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Date: 15 July 2025

Origin: International

Latest date for receipt of comments: 07 September 2025

Project No. 2023/00180

Responsible committee: IST/15 Software and systems engineering

Interested committees:

Title: Draft BS ISO/IEC 29110-5-6-3 Systems and software engineering - Life cycle profiles for very small entities (VSEs). Part 5-6-3: System engineering guidelines for the generic Intermediate profile.

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



DRAFT International Standard

ISO/IEC DIS 29110-5-6-3

Systems and software engineering — Life cycle profiles for very small entities (VSEs) —

Part 5-6-3: System engineering guidelines for the generic Intermediate profile

ICS: 35.080

ISO/IEC JTC 1/SC 7

Secretariat: **BIS**

Voting begins on:
2025-07-15

Voting terminates on:
2025-10-07

This document is circulated as received from the committee secretariat.

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Published in Switzerland

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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.

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).

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

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

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

A list of all parts in the ISO 29110 series can be found on the ISO website.

Introduction

0.1 Introduction to the ISO/IEC 29110 series

For the ISO/IEC 29110 series, a very small entity (VSE) is an enterprise, organization (e.g., government agency, non-profit organization), department or project having up to 25 people. Many VSEs develop and/or maintain systems and the software components used in those systems, either as independent products or incorporated into the larger system. Due to this a recognition of VSEs as suppliers of high-quality products is required.

Very small entities (VSEs) around the world are creating valuable products and services. According to the World Bank, small and medium-sized enterprises (SMEs) account for about 90 % of enterprises worldwide. According to the Organisation for Economic Co-operation and Development (OECD), SMEs represent 99 % of all businesses and generate about 60 % of employment. Almost one person out of three is employed in a micro firm with less than 10 employees. The European Union reports that micro firms, with fewer than 10 persons, account for 93.5 % of all enterprises and small firms, with 10 to 49 employees, account for 5.5 % of all enterprises. 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. Implementation of and conformity with these standards is difficult, if not impossible.

Consequently, VSEs have no, or very limited, ways to be recognized as entities that produce quality systems/system elements including software in their domain. Therefore, VSEs are excluded 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 effort required to apply standards to their business practices. Most VSEs can neither afford the resources, in terms of number of employees, expertise, budget and time, nor do they see a net benefit in establishing over-complex systems or software life cycle processes. To address some of these difficulties, a set of guidelines has been developed based on a set of VSE characteristics. The guidelines are based on subsets of appropriate standards processes, activities, tasks, and outcomes, referred to as profiles. The purpose of a profile is to define a subset of International Standards relevant to the VSEs' context; for example, processes, activities, tasks, and outcomes of ISO/IEC/IEEE 12207 for software; and processes, activities, tasks, and outcomes of ISO/IEC/IEEE 15288 for systems; and information products (documentation) of ISO/IEC/IEEE 15289 for software and systems.

VSEs can achieve recognition through implementing a profile and by being audited against ISO/IEC 29110 specifications.

The ISO/IEC 29110 series can be applied at any phase of system or software development within a life cycle. The ISO/IEC 29110 series is intended to be used by VSEs that do not have experience or expertise in adapting/tailoring ISO/IEC/IEEE 12207 or ISO/IEC/IEEE 15288 standards to the needs of a specific project. VSEs that have expertise in adapting/tailoring ISO/IEC/IEEE 12207 or ISO/IEC/IEEE 15288 are encouraged to use those standards instead of the ISO/IEC 29110 series.

The ISO/IEC 29110 series is intended to be used with any life cycle such as waterfall, iterative, incremental, evolutionary or agile.

The life cycle processes described in the ISO/IEC 29110 series are not intended to preclude or discourage their use by organizations bigger than VSEs.

Systems, in the context of the ISO/IEC 29110 series, are typically composed of hardware and software components.

The ISO/IEC 29110 series, targeted by audience, has been developed to improve system or software and/or service quality, and process performance. Figure 1 describes the ISO/IEC 29110 series and positions the parts within the framework of reference.

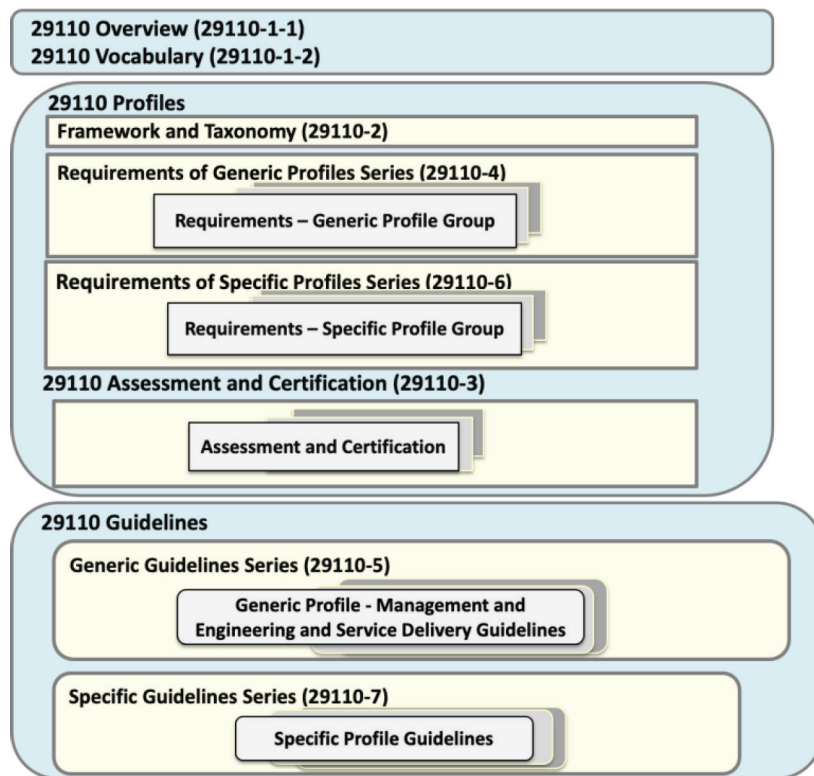


Figure 1 — ISO/IEC 29110 series

ISO/IEC 29110-1-1 introduces processes, life cycle and standardization concepts, the taxonomy (catalogue) of ISO/IEC 29110 profiles and the ISO/IEC 29110 series. ISO/IEC 29110-1-1 also introduces the characteristics and needs of a VSE, and clarifies the rationale for specific profiles, documents, standards and guidelines. ISO/IEC 29110-1-2 defines the terms common to the ISO/IEC 29110 series. ISO/IEC 29110-1-1 and ISO/IEC 29110-1-2 are targeted at VSEs and their customers, assessors, standards producers, tool vendors and methodology vendors.

ISO/IEC 29110-2 introduces the concepts for systems and software engineering profiles for VSEs. It establishes the logic behind the definition and application of profiles. For standardized profiles, it specifies the elements common to all profiles (structure, requirements, conformity, and assessment). For domain-specific profiles (profiles that are not standardized and developed outside of the ISO process), it provides general guidance adapted from the definition of standardized profiles. ISO/IEC 29110-2 is targeted at profile producers, tool vendors and methodology vendors.

ISO/IEC 29110-3 defines certification schemes, assessment guidelines and compliance requirements for process capability assessment, conformity assessments, and self-assessments for process improvements. ISO/IEC 29110-3 also contains information that can be useful to developers of certification and assessment methods and developers of certification and assessment tools. ISO/IEC 29110-3 is addressed to people who have direct involvement with the assessment process, e.g., the auditor, certification and accreditation bodies and the sponsor of the audit, who need guidance on ensuring that the requirements for performing an audit have been met. ISO/IEC 29110-3 is targeted at VSEs and their customers, assessors, accreditation bodies.

ISO/IEC 29110-4 provides the specifications for all generic profiles of the generic profile group that are based on subsets of appropriate standards elements. ISO/IEC 29110-4 is targeted at VSEs, customers, standards producers, tool vendors and methodology vendors.

ISO/IEC 29110-5 provides a management, engineering and service delivery guidelines for profiles of the Generic profile group. ISO/IEC 29110-5 is targeted at VSEs and their customers.

ISO/IEC 29110-6 provides the specifications for specific profiles that are based on subsets of appropriate standards elements. ISO/IEC 29110-6 is targeted at VSEs, customers, standards producers, tool vendors and methodology vendors.

ISO/IEC 29110-7 provides a guideline for each profile of the specific profile group. ISO/IEC 29110-7 is targeted at VSEs and their customers.

If a new profile is needed, ISO/IEC 29110-4 or ISO/IEC 29110-6 and or ISO/IEC 29110-7, ISO/IEC 29110-5 can be developed with minimal impact to existing documents.

Conformity requirements for implementations of this document can be found in ISO/IEC 29110-4-1.

0.2 Introduction to this document

This document is the third software profile of a four-profile systems engineering roadmap (i.e. Entry, Basic, Intermediate and Advanced).

The guidelines of the Intermediate profile describe the processes targeted at VSEs involved in the development of more than one project in parallel with more than one work team

The outcomes and tasks are guidance, not requirements, and not to be interpreted as requirements for purposes of process assessment.

This document applies for the development of non-safety critical systems.

Using this part of ISO/IEC 29110, a VSE can obtain benefits in the following aspects:

- An agreed set of project requirements (technical part of contract) and expected work products are agreed by the acquirer.
- A disciplined management process, that provides project visibility and corrective actions of project problems and deviations, is performed.
- A systematic system definition and realisation process, that satisfies acquirer needs and helps ensure quality work products, is followed.

Using this document, a VSE can obtain benefits in the following aspects:

- An in-place technical management process maintains and improves the business relationship across different projects. Technical management is making sure that the human resources, infrastructure and supportive equipment (H/W and S/W) are available, known and functional for more than one project at a time. The business management process helps ensure that each project satisfies acquirer needs and provides quality work products.
- A set of project needs (acquirer's needs) and a set of technical requirements (technical part of the agreement ~~contract~~) and expected work products as are agreed with the acquirer.
- A disciplined project management process, to plan and execute more than one project at a time and that provides project visibility and control; coupled with corrective actions of project problems and deviations, is performed;
- A disciplined system engineering management process that defines systematic system definition and realisation processes, which satisfies Acquirer needs and helps ensure quality work products, is followed.

To use this document the VSE needs to fulfil the following entry conditions:

- project needs and expectations are documented;
- feasibility of the project was performed before its start;
- project team, including project manager and system engineer, is assigned and trained; and
- goods, services and infrastructure to start the project are available.

In the context of systems engineering, that is the system definition and realisation process, the group that is part of the VSE responsible for developing software elements that are part of the system, should use the management and engineering guidelines of the software engineering Intermediate profile (ISO/IEC 29110-5-1-3).

ISO/IEC DIS 29110-5-6-3:2025(en)

To use this document, a VSE should be familiar with or have implemented ISO/IEC 29110-5-6-3, the systems engineering Intermediate profile, for their system development projects.

In this document, [Annex A](#) provides a mapping between the outcomes of the processes of this document and the ISO/IEC/IEEE 15288 and, [Annex B](#) describes the systems engineering deployment packages to facilitate the implementation of the Intermediate profile by VSEs.

Systems and software engineering — Life cycle profiles for very small entities (VSEs) —

Part 5-6-3: System engineering guidelines for the generic Intermediate profile

1 Scope

1.1 Fields of application

The lifecycle processes described in the ISO/IEC 29110 series are not intended to preclude or discourage their use by organisations bigger than VSEs.

ISO/IEC 29110-4-6 identifies the requirements applicable to the tasks and work products described in this document.

This document has been developed for using the management and engineering guide from the systems engineering Basic profile. Elements were added or modified (e.g. process, task, work product, role) to support VSEs involved in the development of more than one project in parallel with more than one work team.

This guide is oriented towards the management of more than one project in parallel with more than one work team.

This document applies for the development of non-critical systems.

This document is also targeted to VSEs which are familiar with management and engineering guide of the systems engineering Basic profile (ISO/IEC 29110 5-6-2) for their system development projects and are involved in the development of more than one project in parallel with more than one work team.

This document is intended to be used with any processes, techniques and methods that enhance the VSE's stakeholder satisfaction and productivity.

Once the system, developed by a VSE, has been accepted by their customers, the VSE that wants to provide after delivery services can refer to ISO/IEC 29110-5-3.

2 Normative references

There is no normative reference in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

NOTE Definitions for other system and software engineering terms can be found in ISO/IEC/IEEE 24765, available at www.computer.org/sevocab

3.1

Advanced profile

profile targeted at VSEs which want to sustain and grow as a competitive system and/or software development organization

[SOURCE: ISO/IEC 29110-1-2:2024]

3.2

agreement

mutual acknowledgement of terms and conditions under which a working relationship is conducted

EXAMPLE Contract, memorandum of agreement.

[SOURCE: ISO/IEC/IEEE 15288:2023]

3.3

acquirer

stakeholder that acquires or procures a product or service from a supplier

Note 1 to entry: Other terms commonly used for an acquirer are buyer, customer, owner, purchaser or internal/organizational sponsor.

[SOURCE: ISO/IEC/IEEE 15288:2023]

3.4

Basic profile

profile targeted at VSEs developing a single product by a single work team

[SOURCE: ISO/IEC 29110-1-2:2024]

3.5

critical system

System whose failure or malfunction can result in one (or more) of the following outcomes: death or serious injury to people, loss or severe damage to equipment or property, or environmental harm

[SOURCE: ISO/IEC 23643:2020, 3.15]

3.6

conditional process

process that may be mandatory under some specified conditions, may be optional under other specified conditions, and may be out of scope or not applicable under other specified conditions

Note 1 to entry: These are to be observed if the specified conditions apply.

[SOURCE: ISO/IEC 29110-1-2:2024]

3.7

disposed system

system that has been transformed (i.e. state change) by applying the disposal process

Note 1 to entry: A systems approach considers the total system and the total lifecycle of the system. This includes all aspects of the system and the system throughout its life until the day users dispose of the system and the external enterprises complete the handling of the disposed system products.

[SOURCE: ISO/IEC/IEEE 15288:2023, modified]

3.8

enabling system

system that supports a system-of-interest during its life cycle stages but does not necessarily contribute directly to its function during operation

EXAMPLE A configuration management system used to control software elements during software development.

Note 1 to entry: Each enabling system has a life cycle of its own. This document is applicable to each enabling system when, in its own right, it is treated as a system-of-interest.

[SOURCE: ISO/IEC/IEEE 15288:2023]

3.9

Entry profile

profile targeted at start-up VSEs (i.e. VSEs who started their operation fewer than three years ago) and/or at VSEs working on a single small project (e.g. project size of less than 6 person-months)

[SOURCE: ISO/IEC 29110-1-2:2024]

3.10

Intermediate profile

profile targeted at VSEs involved in the development of more than one project in parallel with more than one work team

[SOURCE: ISO/IEC 29110-1-2:2024]

3.11

operator

individual or organization that performs the operations of a system

Note 1 to entry: The role of operator and the role of user can be vested, simultaneously or sequentially, in the same individual or organization.

Note 2 to entry: An individual operator combined with knowledge, skills and procedures can be considered as an element of the system.

Note 3 to entry: An operator may perform operations on a system that is operated, or of a system that is operated, depending on whether or not operating instructions are placed within the system boundary.

[SOURCE: ISO/IEC/IEEE 15288:2023]

3.12

security and intellectual property scheme

established and operated management system in the entity to ensure the security and intellectual property of its information items

[SOURCE: ISO/IEC 29110-5-1-3:2025]

3.13

systems engineering plan

SEMP

top level technical plan for managing the systems engineering effort which defines how the technical aspects of the project will be organized, structured, and conducted and how the systems engineering processes will be controlled to provide a product that satisfies stakeholder requirements

[SOURCE: ISO/IEC/IEEE 24748-4:2016, 4.14]

3.14

small and medium enterprise

SME

enterprises which employ less than 250 persons

[SOURCE: ISO/IEC 29110-1-2:2024]

3.15

system

combination of interacting elements organized to achieve one or more stated purposes

Note 1 to entry: A system is sometimes considered as a product or as the services it provides.

Note 2 to entry: In practice, the interpretation of its meaning is frequently clarified by the use of an associative noun, e.g., aircraft system. Alternatively, the word "system" is substituted simply by a context-dependent synonym, e.g., aircraft, though this potentially obscures a system principles perspective.

Note 3 to entry: A complete system includes all of the associated equipment, facilities, material, computer programs, firmware, technical documentation, services and personnel required for operations and support to the degree necessary for self-sufficient use in its intended environment.

[SOURCE: ISO/IEC/IEEE 15288:2023]

3.16
system-of-interest
SOI

system whose life cycle is under consideration in the context of this document

[SOURCE: ISO/IEC/IEEE 15288:2023]

3.17
trade-off

decision-making actions that select from various requirements and alternative solutions on the basis of net benefit to the stakeholders

[SOURCE: ISO/IEC/IEEE 15288:2023]

3.18
user

individual or group that benefits from a system during its utilization

Note 1 to entry: The role of user and the role of operator are sometimes vested, simultaneously or sequentially, in the same individual or organization.

[SOURCE: ISO/IEC/IEEE 15288:2023]

3.19
system structure

decomposition of a system of interest into a set of interacting systems and system elements Note 1 to entry: The system structure is described in a System Breakdown Structure (SBS).

[SOURCE: ISO/IEC/IEEE 15288:2023]

3.20
statement of work
SOW

document used by the acquirer that includes the needs and expectations, the scope, objectives and deliverables

[SOURCE: ISO/IEC 29110-1-2:2024]

3.21
work breakdown structure
WBS

deliverable-oriented hierarchical decomposition of the work to be executed by the project team to accomplish the project objectives and create the required deliverables

Note 1 to entry: It organizes and defines the total scope of the project.

[SOURCE: ISO/IEC/IEEE 24765:2017, 3.4603, definition 2, modified — Note 1 to entry has been added.]

4 Conventions and abbreviated terms

4.1 Naming, diagramming and definition conventions

The following process structure description and notation are used to describe the processes:

Process name – process identifier, followed by its abbreviation in parentheses “()”.

Process purpose – high-level objective of performing the process and the likely outcomes of effective implementation of the process.

Process outcomes – observable result of the successful achievement of the process purpose. Outcomes are identified by the abbreviation of the process name, followed by the letter “O” and a consecutive number, for example PM.O1, SI.O2, etc.

Input work products – Work products which can be used to perform the process and its corresponding source, which can be another process or an external entity to the project, such as the customer. Identified by the abbreviation of the process name.

Output work products – Work products generated by the process and its corresponding destination, which can be another process or an external entity to the project, such as customer. Identified by the abbreviation of the process name.

Internal work products – Work products generated (i.e., output work product) and consumed (i.e., input work product) by the process. An internal work product is not reviewed or approved by the customer.

All work products’ names initiate with capital letters. Some work products have one or more statuses attached to the work product name surrounded by square brackets “[]” and separated by “,”. The work product state may change during the process execution. See [Clause 9](#) for the alphabetical list of the work products, its descriptions, possible states and the source of the work product. The source can be another process or an external entity to the project, such as the customer.

Roles involved – Names and abbreviation of the functions to be performed by project team members. Several roles may be played by a single person, and one role may be assumed by several persons. Roles are assigned to project participants based on the characteristics of the project. The role list is identified by the abbreviation of the process name and showed as two column tables. See [Clause 8](#) for the alphabetical list of the roles, its abbreviations and recommended competencies description.

Diagram – Graphical representation of the processes. The large round-edged rectangles indicate process or activities, and the smaller square-edged rectangles indicate the work products. The directional or bidirectional thick arrows indicate the major flow of information between processes or activities. The directional or bidirectional thin arrows indicate the input or output work products. The notation used in the diagrams does not imply the use of any specific process life cycle.

Activity – A set of cohesive tasks of a process. The task statements in this guideline are not imperative. A process activity is the first level of process workflow decomposition, and the second one is a task. Activities are identified by process name abbreviation followed by consecutive number and the activity name.

Activity description – Each activity description is identified by the activity name and the list of related process outcomes surrounded by parentheses “()”. For example, activity PM.O1 project planning (PM.O1, PM.O5, PM.O6, PM.O7) means that the activity PM.O1 project planning contributes to the achievement of the listed outcomes: PM.O1, PM.O5, PM.O6 and PM.O7.

Task description – Each task description begins with an active verb (e.g., assign, test) and is followed by an object (e.g., review the project plan). To facilitate their implementation, a few tasks are broken down in elementary tasks. The task description doesn’t impose any technique or method to perform it. The selection of the techniques or methods is left to the VSE or project team.

Task description tables contain four columns corresponding to:

— role - the abbreviation of role(s) involved in the task execution.

- task - description of the task to be performed. Each task is identified by activity ID and consecutive number, for example PM.01.01, PM.01.02. Notes are added to provide additional information intended to assist the understanding or use of tasks. Each note is numbered using the following notation: x).

input work products – work products needed to execute a task.

- output work products – work products created or modified by the execution of a task.

NOTE 1 A conditional task is executed if its associated work product (e.g., software user documentation) is required by the customer and listed in the delivery instructions. A conditional task statement is preceded with this text: " x) Conditional task". A work product associated to a conditional task is identified as an 'optional' work product.

Incorporation to project repository – list of work products to be saved in the project repository; the version control strategy has to be applied to some of them. A few work products (e.g., requirements) are baselined, a change to a baselined work product can be done through an approved change request.

NOTE 2 Tables used in process description are for presentation purposes only.

NOTE 3 The term 'Basic' is using a capital 'B' to indicate an ISO/IEC 29110 profile (e.g., the Basic profile) while the term 'basic' is used when referring to the most important part of something (e.g., basic principles).

NOTE 4 A work product is baselined when it has been approved and uploaded in the repository.

4.2 Notation used to document new processes, additions and modifications to the Basic profile processes

The Intermediate profile is the third profile of a four-profile roadmap (i.e. Entry, Basic, Intermediate and Advanced). The Intermediate profile has been designed to build upon the processes of the Basic profiles such that, when moving from the Basic profile to the Intermediate profile, a VSE has to add to its existing Basic profile processes the new processes (e.g. objectives, activities, tasks, roles and work products) described in this document.

Since, in the Intermediate profile, there are additions and modifications to the Basic profile processes, this document has been written such that it will be easy for a VSE to identify these additions and modifications. The project management (PM) and system definition and realisation (SD) processes, of the Basic profile, have been complemented with additional objectives, tasks and work products in a context where a VSE is conducting more than one project in parallel with more than one work team. The following notation is used to highlight the addition/deletion/modification to the Basic profile:

- added text:
 - is underlined;
 - except for the processes of the Intermediate profile;
- deleted/modified text is struck out as follows: ~~the text is stroked out~~;

The Intermediate profile has two new processes that are not in the Basic profile: The technical management (TM) process and a conditional process, the acquisition management (AM) process. The execution of the AM process is required only if a product/service needs to be obtained from an external Supplier by a VSE. To facilitate the identification of additional abbreviations, roles and work products of the TM and AM processes of the Intermediate profile, these items are underlined. To facilitate reading, the TM and AM processes have not been underlined.

The Intermediate profile terminology has been aligned with the ISO/IEC/IEEE 15288 and with the ISO/IEC/IEEE 15289. The following terms of old standards have been replaced with the new terms:

- "Agreement" and "contract" have been replaced with "agreement";
- work products are identified with a unique code WP.XX where XX is a sequential number in [Clause 12](#). These codes have not been used in the descriptions of activities and tasks to facilitate readability.

4.3 Abbreviated terms

The following abbreviations are used in this document:

ACQ	acquirer
<u>AM</u>	<u>acquisition manager</u>
CUS	customer
DES	designer
DEV	developer
HW	hardware
PO	purchase order
PM	project management
PJM	project manager
SEMP	system engineering management plan
SMART	specific, measurable, accepted, realistic and traced
SME	small and medium enterprise
SBS	system breakdown structure
SDD	system design document
SOW	statement of work
SR	system definition and realisation
STK	stakeholder
<u>SUP</u>	<u>supplier</u>
SYS	system engineer
SW	software
TCM	technical manager
TM	technical management
TPM	technical performance management
VSE	very small entity
V&V	Verification and validation
V&VE	V&V engineer
WBS	Work breakdown structure
WP	work product

5 Systems thinking

The traditional approach to solve a problem is called Cartesian. This approach focuses on dividing a problem into small parts and, once resolved each part is resolved, the whole problem is solved. This approach, however, has limitations because you can lose insight of the whole system. To overcome this limitation, there is the system thinking, which analyses and observes the system as a whole and identifies the interrelationships among the parts that compose it also with the system environment (e.g. enabling systems).

System thinking allows for a better understanding of the systems as a whole: system thinking is used to broaden the perspective to larger environments by considering the entire lifecycle of the system and the different possible applications of the system. Systems can be immersed in different environments and multiple relationships will emerge. Every project has a context in which the system is embedded. Thus, a system is not only composed of software and hardware, but is always part of a larger operation, often involving people and other systems. The designer must clearly understand these relationships before defining a solution.

The “system” perspective enables the design of an optimized system considering all needs and constraints. This perspective also helps to invent new solutions to meet existing needs or in some cases create new needs.

For this document, system thinking should be considered when understanding the system to be designed so that, when identifying the requirements, all the stakeholders must be considered as well as the context in which the system should operate. Following this approach, when deploying the requirements in smaller modules, it will help ensure effective integration the parts.

6 Overview

This document provides the following processes: technical management project management, systems definition and realization and acquisition management. These processes integrate tasks selected from the ISO/IEC/IEEE 15288 and the ISO/IEC/IEEE 15289. [Annex B](#) provides information about deployment packages (DPs) which will facilitate the implementation of these processes.

[Table 1](#) illustrates the four-stage systems engineering roadmap. The 1st column on the left lists the 2 processes of the Entry profile. The list of processes of the Basic profile of the 2nd column is incrementally built from the left column, so that the processes for the 2nd column are all the ones from the Entry profile plus new tasks and new work products. The list of the processes of the Intermediate profile of the 3rd column is the process in the second column plus two new processes. The list of process of the Advanced profile of the 4th column is the process in the 3rd column plus one new process.

Table 1 — Systems engineering four-stage roadmap

ISO/IEC 29110-5-6-1 Entry profile	ISO/IEC 29110-5-6-2 Basic profile	ISO/IEC 29110-5-6-3 Intermediate profile	ISO/IEC 29110-5-6-4 Advanced profile
— System definition and realization process	Processes of ISO/IEC 29110-5-6-1 and:	Processes of ISO/IEC 29110-5-6-2 and:	Processes of ISO/IEC 29110-5-6-3 and:
— Project management process	— Conditional process: Acquisition process	— Technical management	— Conditional process: Acquisition process

This document is intended to be used by the VSE to establish processes to implement any development approach or methodology including, e.g. agile, evolutionary, incremental, test-driven development, etc. based on the VSE organisation or project needs.

To use this document, a VSE needs to be familiar with or have implemented ISO/IEC 29110-5-6-2, the systems engineering Basic profile, for their system development projects.

In previous systems engineering profiles of the generic profile group, the Entry and the Basic profiles, the boundary between the VSE, its business environment and its work product were naturally vague as everyone had to focus on one work product. With the Intermediate profile, the VSE has more than one project and therefore in need of more VSE actors, a difficult but necessary boundary needs to be defined. That boundary

differentiates between what the VSE needs to do to survive in its business environment and what the VSE actors need to bring to fruition the different Agreements (engagement) undertaken by the VSE.

The purpose of the technical management (TM) process is to cover more business areas than those pertaining exclusively to the management of the individual projects and systems engineering. This includes the efforts required to define, design, produce, qualify, and deliver a project to the customer, thus assuring the continued operation of the VSE. Technical management identifies business opportunities that fit within the organizational goals and resources (e.g. human, knowledge and material) of the VSE. Technical management then consults with the subject matter experts, project management, and systems engineering resources, on the feasibility of the proposed opportunity by the VSE. The same is true with the proposed agreement, where the technical management will help ensure the feasibility and validity of the proposed agreement, arising from the interpretation of the request for proposal (RFP) or business opportunity. The result is the formal acceptance of the agreement into the project to help ensure the viability of the VSE (until then no official project exists).

The purpose of the project management (PM) process is to establish and carry out in a systematic way the tasks of the system definition and realisation process, while complying with the project's objectives in the expected quality, time, cost and risks.

The purpose of the system definition and realisation (SR) process is the systematic performance of the analysis, design, construction, integration, verification, and validation activities for new or modified system according to the specified requirements.

The purpose of the acquisition management (AM) process is to obtain work products e.g. material, software), or services or both required by the VSE. The execution of the AM process is only required if a work product/service needs to be obtained from a supplier by the VSE, i.e. a conditional process.

The processes are interrelated (see [Figure 2](#)). The arrow connecting the AM process to the other processes and the process itself are dashed to indicate that this process is a conditional process.

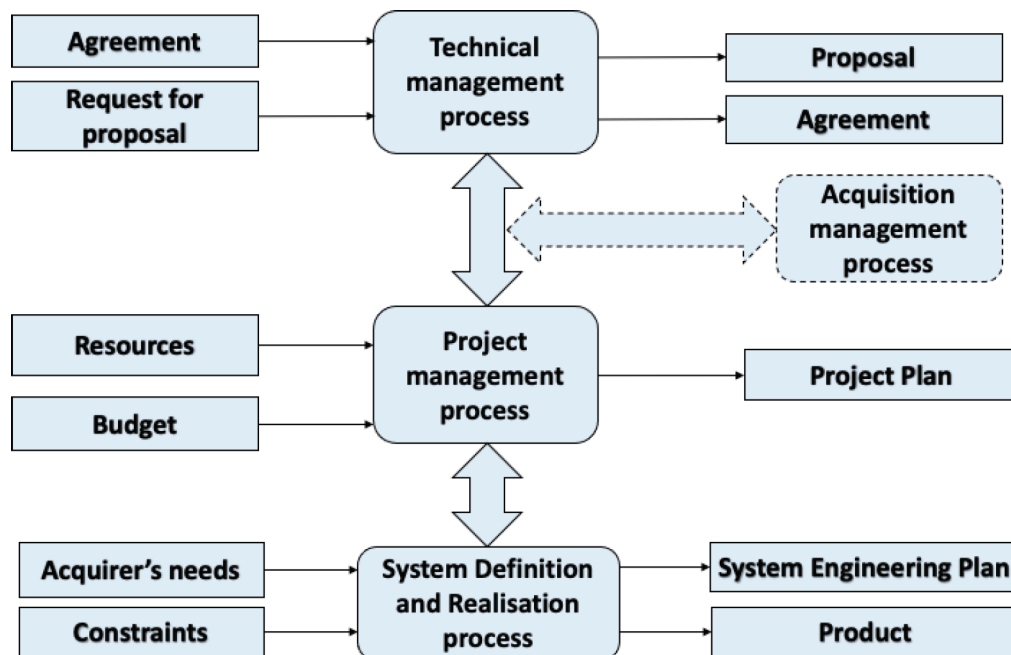


Figure 2 — Processes of the Intermediate profile

7 Technical management (TM) process

7.1 TM process purpose

The purpose of the technical management process is to identify opportunities, evaluate all in-place *Agreements* or requests from customers for fit with organisational objectives and resources, obtain and provide the VSE with the necessary resources to perform all projects, monitor and evaluate all projects, conduct lessons learned to improve the VSE and protect its intellectual property and the security of its assets and information items.

This document is intended to be used by a VSE to establish processes to implement any development approach or methodology including, for example, agile, evolutionary, incremental, test-driven development, etc. based on the VSE or project needs.

7.2 TM process outcomes

TM.01. Initiate and sustain suitable projects that fit with the organisational goals and resources (human, knowledge and material) to meet the business objectives of the VSE.

TM.02. Provide to the customer the work products that meets the agreed requirements.

TM.03. Provide the VSE with necessary human resources and to maintain their competencies, consistent with business needs.

TM.04. Provide an enabling infrastructure and services to all projects to support the VSE and the project objectives throughout the life cycle.

TM.05. Collect and analyse measures with VSE actors to disseminate internally the results as lessons and to institutionalise them as lessons learned for all projects.

TM.06. Protect the intellectual property and the security of the assets and information items of the VSE.

TM.07. Establish and maintain current an organisational repository, to capture, maintain history and disseminate the projects' relevant documentation. Including TM input and output work products.

TM.08. Provide structure for all projects evaluation, critiques and mentoring, if required, to deliver to the acquirer a system of defined quality, in time, and on cost.

7.3 TM process roles

The roles involved in the TM process are:

- Technical manager
- Project manager
- Customer

7.4 TM process description

7.4.1 TM process diagram

[Figure 3](#) shows the flow of information between the business management process activities including the most relevant work products and their relationships.

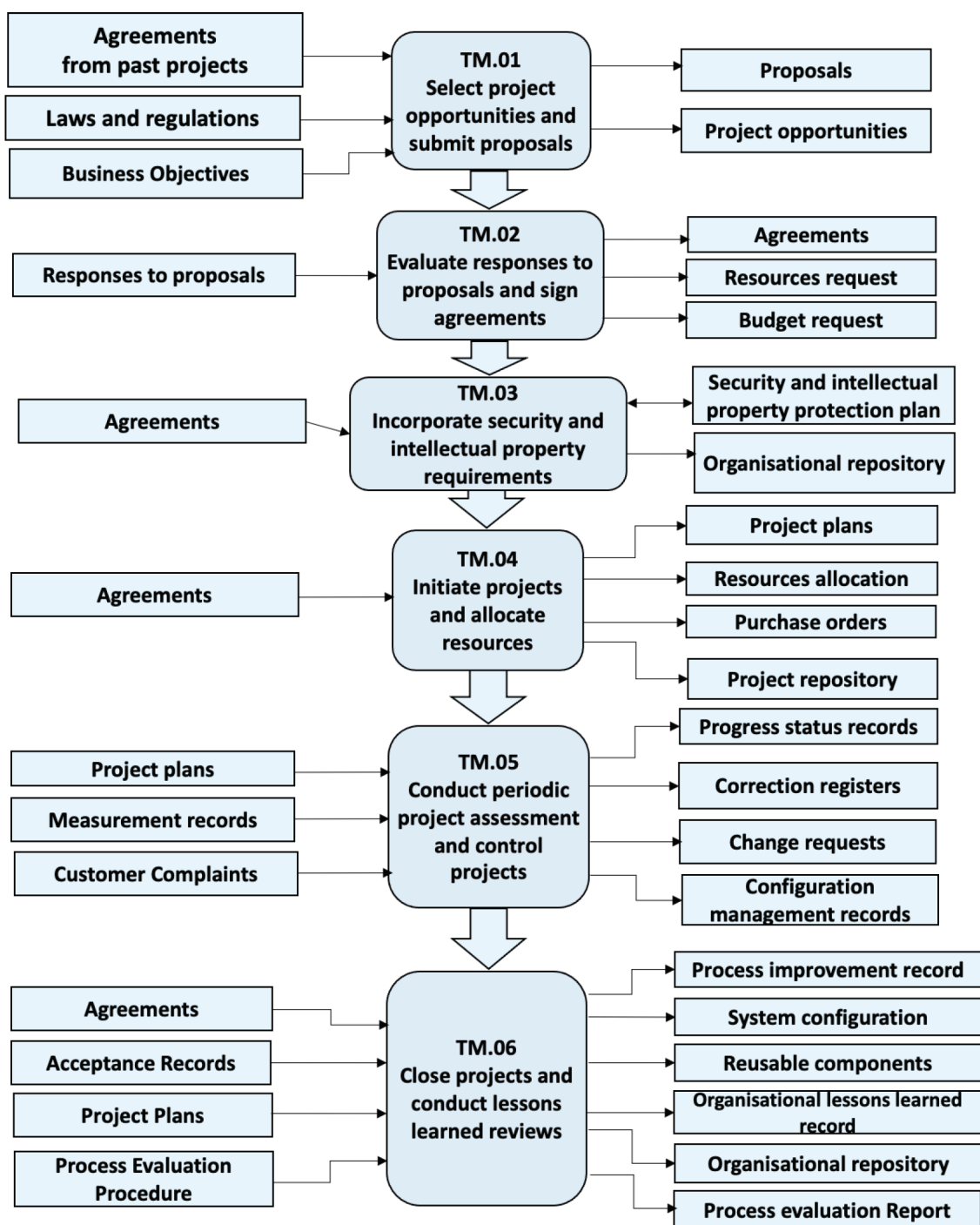


Figure 3 — Technical management process

Note All the feedback lines are not all displayed to facilitate readability.

7.4.2 TM activities

The technical management process has the following activities:

- TM.01. Select project opportunities and submit proposals;
- TM.02. Evaluate responses to proposals and sign agreements;
- TM.03. Incorporate security and intellectual property requirements;

- TM.04. Initiate projects and allocate resources;
- TM.05. Conduct periodic project assessment and control projects;
- TM.06. Close projects and conduct lessons learned reviews and institutionalised them.

7.4.2.1 TM.01 Select project opportunities and submit proposals (contributes to outcome TM.01)

This activity describes the tasks and information items needed to document project opportunities and proposals sent to potential customers.

The activity provides:

- Project opportunities, and
- Proposals submitted to potential customers.

The list of tasks for activity TM.01 is given in [Table 2](#).

Table 2 — TM.01 task list

Role	Task list	Input work products	Output work products
TCM PJMs	TM.01.01 Document project opportunities. 1) Agreements (e.g. contracts) from past projects can be used to document the project opportunities.	Business objectives [approved] Project opportunities [updated] Agreements [approved]	Project opportunities [initiated]
TCM PJMs	TM.01.02 Select project opportunities.	Project opportunities [updated] Request for proposal [published] Laws and regulations	Project opportunities [approved]
TCM PJMs SYS	TM.01.03 Prepare and approve proposals. 1) A proposal is prepared by a PJM during the execution of the AM process for a specific project. 2) Proposals can be developed using the proposal template in the work product description section of this document.	Project opportunities [approved] Proposal [received]	Proposal [approved]
TCM PJMs	TM.01.04 Submit proposals to potential customers.	Proposal [approved]	Proposal [submitted]

7.4.2.2 TM.02. Evaluate responses to proposals and sign agreements (contributes to outcome TM.01)

This activity involves the evaluation of the responses to proposals received from customers, the negotiation and signature of agreements with customers. once an agreement is signed, a project manager is assigned to the project, and the project manager documents its project plan.

The activity provides:

- request for proposal(s), and
- agreements.

The list of tasks for activity TM.02 is given in [Table 3](#).

Table 3 — TM.02 task list

Role	Task list	Input work products	Output work products
TCM	TM.02.01 Evaluate all responses to proposals from potential customers and prepare agreements for the accepted proposals.	Proposals [submitted] Responses to proposals	Agreement [initiated]
TCM CUS	TM.02.02 Negotiate, finalize and sign all agreements with customers.	Agreement [initiated]	Agreement [signed]
TCM PJMs	TM.02.03 Approve projects and assign project managers to develop project plans and resources requests. 1) Project opportunities are updated (if applicable). 2) Project plans are developed according to the planning activity of the PM process.	Agreement [approved]	Project opportunities [updated]

7.4.2.3 TM.03 Incorporate security and intellectual property requirements (contributes to outcome TM.06)

This activity documents the tasks and information items needed to develop and implement security of its assets and information items and the protection of the intellectual property of the VSE.

The activity provides:

- security and intellectual property protection plan,
- organisational repository to store assets and information items securely.

The list of tasks for activity TM.03 is given in [Table 4](#).

Table 4 — TM.03 task list

Role	Task list	Input work products	Output work products
TCM	TM.03.01 Develop a security and intellectual property protection plan. 1) The plan includes preventing infringements in the use of intellectual property of a third party and dealing with security issues of its assets and information.	Agreement [signed]	Security and intellectual property protection plan [initiated]
TCM PJMs	TM.03.02 Review and approve the security and intellectual property protection plan.	Security and intellectual property protection plan [initiated]	Security and intellectual property protection plan [approved]
TCM PJMs	TM.03.03 Implement the security and intellectual property protection plan.	Security and intellectual property protection plan [approved]	Security and intellectual property protection plan [implemented]
TCM	TM.03.04 Establish and maintain an organizational repository. 1) The repository should protect the security and intellectual property of the VSE and its customers.	Security and intellectual property protection plan [approved]	Organizational repository [established]

7.4.2.4 TM.04. Initiate projects and allocate resources (contributes to outcomes TM.03, TM.03, TM.07)

This activity is initiated with the approval of project plans and the resources requests. Human resources are allocated to projects. If work products or services should be acquired, purchase orders are approved. An organizational repository is established.

The activity provides:

- approved project plans;
- approved resources requests;
- approved purchased orders;
- human resource record.

The list of tasks for activity TM.04 is given in [Table 5](#).

Table 5 — TM.04 task list

Role	Task List	Input work products	Output work products
TCM PJMs	TM.04.01 Review and approve all project plans, budget allocations and resource requests. 1) Assign required human resources and other resources to project (e.g. work team, computer facilities). 2) Human resource record is developed.	Agreements [approved] Project plans [initiated] Resources requests [initiated]	Project plans [approved] Resources requests [approved] Budget [approved] Human resource record [approved]
TCM PJMs	TM.04.02 Obtain resources and train project team members if needed.	Resources requests [approved] Human resource record [approved]	Resources obtained and trained Human resource record [updated]
TCM PJMs	TM.04.03 Decide if work products or services should be acquired from suppliers and/or services to be acquired. 1) If a work product or a service should be acquired, a purchase order is initiated. 2) If a work product (e.g. software component) or a service should be acquired from supplier(s), use the acquisition management process of this document.	Project plans [approved]	Purchase orders [initiated]
TCM PJMs	TM.04.04 Approve all purchase orders to obtain work products or services from suppliers. 1) Purchase orders are approved by the project plan execution activity of the PM process.	Purchase orders [initiated]	Purchase orders [approved]

7.4.2.5 TM.05. Conduct periodic project assessment and control projects (contributes to outcomes TM.02, TM.06)

This activity evaluates the performance of all the plans against documented commitments. The information items needed to perform this activity are the outputs of the project assessment and control activity of the PM process.

The activity provides:

- progress status record;
- correction register;
- change request.

The list of tasks for activity TM.05 is given in [Table 6](#).

Table 6 — TM.05 task list

Role	Task list	Input work products	Output work products
TCM PJMs	TM.05.01 Evaluate all projects progress with respect to the project plans, comparing: — actual tasks against planned tasks; — actual results against established project objectives; — actual resource allocation against planned resources; — actual cost against budget estimates; — actual time against planned schedule; — actual risk against previously identified; — Identify deficiency in knowledge or training.	Project plans [approved] Customer complaints [published]	Progress status records [evaluated]
TCM PJMs	TM.05.02 Establish actions to correct deviations or problems and identified risks. 1) Concerning the accomplishment of the plan, as needed, document them in correction register and track them to closure.	Progress status records [evaluated]	Correction register [initial]
TCM PJMs	TM.05.03 Identify changes to requirements or project plans or both. 1) To address major deviations, potential risks or problems concerning the accomplishment of the plan, document them in change requests and track them to closure.	Progress status records [evaluated]	Change requests [initiated]
TCM	TM.05.04 Record and report the status of the items and modifications.	Configuration management strategy [initiated]	Configuration management records [initiated]

7.4.2.6 TM.06. Close projects and conduct lessons learned reviews (contributes to outcomes TM.01, TM.05)

This activity formalizes, at the organizational level, the project closure activity of the PM process, by delivering the work products to the customers. organizational lessons learned reviews are performed using the output of the project closure activity of the PM process. Process improvement opportunities are documented, implemented, and reusable components are identified and stored in the organizational repository.

The activity provides:

- acceptance record;
- delivery instructions signed by customer;
- product;
- organizational lessons learned;
- process improvement record;
- reusable components;
- updated organizational repository.

The list of tasks for activity TM.06 is given in [Table 7](#).

Table 7 — TM.06 task list

Role	Task list	Input work products	Output work products
TCM PJMs CUS	TM.06.01 Formalize the completion of the projects according to the delivery instructions. 1) As established in the project plans, providing acceptance support and getting the acceptance record signed from the customers. 2) The delivery instructions have been produced by the PM process of a specific project. The document is used as an input, no changes are done to this WP.	Agreements [ap-proved] Acceptance records [initiated] Delivery instructions [signed] Product [delivered internally]	Acceptance records [signed] Delivery instructions [signed] Product [accepted]
TCM PJMs	TM.06.02 Perform the evaluation of processes. 1) The processes of the VSE are evaluated to identify weaknesses and propose improvements.	Process evaluation procedure [approved]	Process evaluation report [published]
TCM PJMs	TM.06.03 Conduct a lesson learned review of all projects. 1) Lessons learned are analysed to identify improvements to processes, work products, and prioritise them in the improvement record. 2) The business objectives are updated if necessary. 3) A few input WPs (e.g., meeting records) have been produced during the execution of a project.	Agreements [ap-proved] Business objectives [approved] Project plans [ap-proved] Meeting records [published] Customer complaints [published] Project lessons learned record [ap-proved] Measurement records [published]	Organizational lessons learned record [approved] Process improvement record [ap-proved] Business objectives [updated]
TCM PJMs	TM.06.04 Implement selected improvements.	Process improvement record [approved]	Process improvement record [implemented]
TCM PJM	TM.06.05 Identify reusable components from project repositories and store them in the organizational repository.	Product [accepted] Project repositories [baselined]	Organizational repository [updated]: — Reusable components
TCM PJM	TM.06.06 Update the organizational repository.	Product [accepted] Project repositories [baselined]	Organizational repository [updated]

7.4.3 TM incorporation to the organisational repository

The work products to be saved in organizational repository are:

- Organizational objectives

- Project opportunities
- Proposal
- Agreement
- Project plan
- Acceptance record
- Security and intellectual property protection plan
- Organizational lessons learned record
- Process improvement record
- Meeting record
- Purchase order
- Reusable components
- Resource request
- Human resource record

8 Project management (PM) process

8.1 PM process purpose

The purpose of the project management process is to establish and carry out in a systematic way the tasks of the system development project, which allows complying with the project's objectives in the expected quality, time and costs.

The purpose of the project management process is to establish and carry out in a systematic way the tasks of the system definition and realisation project, which allows complying with the project's objectives in the expected quality, time and costs, within the acceptable risks.

The PM process of the Basic profile has been complemented with additional objectives, tasks and work products in a context where a VSE is conducting more than one project with more than one work team. In addition, new tasks have been added to the PM process of the Basic profile to improve the management of projects.

This part of ISO/IEC 29110 is intended to be used by the VSE to establish processes to implement any development approach or methodology including, e.g. agile, evolutionary, incremental, test-driven development, etc. based on the VSE organisation or project needs.

8.2 PM process outcomes

PM.01. The project plan, the approved VSE proposal and commitments are reviewed and accepted by both the acquirer, the organisational management and the project manager. The tasks and resources necessary to complete the work are sized and estimated.

PM.02. Progress of the project is monitored against the project plan and recorded in the progress status record. Corrections to remediate problems and deviations from the plan are taken when project targets are not achieved. Closure of the project is performed to get the acquirer acceptance documented in the product acceptance record. The system is disposed according to the agreement.

PM.03. Change requests are addressed through their reception and analysis. Changes to system requirements are evaluated by the project team for cost, schedule, risks and technical impacts.

PM.04. Review meetings with the work team and the acquirer, suppliers are held. Reviews of work products of activities are conducted. Agreements are registered and tracked.

PM.05. A risk management approach is developed. Risks are identified, analysed, prioritized, and monitored as they develop and during the conduct of the project. Resources to manage the risks are determined.

PM.06. A ~~product~~ project configuration management strategy is developed. Configuration items (CI) are identified, defined and baselined. Modifications and releases of the configuration Items are controlled and made available to the customer and work team. The status of the configuration items and modifications are recorded and reported; the completeness and consistency of the configuration items is ensured; the storage, handling and delivery of the items are controlled

PM.07. Quality assurance is performed to provide assurance that PM process and work products comply with the technical management goals and resources (human, knowledge and material), ensuring the respect of cost, schedule, risks for the perennity of the VSE.

NOTE The implementation of the quality assurance is through the performance of the verifications, validations and review tasks performed in project management and system definition and realisation processes.

PM.08. A disposal management approach is developed in accord with the acquirer to end the existence of a system entity and dispose of it.

8.3 PM process roles

The roles involved in the PM process are:

- Project manager
- Acquirer
- Customer
- Designer
- Systems engineer
- Stakeholder
- Technical leader

8.4 PM process diagram

[Figure 4](#) shows the flow of information between the project management process activities including the most relevant work products and their relationship.