TS 17027 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
applicant
person who has submitted an application to be admitted into the *certification process* (3.6)

[SOURCE: ISO/IEC 17024:2012, 3.13]

3.2
assessment
process that evaluates a person's fulfilment of the requirements of the *certification scheme* (3.8)

[SOURCE: ISO/IEC 17024:2012, 3.8]

3.3
candidate
applicant (3.1) who has fulfilled specified prerequisites and has been admitted to the *certification process* (3.6)

[SOURCE: ISO/IEC 17024:2012, 3.14]

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3.4
certificant
recipient or holder of a certification

3.5
certificate
document issued by a certification body under the provisions of this document, indicating that the named person has fulfilled the *certification requirements* (3.7)

[SOURCE: ISO/IEC 17024:2012, 3.5, modified — The NOTE has been removed.]

3.6
certification process
activities by which a certification body determines that a person fulfils *certification requirements* (3.7), including application, assessment, decision on certification, recertification and use of *certificates* (3.5) and logos/marks

[SOURCE: ISO/IEC 17024:2012, 3.1]

3.7
certification requirements
set of specified requirements, including requirements of the scheme to be fulfilled in order to establish or maintain certification

Note 1 to entry: This definition refers to requirements which apply to the candidate.

[SOURCE: ISO/IEC 17024:2012, 3.3, modified — Note 1 to entry has been added.]

3.8
certification scheme
competence (3.9) and other requirements related to specific occupational or skilled categories of persons

Note 1 to entry: A certification scheme addresses a candidate's knowledge, skill, competence or proficiency, but it also includes requirements for certified person's ongoing maintenance of proficiency. A specific scheme also contains declarations concerning scope and title; the criteria for assessment of the certified person; and declarations regarding validation of the scheme. The scheme is documented.

[SOURCE: ISO/IEC 17024:2012, 3.2, modified — The original NOTE has been removed; Note 1 to entry has been added.]

3.9
competence
competency
ability to apply knowledge and skills to achieve intended results

Note 1 to entry: Results are defined with respect to tasks, functions or responsibilities which in turn are job/role/title-related.

Note 2 to entry: The word competency and competencies can be used as synonyms of competence and competences. Competence can be used to refer to general ability (e.g. overall competence), while competency can be used to refer to a specific ability (e.g. competency in design of user interfaces). The word competence is used in this document to refer to a general ability; and the word competency is used in this document to refer to a specific ability.

[SOURCE: ISO/IEC 17024:2012, 3., modified — The alternative term "competency" has been added; Note 1 and Note 2 to entry have been added.]

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3.10
examination
mechanism that is part of the *assessment* (3.2), which measures a *candidate's* (3.3) *competence* (3.9) by one or more means such as written, oral, practical and observational, as defined in the *certification scheme* (3.8)

[SOURCE: ISO/IEC 17024:2012, 3.9]

3.11
body of knowledge
BOK
collection of knowledge items or areas generally agreed to be essential to understanding a particular subject

3.12
reference body of knowledge
body of knowledge (3.11) that is used for the comparison of a particular body of knowledge associated with a *certification scheme* (3.8)

3.13
qualification
<general> demonstrated education, training and work experience, where applicable

[SOURCE: ISO/IEC 17024:2012, 3.7]

3.14
qualification
<professional recognition> specific recognition, title or token, which may indicate proficiency, skill or knowledge in a given domain, but which is done on a one-time basis only

Note 1 to entry: A qualification of this meaning is similar to a certification but satisfying fewer requirements specified for certifications. See 5.2 for more explanations.

3.15
qualification scheme
requirements which, when satisfied, results in the issuance of a *qualification* (3.14)

4 Conformance

This document contains general requirements that apply to all certifications within the scope of the ISO/IEC 24773 series. The general requirements in this document are referenced and incorporated by subsequent parts of the ISO/IEC 24773 series. Therefore, conformance cannot be claimed to this document alone.

One of the requirements contained in this document is that of conformance to ISO/IEC 17024. This means that conformance to ISO/IEC 17024 is a prerequisite of any claim of conformance to this document. However, this document does not address conformance to ISO/IEC 17024, nor does it address conformity assessment under ISO/IEC 17024. These issues are addressed directly by ISO/IEC 17024.

5 Concepts relating to certification and qualification

5.1 General

This clause introduces major concepts related to the certification and qualification of professionals in systems and software engineering.

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