# INTERNATIONAL STANDARD



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# Information technology — Process Assessment —

Part 5: An exemplar Process Assessment Model

iTeh STANDOgies de l'information — Évaluation des processus — Partie 5: Un exemple de modèle d'évaluation de processus (standards.iteh.ai)

ISO/IEC 15504-5:2006 https://standards.iteh.ai/catalog/standards/sist/9ce04c8e-cd2e-446b-ad92-9e1aa2661c2c/iso-iec-15504-5-2006



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# Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 15504-5 was prepared by Joint Technical Committee ISO/IEC JTC 1, Information technology, Subcommittee SC 7, Software and system engineering A RD PREVIEW

This first edition cancels and replaces ISO/IEC TR 15504-5 1998, which has been technically revised.

ISO/IEC 15504 consists of the following parts, under the general title *Information technology* — *Process* Assessment: https://standards.iteh.ai/catalog/standards/sist/9ce04c8e-cd2e-446b-ad92-

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- Part 1: Concepts and vocabulary
- Part 2: Performing an assessment
- Part 3: Guidance on performing an assessment
- Part 4: Guidance on use for process improvement and process capability determination
- Part 5: An exemplar Process Assessment Model

The complete series replaces ISO/IEC TR 15504-1 to ISO/IEC TR 15504-9.

This Part of ISO/IEC 15504 is informative.

# Introduction

This part of ISO/IEC 15504 provides an example of a Process Assessment Model for use in performing a conformant assessment in accordance with the requirements of ISO/IEC 15504-2.

An integral part of conducting an assessment is to use a Process Assessment Model constructed for that purpose, related to a Process Reference Model and conformant with the requirements defined in ISO/IEC 15504-2. ISO/IEC 15504-2 provides a framework for process assessment and sets out the minimum requirements for performing an assessment in order to ensure consistency and repeatability of the ratings.

A Process Reference Model cannot be used alone as the basis for conducting consistent and reliable assessments of process capability since the level of detail is not sufficient. Therefore:

- the descriptions of process purpose and process outcomes provided by the Process Reference Model need to be supported with a comprehensive set of indicators of process performance; and
- the capability levels and process attributes defined in ISO/IEC 15504-2 and its associated rating scale need to be supported with a set of indicators of process capability.

Used in this way, in conjunction with a documented process, consistent and repeatable ratings of process capability will be possible. Teh STANDARD PREVIEW

This Process Assessment Model in Part 5 contains a set of indicators to be considered when interpreting the intent of the Process Reference Model. These indicators may also be used when implementing a process improvement program or to help evaluate and select an assessment model, method, methodology or tools.

The Process Reference Model defined in ISO/IEC 12207 AMD1 and AMD2 has been used as the basis for the Process Assessment Model in this part.

As an exemplar, this Process Assessment Model embodies the core characteristics that could be expected of any Process Assessment Model consistent with ISO/IEC 15504-2. Nevertheless, use of this Process Assessment Model is not required to meet the requirements of ISO/IEC 15504; any other Process Assessment Models meeting the requirements of ISO/IEC 15504-2 may be used in a conformant assessment.

Within this part of ISO/IEC 15504:

- Clause 4 provides a detailed description of the structure and key components of the process assessment model, which includes two dimensions: a process dimension and a capability dimension; assessment indicators are introduced in this clause;
- Clause 5 addresses the process dimension. It uses process definitions from ISO/IEC 12207 AMD1 and AMD2 to identify a Process Reference Model. The processes of the Process Reference Model are described in the Process Assessment Model in terms of purpose and outcomes and are grouped in three process categories. The Process Assessment Model expands the Process Reference Model process definitions by including a set of process performance indicators called base practices for each process. The Process Assessment Model also defines a second set of indicators of process performance by associating work products with each process. Annex B is also linked directly to clause 5 as it defines the work product characteristics;
- Clause 6 addresses the capability dimension. It duplicates the definitions of the capability levels and process attributes from ISO/IEC 15504-2, and expands each of the 9 attributes through the inclusion of a set of generic practices. These generic practices belong to a set of indicators of process capability, in association with generic resource indicators, and generic work product indicators;

- Annex A provides a statement of conformance of the Process Assessment Model to the requirements defined in ISO/IEC 15504-2;
- Annex B provides selected characteristics for typical work products to assist the assessor in evaluating the capability level of processes;
- Annex C contains style guides for defining base practices, work products and generic practices for adjusting the Process Assessment Model, and guidance explaining how to expand or adapt the model; and
- The Bibliography contains a list of informative references.

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# Information technology — Process Assessment —

# Part 5: An exemplar Process Assessment Model

## 1 Scope

This informative part of ISO/IEC 15504:

 defines an exemplar Process Assessment Model that meets the requirements of ISO/IEC 15504-2 and that supports the performance of an assessment by providing indicators for guidance on the interpretation of the process purposes and outcomes as defined in ISO/IEC 12207 AMD1 and AMD2 and the process attributes as defined in ISO/IEC 15504-2;

— provides guidance, by example, on the definition, selection and use of assessment indicators.

A Process Assessment Model comprises a set of indicators of process performance and process capability. The indicators are used as a basis for collecting the objective evidence that enables an assessor to assign ratings. The set of indicators included in this part of ISO/IEC 15504 is not intended to be an all-inclusive set nor is it intended to be applicable in its entirety. Subsets that are appropriate to the context and scope of the assessment should be selected, and possibly augmented with additional indicators (see Annex C).

The Process Assessment Model in this part of ISO/IEC 15504 is directed at assessment sponsors and competent assessors who wish to select a model, and associated documented process method, for assessment (for either capability determination or process improvement). Additionally it may be of use to developers of assessment models in the construction of their own model, by providing examples of good software engineering and management practices.

Any Process Assessment Model meeting the requirements defined in ISO/IEC 15504-2 concerning models for process assessment may be used for assessment. Different models and methods may be needed to address differing business needs. The assessment model in this part of ISO/IEC 15504 is provided as an exemplar of a model meeting all the requirements expressed in ISO/IEC 15504-2.

NOTE **Copyright release for the Exemplar Process Assessment Model:** Users of this part of ISO/IEC 15504 may freely reproduce the detailed descriptions contained in the exemplar 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.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 12207:1995/Amd.1:2002; Amd.2:2004, Information technology — Software life cycle processes

ISO/IEC 15504-1:2004, Information technology — Process assessment — Part 1: Concepts and vocabulary

ISO/IEC 15504-2:2003, Information technology — Process assessment — Part 2: Performing an assessment

# 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 15504-1 apply.

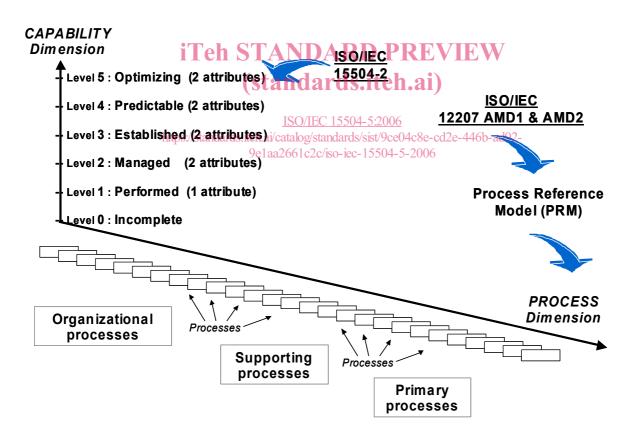
# 4 Overview of the exemplar Process Assessment Model

## 4.1 Introduction

This part of ISO/IEC 15504 provides an exemplar Process Assessment Model that includes examples of assessment indicators.

The Process Reference Model defined in ISO/IEC 12207 AMD1 and AMD2, associated with the process attributes defined in ISO/IEC 15504-2, establish a Process Assessment Model used as a common basis for performing assessments of software engineering process capability, allowing for the reporting of results using a common rating scale.

The Process Assessment Model is a two-dimensional model of process capability. In one dimension, the <u>process dimension</u>, the processes are defined and classified into process categories. In the other dimension, the <u>capability dimension</u>, a set of process attributes grouped into capability levels is defined. The process attributes provide the measurable characteristics of process capability.



### Figure 1 — Relationship between the Process Assessment Model and its inputs

Figure 1 shows the relationship between the general structure of the Process Assessment Model, ISO/IEC 15504-2 and ISO/IEC 12207 AMD1 and AMD2.

The Process Reference Model and the capability dimension defined in ISO/IEC 15504-2 cannot be used alone as the basis for conducting reliable and consistent assessments of process capability since the level of detail provided is not sufficient. The descriptions of process purpose and outcomes in the Process Reference Model, and the process attribute definitions in ISO/IEC 15504-2, need to be supported with a comprehensive set of indicators of process performance and process capability that are used for assessment performance.

The exemplar Process Assessment Model defined in this part of ISO/IEC 15504 is conformant with the ISO/IEC 15504-2 requirements for a Process Assessment Model, and can be used as the basis for conducting an assessment of software engineering process capability.

In order to meet the requirements of ISO/IEC 15504-2, a documented process supporting other requirements of ISO/IEC 15504-2 is also required. This need may be met, for example, by the adoption of a supporting method for conducting assessments.

#### 4.2 Structure of the exemplar Process Assessment Model

This clause describes the detailed structure of the Process Assessment Model and its key components.

This Process Assessment Model expands upon the Process Reference Model by adding the definition and use of assessment indicators. Assessment indicators comprise indicators of process performance and process capability and are defined to support an assessor's judgment of the performance and capability of an implemented process.

Clause 5, together with its associated Annex B, describes the components of the process dimension, and Clause 6 describes the components of the capability dimension. Annex A provides a demonstration of conformity that meets the requirements of ISO/IEC 15504-2.

ISO/IEC 15504-2 requires that processes included in a Process Reference Model satisfy the following:

"The fundamental elements of a Process <u>Reference Model are</u> the set of descriptions of the processes within the scope of the model. These process descriptions shall meet the following requirements:

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- a) A process shall be described in terms of its Purpose and Outcomes.
- b) In any description the set of process outcomes shall be necessary and sufficient to achieve the purpose of the process.
- c) Process descriptions shall be such that no aspects of the measurement framework as described in clause 5 of this International Standard beyond level 1 are contained or implied."

As processes are derived directly from ISO/IEC 12207 AMD1 and AMD2, these requirements are satisfied.

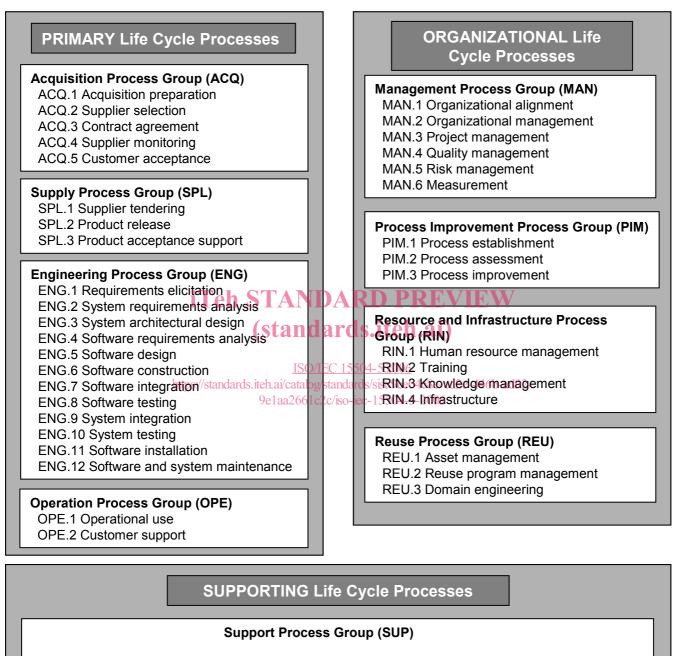
The Process Assessment Model includes processes, which are grouped in three process categories, identical to the process categories defined in ISO/IEC 12207 AMD1 and AMD2, which are:

- the Primary life cycle processes category;
- the Supporting life cycle processes category;
- the Organizational life cycle processes category.

Within a process category, processes are grouped at a second level according to the type of activity they address: the processes included in the same group contribute to a complementary area. These groups are defined in order to help assessors in defining the assessment scope in term of process selection.

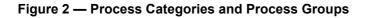
#### 4.2.1 Processes

Figure 2 lists the processes from ISO/IEC 12207 AMD1 and AMD2 that are included in the process dimension of the exemplar Process Assessment Model, and show their classification (for the purpose of this Process Assessment Model) into Process Categories and Process Groups.



SUP.1 Quality assurance
SUP.2 Verification
SUP.3 Validation
SUP.4 Joint review
SUP.5 Audit

- SUP.6 Product evaluation SUP.7 Documentation SUP.8 Configuration management
- SUP.9 Problem resolution management
- SUP.10 Change request management



The description of each Process Group includes a characterization of the processes it contains, followed by a list of the processes. Each process belonging to a Group is identified with a Process Identifier [ID] consisting of the Group abbreviated name and a sequential number of the process in that Group.

The Process Categories and Process Groups are described in more detail below.

## 4.2.1.1 Primary Life Cycle Processes Category

The **Primary Life Cycle Processes** consist of processes that serve primary parties during the life cycle of software. A primary party is one that initiates or performs the development, operation, or maintenance of software products. These primary parties are the acquirer, the supplier, the developer, the operator, and the maintainer of software products.

The Primary Life Cycle Processes Category contains the following four groups of processes:

- the Acquisition process group;
- the Supply process group;
- the Engineering process group;
- the Operation process group.

The Acquisition process group (ACQ) consists of processes performed by the customer, in order to acquire a product and/or a service Teh STANDARD PREVIEW

Note: A supplier may also act as a customer when acquiring a product and/or service from another supplier.

This group includes the processes listed in Table 1.

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#### https://standards.iteh.ai/catalog/standards/sist/9ce04c8e-cd2e-446b-ad92-Table 1 — Primary Life Cycle, Processes - Acquisition process group

Process Identification	Process name	Source
ACQ.1	Acquisition preparation	ISO/IEC 12207 AMD1
ACQ.2	Supplier selection	ISO/IEC 12207 AMD1
ACQ.3	Contract agreement	ISO/IEC 12207 AMD2
ACQ.4	Supplier monitoring	ISO/IEC 12207 AMD1
ACQ.5	Customer acceptance	ISO/IEC 12207 AMD1

The **Supply** process group (SPL) consists of processes performed by the supplier in order to propose and deliver a product and/or a service.

Process Identification	Process name	Source
SPL.1	Supplier tendering	ISO/IEC 12207 AMD2
SPL.2	Product release	ISO/IEC 12207 AMD2
SPL.3	Product acceptance support	ISO/IEC 12207 AMD2

This group includes the processes listed in Table 2.

The **Engineering** process group (ENG) consists of processes that directly elicit and manage the customer's requirements, specify, implement, and/or maintain the software product and it's relation to the system.

This group includes the processes listed in Table 3.

Process Identification	Process name	Source
ENG.1	Requirements elicitation	ISO/IEC 12207 AMD1
ENG.2	System requirements analysis	ISO/IEC 12207 AMD1
ENG.3	System architectural design	ISO/IEC 12207 AMD1
ENG.4	Software requirements analysis	ISO/IEC 12207 AMD1
ENG.5	Software design	ISO/IEC 12207 AMD1
ENG.6	Software construction	ISO/IEC 12207 AMD1
ENG.7	Software integration	ISO/IEC 12207 AMD1
ENG.8	Software testing	ISO/IEC 12207 AMD1
ENG.9	System integration	ISO/IEC 12207 AMD1
ENG.10	System testing STANDAR	ISO/IEC 12207 AMD1
ENG.11	Software installation tandards	ISO/IEC 12207 AMD1
ENG.12	Software and system maintenance	ISO/IEC 12207 AMD1

Table 3 — Primary Life Cycle Processes – Engineering process group

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The **Operation** process group (OPE) consists 266 processes performed in order to provide for the correct operation and use of the software product and/or service.

This group includes the processes listed in Table 4.

### Table 4 — Primary Life Cycle Processes – Operation process group

Process Identification	Process name	Source
OPE.1	Operational use	ISO/IEC 12207 AMD1
OPE.2	Customer support	ISO/IEC 12207 AMD1

## 4.2.1.2 Supporting Life Cycle Processes Category

The **Supporting Life Cycle Processes** consist of processes that support another process as an integral part with a distinct purpose and contributes to the success and quality of the software project. A supporting process is employed and executed, as needed, by another process.

This group includes the processes listed in Table 5.

Process Identification	Process name	Source
SUP.1	Quality assurance	ISO/IEC 12207 AMD1
SUP.2	Verification	ISO/IEC 12207 AMD1
SUP.3	Validation	ISO/IEC 12207 AMD1
SUP.4	Joint review	ISO/IEC 12207 AMD1
SUP.5	Audit	ISO/IEC 12207 AMD1
SUP.6	Product evaluation	ISO/IEC 12207 AMD1
SUP.7	Documentation	ISO/IEC 12207 AMD1
SUP.8	Configuration management	ISO/IEC 12207 AMD2
SUP.9	Problem resolution management	ISO/IEC 12207 AMD2
SUP.10	Change request management	ISO/IEC 12207 AMD2

Table 5 — Supporting Life Cycle Processes - Support process group

NOTE The Usability process in ISO/IEC 12207 is not included. Where usability is a relevant attribute, or human engineering is a customer or product requirement, ISO TR 18529 provides a definition of human-centred design processes that complies with the requirements of ISO/IEC 15504-2.

#### 4.2.1.3 **Organizational Life Cycle Processes Category**

The Organizational Life Cycle Processes consist of processes employed by an organization to establish and implement an underlying structure made up of associated life cycle processes and personnel and continuously improve the structure and processes. They are typically employed outside the realm of specific projects and contracts; however, lessons from such projects and contracts contribute to the improvement of the organization.

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The Organizational Life Cycle Processes, Category contains the following four groups of processes:

- the Management process group;
- the Process Improvement process group;
- the Resource and Infrastructure process group; and
- the Reuse process group.

The **Management** process group (MAN) consists of processes that contain practices that may be used by anyone who manages any type of project or process within a software life cycle.

This group includes the processes listed in Table 6.

Process Identification	Process name	Source
MAN.1	Organizational alignment	ISO/IEC 12207 AMD1
MAN.2	Organizational management	ISO/IEC 12207 AMD1
MAN.3	Project management	ISO/IEC 12207 AMD1
MAN.4	Quality management	ISO/IEC 12207 AMD1
MAN.5	Risk management	ISO/IEC 12207 AMD2
MAN.6	Measurement	ISO/IEC 12207 AMD1

#### Table 6 — Organizational Life Cycle Processes - MAN process group

The Process Improvement process group (PIM) consists of processes performed in order to define, deploy, assess and improve the processes performed in the organizational unit.

This group includes the processes listed in Table 7.

Process Identification	Process name	Source
PIM.1	Process establishment	ISO/IEC 12207 AMD1
PIM.2	Process assessment	ISO/IEC 12207 AMD1
PIM.3	Process improvement	ISO/IEC 12207 AMD2

Table 7 — Organizational Life Cycle Processes - PIM process group

The Resource and Infrastructure process group (RIN) consists of processes performed in order to provide adequate human resources and necessary infrastructure as required by any other process performed by the organizational unit.

This group includes the processes listed in Table 8.

#### Table 8 — Organizational Life Cycle Processes - RIN process group

Process Identification	iTe <sup>Process</sup> name DARI	D PREV Source
RIN.1	Human resource management	ISO/IEC 12207 AMD1
RIN.2	Training	ISO/IEC 12207 AMD1
RIN.3	Knowledge managementso/IEC 15504	180//EC 12207 AMD1
RIN.4	Infrast/standards.iteh.ai/catalog/standards/s	150/160 12207 AMD2-ad92-

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The Reuse process group (REU) consists of processes performed in order to systematically exploit reuse opportunities in the organization's reuse programmes.

This group includes the processes listed in Table 9.

Process Identification	Process name	Source
REU.1	Asset management	ISO/IEC 12207 AMD1
REU.2	Reuse program management	ISO/IEC 12207 AMD2
REU.3	Domain engineering	ISO/IEC 12207 AMD1

Table 9 — Organizational Life Cycle Processes - REU process group

## 4.2.2 Process dimension

For the process dimension, all the processes in Figure 2 are included within the process dimension of the Process Assessment Model. The processes are classified into Process Categories and Process Groups. There are three Process Categories: Primary Life Cycle Processes, Organizational Life Cycle Processes and Supporting Life Cycle Processes. Each process in the Process Assessment Model 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 outcomes is associated with each of the process purpose statements, as a list of expected positive results of the process performance.

Satisfying the purpose statements of a process represents the first step in building a level 1 process capability where the expected outcomes are observable. The Process Groups and their associated processes are described in Clause 5.

#### 4.2.3 Capability dimension

For the capability dimension, the process capability levels and process attributes are identical to those defined in ISO/IEC 15504-2.

Evolving process capability is expressed in the Process Assessment Model in terms of process attributes grouped into capability levels. Process attributes are features of a process that can be evaluated on a scale of achievement, providing a measure of the capability of the process. They are applicable to all processes. Each process attribute describes a facet of the overall capability of managing and improving the effectiveness of a process in achieving its purpose and contributing to the business goals of the organization.

A capability level is a set of process attribute(s) that work together to provide a major enhancement in the capability to perform a process. The levels constitute a rational way of progressing through improvement of the capability of any process and are defined in ISO/IEC 15504-2.

There are six capability levels, incorporating nine process attributes.

#### Level 0: Incomplete process

The process is not implemented, or fails to achieve its process purpose.

At this level, there is little or no evidence of any systematic achievement of the process purpose.

# Level 1: Performed process (standards.iteh.ai)

The implemented process achieves its process purposes 2006

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The previously described Performed process is now implemented in a managed fashion (planned, monitored and adjusted) and its work products are appropriately established, controlled and maintained.

#### Level 3: Established process

The previously described Managed process is now implemented using a defined process that is capable of achieving its process outcomes.

#### Level 4: Predictable process

The previously described Established process now operates within defined limits to achieve its process outcomes.

#### Level 5: Optimizing process

The previously described Predictable process is continuously improved to meet relevant current and projected business goals.

Within the Process Assessment Model, the measure of capability is based upon the nine process attributes (PA) defined in ISO/IEC 15504-2. Process attributes are used to determine whether a process has reached a given capability. Each attribute measures a particular aspect of the process capability.

At each level there is no ordering between the process attributes; each attribute addresses a specific aspect of the capability level. The list of process attributes is shown in Table 10.