



DPC: 23/30468584 DC

BSI Group Headquarters

389 Chiswick High Road London W4 4AL

Tel: +44 (0)20 8996 9000

Fax: +44 (0)20 8996 7400

www.bsigroup.com

Date: 29 September 2023

Origin: International

Latest date for receipt of comments: 22 November 2023

Project No. 2023/00140

Responsible committee: IST/15 Software and systems engineering

Interested committees:

Title: Draft BS EN ISO/IEC 29110-5-6-4 Systems and software engineering. Lifecycle profiles for Very Small Entities (VSEs). Part 5-6-4: Management and engineering guidelines: Generic profile group: Advanced profile.

Please notify admin.start@bsigroup.com if you are aware of any keywords that might assist in clarifying or identifying the standard or of the content of this standard:

- i) has any issues related to 3rd party IPR, patent or copyright
- ii) affects other national standard(s)
- iii) requires additional national guidance or information

WARNING: THIS IS A DRAFT AND MUST NOT BE REGARDED OR USED AS A BRITISH STANDARD. THIS DRAFT IS NOT CURRENT BEYOND 22 November 2023

This draft is issued to allow comments from interested parties; all comments will be given consideration prior to publication. No acknowledgement will normally be sent. **See overleaf for information on the submission of comments.**

No copying is allowed, in any form, without prior written permission from BSI except as permitted under the Copyright, Designs and Patent Act 1988 or for circulation within a nominating organization for briefing purposes. Electronic circulation is limited to dissemination by e-mail within such an organization by committee members.

Further copies of this draft may be purchased from BSI Shop <http://shop.bsigroup.com> or from BSI Customer Services, Tel: +44(0) 20 8996 9001 or email cservices@bsigroup.com. British, International and foreign standards are also available from BSI Customer Services.

Information on the co-operating organizations represented on the committees referenced above may be obtained from <https://standardsdevelopment.bsigroup.com/>.

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
------------------	------------------------

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 29110-5-6-4

ISO/IEC JTC 1/SC 7

Secretariat: BIS

Voting begins on:
2023-09-29

Voting terminates on:
2023-12-22

Systems and software engineering — Lifecycle profiles for Very Small Entities (VSEs) —

Part 5-6-4:

Management and engineering guidelines: Generic profile group: Advanced profile

ICS: 35.080

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

This document is circulated as received from the committee secretariat.



Reference number
ISO/IEC DIS 29110-5-6-4:2023(E)
Documents
AVA Document Sharing Hub
© ISO/IEC 2023



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2023

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword	v
1 Scope	1
1.1 Fields of application	1
1.2 Target audience	1
2 Normative references	1
3 Terms and definitions	1
4 Conventions and abbreviated terms	5
4.1 Introduction	5
4.2 Naming, diagramming and definition conventions	5
4.3 Notation used to document new processes, additions and modifications to the processes of the Intermediate profile	7
4.4 Abbreviated terms	8
5 Systems thinking	8
6 Overview	9
7 Technical management (TM) process	10
7.1 TM process purpose	10
7.2 TM process outcomes	11
7.3 TM roles involved	11
7.4 TM process description	11
7.4.1 TM diagram	11
7.4.2 TM activities	12
8 Project management (PM) process	19
8.1 PM process purpose	19
8.2 PM process outcomes	19
8.3 PM roles involved	20
8.4 PM process description	20
8.5 PM diagram	20
8.5.1 PM activities	21
9 System definition and realisation (SR) process	32
9.1 SR process purpose	32
9.2 SR process outcomes	32
9.3 SR roles involved	33
9.4 SR process description	34
9.4.1 SR diagram	34
9.4.2 SR activities	34
10 Acquisition management process (AM)	49
10.1 AM process purpose	49
10.2 AM process outcome	49
10.3 AM roles involved	49
10.4 AM process description	50
10.4.1 AM diagrams	50
10.4.2 AM activities	50
11 System transition and disposal process (SYTD)	53
11.1 SYTD process purpose	53
11.2 SYTD process outcomes	53
11.3 SYTD roles involved	53
11.4 SYTD process description	54
11.4.1 SYTD diagram	54
11.4.2 SYTD activities	54
12 Roles	58

13 **Work product description**.....60

13.1 States of work products.....60

13.2 Description of work products 61

14 **System tools requirements**.....86

14.1 System tools requirements overview 86

14.2 Project management process.....86

14.3 System definition and realisation process.....87

Annex A (informative) Systems engineering deployment packages.....88

Bibliography 90

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 of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

0.1 Introduction

Very Small Entities (VSEs) around the world are creating valuable products and services. For the purpose of ISO/IEC 29110 series, a very small entity (VSE) is an enterprise, organisation (e.g., government agency, non-profit organisation), department or project having up to 25 people. Since many VSEs develop and/or maintain system and software components used in systems, either as independent products or incorporated in larger systems, a recognition of VSEs as suppliers of high-quality products is required.

According to the Organisation for Economic Co-operation and Development (OECD) SME and Entrepreneurship Outlook report (2019) “Small and medium-sized enterprises (SMEs) and entrepreneurship are essential drivers of economic and social well-being. Representing 99 % of all businesses, generating about 60 % of employment and totalling between 50 % and 60 % of value added in the OECD area. Almost one person out of three is employed in a micro firm with fewer than 10 employees”. 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 conformance 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 the 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 the specifications of the ISO/IEC 29110 series.

The ISO/IEC 29110 series can be applied at any phase of system or software development within a life cycle. This 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 ISO/IEC 29110.

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

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. See [Table 1](#).

Table 1 — ISO/IEC 29110 target audience

ISO/IEC 29110	Title	Target audience
ISO/IEC 29110-1-1	Overview	VSEs and their customers, assessors, standards producers, tool vendors and methodology vendors.
ISO/IEC 29110-1-2	Vocabulary	VSEs and their customers, assessors, standards producers, tool vendors and methodology vendors.
ISO/IEC 29110-2	Framework for profile preparation	Profile producers, tool vendors and methodology vendors.
ISO/IEC 29110-3	Certification and assessment guidance	VSEs and their customers, assessors, accreditation bodies.
ISO/IEC 29110-4	Generic profile specifications	VSEs, customers, standards producers, tool vendors and methodology vendors.
ISO/IEC 29110-5	Management, engineering and service delivery guidelines	VSEs and their customers.
ISO/IEC 29110-6	Specific profile specifications	VSEs, customers, standards producers, tool vendors and methodology vendors.
ISO/IEC 29110-7 ^a	Specific profile guidelines	VSEs and their customers.
^a To be developed.		

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.

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. This document 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 29110-2 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, conformance, 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 29110-3 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 29110-4-m provides the specifications for all generic profiles of the generic profile group that are based on subsets of appropriate standards elements.

ISO/IEC 29110-5-m-n provides a management, engineering and service delivery guidelines for profiles of the generic profile group.

ISO/IEC 29110-6-m provides the specifications for specific profiles that are based on subsets of appropriate standards elements.

ISO/IEC 29110-7-m-n provides a guideline for each profile of the specific profile group.

Figure 1 describes the ISO/IEC 29110 series and positions the parts within the framework of reference.

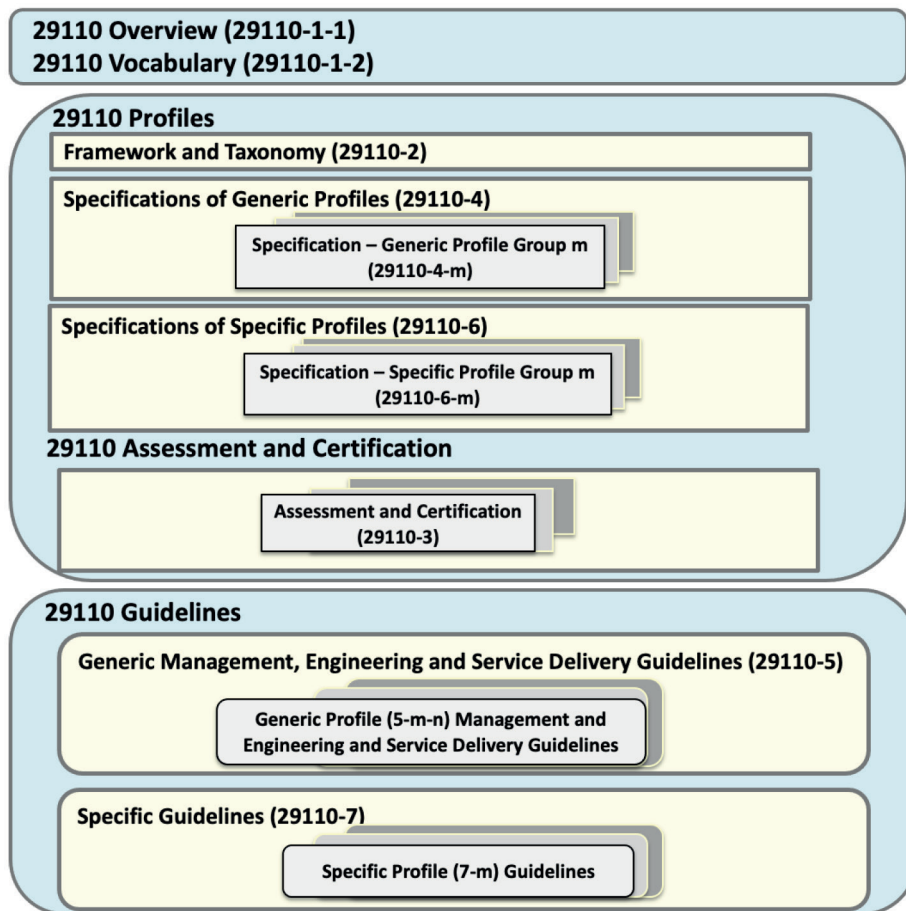


Figure 1 — ISO/IEC 29110 series

0.2 Introduction to this document

This document provides management and engineering guidelines for the systems engineering Advanced profile of the generic profile group.

The Advanced profile is the fourth profile of a four-profile systems engineering roadmap (i.e., Entry, Basic, Intermediate and Advanced).

The guidelines of the Advanced profile describe the processes targeted at VSEs that want to sustain and grow as an independent competitive business.

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

- Systematic system definition and realisation process is followed, that satisfies the acquirer needs and helps ensure quality work processes are followed;
- Management and monitoring of more than one project in parallel with more than one work team;
- Reuse of existing system components (e.g., code and document) in new projects;
- Continuous measurement and evaluation of projects;
- Continuous evaluation and improvement processes;

- Continuous sustainability and growth; and
- Support to customers in the disposal of a current system and installation of a new system.

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

To use this guideline, the VSE needs to ensure the following entry conditions:

- Project needs and expectations are documented;
- Feasibility of the project was performed;
- Project team, including project manager and system engineer, assigned; and
- Goods, services, and infrastructure to start the project are available.

In the context of systems engineering, that is the system definition and realisation (SR) process, the group that is part of the VSE responsible for developing software elements that are part of the system, are encouraged to use the management and engineering guidelines of the software engineering Advanced profile (ISO/IEC 29110-5-1-4 [9]).

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

Systems and software engineering — Lifecycle profiles for Very Small Entities (VSEs) —

Part 5-6-4:

Management and engineering guidelines: Generic profile group: Advanced profile

1 Scope

1.1 Fields of application

This document describes processes targeted at VSEs that want to sustain and grow as an independent competitive system development business.

The ISO/IEC 29110-4-6¹⁾ identifies the requirements applicable to the tasks and work products described in this document.

This document has been developed using the management and engineering guidelines from the systems engineering Intermediate 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.

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

These guidelines are oriented towards the management of more than one project in parallel with more than one work team.

1.2 Target audience

This document is targeted for VSEs that do not develop critical systems and have little or no experience with systems engineering (SE) process planning and implementation using the ISO/IEC/IEEE 15288.

This document is also targeted for VSEs which are familiar with the management and engineering guidelines of the systems engineering Intermediate profile (ISO/IEC 29110 5-6-3) 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 process, technique and method that enhances the VSE's stakeholder satisfaction and productivity.

2 Normative references

This document has no normative references.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in the ISO/IEC 29110-1-2 and the following apply.

1) To be developed.

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

NOTE 2 The titles of the profiles (e.g., Entry, Basic, Intermediate, Advanced) are written with a capital letter to eliminate ambiguities (e.g., 'Basic profile' to indicate an ISO/IEC 29110 profile while the term 'basic' is used when referring to the most important part of something (e.g., basic principles).

3.1 Advanced profile

profile targeted at VSEs which want to sustain and grow as an independent competitive system and/or software development business

[SOURCE: ISO/IEC 29110-2-1:2015]

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 15288:2015, 4.1.4]

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 15288:2015, 4.1.1]

3.4 Basic profile

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

[SOURCE: ISO/IEC 29110-2-1:2015, modified]

3.5 business objective

strategy designed by senior management to ensure an organization's continued existence and enhance its profitability, market share, and other factors influencing the organization's success

[SOURCE: ISO/IEC/IEEE 24765:2017]

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 TR 29110-5-1-3:2017]

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 life cycle of the system. This includes all aspects of 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 15288:2008, 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 15288:2015]

3.9**Entry profile**

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

[SOURCE: ISO/IEC 29110-2-1:2015]

3.10**generic profile group**

profile group applicable to VSEs (very small entities) that do not develop critical systems or critical software and have typical situational factors

[SOURCE: ISO/IEC 29110-2-1:2015]

3.11**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 29110-2-1:2015]

3.12**profile**

set of one or more *base standards* and/or profiles, and where applicable, the identification of chosen classes, conforming subsets, option and parameters of those base standards, or standardized profiles necessary to accomplish a particular function

[SOURCE: ISO/IEC/TR 10000-1:1998, modified — “International Standardized Profiles” or “ISPs” have been replaced by “standardised profiles”]

3.13**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 15288:2015]

3.14

process purpose

high-level objective of performing the process and the likely outcomes of effective implementation of the process

[SOURCE: ISO/IEC/IEEE 24774:2021]

3.15

process outcome

observable result of the successful achievement of the process

[SOURCE: ISO/IEC/IEEE 24774:2021]

3.16

safety critical product

product whose failure or malfunction may result in death or serious injury to people, loss of or severe damage to equipment or property, or damage to the natural environment

[SOURCE: ISO/IEC 29110-5-1-2:2024]

3.17

small and medium enterprise

SME

enterprises which employ fewer than 250 persons

[SOURCE: OECD 2005, modified]

3.18

stakeholder

individual or organization having a right, share, claim, or interest in a system or in its possession of characteristics that meet their needs and expectations

[SOURCE: ISO/IEC/IEEE 12207:2017]

3.19

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 15288:2015]

3.20

systems engineering management plan

top-level plan for managing the systems engineering effort which, as such, defines how the project will be organized, structured, and conducted and how the total engineering process will be controlled to provide a product that satisfies stakeholder requirements

[SOURCE: INCOSE: 2010]

3.21**system-of-interest****SOI**

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

[SOURCE: ISO/IEC/IEEE 15288:2015]

3.22**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 15288:2008]

3.23**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 15288:2015]

3.24**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 15288:2015]

3.25**work breakdown structure****WBS**

[output/input] 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 24765:2010, modified]

4 Conventions and abbreviated terms**4.1 Introduction**

Conventions for naming, diagramming, describing and defining profiles are defined in ISO/IEC 29110-2-1:2015.

4.2 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 – the high-level objectives and results expected of the effective implementation of the process. The implementation of the process should provide tangible benefits to the stakeholders.

Process outcomes - the process outcomes are identified by the abbreviation of the process name, followed by the letter “O” and a consecutive number, for example PM.O1, SR.O2.

Input work products – work products required to perform the process and its corresponding source, which can be another process or an external entity to the project, such as the acquirer. Input work products are 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 an acquirer. Output work products are 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. Internal work products are identified by the abbreviation of the process name. An internal work product is not reviewed or approved by the customer.

All work products' names begin with capital letters. Some work products have one or more states 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 14](#) for the alphabetical listing 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 acquirer.

Roles involved – names and abbreviation of the functions to be performed by project team members. Several roles may be performed 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 shown as a two-column table. See [Clause 13](#) for the alphabetical list of the roles, its abbreviations and required 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 thin directional 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. A task is a requirement, recommendation, or permissible action, intended to contribute to the achievement of one or more objectives of a process. 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 objectives surrounded by parenthesis "()". For example, PM.1 project planning (PM.01, PM.05, PM.06, and PM.07) means that the activity PM.1 project planning contributes to the achievement of the listed objectives: PM.01, PM.05, PM.06 and PM.07. The activity description begins with the task summary and is followed by the task descriptions table.

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). 'Notes' are added to provide additional information intended to assist the understanding or use of 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.

Tasks description tables contain four columns corresponding to:

- Role – the abbreviation of roles 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.1.1, PM.1.2, and so on.
- Input work products – work products needed to execute the task.
- Output work products – work products created or modified by the execution of the task.
- NOTE 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 followed with this text: NOTE Conditional task.

Organisational repository – list of work products to be saved in organisational repository; the configuration management strategy has to be applied to some of them.

NOTE 1 Tables used in process description are for presentation purpose only. The tables are not prescribing a waterfall approach.

NOTE 2 The term ‘Advanced’ is using a capital ‘A’ to indicate an ISO/IEC 29110 profile (e.g., Advanced profile) while the term ‘advanced’ is used when referring to something modern and highly developed.

NOTE 3 To indicate an optional item, an ‘*’ is printed before the item (e.g., * Purchase order)

NOTE 4 “If the list comprises one sentence broken into a list format, then the list items start in upper case and end with a semicolon (preferred) or a comma, used consistently.”

4.3 Notation used to document new processes, additions and modifications to the processes of the Intermediate profile

The Advanced profile has been designed to build upon the processes of the Intermediate profile such that, when moving from the Intermediate profile to the Advanced profile, a VSE has to only add to its existing Intermediate profile processes the new processes (e.g., outcomes, activities, tasks, roles and work products) described in this document.

Since, in the Advanced profile, there are additions and modifications to the Intermediate 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 (SR) processes, of the Intermediate 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 Intermediate profile:

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

The Advanced profile has one new process that is not in the Intermediate profile: system transition and disposal process (SYTD).

The purpose of the system transition and disposal process is to move the system, in an orderly and planned manner, into the operational status. In this way, the system is functional and operable in the operational environment of the customer to end the existence of a system element or system for a specified intended use. At this time, the customer can appropriately handle, replace, or retire elements, by properly attending to critical disposal needs (e.g., per an agreement, per organisational policy, or for environmental, safety, security aspects).

The SYTD process is a conditional process. It is executed if a VSE is required, in the agreement (e.g., statement of work), to install and/or dispose of a system at the customer operational environment. If this is the case, this process is included in the scope of an audit or an assessment.

To facilitate the identification of additional abbreviations, roles and work products of the SYTD process of the Advanced profile, these items are underlined. To facilitate reading, the SYTD process has not been underlined.

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

- “Statement of work”, “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 10](#). These codes have not been used in the descriptions of activities and tasks to facilitate readability.

4.4 Abbreviated terms

The following abbreviations are used in this document:

ACQ	acquirer
AM	acquisition management
CUS	customer
PO	purchase order
PM	project management
PJM	project manager
PROM	proposal manager
SBS	system breakdown structure
SDD	system design document
SEMP	systems engineering management plan
SMART	specific, measurable, accepted, realistic and traced
SME	small and medium enterprise
SR	system definition and realisation
STK	stakeholder
SW	software
<u>SYTD</u>	<u>system transition and disposal</u>
TM	technical management
TCM	technical manager
TPM	technical performance management
VSE	very small entity
V&V	verification, and alidation
V&VE	V&V engineer
WBS	work breakdown structure
WP	work product

5 Systems thinking

The traditional approach to solve a problem is called artisan. 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 the insight of the whole system. To overcome this limitation, there is the systems thinking concept, 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).

Systems thinking allows for a better understanding of the systems as a whole: Systems thinking is used to broaden the perspective to larger environments by considering the entire life cycle 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 to consider 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, systems thinking should be considered when understanding the system to be designed so that, when identifying the requirements, all stakeholders’ needs are 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 of the parts.

6 Overview

This document provides the following processes: technical management, acquisition management, project management, systems definition and realisation and system transition and disposal. These processes integrate tasks selected from the ISO/IEC/IEEE 15288, systems and software engineering — system life cycle processes and the ISO/IEC/IEEE 15289, systems and software engineering – content of life cycle information products (documentation) standards elements. [Annex A](#) provides information about deployment packages (DPs) which will facilitate the implementation of these processes.

In the Entry, Basic, and Intermediate profiles of the generic profile group, the boundary between the VSE, its business environment, and its work product were naturally vague, since everyone was focused on one work product. With the Advanced profile, the VSE may have more than one project ongoing at a time. With the potential need for more workers, 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 do to fulfil 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 organisational 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 for 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 a 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), work 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 purpose of the system transition and disposal (SYTD) process is to move the system, in an orderly, planned manner, into the operational status such that the system is functional and operable in the customer's operational environment. At the end of the need or intended use of the system element or system, the appropriate replacement or disposal of the product will be properly attended to, to include any critical disposal needs (e.g., per an agreement, per organisational policy, or for environmental, safety, and security aspects).

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

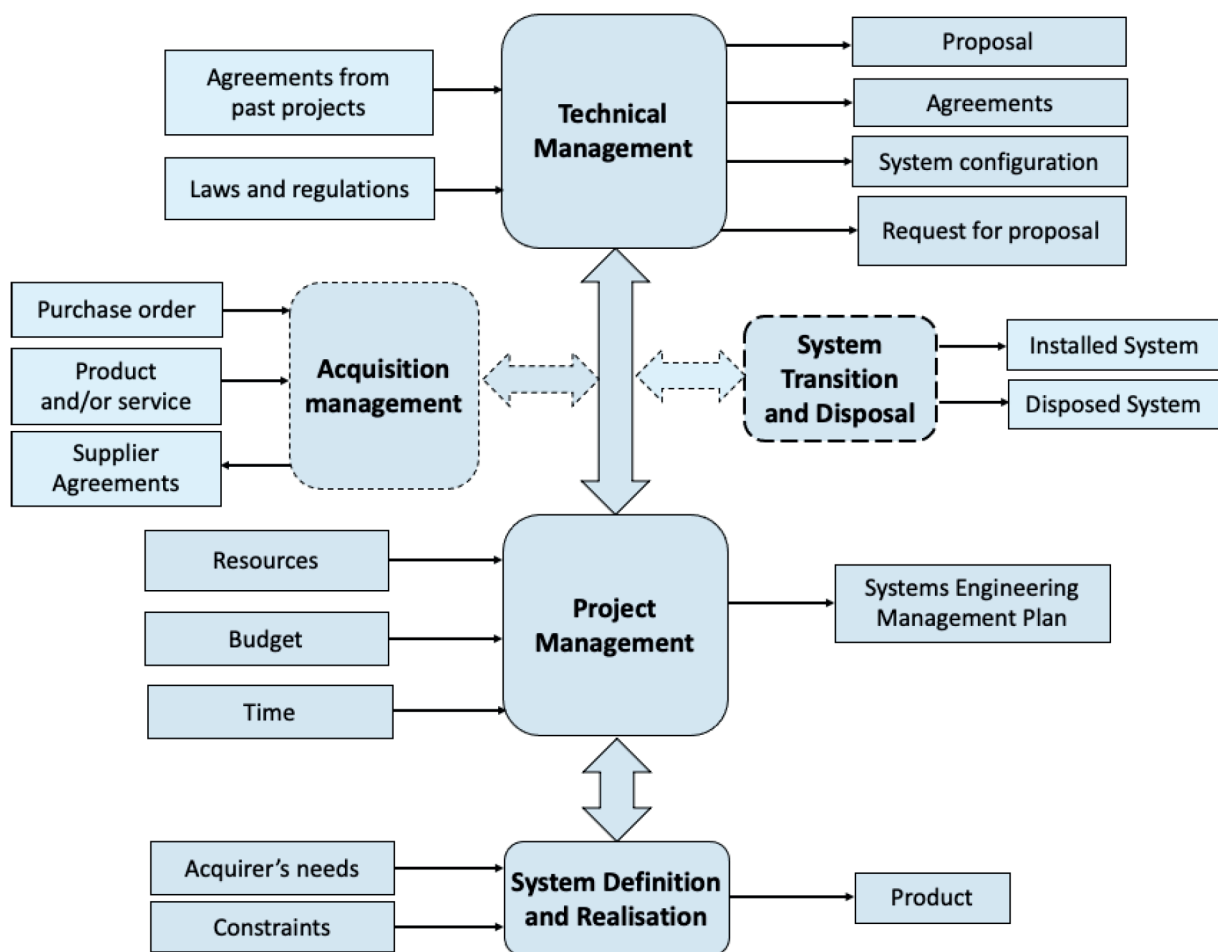


Figure 2 — Advanced profile processes

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, protect its intellectual property, and protect 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 (e.g., agile, evolutionary, incremental, test-driven development) 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 (e.g., human, knowledge and material) in order to meet the business objectives of the VSE.

TM.02. Provide to the customer the work product 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 internally disseminate 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 evaluations, critiques and mentoring, if required, in order to deliver to the acquirer a system of defined quality, in time, and on cost.

7.3 TM roles involved

[Table 2](#) provides a list of roles involved in the TM process.

Table 2 — TM roles involved

Role	Abbreviation
Technical manager	TCM
Project manager	PJM
Customer	CUS

7.4 TM process description

7.4.1 TM diagram

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

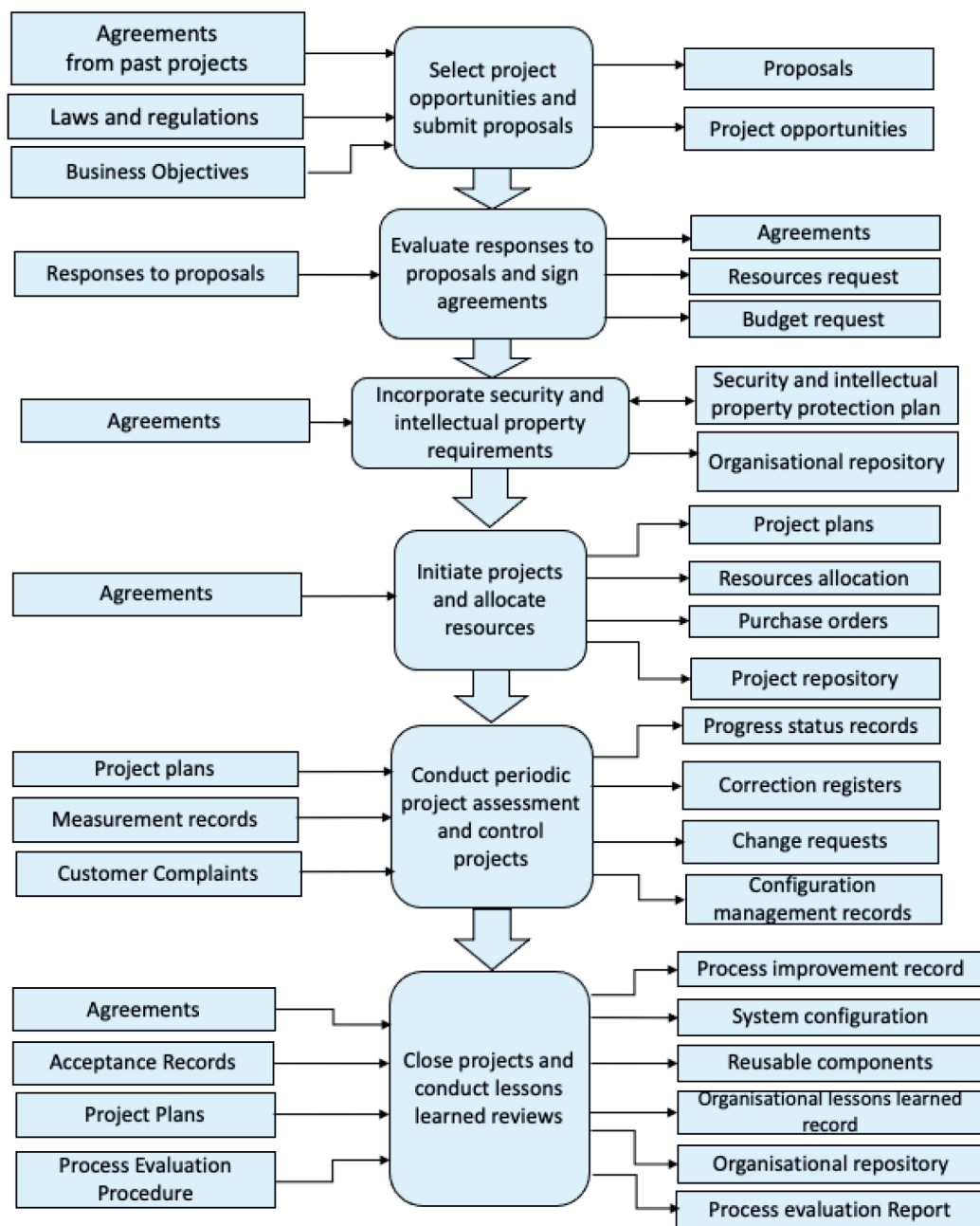


Figure 3 — Technical management process diagram

NOTE 1 All the feedback lines are not all displayed to facilitate readability.

NOTE 2 A few input WPs have been produced by other processes (e.g., PM) during the execution of a specific project.

7.4.2 TM activities

7.4.2.1 General

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.

7.4.2.2 TM.01 Select project opportunities and submit proposals (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
- Proposals submitted to potential customers.

TM.01 task list is given in [Table 3](#).

Table 3 — TM.01 task list

Role	Task list	Input Work products	Output Work products
TCM PJMs	TM.01.01 Document project opportunities. NOTE 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. NOTE 1 A proposal is prepared by a PJM during the execution of the AM process for a specific project. NOTE 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]

7.4.2.3 TM.02 Evaluate responses to proposals and sign agreements (TM.01)

This activity involves the evaluation of the responses to proposals submitted by 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 creates its project plan.

The activity provides:

- Request for proposal(s),
- Agreements.

TM.02 task list is given in [Table 4](#).

Table 4 — 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 PJM	TM.02.03 Approve projects and assign project managers to develop project plans and resources requests. NOTE 1 Project opportunities are updated (if applicable). NOTE 2 Project plans are developed according to the planning activity of the PM process.	Agreement [approved]	Project opportunities [updated]

7.4.2.4 TM.03 Incorporate security and intellectual property requirements (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.

TM.03 task list is given in [Table 5](#).

Table 5 — 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. NOTE 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 organisational repository. NOTE The repository has to protect the security and intellectual property of the VSE and its customers.	Security and intellectual property protection plan [approved]	Organisational repository [established]

7.4.2.5 TM.04 Initiate projects and allocate resources (TM.03, TM.04, 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 have to be acquired, purchase orders are approved. An organisational repository is established.

The activity provides:

- Approved project plans,
- Approved resources requests,
- Approved purchased orders,
- Human resource record.

TM.04 task list is given in [Table 6](#).

Table 6 — 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. NOTE 1 Assign required human resources and other resources to project (e.g., work team, computer facilities). NOTE 2 Human resource record are 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 have to be acquired from suppliers and/or services to be acquired. NOTE 1 If a work product or a service has to be acquired, a purchase order is initiated. NOTE 2 If a work product (e.g., software component) or a service has to 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. NOTE Purchase orders are approved by the project plan execution activity of the PM process.	Purchase orders [initiated]	Purchase orders [approved]

7.4.2.6 TM.05. Conduct periodic project assessment and control projects (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.

TM.05 task list is given in [Table 7](#).

Table 7 — TM.05 task list

Role	Task list	Input Work products	Output Work products
TCM PJM	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 [ap- proved] Customer complaints [published]	Progress status records [evaluated]
TCM PJM	TM.05.02 Establish actions to correct deviations or problems and identified risks. NOTE Concerning the accomplishment of the plan, as needed, document them in correction register and track them to closure.	Progress status re- cords [evaluated]	Correction register [initial]
TCM PJM	TM.05.03 Identify changes to requirements or project plans or both. NOTE 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 re- cords [evaluated]	Change requests [initi- ated]
TCM	TM.05.04 Record and report the status of the items and modifications.	Configuration man- agement strategy [initiated]	Configuration manage- ment records [initiated]

7.4.2.7 TM.06. Close projects and conduct lessons learned reviews (TM.01, TM.05)

This activity formalizes, at the organisational level, the project closure activity of the PM process, by delivering the work products to the customers. organisational 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 organisational repository.

The activity provides:

- Acceptance record;
- Delivery instructions signed by customer;
- Product;
- Organisational lessons learned;
- Process improvement record;
- Reusable components;

— Updated organisational repository.

TM.06 task list is given in [Table 8](#).

Table 8 — 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. NOTE 1 As established in the project plans, providing acceptance support and getting the acceptance record signed from the customers. NOTE 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 [approved] 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. NOTE 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. NOTE 1 Lessons learned are analysed to identify improvements to processes, work products, and prioritise them in the improvement record. NOTE 2 The business objectives are updated if necessary. NOTE 3 A few input WPs (e.g., meeting records) have been produced during the execution of a project.	Agreements [approved] Business objectives [approved] Project plans [approved] Meeting records [published] Customer complaints [published] Project lessons learned record [approved] Measurement records [published]	Organisational lessons learned record [approved] Process improvement record [approved] 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 organisational repository.	Product [accepted] Project repositories [baselined]	Organisational repository [updated] — Reusable components

Table 8 (continued)

Role	Task list	Input Work products	Output Work products
TCM PJM	TM.06.06 Update the organisational repository.	Product [accepted] Project repositories [baselined]	Organisational repository [updated]

7.4.2.8 Incorporation to the organisational repository

The list of work products to be saved in organisational repository is given in [Table 9](#).

Table 9 — TM repository work products

Name
Organisational objectives
Project opportunities
Proposal
Agreement
Project plan
Acceptance record
Security and intellectual property protection plan
Organisational 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 definition and realisation project. This supports compliance with the project's objectives in the expected quality, time, and cost, 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. It also carries out administrative tasks relating to the storage, handling, protection and delivery of work products and configuration items.

This part of ISO/IEC 29110 series is intended to be used by the VSE to establish processes to implement any development approach or methodology (for example agile, evolutionary, incremental, test-driven development, etc.) based on the VSE 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.