TECHNICAL SPECIFICATION

ISO/IEC TS 33060

First edition
2020-03

Information technology — Process assessment — Process assessment model for system life cycle processes

Reference number
ISO/IEC TS 33060:2020(E)

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents) or the IEC list of patent declarations received (see http://patents.iec.ch).

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

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

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

This document cancels and replaces ISO/IEC 15504-6:2013, which has been technically revised.

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

— all processes and their base practices are changed to reflect the ISO/IEC/IEEE 15288 processes;

— all process related information products and their descriptions are revised;

— this process assessment model includes a process quality attribute of process performance and can be used with other models of process quality, for instance capability as described in ISO/IEC 33020.

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.

Introduction

The set of International Standards ISO/IEC 33001 to ISO/IEC 33099, termed the ISO/IEC 330xx family, defines the requirements and resources needed for process assessment. The overall architecture and content of the series is described in ISO/IEC 33001. Several standards in the ISO/IEC 330xx family for process assessment are intended to replace and extend parts of the ISO/IEC 15504 series.

This document defines a process assessment model for system life cycle processes, conformant with the requirements of ISO/IEC 33004, for use in performing a conformant assessment in accordance with the requirements of ISO/IEC 33002.

A process assessment model is related to one or more process reference models. The process reference model defined in ISO/IEC/IEEE 15288 is used as the basis for the process assessment model in this document.

A process assessment model incorporates a process measurement framework conformant with the requirements of ISO/IEC 33003 and is expressed as a process quality characteristic with a defined set of process attributes.

A process assessment model includes a set of assessment indicators. Process performance indicators address the process purpose and outcomes of each process in the process assessment model. Process quality indicators demonstrate the achievement of the process attributes in the process measurement framework. These indicators may also provide a reference source of practices when implementing a process improvement program.

The assessment indicators are used as a basis for collecting objective evidence to support an assessor's judgement in assigning ratings of the performance and quality of an implemented process. The set of indicators defined in this document is not intended to be an all-inclusive set and applicable in its entirety. Subsets appropriate to the context and scope of the assessment should be selected, and potentially augmented with additional indicators.

A process assessment is conducted according to a documented assessment process. A documented assessment process will identify the rating method to be used in rating process attributes and identify or define the aggregation method to be used in determining ratings.

ISO/IEC 33020 provides a process measurement framework for the assessment of process capability which may be incorporated as a process measurement framework in this document. ISO/IEC 33020:2019, Annex B includes a set of process quality indicators for each process attribute in the process measurement framework.

Information technology — Process assessment — Process assessment model for system life cycle processes

1 Scope

This document defines a process assessment model for system life cycle processes, conformant with the requirements of ISO/IEC 33004, for use in performing a conformant assessment in accordance with the requirements of ISO/IEC 33002.

2 Normative references

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

ISO/IEC/IEEE 15288:2015, *Systems and software engineering — System life cycle processes*

ISO/IEC 33001, *Information technology — Process assessment — Concepts and terminology*

ISO/IEC 33003, *Information technology — Process assessment — Requirements for process measurement frameworks*

ISO/IEC 33004:2015, *Information technology — Process assessment — Requirements for process reference, process assessment and maturity models*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 33001 apply.

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

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

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

4 The process assessment model

4.1 General

This document provides a basis for a process assessment model that is two-dimensional. In one dimension, the process dimension, the processes are defined and classified into process categories together with the set of assessment indicators of process performance. In the other dimension, the quality dimension, for each process attribute in the process measurement framework a set of process quality indicators is defined for the selected process quality characteristic.

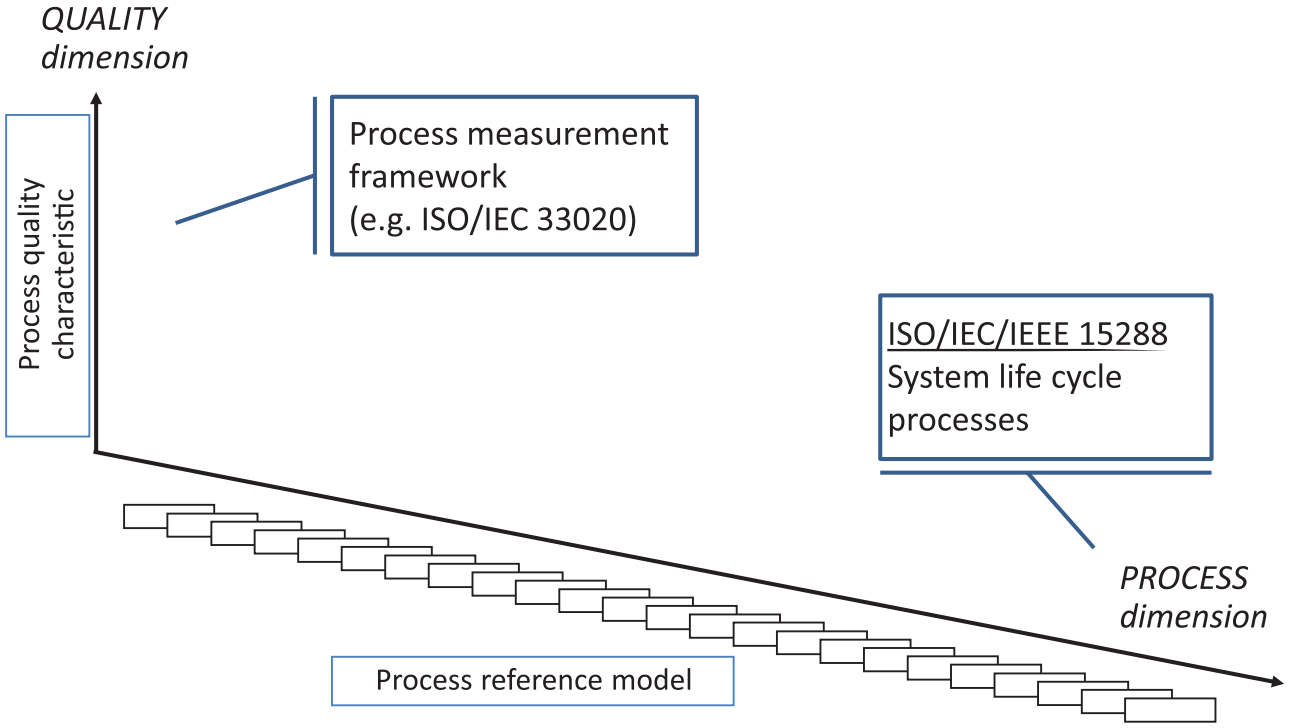

Figure 1 — Two-dimensional model

Figure 1 shows the process assessment model as a two-dimensional model, the process dimension with its relationship to ISO/IEC/IEEE 15288 system life cycle processes, and the quality dimension in relationship to a process measurement framework.

Users of this document may freely reproduce the detailed descriptions contained in the assessment model as part of any tool or other material to support the performance of process assessments, so that it can be used for its intended purpose.

4.2 Structure of the process assessment model

4.2.1 General

This clause describes the detailed structure of the process assessment model and its key components.

The process dimension comprises the set of processes defined with the process purpose and process outcomes together with a set of assessment indicators of process performance.

Processes included in a process reference model shall be in accordance with ISO/IEC 33004:2015, 5.4.

The processes in this document are derived directly from ISO/IEC/IEEE 15288 and meet the ISO/IEC 33004 requirements for process descriptions, process purposes and outcomes.

The quality dimension comprising a set of process attributes for a selected process quality characteristic is incorporated as a process measurement framework together with a set of process quality indicators.

NOTE ISO/IEC 33020 provides a process measurement framework for the assessment of process capability which can be incorporated into this document. ISO/IEC 33020 also includes a set of process quality indicators for each process attribute in the process measurement framework.

4.2.2 Processes

The process assessment model is based upon the system life cycle processes defined in ISO/IEC/IEEE 15288. The process reference model drawn from ISO/IEC/IEEE 15288 consists of the

process purpose and outcomes defined in that standard. If this document is used to claim full or tailored conformance to ISO/IEC/IEEE 15288, the requirements of ISO/IEC/IEEE 15288:2015, Clause 4 shall be satisfied.

Figure 2 lists the processes from ISO/IEC/IEEE 15288 that are included in the process dimension of the process assessment model and shows their classification into process groups.

The process groups and their associated processes are described in Clause 5.

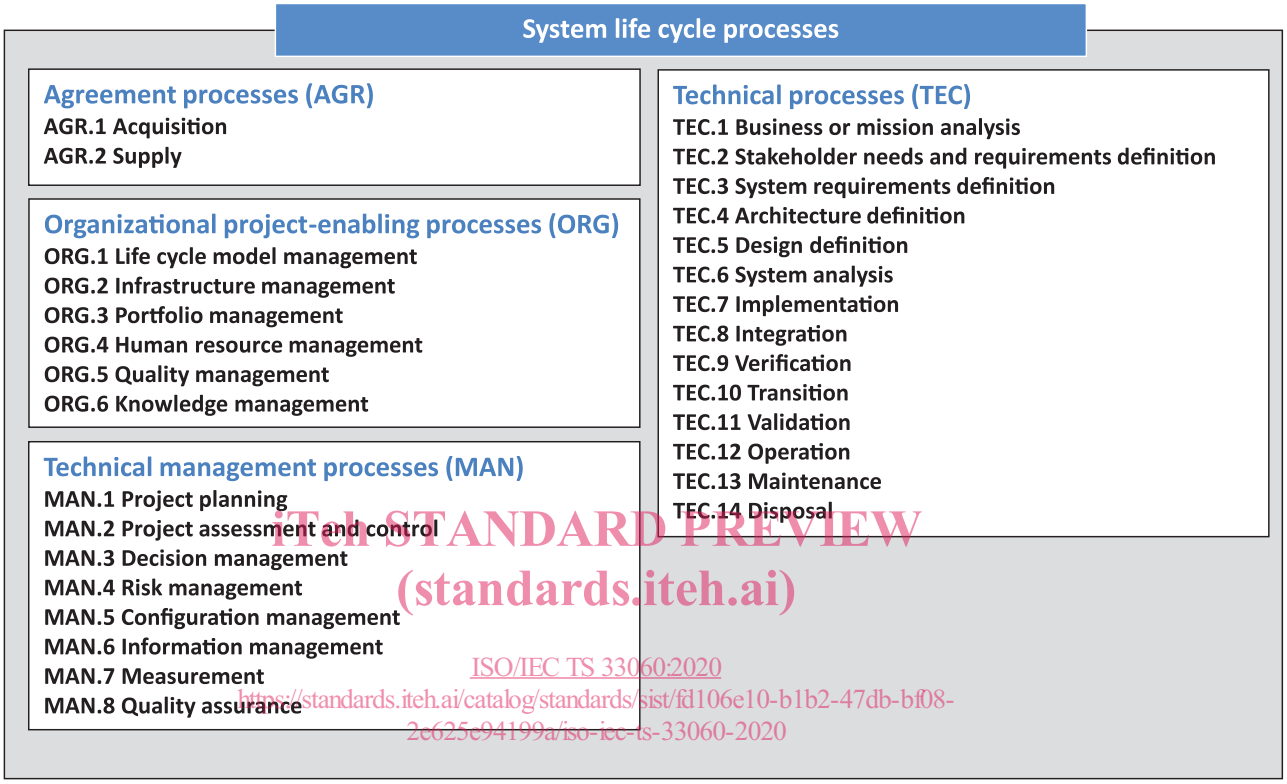

Figure 2 — Process groups

4.2.3 Process dimension

Each process has a process identifier (ID) consisting of the process group abbreviated name and the sequential number of the process in that group. Each process is described by its name, purpose, outcomes, base practices, and information products.

Each process is described in terms of a purpose statement. These statements contain the unique functional objectives of the process when performed in a particular environment. A list of specific process outcomes is associated with each of the process purpose statements, as a list of expected positive results of the process performance.

4.2.4 Quality dimension

For the quality dimension, the minimum requirement is that the process is performed, i.e. the implemented process achieves its process purpose and the expected outcomes are observable.

Process attributes are features of a process that can be evaluated on a scale of achievement, providing a measure of the quality of the process and are applicable to all processes.

4.3 Assessment indicators

A process assessment model is based on the principle that the quality of a process can be assessed by demonstrating the achievement of process attributes on the basis of evidences related to assessment indicators.

There are two types of assessment indicators: process performance indicators and process quality indicators. Process performance indicators address the process purpose and outcomes of each process in the process dimension. Process quality indicators demonstrate the achievement of the process attributes in the quality dimension.

The process performance indicators are:

— Base practice (BP);

— Information product (IP).

The performance of base practices (BPs) provides an indication of the extent of achievement of the process purpose and process outcomes. The base practices correspond to ISO/IEC/IEEE 15288 activities and tasks. Information products (IPs) are either used or produced (or both), when performing the process. Information products that are the key outputs of the process, are primarily used as performance indicators.

Annex A provides the list of information products (IPs) associated with the processes in Clause 5. The information products are assorted by categories. The information products are outputs of processes which are indicated by the process IDs.

Process quality indicators depend on the process quality characteristic of interest. The minimum requirement is that at least one of the process attributes shall comprise the achievement of the defined process purpose and process outcomes for the process; this is termed the process performance attribute (see ISO/IEC 33003:2015, 4.2.1). Other process quality attributes can be defined as needed.

The process performance and process quality indicators represent types of objective evidence that might be found in an instantiation of a process and therefore could be used to judge achievement of quality. Figure 3 shows how the assessment indicators are related to process performance and process quality.

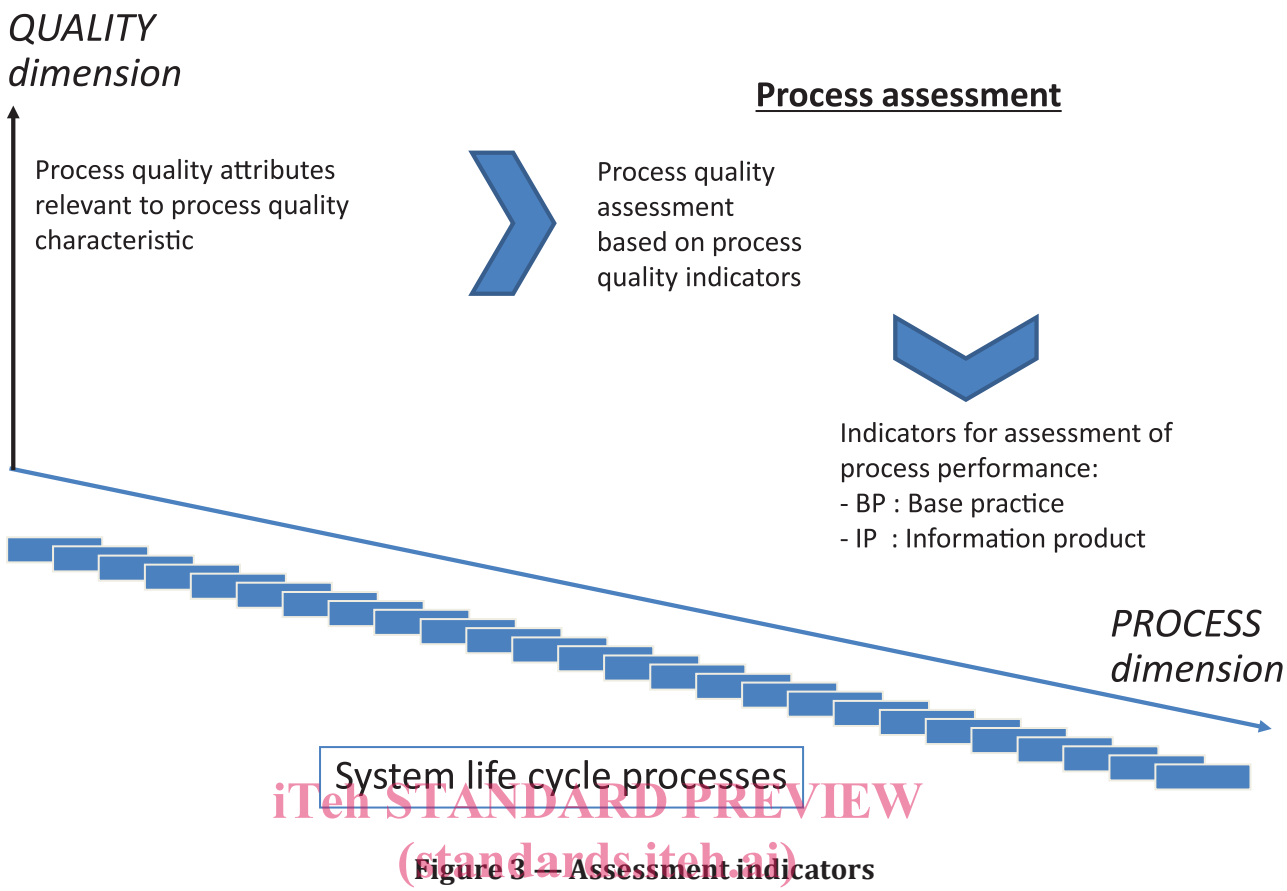

Figure 3 — Assessment indicators

5 The process dimension

5.1 General

The process dimension comprises the set of processes defined with process purpose and process outcomes together with a set of assessment indicators of process performance.

The individual processes each have a process identifier (ID) consisting of the process group abbreviated name and the sequential number of the process in that group and are described in terms of process name, process purpose, and process outcomes as defined in ISO/IEC/IEEE 15288.

In addition, the process dimension of the process assessment model provides information in the form of a set of:

a) base practices for the process providing a definition of the tasks and activities needed to accomplish the process purpose and fulfil the process outcomes; each base practice is associated to one or more process outcomes; and

b) information products that are the key outputs of the process, and are related to one or more process outcomes;

The process purposes, outcomes, base practices and information products associated with the processes are included in this clause. The base practices and information products constitute the set of indicators of process performance.

A documented assessment process and assessor judgment is needed to ensure that process context (application domain, business purpose, development methodology, size of the organization, etc.) is explicitly considered when using this information.

5.2 Agreement processes (AGR)

5.2.1 General

Organizations are producers and users of systems. One organization (acting as an acquirer) can task another (acting as a supplier) for products or services. This is achieved using agreements.

Generally, organizations act simultaneously or successively as both acquirers and suppliers of systems. The agreement processes can be used with less formality when the acquirer and the supplier are in the same organization. Similarly, they can be used within the organization to agree on the respective responsibilities of organization, project and technical functions (ISO/IEC/IEEE 15288).

5.2.2 Acquisition process

Process ID	**AGR.1**
Process name	**Acquisition process**
Process purpose	The purpose of the acquisition process is to obtain a product or service in accordance with the acquirer's requirements. NOTE As part of this process, the agreement is modified when a change request is agreed to by both the acquirer and supplier.
Process outcomes	As a result of the successful implementation of the acquisition process: a) A request for supply is prepared. b) One or more suppliers are selected. c) An agreement is established between the acquirer and supplier. d) A product or service complying with the agreement is accepted. e) Acquirer obligations defined in the agreement are satisfied.
Base practices	**AGR.1.BP1: Prepare for the acquisition.** [Outcome: a] 1) Define a strategy for how the acquisition will be conducted. 2) Prepare a request for the supply of a product or service that includes the requirements. **AGR.1.BP2: Advertise the acquisition and select the supplier.** [Outcome: b] 1) Communicate the request for the supply of a product or service to potential suppliers. 2) Select one or more suppliers. **AGR.1.BP3: Establish and maintain an agreement.** [Outcome: c, d] 1) Develop an agreement with the supplier that includes acceptance criteria. 2) Identify necessary changes to the agreement. 3) Evaluate impact of changes on the agreement. 4) Negotiate the agreement with the supplier. 5) Update the agreement with the supplier, as necessary. **AGR.1.BP4: Monitor the agreement.** [Outcome: d, e] 1) Assess the execution of the agreement. 2) Provide data needed by the supplier and resolve issues in a timely manner.

	AGR.1.BP5: Accept the product or service. [Outcome: d, e] 1) Confirm that the delivered product or service complies with the agreement. 2) Provide payment or other agreed consideration. 3) Accept the product or service from the supplier, or other party, as directed by the agreement. 4) Close the agreement.
Information products	Acquisition approach [Outcome: a] Request for supply [Outcome: a] Acquisition agreement [Outcome: c] Acquisition agreement change request [Outcome: c] Accepted system or system element [Outcome: d] Acquisition report [Outcome: e] Acquisition record [Outcome: e]

5.2.3 Supply process

Process ID	**AGR.2**
Process name	**Supply process**
Process purpose	The purpose of the supply process is to provide an acquirer with a product or service that meets agreed requirements. NOTE As part of this process, the agreement is modified when a change request is agreed to by both the acquirer and supplier.
Process outcomes	As a result of the successful implementation of the supply process: a) An acquirer for a product or service is identified. b) A response to the acquirer's request is produced. c) An agreement is established between the acquirer and supplier. d) A product or service is provided. e) Supplier obligations defined in the agreement are satisfied. f) Responsibility for the acquired product or service, as directed by the agreement, is transferred.
Base practices	**AGR.2.BP1: Prepare for the supply.** [Outcome: a] 1) Determine the existence and identity of an acquirer who has a need for a product or service. 2) Define a supply strategy. **AGR.2.BP2: Respond to a tender.** [Outcome: b] 1) Evaluate a request for the supply of a product or service to determine feasibility and how to respond. 2) Prepare a response that satisfies the solicitation.

	AGR.2.BP3: Establish and maintain an agreement. [Outcome: c] 1) Negotiate an agreement with the acquirer that includes acceptance criteria. 2) Identify necessary changes to the agreement. 3) Evaluate impact of changes on the agreement. 4) Negotiate the agreement with the acquirer, as necessary. 5) Update the agreement with the acquirer, as necessary. **AGR.2.BP4: Execute the agreement.** [Outcome: d, e] 1) Execute the agreement according to the established project plans. 2) Assess the execution of the agreement. **AGR.2.BP5: Deliver and support the product or service.** [Outcome: d, e, f] 1) Deliver the product or service in accordance with the agreement criteria. 2) Provide assistance to the acquirer in support of the delivered product or service, per the agreement. 3) Accept and acknowledge payment or other agreed consideration. 4) Transfer the product or service to the acquirer, or other party, as directed by the agreement. 5) Close the agreement.
Information products	Supply approach [Outcome: a] Request for supply response [Outcome: b] Supply agreement [Outcome: c] Supply agreement change request [Outcome: c] Supplied system [Outcome: d] Supply report [Outcome: e, f] Supply record [Outcome: e, f]

5.3 Organizational project-enabling processes (ORG)

5.3.1 General

The organizational project-enabling processes are concerned with providing the resources needed to enable the project to meet the needs and expectations of the organization's interested parties. The organizational project-enabling processes are typically concerned at a strategic level with the management and improvement of the organization's business or undertaking, with the provision and deployment of resources and assets, and with its management of risks in competitive or uncertain situations.

The organizational project-enabling processes establish the environment in which projects are conducted. The organization establishes the processes and life cycle models to be used by projects; establishes, redirects, or cancels projects; provides resources required, including human and financial; and sets and monitors the quality measures for systems and other deliverables that are developed by projects for internal and external customers.

The organizational project-enabling processes create a strong business image for many organizations and imply commercial and profit-making motives. Nevertheless, the organizational project-enabling processes are equally relevant to non-profit organizations, since they are also accountable to

stakeholders, are responsible for resources and encounter risk in their undertakings. This document can be applied to non-profit organizations as well as to profit-making organizations (ISO/IEC/IEEE 15288).

5.3.2 Life cycle model management process

Process ID	**ORG.1**
Process name	**Life cycle model management process**
Process purpose	The purpose of the life cycle model management process is to define, maintain, and assure availability of policies, life cycle processes, life cycle models, and procedures for use by the organization with respect to the scope of this document. This process provides life cycle policies, processes, models, and procedures that are consistent with the organization's objectives, that are defined, adapted, improved, and maintained to support individual project needs within the context of the organization, and that are capable of being applied using effective, proven methods and tools.
Process outcomes	As a result of the successful implementation of the life cycle model management process: a) Organizational policies and procedures for the management and deployment of life cycle models and processes are established. b) Responsibility, accountability, and authority within life cycle policies, processes, models, and procedures are defined. c) Life cycle models and processes for use by the organization are assessed. d) Prioritized process, model, and procedure improvements are implemented.
Base practices	**ORG.1.BP1: Establish the process.** [Outcome: a, b] 1) Establish policies and procedures for process management and deployment that are consistent with organizational strategies. 2) Establish the processes that implement the requirements of this document and that are consistent with organizational strategies. 3) Define the roles, responsibilities, accountabilities, and authorities to facilitate implementation of processes and the strategic management of life cycles. 4) Define business criteria that control progression through the life cycle. 5) Establish standard life cycle models for the organization that are comprised of stages, and define the purpose and outcomes for each stage. **ORG.1.BP2: Assess the process.** [Outcome: c] 1) Monitor process execution across the organization. 2) Conduct periodic reviews of the life cycle models used by the projects. 3) Identify improvement opportunities from assessment results. **ORG.1.BP3: Improve the process.** [Outcome: d] 1) Prioritize and plan improvement opportunities. 2) Implement improvement opportunities and inform relevant stakeholders.