INTERNATIONAL STANDARD

ISO/IEC 29110-2

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Software engineering — Lifecycle profiles for Very Small Entities (VSEs) —

Part 2:
Framework and taxonomy

Ingénierie du logiciel — Profils de cycle de vie pour très petits organismes (TPO) —

Partie 2: Cadre général et taxinomie

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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 29110-2 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*.

ISO/IEC 29110 consists of the following parts, under the general title *Software engineering — Lifecycle profiles for Very Small Entities (VSEs)*:

⎯ *Part 1: Overview* [Technical Report]

⎯ *Part 2: Framework and taxonomy*

⎯ *Part 3: Assessment guide* [Technical Report]

⎯ *Part 4-1: Profile specifications: Generic profile group*

⎯ *Part 5-1-2: Management and engineering guide: Generic profile group: Basic profile* [Technical Report]

Parts 4 and 5 can be developed to accommodate new profile specifications and management and engineering guides as follows:

⎯ *Part 4-m: Profile specifications: Profile group aaaaa*

⎯ *Part 5-m-n: Management and engineering guide: Profile group aaaaa: Profile bbbbb* [Technical Report]

Introduction

The software industry recognizes the value of Very Small Entities (VSEs) in contributing valuable products and services. For the purpose of ISO/IEC 29110, a Very Small Entity (VSE) is an entity (enterprise, organization, department or project) having up to 25 people. VSEs also develop and/or maintain software that is used in larger systems; therefore, recognition of VSEs as suppliers of high quality software is often required.

According to the Organization for Economic Co-operation and Development (OECD) SME and Entrepreneurship Outlook report (2005) 'SMEs constitute the dominant form of business organisation in all countries world-wide, accounting for over 95 % and up to 99 % of the business population depending on country'. The challenge facing OECD governments is to provide a business environment that supports the competitiveness of this large heterogeneous business population and that promotes a vibrant entrepreneurial culture.

From studies and surveys conducted, it is clear that the majority of International Standards do not address the needs of VSEs. Conformance with these standards is difficult, if not impossible. Subsequently VSEs have no, or very limited, ways to be recognized as entities that produce quality software in their domain. Therefore, VSEs are often cut off from some economic activities.

It has been found that VSEs find it difficult to relate International Standards to their business needs and to justify the application of the standards to their business practices. Most VSEs can neither afford the resources, in terms of number of employees, budget and time, nor do they see a net benefit in establishing software life cycle processes. To rectify some of these difficulties, a set of guides has been developed according to a set of VSE characteristics. The guides are based on subsets of appropriate standards elements, referred to as VSE Profiles. The purpose of a VSE profile is to define a subset of International Standards relevant to the VSE context, for example, processes and outcomes of ISO/IEC 12207 and products of ISO/IEC 15289.

ISO/IEC 29110, targeted by audience, has been developed to improve product and/or service quality, and process performance. See Table 1. ISO/IEC 29110 is not intended to preclude the use of different life cycles, such as waterfall, iterative, incremental, evolutionary or agile.

Table 1 — ISO/IEC 29110 target audience

ISO/IEC 29110	Title	Target audience
Part 1	Overview	VSEs, assessors, standards producers, tool vendors, and methodology vendors
Part 2	Framework and taxonomy	Standards producers, tool vendors and methodology vendors. Not intended for VSEs.
Part 3	Assessment guide	Assessors and VSEs
Part 4	Profile specifications	Standards producers, tool vendors and methodology vendors. Not intended for VSEs.
Part 5	Management and engineering guide	VSEs

If a new profile is needed, ISO/IEC 29110-4 and ISO/IEC TR 29110-5 can be developed without impacting existing documents and they become ISO/IEC 29110-4-m and ISO/IEC 29110-5-m-n, respectively, through the ISO/IEC process.

ISO/IEC TR 29110-1 defines the business terms common to the VSE Profile Set of Documents. It introduces processes, lifecycle and standardization concepts, and the ISO/IEC 29110 series. It also introduces the characteristics and requirements of a VSE, and clarifies the rationale for VSE-specific profiles, documents, standards and guides.

This part of ISO/IEC 29110 introduces the concepts for software engineering standardized profiles for VSEs, and defines the terms common to the VSE Profile Set of Documents. It establishes the logic behind the definition and application of standardized profiles. It specifies the elements common to all standardized profiles (structure, conformance, assessment) and introduces the taxonomy (catalogue) of ISO/IEC 29110 profiles.

ISO/IEC TR 29110-3 defines the process assessment guidelines and compliance requirements needed to meet the purpose of the defined VSEs Profiles. ISO/IEC TR 29110-3 also contains information that can be useful to developers of assessment methods and assessment tools. ISO/IEC TR 29110-3 is addressed to people who have direct relation with the assessment process, e.g. the assessor and the sponsor of the assessment, who need guidance on ensuring that the requirements for performing an assessment have been met.

ISO/IEC 29110-4-m provides the specification for all the profiles in one profile group that are based on subsets of appropriate standards elements. VSE Profiles apply and are targeted to authors/providers of guides and authors/providers of tools and other support material.

ISO/IEC TR 29110-5-m-n provides an implementation management and engineering guide for the VSE Profile described in ISO/IEC 29110-4-m.

Figure 1 describes the ISO/IEC 29110 series and positions the parts within the framework of reference. Overviews and guides are published as Technical Reports (TR), and profiles are published as International Standards (IS).

29110 Overview (TR 29110-1)

29110 Profiles (IS)

Framework and Taxonomy (IS 29110-2)

Specifications of VSE Profiles (IS 29110-4)

Specification - VSE Profile Group m
(IS 29110-4-m)

29110 Guides (TR)

Assessment Guide (TR 29110-3)

Management and Engineering Guide (TR 29110-5)

Management and Engineering Guide VSE Profile m-n
(TR 29110-5-m-n)
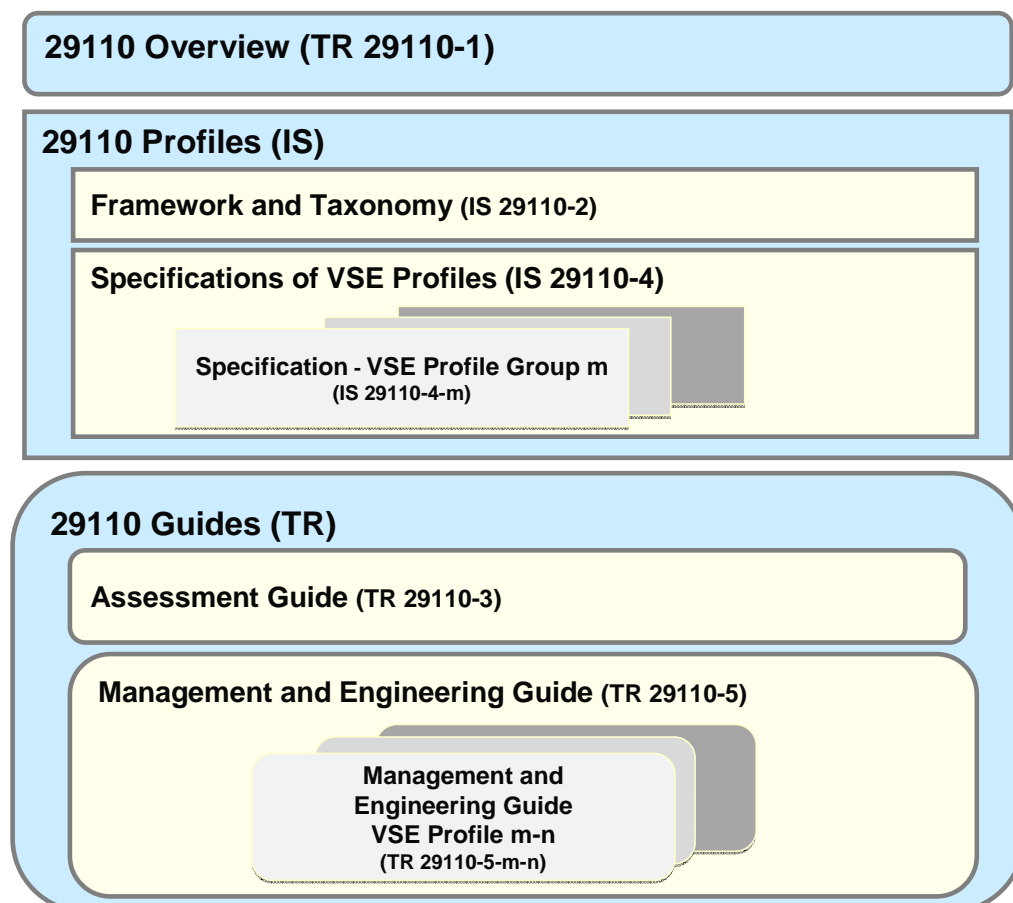
Figure 1 — ISO/IEC 29110 series

Software engineering — Lifecycle profiles for Very Small Entities (VSEs) —

Part 2:
Framework and taxonomy

1 Scope

1.1 Fields of application

ISO/IEC 29110 is applicable to Very Small Entities (VSEs). The life cycle processes described in ISO/IEC 29110 are not intended to preclude or discourage their use by organizations bigger than VSEs. However, certain issues faced by large organizations might not be covered by ISO/IEC 29110.

The life cycle processes defined in ISO/IEC 29110 can be used by VSEs when acquiring and using, as well as when creating and supplying, a software system. They can be applied at any level in a software system's structure and at any stage in the lifecycle. The processes described in ISO/IEC 29110 are not intended to preclude or discourage the use of additional processes that VSEs find useful.

This part of ISO/IEC 29110 introduces the major concepts for software engineering profiles for VSEs, and defines the terms common to the set of documents associated with VSE profiles.

It establishes the logic behind the definition and application of profiles. It specifies the elements common to all standardized profiles (structure, conformance, assessment) and introduces the taxonomy (catalogue) of ISO/IEC 29110 profiles.

This part of ISO/IEC 29110 is applicable to all profiles.

1.2 Target audience

This part of ISO/IEC 29110 is targeted at authors and reviewers of standardized profiles, authors of other parts, and authors of other VSE profiles.

2 Conformance to standardized profiles

2.1 Introduction

Conformance is specified within each profile specification document, published as ISO/IEC 29110-4-m. The general rules for conformance to ISO/IEC 29110 profiles are outlined in 2.2 and 2.3.

2.2 General principles

2.2.1 Tailoring and exclusions

ISO/IEC 29110 standardized profiles are pre-tailored packages of related software engineering standards, therefore:

— Tailoring of ISO/IEC 29110 profiles is not needed nor allowed.

— Partial compliance is not allowed (except in one case outlined in 2.2.3).

— There are no levels of conformance.

2.2.2 Extensions

It is acceptable for an implementation to incorporate elements beyond what is defined in the specification of the profile. However this can cause implementation interoperability problems, and could be accommodated by defining or using a richer profile.

If a profile allows extensions, each implementation shall fully support all required elements of the profile specification exactly as specified, and the extensions shall not contradict nor cause the non-conformance of elements defined in the profile specification. The conformance clause of profiles that allow extensions should include some additional, more specific, requirements, such as the following.

— Extensions shall not re-define semantics for existing elements.

— Extensions shall not cause standard-conforming implementations (i.e., processes that do not use the extensions) to be performed incorrectly.

— Extensions shall follow the principles and guidelines of the specification they extend, i.e., the specifications must be extended in a standard manner (see section below).

— For implementations and/or applications that contain extensions, extensions shall be clearly described in supporting documentation and the extensions shall be marked as such within the implementation/application.

— For implementations that contain extensions, there shall be a mode under which the implementation can be directed to produce only conformant files (documents) or to operate in a strictly conformant manner.

2.2.3 Conformance to base standards

The purpose of a standardized profile is to specify the use of sets of specifications to provide clearly defined functionality. Hence, conformance to ISO/IEC 29110 standardized profile specifications always implies conformance to the referenced base standards' specifications, if it is referenced in totality in the profile.

However, if only part of the base standard is referenced in the profile, the above statement is true inasmuch as the base standard conformance clause allows for tailored and partial compliance.

The conformance requirements of an ISO/IEC 29110 standardized profile shall relate to the conformance requirements in the base standards in the following ways.

a) Unconditional mandatory requirements in the base standards shall remain mandatory in the ISO/IEC 29110 profile.

b) Unconditional options in base standards may remain optional or may be changed within the profile to become:

    1) mandatory;

2) conditional, giving rise to different statuses dependent upon some appropriate condition;

3) out of scope, if the option is not relevant to the scope of the profile – for example, functional elements which are unused in the context of the profile;

4) prohibited, if the use of the option is to be regarded as non-conformant behaviour within the context of the profile – this choice should only be used when really necessary, "out of scope" can often be more appropriate.

c) If the conditions in the conditional requirements in the base standards can be fully evaluated in the context of the profile, then these requirements become unconditional mandatory requirements or unconditional options, or they become out of scope or prohibited. Otherwise the conditions remain conditional, with the appropriate, possibly partially, evaluated conditions.

2.3 Conformance requirements for standardized profiles

2.3.1 Conformance situations

Conformance may be interpreted differently for various situations. The relevant situation shall be identified in the claim of conformance.

ISO/IEC 29110 profiles can be implemented by:

— developers of products that facilitate the implementation and the use of the profile within organizations – these can be methods, courses, teaching aids, tools, forms;

— organizations or projects implementing and using the processes and products prescribed by the profile.

NOTE   The case where another ISO document, such as a Guide or Technical Report, complies with the profile specification is not considered implementation conformance and subject to conformance clauses. For instance, ISO/IEC TR 29110-5 guides comply with ISO/IEC 29110-4 profile specifications, and this is evidenced by a normative reference to ISO/IEC 29110-4 in ISO/IEC TR 29110-5, not by a conformance clause.

2.3.2 Conformance to a standardized profile

A product that claims conformance to an ISO/IEC 29110 standardized profile shall implement all the mandatory profile elements as identified in the profile specification ISO/IEC 29110-4-m, and the associated properties and requirements as described in the base standards when applicable. Conformance is achieved by demonstrating that the conforming product does not exclude, modify or contradict any of the mandatory profile elements.

An organization that claims conformance to a ISO/IEC 29110 profile shall implement and use all the mandatory profile elements as identified in the profile specification ISO/IEC 29110-4-m, and the associated properties and requirements as described in the base standards when applicable. Conformance is achieved by demonstrating that:

— mandatory requirements for the lifecycle products (information items) have been satisfied using the content of conformant lifecycle products as evidence;

— mandatory requirements for the lifecycle processes have been satisfied using the outcomes and products as evidence.

Unless otherwise noted in the standardized profile conformance clause, conformance to the profile implies conformance to the base standards.

2.3.3 Limited conformance to the base standards included in the standardized profile

If an organization or a product cannot claim conformance to the profile, it can still claim conformance to the elements of the base standard included in the profile under the following conditions.

— The base standard is not totally included in the profile (if it is totally included, then the implementation should claim conformance to the base standards).

— The base standard's conformance clause allows for partial conformance and/or tailored performance.

In that case, the conformance clause shall refer only to the mandatory profile elements as identified in the profile specification ISO/IEC 29110-4-m that

— refer to the base standards in question, and

— are identified as mandatory (normative) in the base standards.

3 Normative references

The following referenced documents are indispensable for the application 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 TR 29110-1, *Software engineering — Lifecycle profiles for Very Small Entities (VSEs) — Part 1: Overview*

4 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC TR 29110-1 apply.

5 Conventions and abbreviated terms

5.1 Naming, diagramming and definition conventions

None.

5.2 Abbreviations

VSE   Very Small Entity

VSEs   Very Small Entities

SE   Software Engineering

6 Software engineering profiles for VSEs

6.1 Basic concepts

The context of Functional Standardization is one part of the overall field of IT standardization activities covering:

Base Standards, which define fundamentals and generalized procedures. They provide an infrastructure that can be used by a variety of applications, each of which can make its own selection from the options offered by them.

Standardized Profiles, which define conforming subsets or combinations of base standards used to provide specific functions. Profiles identify the use of particular options available in the base standards, and provide a basis for the development of uniform, internationally recognized, conformance tests.

Registration Mechanisms, which provide the means to specify detailed parameterization within the framework of the base standards or profiles.

Within ISO/IEC JTC 1, the process of Functional Standardization is concerned with the methodology of defining profiles, and their publication as International Standards (ISs) in accordance with procedures contained in the Directives of JTC 1. Please refer to ISO/IEC 10000-1 for the complete methodology.

6.2 Purpose of standardized profiles

Standardized profiles promote integration of base standards by defining how to use a combination of base standards for a given function and environment. In addition to the selection of base standards, a choice is made of permitted options for each base standard and of suitable values for parameters left unspecified in the base standard.

In general, profiles are prepared in order to:

— Identify the standards and profiles, together with appropriate classes, conforming subsets, options and parameters, which are necessary to accomplish identified functions or to support a class of applications;

— Provide a scheme of referencing the various uses of standards and profiles which is meaningful to both users and suppliers in response to a systematic identification and analysis of user requirements;

— Providing a means to enhance the availability for procurement of consistent implementations of activities defined groups of standards and profiles, which are expected to be the major components of real IT systems, and which realize the intentions of the corresponding reference models or frameworks with which the standards are associated.

— Promote uniformity in the development of conformance tests for IT systems that implement the functions associated with the profiles.

Underlying all these purposes is the assumption that there exists a requirement for the definition, standardization, implementation, and testing of such a profile. The processes employed shall therefore include the identification, recording, and monitoring of such requirements, as expressed by the eventual users of the profile.

Occasionally, satisfaction of some of these requirements may identify activities that are not covered by accepted base standards. This is defined as a "gap" in available standards.

Profiles shall not contradict base standards but shall make specific choices where options and ranges of values are available. The choice of the base standard options should be restricted so as to maximise the probability of achieving the objective of the profile.

6.3 Preparation of profiles

The preparation of a standardized profile requires three types of activities.

a) Selection and preparation of base standards

Once the base standards have been selected, it is important to verify that their constituting elements can be unambiguously referred to, and that relationships between those base standards are also be unambiguously referred to.

This may involve assigning unique identifiers to relevant elements of the standards, and expressing external relationships between base standards using those identifiers. When a base standard has multiple related elements, for instance if a process has outcomes, these internal relationships need to be expressed unambiguously (independently of their position in the document).

It is also important at this stage to identify if these elements are normative or informative.

b)   Selection of profile elements

Once the purpose and the content of a profile has been defined, the profile is given and identified (from the taxonomy), and it is structured into profile elements. These profile elements have to be identified in such a way that they can be unambiguously referred to, either as part of assessments or conformance, or because this profile may itself become the base for another profile.

Each of the profile element is then associated with the corresponding element in the base standard.

Relationships existing in the base standards cannot be altered by this process. For instance if process P1 has outcome O1 and activity A1, and process P2 has outcome O2 and activity A2, their inclusion in a profile cannot make O2 an outcome of P1, nor A2 a part of P1.

c)   Refinement of the profile

If the base standards identified attributes or characteristics for the elements selected in the profile, then these may require selection and precision of these. For instance, if a process can be performed at different capability levels, then mapping the profile element to the base standard element may not be sufficient for the intended purpose, and the capability level may need to be identified.

If there are "gaps" in available standards, the additional elements are incorporated in the profile as required.

A profile can be made more normative that the base standards that constitute it. It is therefore important to carry forward in the profile normative/informative characteristics, and levels of conformance if they exists.

7   Preparing profiles of Software Engineering standards

7.1   Rationale for SE profiles

In general there are multiple reasons that justify the need for profiling SE Standards:

As SE standards have been produced by several different groups and organisations, without a central guiding authority, many existing standards are not well integrated. By making more explicit the interdependencies between these standards, a profile will allow for integration whenever possible;

SE Standards generally target large entities, making initial compliance difficult for smaller entities. Preparing profiles with progressive capability levels enable a stepwise approach to full compliance;

SE Standards are generally large, and specify many elements that are not necessarily applicable to small entities. The preparation of profiles that address a subset of the base standards facilitate the match between the standards and the target audiences;

Since the ISO/IEC SE Standards do not necessarily cover all the topics, profiles can be used to integrate required elements that are not yet addressed in existing ISO/IEC SE Standards.

For the purpose of ISO/IEC 29110, SE standards are categorized in two:

a)   Process standards define the activities required to achieve identified objectives or outcomes;

b)   Product standards define the structure and content of artefacts produced by the processes.

Clause 7.2 addresses point b. while Clause 7.3 covers point a.

7.2 Profiling lifecycle product standards

A SE process product profile could be prepared to clarify the multiple options available for a given specific artefact. For instance:

ISO/IEC 15289 identifies "Database Design Description" as a standardized product of a lifecycle process.

A profile in Part 4 may decide to refer to Unified Modelling Language (UML) standard in order to describe the database design. In particular, it may suggest that Class diagram be used in order to describe the database schema. Class diagram are standardized as an IV_Object in the Unified Modelling Language Specification. Table 2 illustrates the example above. In particular, the Profile Composition refers to a particular element of a profile (defined in Part 4), then correspondence to the desired information product are given in the part of the table labelled Content of SE LC (life cycle) Information Product, in the example, reference to Database Design Description from ISO/IEC 15289 is given.

In the case where the same artefact is identified differently in multiple documents, a profile might be created to formalize that correspondence, and facilitate the use of the documents. For instance, SE assessment standards have defined their own identification scheme for SE products.

A profile (or a part of a profile) could be built to formalize this correspondence.

Table 3 gives an example of a correspondence profile for lifecycle products.

7.3 Profiling lifecycle process standards

SE lifecycle standards are generally defined using a common pattern, involving processes and outcomes, activities and tasks.

Profiling such a standard would involve selecting applicable processes and outcomes.

Table 4 gives an example of a profile for lifecycle processes and outcomes.

Because processes and outcomes are considered normative in the base standard, these elements have to be normative in the profile.

It is important to note the applicable integrity constraint, that is if in the base standard a process X has an outcome Y, it cannot be shown in the profile as the outcome another base standard process Z.

In the case where the same process is identified differently in multiple documents, a profile might be created to formalize that correspondence, and facilitate the use of the documents. For instance, SE assessment standards have defined their own identification scheme for SE processes.

An addition to the Table 4 profile could be prepared to formalize this correspondence. See Table 5.

7.4 Relating process and product standards in profiles

The relationship between processes and products is established in either product or process standards. If both processes and products are carried forward in a profile, and their relationship is also carried forward, then the tables specifying the applicable relationships (input and or output) must be added to the profile.

It is important to note the applicable integrity constraint, that is if in the base standard a product X is an output of a process Y, it cannot be shown in the profile as an output of another base standard process Z.

Table 6 gives an example profile for lifecycle processes and output products.

In the case where the same processes and products are identified differently in multiple documents, a profile might be created to formalize that correspondence, and facilitate the use of the documents. For instance, SE assessment standards have defined their own identification scheme for SE processes.

An addition to the Table 6 profile could be prepared to formalize this correspondence. See Table 7.

Table 2 — Example of a modelling formalism profile for lifecycle products

Profile Composition					Content of SE LC Information Products					Use of UML for ODP system specifications					Unified Modeling Language Specification				
Document ID	Clause #	Clause Title	Element ID	Element Name	Document ID	Clause #	Clause Title	Element ID	Element Name	Document ID	Clause #	Clause Title	Element ID	Element Name	Document ID	Clause #	Clause Title	Element ID	Element Name
Profile (IS) ID			*Profile Element*		*Standard ID*			*Record*		*Standard ID*			*Record*						
nnnnn-m	n	aaaaaaa	v.w	bbbbbb	IS 15289:2005	10	Specific Information Items	10.14	Database-Design Description	IS 19793:2007	8	Information Specification	10.14	IV_Object	IS 19501:2005	5	Static Structure Diagrams	3.19	Class Diagrams
...	...	...	...	...															

Table 3 — Example of a correspondence profile for lifecycle products

Profile Composition					Content of SE LC Information Products					Exemplar Process Assessment Model				
Document ID	Clause #	Clause Title	Element ID	Element Name	Document ID	Clause #	Clause Title	Element ID	Element Name	Document ID	Clause #	Clause Title	Element ID	Element Name
Profile (IS) ID			*Profile Element*		*Standard ID*			*Record*		*Standard ID*			*Work-product*	
nnnnn-m	n	aaaaaaa	v.w	bbbbbb	IS 15289:2005	10	Specific Information Items	10.75	System Requirements Specification	IS 15504-5:2005	Annex B (Inf)	Work product characteristics	17-03	Customer requirements
					IS 15289:2005	10	Specific Information Items	10.75	System Requirements Specification	IS 15504-5:2005	Annex B (Inf)	Work product characteristics	17-12	System requirements
					IS 15289:2005	10	Specific Information Items	10.14	Database-Design Description	IS 15504-5:2005	Annex B (Inf)	Work product characteristics	04-01	Database design
...	...	...	...	...										

Table 4 — Example of a profile for lifecycle processes and outcomes

Profile Composition

Document ID	Clause #	Clause Title	Element ID	Element Name
Profile (IS) ID			*Profile Element*	
nnnnn-m	8	aaaaaaa	8.1	...
nnnnn-m	8	aaaaaaa	8.2	...
nnnnn-m	8	aaaaaaa	8.3	...
nnnnn-m	8	aaaaaaa	8.4	...
nnnnn-m	8	aaaaaaa	8.5	...
nnnnn-m	8	aaaaaaa	8.6	...
nnnnn-m	8	aaaaaaa	8.7	...
nnnnn-m	8	aaaaaaa	8.8	...
nnnnn-m	8	aaaaaaa	8.9	...
...	...	...	...	...

Software Lifecycle Processes

Document ID	Clause #	Clause Title	Element ID	Element Name	Element ID	Element Name
Standard ID			*Process*		*Outcome*	
IS 12207:2008	6	Systems LC Processes	6.4.1	Stakeholder Requirements Definition Process	6.4.1.a	the required characteristics and context of use of services are specified;
IS 12207:2008	6	Systems LC Processes	6.4.1	Stakeholder Requirements Definition Process	6.4.1.c	traceability of stakeholder requirements to stakeholders and their needs is achieved;
IS 12207:2008	6	Systems LC Processes	6.4.1	Stakeholder Requirements Definition Process	6.4.1.d	the basis for defining the system requirements is described;
IS 12207:2008	6	Systems LC Processes	6.4.1	Stakeholder Requirements Definition Process	6.4.1.f	a basis for negotiating and agreeing to supply a service or product is provided.
IS 12207:2008	6	Systems LC Processes	6.4.2	System Requirements Analysis Process	6.4.2.a	a defined set of system functional and non-functional requirements describing the problem to be solved are established;
IS 12207:2008	6	Systems LC Processes	6.4.2	System Requirements Analysis Process	6.4.2.b	the appropriate techniques are performed to optimize the preferred project solution;
IS 12207:2008	6	Systems LC Processes	6.4.2	System Requirements Analysis Process	6.4.2.c	system requirements are analyzed for correctness and testability;
IS 12207:2008	6	Systems LC Processes	6.4.2	System Requirements Analysis Process	6.4.2.e	the requirements are prioritized, approved and updated as needed;
IS 12207:2008	6	Systems LC Processes	6.4.2	System Requirements Analysis Process	6.4.2.g	changes to the baseline are evaluated for cost, schedule and technical impact; and

Table 5 — Example of adding correspondence elements for lifecycle processes

Profile Composition					Exemplar Process Assessment Model						
Document ID	Clause #	Clause Title	Element ID	Element Name	Document ID	Clause #	Clause Title	Element ID	Element Name	Element ID	Element Name
Profile (IS) ID			*Profile Element*		*Standard ID*			*Process*		*Outcome*	
nnnnn-m	8	aaaaaaa	8.1	...	IS 15504-5:2005	5	Process dimension & performance indicators	ENG.1	Requirements elicitation	ENG.1.O2	agreed customer requirements are defined and baselined;
nnnnn-m	8	aaaaaaa	...	...	IS 15504-5:2005	5	Process dimension & performance indicators	...	...	...	...
nnnnn-m	8	aaaaaaa	8.8	...	IS 15504-5:2005	5	Process dimension & performance indicators	ENG.2	System requirements analysis	ENG.2.O5	the requirements are prioritized, approved and updated as needed
nnnnn-m	8	aaaaaaa	...	...	IS 15504-5:2005	5	Process dimension & performance indicators	...	...	...	...
...	...	...	...	...							

Table 6 — Example of a profile for lifecycle processes and output products

Profile Composition					Software Lifecycle Processes					Content of SE LC Information Products				
Document ID	Clause #	Clause Title	Element ID	Element Name	Document ID	Clause #	Clause Title	Element ID	Element Name	Document ID	Clause #	Clause Title	Element ID	Element Name
Profile (IS) ID			*Profile Element*		*Standard ID*			*Process*		*Standard ID*			*Record*	
nnnnn-m	7	aaaaaaa	7.1	...	IS 12207:2008	6	Systems LC Processes	6.4.1	Stakeholder Requirements Definition Process	IS 15289:2005	10	Specific Information Items	10.75	System Requirements Specification
nnnnn-m	7	aaaaaaa	7.2	...	IS 12207:2008	6	Systems LC Processes	6.4.2	System Requirements Analysis Process	IS 15289:2005	10	Specific Information Items	10.75	System Requirements Specification
...	...	...	...	...										

Table 7 — Example of adding correspondence elements for lifecycle processes and products

Profile Composition					Exemplar Process Assessment Model									
Document ID	Clause #	Clause Title	Element ID	Element Name	Document ID	Clause #	Clause Title	Element ID	Element Name	Document ID	Clause #	Clause Title	Element ID	Element Name
Profile (IS) ID			*Profile Element*		*Standard ID*			*Process*		*Standard ID*			*Work-product*	
nnnnn-m	7	aaaaaaa	7.1	…	IS 15504-5:2005	5	Process dimension & performance indicators	ENG.1	Requirements elicitation	IS 15504-5:2005	5	Process dimension & performance indicators	17-03	Customer requirements
nnnnn-m	7	aaaaaaa	7.2	…	IS 15504-5:2005	5	Process dimension & performance indicators	ENG.2	System requirements analysis	IS 15504-5:2005	5	Process dimension & performance indicators	17-12	System requirements
…	…	…	…	…										

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7.5   Adding assessment specification to profiles

In order to make SE profiles assessable, two conditions must be met:

a)   The profile must be specified in such a way that it conforms to a "Process reference model";

b)   The target capability levels must be specified in a conformant way, when profiles are predicated in achieving specific capability levels.

7.5.1   Process reference models

Process Reference Models provide the mechanism whereby defined Process Assessment Models are related to the Measurement Framework defined by ISO/IEC 15504. A Process Reference Model provides the basis for one or more Process Assessment Models. Process Assessment Model(s) are based on the process descriptions provided in Process Reference Models. In order to assure that assessment results are translatable into an ISO/IEC 15504 process profile in a repeatable and reliable manner, Process Reference Models shall adhere to certain requirements outlined in ISO/IEC 15504-2. When prepared, process reference models are provided as a normative annex to the profile specification (part 4).

Standardized SE capability levels are shown in Table 8.

7.5.2   Specifying profiles with capability levels

Assessment should be performed in conformance to ISO/IEC 15504. When capability levels are part of the definition of a profile, the target profile is specified using the standardized process attribute. Table 9 shows an example of adding capability levels (process attributes) to a lifecycle processes profile

When capability levels are not specified in a profile, then the default assumption is "Level-1", the process is performed.

7.6   Graduated profiles

When the objective of a set of profile is to provide a path to full conformance or performance of a profile group, it may be a duplication of effort (and a risk in terms of consistency) to define each of these profiles in terms of the base standards.

In such a case, it is easier to define the profile group in terms of the base standards, and then define the intermediate profiles in terms of the profile group. The principles of functional standardization allow for profiles to be used as base standards for other profiles.

In Table 10, the intermediate profile requires a lower capability level for process 7.2, whereas the initial profile does not require the performance of process 7.2.

Table 8 — Standardized SE capability levels

Document ID	Clause #	Clause Title	Process Attribute ID	Capability Levels And Process Attributes	Level Name	Level Definition
Standard ID					*Process*	
IS 15504-2:2002	5	Measurement Framework for process capability		Level 0	Incomplete process	The process is not implemented, or fails to achieve its process purpose.
IS 15504-2:2002	5	Measurement Framework for process capability		Level 1	Performed process	The implemented process achieves its process purpose.
IS 15504-2:2002	5	Measurement Framework for process capability	PA 1.1		Process performance	
IS 15504-2:2002	5	Measurement Framework for process capability		Level 2	Managed process	The previously described Performed process is now implemented in a managed fashion (planned, monitored and adjusted) and its work products are appropriately established, controlled and maintained.
IS 15504-2:2002	5	Measurement Framework for process capability	PA 2.1		Performance management	
IS 15504-2:2002	5	Measurement Framework for process capability	PA 2.2		Work product management	
IS 15504-2:2002	5	Measurement Framework for process capability		Level 3	Established process	The previously described Managed process is now implemented using a defined process that is capable of achieving its process outcomes.
IS 15504-2:2002	5	Measurement Framework for process capability	PA 3.1		Process definition	
IS 15504-2:2002	5	Measurement Framework for process capability	PA 3.2		Process deployment	
IS 15504-2:2002	5	Measurement Framework for process capability		Level 4	Predictable process	The previously described Established process now operates within defined limits to achieve its process outcomes.
IS 15504-2:2002	5	Measurement Framework for process capability	PA 4.1		Process measurement	
IS 15504-2:2002	5	Measurement Framework for process capability	PA 4.2		Process control	
IS 15504-2:2002	5	Measurement Framework for process capability		Level 5	Optimizing process	The previously described Predictable process is continuously improved to meet relevant current and projected business goals.
IS 15504-2:2002	5	Measurement Framework for process capability	PA 5.1		Process innovation	
IS 15504-2:2002	5	Measurement Framework for process capability	PA 5.2		Continuous optimization	

Table 9 — Example of adding capability levels (process attributes) to a lifecycle processes profile

Profile Composition				
Document ID	Clause #	Clause Title	Element ID	Element Name
Profile (IS) ID			Profile Element	
nnnnn-m	7	aaaaaaa	7.1	...
nnnnn-m	7	aaaaaaa	7.2	...
...	...	...	...	...

Software Lifecycle Processes				
Document ID	Clause #	Clause Title	Element ID	Element Name
Standard ID			Process	
IS 12207:2008	6	Systems LC Processes	6.4.1	Stakeholder Requirements Definition Process
IS 12207:2008	6	Systems LC Processes	6.4.2	System Requirements Analysis Process

Capability Levels				
Document ID	Clause #	Clause Title	Element ID	Element Name
Standard ID			Process Attribute	
IS 15504-2:2002	5	Measurement Framework for process capability	PA 1.1	Process performance
IS 15504-2:2002	5	Measurement Framework for process capability	PA 2.2	Work product management

Table 10 — Example of defining profiles in terms of other profiles

Initial Profile					
Document ID	Clause #	Clause Title	Element ID	Element Name	Capability Attribute
Profile (IS) ID			Process		
29110-4.n	7	aaaaaaa	7.1	Stakeholder Requirements Definition Process	PA 1.1
...	...	...	...	...	...

Intermediate Profile					
Document ID	Clause #	Clause Title	Element ID	Element Name	Capability Attribute
Profile (IS) ID			Process		
29110-4.m	7	aaaaaaa	7.1	Stakeholder Requirements Definition Process	PA 1.1
29110-4.m	7	aaaaaaa	7.2	System Requirements Analysis Process	PA 1.1
...	...	...	...	...	...

Target Profile					
Document ID	Clause #	Clause Title	Element ID	Element Name	Capability Attribute
Profile (IS) ID			Process		
29110-4.p	7	aaaaaaa	7.1	Stakeholder Requirements Definition Process	PA 1.1
29110-4.p	7	aaaaaaa	7.2	System Requirements Analysis Process	PA 2.2
...	...	...	...	...	...

8   The VSE profile taxonomy principles

8.1   VSE classification dimensions

The core characteristic of the entities targeted by this set of profiles is size. These profiles are targeted at Very Small Entities (VSEs). What is meant by "very small" is defined in ISO/IEC TR 29110-1, as well as the other aspects and characteristics of VSE that may affect profile preparation or selection. These may include:

— business models (commercial, contracting, in-house development, etc.) for VSE;

— situational factors for VSE, such as criticality, uncertainty environment, etc.;

— risk levels for VSE;

— capability levels of VSE.

8.2   Decoupling VSE classification from profile preparation

Creating one profile for each possible combination of values of the various dimensions introduced above would result in an unmanageable set of profiles.

Accordingly profiles are grouped in such a way as to be applicable to more than one category.

Table 11 illustrates a Profile Group which contains three profiles (labelled A, B and C) that are mapped to nine combinations of business models and situational factors.

Table 11 — Allocating VSE characteristics to profile groups

	Profile Situational Factors		
Business Models	**Critical**	**User Uncertainty**	**Environment Change**
Contract	*Profile A*	*Profile A*	*Profile A*
In-House	*Profile C*	*Profile B*	*Profile A*
Commercial	*Profile B*	*Profile A*	*Profile A*

8.3   Graduating a profile group

Profile Groups are a collection of profiles which are related either by composition of processes (i.e. activities, tasks), or by capability level, or both. In Table 12, Profile Group A is a collection of four profiles (A-1 to A-4), providing a progressive approach to satisfying the requirements of profile group A.

Table 12 — Graduated profile group

Profile Group A			
Profile A-1	**Profile A-2**	**Profile A-3**	**Profile A-4**

9   Taxonomy of VSE profile groups

9.1   Introduction

For illustrative purposes one profile group is described here as an instantiation of a profile group.

9.2   The "Generic" profile group

The "Generic" profile group has been identified as applicable to a vast majority of VSEs that do not develop critical software and have typical situational factors. The "generic" profile group does not imply any specific application domain, however, it is envisaged that in the future new domain-specific sub-profiles may be developed in the future.

9.3   Profiles within the "Generic" profile group

The following profiles within the "Generic" profile group have been identified:

Table 13 — The "Generic" profile group

Profile Group	Profile
1 Generic	1-1 Entry
1 Generic	1-2 Basic
1 Generic	1-3 Intermediate
1 Generic	1-4 Advanced

9.3.1   The Entry profile

NOTE   Reserved for future editions.

9.3.2   The Basic profile

9.3.2.1   Rationale of the Basic profile

The purpose of the Basic Profile is to define a software development and project management guide for a subset of processes and outcomes of ISO/IEC 12207 and ISO/IEC 15289 products, appropriate for characteristics and needs of VSEs. The main reason to include project management is that VSEs core business is software development and their financial success depends on project profits.

9.3.2.2   Applicability of the Basic profile

The basic profile describes software development of a single application by a single project team with no special risk or situational factors.

The project may be to fulfil an external or internal contract. The internal contract need not be explicit between the project team and their client.

9.3.2.3   Requirements of the Basic profile

In order to benefit from the use of the Basic Profile, the VSE needs to comply with the following requirements:

— Project contract or agreement with Statement of Work

— The feasibility assessment was performed before the start of the project

⎯ Human resources are assigned and trained

⎯ A Project Manager assigned

⎯ Goods, Services and Infrastructures available

9.3.2.4   Base documents for the Basic profile

This profile will draw on sections from the following International Standards:

ISO/IEC 12207:2008, *Systems and software engineering — Software life cycle processes*

ISO/IEC 15289:2006, *Systems and software engineering — Content of systems and software life cycle process information products (Documentation)*

9.3.3   The Intermediate profile

NOTE   Reserved for future editions.

9.3.4   The Advanced profile

NOTE   Reserved for future editions.

10 Guidelines for the specification of VSE profiles

10.1 Profile tables

In profile specification documents, SE profiles are specified using tables. Multiple types of tables are used:

a)   profile identification tables, which identify elements in the profile;

b)   profile composition tables, which identify the aggregation hierarchy of the profile elements;

c)   profile relationship tables, which identify relationships between profile elements;

d)   profile reference tables, which map elements in the three above types of tables to the selected elements and attributes of the source documents (base standards).

When a profile has selected both informative and normative elements from the source documents, then these must be clearly identified, to facilitate conformance evaluation and assessment.

All the tables specifying a profile have to be considered as views on one underlying database, with the required consistency and referential integrity.

If other views are required for specific purposes, over and above the minimal number of tables to fully specify the profile, then these can be included in an informative annex.

10.2 Profile table columns

10.2.1 Profile element identification and composition specification tables

The profile identification and composition specification tables contain the following columns for each element:

a)   Profile Document ID

The unique identifier assigned to the profile. (required).

b) Profile Conformity Type

Each row in the specification table identifies a requirement. The conformity type identifies whether this requirement is mandatory (MAN) or optional (OPT). (required)

c) Target Capability Level

For process-related element types, this column identifies the required capability level (1,2,3,4,5), as defined in ISO/IEC 15504:2003. This column is required for this type of elements, and not used for the other types.

d) Profile Element1 Type

The nature of the element of the profile (process, task, objective, outcome, workproduct, etc.) (required)

e) Profile Element1 ID

The unique identifier assigned to the profile element. In the absence of a unique identifier, a clause number in the definition or specification document can be used. (required)

f) Profile Element1 Name

The name assigned to the profile element. (required).

Profile elements can be nested hierarchically as required, to specify composition. They are identified "Element2", "Element3" and so on.

10.2.2 Profile element relationship specification tables

When a profile contains the specification for a relationship between two elements, for instance activity A "produces" workproduct W, this relationship is specified by the identification of each element, as described in the previous clause, separated by a relationship type.

a) Profile Relationship Type

The relationship is expressed by a meaningful abbreviation, for instance INP for "uses as input".

10.2.3 Source document reference specification tables

These tables identify which elements in the source documents have been selected to be part of the profile. These tables are created by adding to the tables specified in the two previous clauses the following columns:

a) Source Document ID

The unique identifier assigned to the Source document. (required).

b) Source Conformity type

The conformity type of the source requirement. The conformity type identifies whether this requirement is mandatory (MAN) or optional (OPT). (required)

c) Source Element1 Type

The nature of the element of the source document (process, task, objective, outcome, workproduct, etc.) (required)

d) Source Element1 ID

The unique identifier assigned to the source element. In the absence of a unique identifier, a clause number in the source document can be used. (required)

e) Source Element1 Name

The name assigned to the source element. (optional, for readability purpose).

f) Source Element1 Property (ies)

The selected value of the selected property applicable to the selected element (required if applicable).

g) Source Element1 Mapping Notes

Explanatory text on the selection and the correspondence. (optional).

Source elements can be nested hierarchically as required, to establish unambiguous mapping. They are identified "Element2", "Element3" and so on.

Bibliography

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