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ISO/IEC 15504-5

Second edition
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Information technology — Process assessment —

Part 5: An exemplar software life cycle process assessment model

Technologies de l'information — Évaluation des procédés —

Partie 5: Un exemple de modèle d'évaluation des procédés du cycle de vie d'un logiciel

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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 systems engineering*.

This second edition cancels and replaces the first edition (ISO/IEC 15504-5:2006), which has been revised as follows:

— Clause 2 has been modified by updating the reference to ISO/IEC 12207;

— Clauses 4 and 5 have been replaced with new text;

— 6.6 has been replaced with new text;

— B.2 has been replaced with new text;

— a new Annex D – Supplementary process definitions has been added;

— the Bibliography has been updated to reflect current versions of works referenced.

ISO/IEC 15504 consists of the following parts, under the general title *Information technology — Process assessment*:

— *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 software life cycle process assessment model*

— *Part 6: An exemplar system life cycle process assessment model* [Technical Report]

— *Part 7: Assessment of organizational maturity* [Technical Report]

— *Part 9: Target process profiles* [Technical Specification]

— *Part 10: Safety extension* [Technical Specification]

The following part is under preparation:

— *Part 8: An exemplar process assessment model for IT service management* [Technical Report]

Introduction

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.

The ISO/IEC 15504-5 exemplar Process Assessment Model 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 12207:2008 has been used as the basis for the ISO/IEC 15504-5 exemplar software life cycle Process Assessment Model.

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.

Information technology — Process assessment —

Part 5:
An exemplar software life cycle process assessment model

1 Scope

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.

This part of ISO/IEC 15504 is structured as follows.

— 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 12207:2008 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 nine 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.

— Annex D presents some processes supplementary to the Process Assessment Model.

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 12207:2008, *Systems and software engineering — 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.

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).

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.

The Process Reference Model defined in ISO/IEC 12207:2008 and 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 process dimension, the processes are defined and classified into process categories. In the other dimension, the capability dimension, a set of process attributes grouped into capability levels is defined. The process attributes provide the measurable characteristics of process capability.

Figure 1 shows the relationship between the general structure of the Process Assessment Model, ISO/IEC 15504-2 and ISO/IEC 12207:2008.

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.

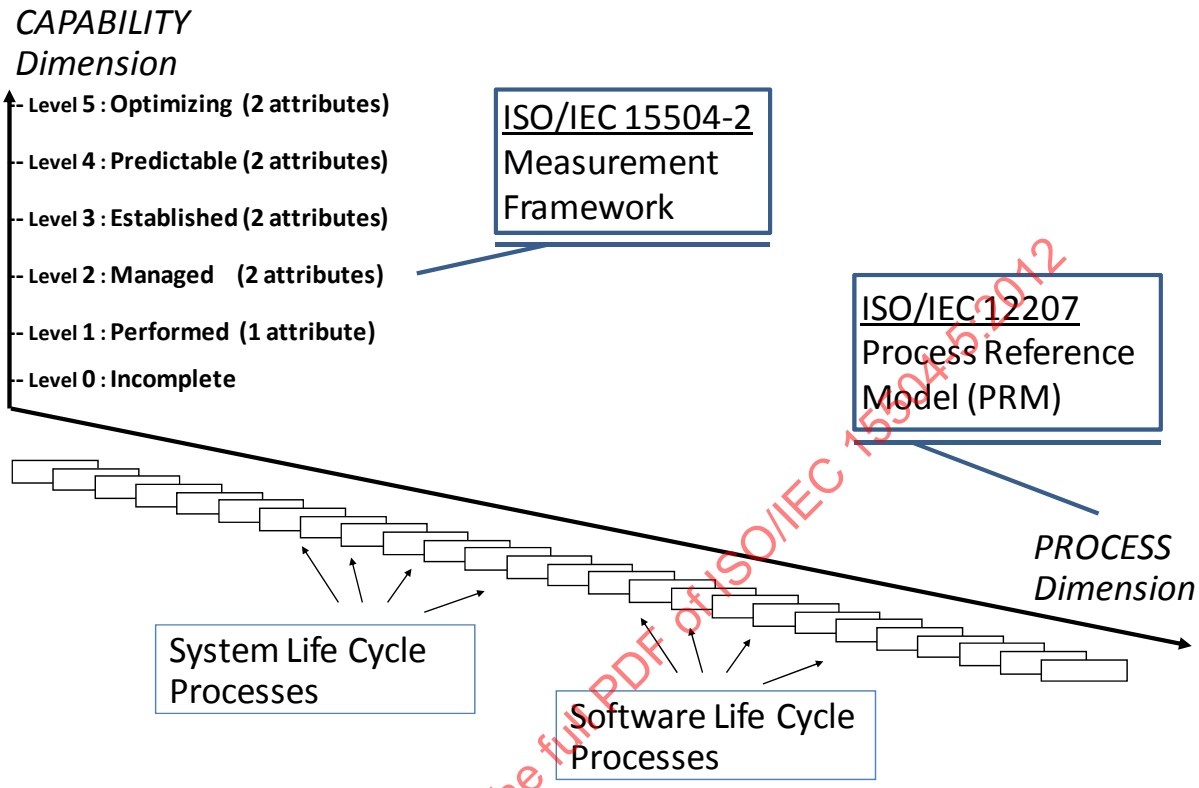

Figure 1 — Relationship between the Process Assessment Model and its inputs

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 Reference Model are the set of descriptions of the processes within the scope of the model. These process descriptions shall meet the following requirements:

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 12207:2008, these requirements are satisfied.

The Process Assessment Model includes processes, which are grouped in two process categories, similar to the process categories defined in ISO/IEC 12207:2008, which are:

— the System life cycle processes category; and

— the Software 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 12207:2008 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.

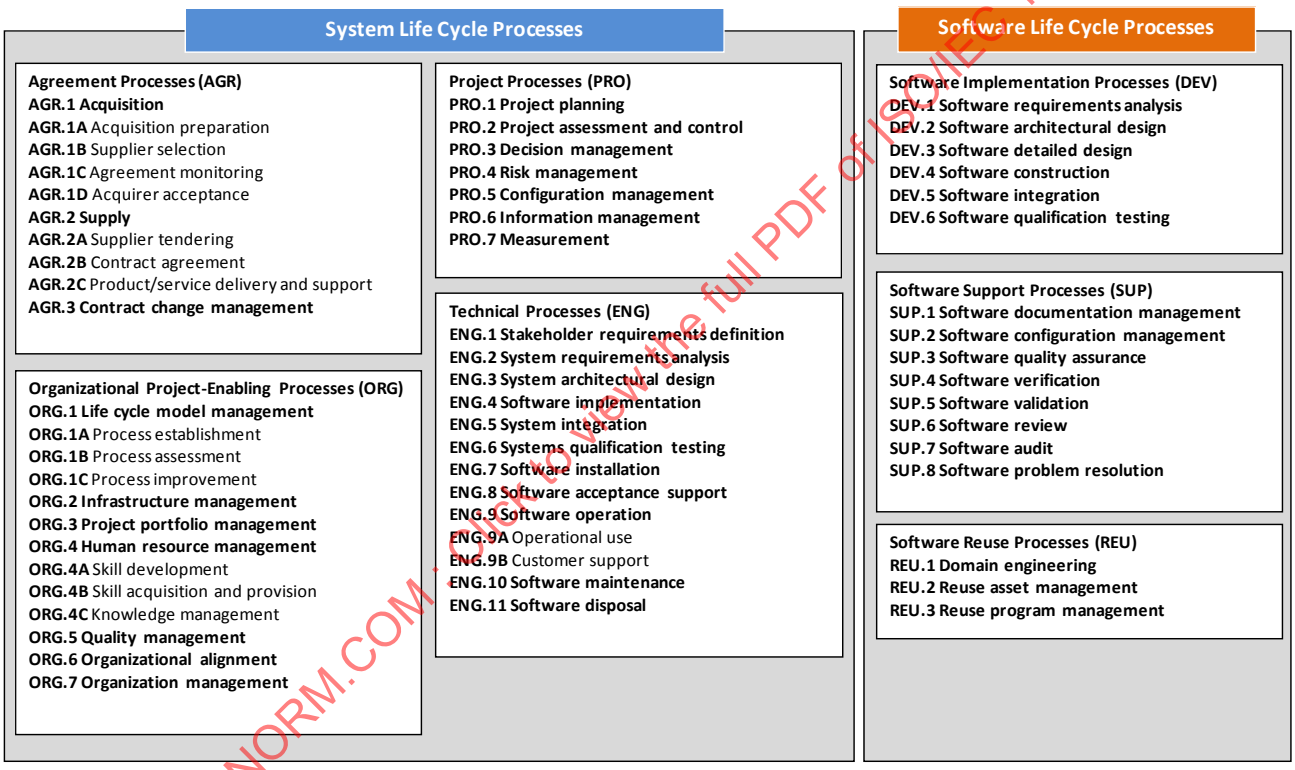

Figure 2 — Process Categories and Process Groups

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 System Life Cycle Processes Category

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

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

— the Agreement Processes group;;

— the Organizational Project-Enabling Processes group;

— the Project Processes group;

— the Technical Processes group.

The **Agreement Processes** (AGR) define the activities necessary to establish an agreement between two organizations. If the Acquisition Process is invoked, it provides the means for conducting business with a supplier of products that are supplied for use as an operational system, of services in support of an operational system, or of elements of a system being developed by a project. If the Supply Process is invoked, it provides the means for conducting a project in which the result is a product or service that is delivered to the acquirer. [ISO/IEC 12207:2008]

This group includes the processes listed in Table 1.

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

Table 1 — System Life Cycle Processes - Agreement Processes

Process Identification	Process name	Source
AGR.1	Acquisition	ISO/IEC 12207:2008, 6.1.1
AGR.1A	Acquisition preparation (subprocess)	ISO/IEC 12207:2008, B.3.1.1
AGR.1B	Supplier selection (subprocess)	ISO/IEC 12207:2008, B.3.1.2
AGR.1C	Agreement monitoring (subprocess)	ISO/IEC 12207:2008, B.3.1.3
AGR.1D	Acquirer acceptance (subprocess)	ISO/IEC 12207:2008, B.3.1.4
AGR.2	Supply	ISO/IEC 12207:2008, 6.1.2
AGR.2A	Supplier tendering (subprocess)	ISO/IEC 12207:2008, B.3.2.1
AGR.2B	Contract agreement (subprocess)	ISO/IEC 12207:2008, B.3.2.2
AGR.2C	Product/service delivery and support (subprocess)	ISO/IEC 12207:2008, B.3.2.3
AGR.3	Contract change management	ISO/IEC 12207:2008, F.3

The **Organizational Project-Enabling Processes** (ORG) manage the organization's capability to acquire and supply products or services through the initiation, support and control of projects. They provide resources and infrastructure necessary to support projects and ensure the satisfaction of organizational objectives and established agreements. They are not intended to be a comprehensive set of business processes that enable management of the organization's business. [ISO/IEC 12207:2008]

This group includes the processes listed in Table 2.

Table 2 — System Life Cycle Processes - Organizational Project-Enabling Processes

Process Identification	Process name	Source
ORG.1	Life cycle model management	ISO/IEC 12207:2008, 6.2.1
ORG.1A	Process establishment (subprocess)	ISO/IEC 12207:2008, B.3.3.1
ORG.1B	Process assessment (subprocess)	ISO/IEC 12207:2008, B.3.3.2
ORG.1C	Process improvement (subprocess)	ISO/IEC 12207:2008, B.3.3.3
ORG.2	Infrastructure management	ISO/IEC 12207:2008, 6.2.2
ORG.3	Project portfolio management	ISO/IEC 12207:2008, 6.2.3
ORG.4	Human resource management	ISO/IEC 12207:2008, 6.2.4
ORG.4A	Skill development (subprocess)	ISO/IEC 12207:2008, B.3.4.1
ORG.4B	Skill acquisition and provision (subprocess)	ISO/IEC 12207:2008, B.3.4.2
ORG.4C	Knowledge management (subprocess)	ISO/IEC 12207:2008, B.3.4.3
ORG.5	Quality management	ISO/IEC 12207:2008, 6.2.5
ORG.6	Organizational alignment	ISO/IEC 12207:2008, F.1
ORG.7	Organization management	ISO/IEC 12207:2008, F.2

There are two categories of the **Project Processes** (PRO). The Project Management Processes are used to plan, execute, assess and control the progress of a project. The Project Support Processes support specialized management objectives. [ISO/IEC 12207:2008]

The Project Management Processes (PRO.1 and PRO.2) are used to establish and evolve project plans, to assess actual achievement and progress against the plans and to control execution of the project through to fulfilment. Individual Project Management Processes may be invoked at any time in the life cycle and at any level in a hierarchy of projects, as required by project plans or unforeseen events. The Project Management Processes are applied with a level of rigor and formality that depends on the risk and complexity of the project.

The Project Support Processes (PRO.3, PRO.4, PRO.5, PRO.6 and PRO.7) provide a specific focused set of tasks for performing a specialized management objective. They are all evident in the management of any undertaking, ranging from a complete organization down to a single life cycle process and its tasks.

This group includes the processes listed in Table 3.

Table 3 — System Life Cycle Processes - Project Processes

Process Identification	Process name	Source
PRO.1	Project planning	ISO/IEC 12207:2008, 6.3.1
PRO.2	Project assessment and control	ISO/IEC 12207:2008, 6.3.2
PRO.3	Decision management	ISO/IEC 12207:2008, 6.3.3
PRO.4	Risk management	ISO/IEC 12207:2008, 6.3.4
PRO.5	Configuration management	ISO/IEC 12207:2008, 6.3.5
PRO.6	Information management	ISO/IEC 12207:2008, 6.3.6
PRO.7	Measurement	ISO/IEC 12207:2008, 6.3.7

The **Technical Processes** (ENG) are used to define the requirements for a system, to transform the requirements into an effective product, to permit consistent reproduction of the product where necessary, to use the product, to provide the required services, to sustain the provision of those services and to dispose of the product when it is retired from service.

The Technical Processes define the activities that enable organizational and project functions to optimize the benefits and reduce the risks that arise from technical decisions and actions. These activities enable products and services to possess the timeliness and availability, the cost effectiveness, and the functionality, reliability, maintainability, producibility, usability and other qualities required by acquiring and supplying organizations.

They also enable products and services to conform to the expectations or legislated requirements of society, including health, safety, security and environmental factors. [ISO/IEC 12207:2008]

This group includes the processes listed in Table 4.

Table 4 — System Life Cycle Processes - Technical Processes

Process Identification	Process name	Source
ENG.1	Stakeholder requirements definition	ISO/IEC 12207:2008, 6.4.1
ENG.2	System requirements analysis	ISO/IEC 12207:2008, 6.4.2
ENG.3	System architectural design	ISO/IEC 12207:2008, 6.4.3
ENG.4	Software implementation	ISO/IEC 12207:2008, 7.1.1
ENG.5	System integration	ISO/IEC 12207:2008, 6.4.5
ENG.6	Systems qualification testing	ISO/IEC 12207:2008, 6.4.6
ENG.7	Software installation	ISO/IEC 12207:2008, 6.4.7
ENG.8	Software acceptance support	ISO/IEC 12207:2008, 6.4.8
ENG.9	Software operation	ISO/IEC 12207:2008, 6.4.9
ENG.9A	Operational use (subprocess)	ISO/IEC 12207:2008, B.3.5.1
ENG.9B	Customer support (subprocess)	ISO/IEC 12207:2008, B.3.5.2
ENG.10	Software maintenance	ISO/IEC 12207:2008, 6.4.10
ENG.11	Software disposal	ISO/IEC 12207:2008, 6.4.11

4.2.1.2 Software Life Cycle Processes Category

The **Software Life Cycle Processes** consist of software specific processes that serve the stakeholders during the life cycle of a software product.

The Software Life Cycle Processes Category contains the following three groups of processes:

— the Software Implementation Processes group;

— the Software Support Processes group;

— the Software Reuse Processes group.

The **Software Implementation Processes** (DEV) are used to produce a specified system element (software item) implemented in software. Those processes transform specified behaviour, interfaces and implementation constraints into implementation actions resulting in a system element that satisfies the requirements derived from the system requirements. [ISO/IEC 12207:2008]

This group includes the processes listed in Table 5.

Table 5 — Software Life Cycle Processes - Software Implementation Processes

Process Identification	Process name	Source
DEV.1	Software requirements analysis	ISO/IEC 12207:2008, 7.1.2
DEV.2	Software architectural design	ISO/IEC 12207:2008, 7.1.3
DEV.3	Software detailed design	ISO/IEC 12207:2008, 7.1.4
DEV.4	Software construction	ISO/IEC 12207:2008, 7.1.5
DEV.5	Software integration	ISO/IEC 12207:2008, 7.1.6
DEV.6	Software qualification testing	ISO/IEC 12207:2008, 7.1.7

The **Software Support Processes** (SUP) provide a specific focused set of activities for performing a specialized software process. A supporting process assists the Software Implementation Process as an integral part with a distinct purpose, contributing to the success and quality of the software project.of processes which support another software specific process as an integral part of it, having a distinct purpose which contributes to the success and quality of the software project. A supporting process is employed and executed, as needed, by another process. [ISO/IEC 12207:2008]

This group includes the processes listed in Table 6.

Table 6 — Software Life Cycle Processes - Software Support Processes

Process Identification	Process name	Source
SUP.1	Software documentation management	ISO/IEC 12207:2008, 7.2.1
SUP.2	Software configuration management	ISO/IEC 12207:2008, 7.2.2
SUP.3	Software quality assurance	ISO/IEC 12207:2008, 7.2.3
SUP.4	Software verification	ISO/IEC 12207:2008, 7.2.4
SUP.5	Software validation	ISO/IEC 12207:2008, 7.2.5
SUP.6	Software review	ISO/IEC 12207:2008, 7.2.6
SUP.7	Software audit	ISO/IEC 12207:2008, 7.2.7
SUP.8	Software problem resolution	ISO/IEC 12207:2008, 7.2.8

The **Software Reuse Processes** group (REU) consists of processes that support an organization's ability to reuse software items across project boundaries. These processes are unique because, by their nature, they operate outside the bounds of any particular project. [ISO/IEC 12207:2008]

This group includes the processes listed in Table 7.

Table 7 — Software Life Cycle Processes - Software Reuse Processes

Process Identification	Process name	Source
REU.1	Domain engineering	ISO/IEC 12207:2008, 7.3.1
REU.2	Reuse asset management	ISO/IEC 12207:2008, 7.3.2
REU.3	Reuse program management	ISO/IEC 12207:2008, 7.3.3

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 two Process Categories: System Life Cycle Processes and Software 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

The implemented process achieves its process purpose.

Level 2: Managed process

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

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.

Table 10 — Capability levels and process attributes

Process Attribute ID	Capability Levels and Process Attributes
	Level 0: Incomplete process
	Level 1: Performed process
PA 1.1	Process performance
	Level 2: Managed process
PA 2.1	Performance management
PA 2.2	Work product management
	Level 3: Established process
PA 3.1	Process definition
PA 3.2	Process deployment
	Level 4: Predictable process
PA 4.1	Process measurement
PA 4.2	Process control
	Level 5: Optimizing process
PA 5.1	Process innovation
PA 5.2	Continuous optimization

The process attributes are evaluated on a four point ordinal scale of achievement, as defined in ISO/IEC 15504-2. They provide insight into the specific aspects of process capability required to support process improvement and capability determination.

4.3 Assessment Indicators

The Process Assessment Model is based on the principle that the capability 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 capability indicators, which apply to capability levels 1 to 5 and process performance indicators, which apply exclusively to capability level 1. These indicators are defined in Clause 4.3.2.

The process attributes in the capability dimension have a set of process capability indicators that provide an indication of the extent of achievement of the attribute in the instantiated process. These indicators concern significant activities, resources or results associated with the achievement of the attribute purpose by a process.

The process capability indicators are:

— Generic Practice (GP);

— Generic Resource (GR);

— Generic Work Product (GWP).

As additional indicators for supporting the assessment of a process at Level 1, each process in the process dimension has a set of process performance indicators which is used to measure the degree of achievement of the process performance attribute for the process assessed.

The process performance indicators are:

— Base Practice (BP);

— Work Product (WP).

The performance of Base Practices (BPs) provides an indication of the extent of achievement of the process purpose and process outcomes. Work Products (WPs) are either used or produced (or both), when performing the process.

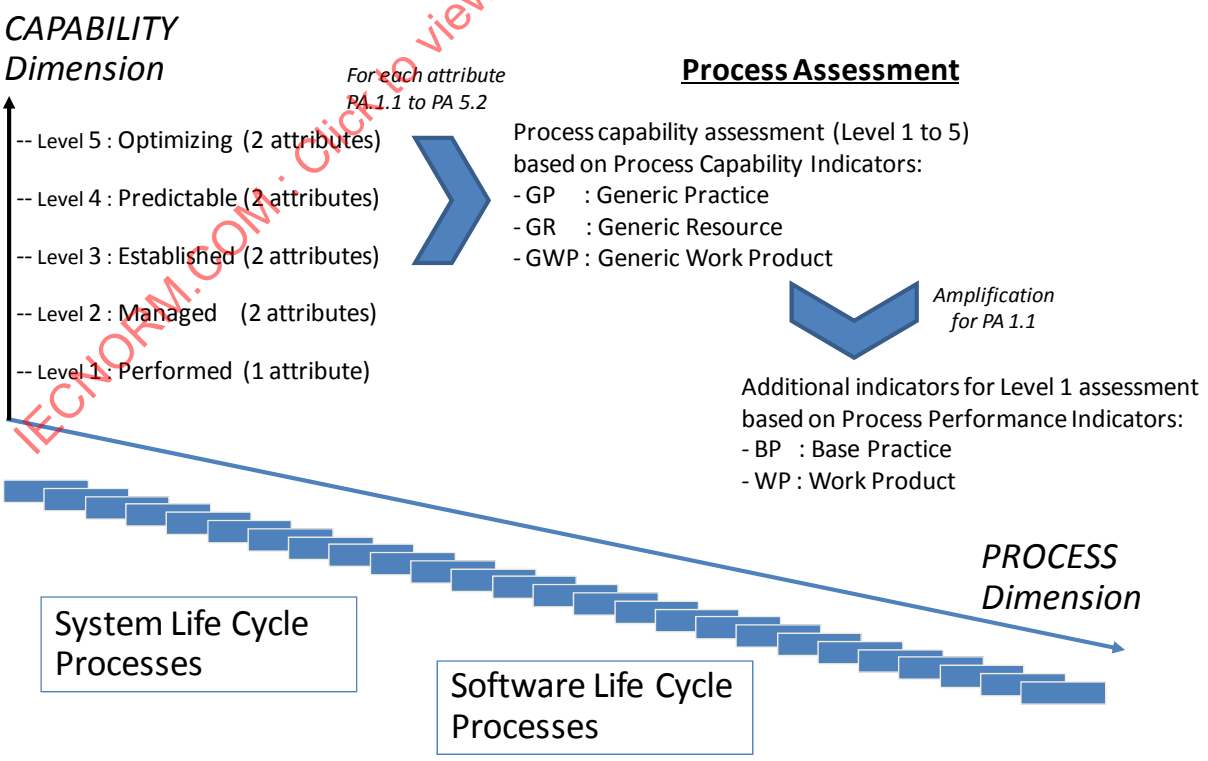

Figure 3 — Assessment indicators

The process performance and process capability indicators defined in the Process Assessment Model represent types of objective evidence that might be found in an instantiation of a process and therefore could be used to judge achievement of capability.

Figure 3 shows how the assessment indicators are related to process performance and process capability.

4.3.1 Process Capability Indicators

The three types of process capability indicators related to levels 1 to 5 are identified in Figure 4. They are intended to be applicable to all processes.

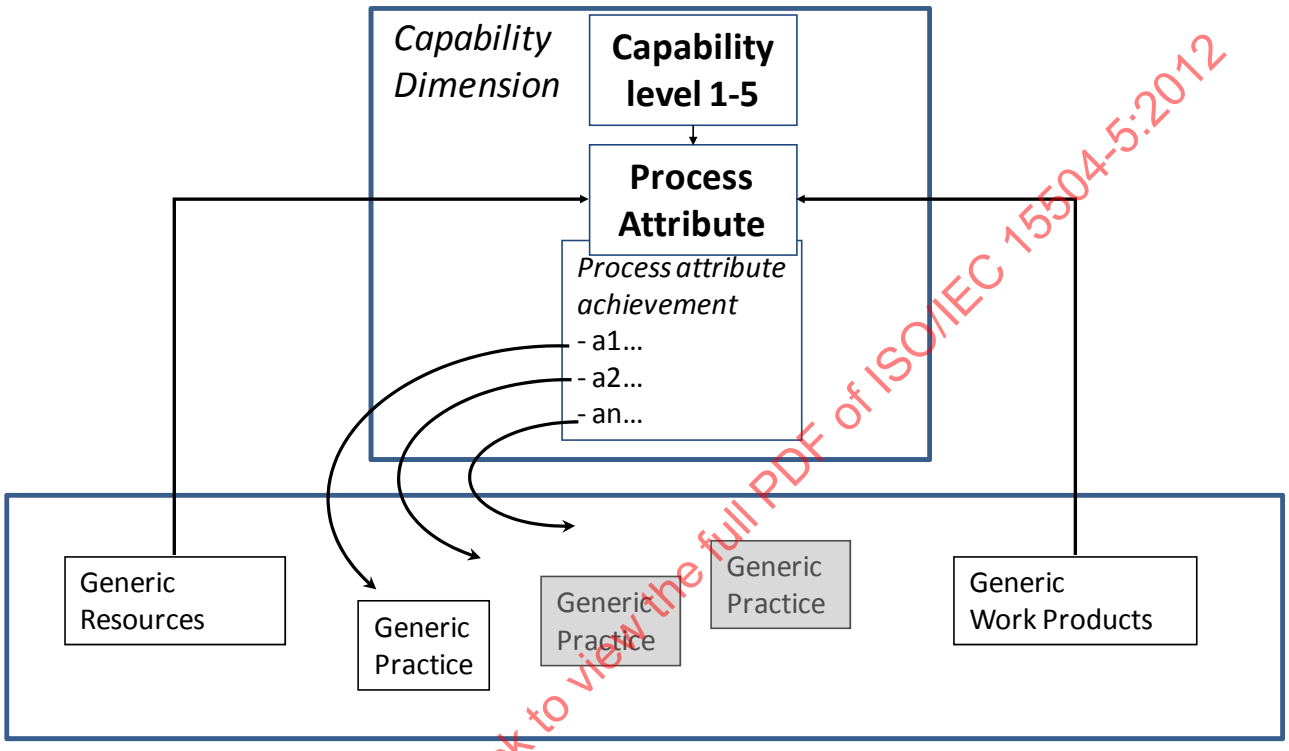

Figure 4 — Process capability indicators

All the process capability indicators relate to the process attributes defined in the capability dimension of the Process Assessment Model. They represent the type of evidence that would support judgments of the extent to which the attributes are achieved. Evidence of their effective performance or existence supports the judgment of the degree of achievement of the attribute. The generic practices are the principal indicators of process capability.

The **Generic Practice (GP)** indicators are activities of a generic type and provide guidance on the implementation of the attribute's characteristics. They support the achievement of the process attribute and many of them concern management practices, i.e. practices that are established to support the process performance as it is characterized at level 1.

During the evaluation of process capability, the primary focus is on the performance of the generic practices. In general, performance of all generic practices is expected for full achievement of the process attribute.

The **Generic Resource (GR)** indicators are associated resources that may be used when performing the process in order to achieve the attribute. These resources may include human resources, tools, methods and infrastructure. The availability of a resource indicates the potential to fulfil the purpose of a specific attribute.

NOTE: The assessor should interpret the generic resources according to the process assessed; e.g. for PA2.1 resources (with identified objectives, responsibilities and authorities), an assessor would look for roles (with identified objectives, responsibilities and authorities) in primary and supporting processes, but for organisational processes would

look for governance structures (e.g. mandated committees, positions) with identified objectives, responsibilities and authorities.

The **Generic Work Product (GWP)** indicators are sets of characteristics that would be expected to be evident in work products of generic types as a result of achievement of an attribute. The generic work products form the basis for the classification of the work products defined as process performance indicators; they represent basic types of work products that may be inputs to or outputs from all types of process.

These three types of indicators help to establish objective evidence of the extent of achievement of the specified process attribute.

Due to the fact that Level 1 capability of a process is only characterized by the measure of the extent to which the process purpose is achieved, the process performance attribute (PA.1.1) has a single generic practice indicator (GP.1.1.1). In order to support the assessment of PA.1.1 and to amplify the process performance achievement analysis, additional process performance indicators are defined in the Process Assessment Model.

4.3.2 Process Performance Indicators

There are two types of process performance indicators; **Base Practice (BP)** indicators and **Work Product (WP)** indicators. Process performance indicators relate to individual processes defined in the process dimension of the Process Assessment Model and are chosen to explicitly address the achievement of the defined process purpose.

Evidence of performance of the base practices, and the presence of work products with their expected work product characteristics, provide objective evidence of the achievement of the purpose of the process.

A base practice is an activity that addresses the purpose of a particular process. Consistently performing the base practices associated with a process will help the consistent achievement of its purpose. A coherent set of base practices is associated with each process in the process dimension. The base practices are described at an abstract level, identifying "what" should be done without specifying "how". Implementing the base practices of a process should achieve the basic outcomes that reflect the process purpose. Base practices represent only the first step in building process capability, but the base practices represent the unique, functional activities of the process, even if that performance is not systematic. The performance of a process produces work products that are identifiable and usable in achieving the purpose of the process. In this assessment model, each work product has a defined set of example work product characteristics that may be used when reviewing the work product to assess the effective performance of a process. Work product characteristics may be used to identify the corresponding work product produced/used by the assessed organization.

Clause 5 contains a complete description of the processes, including the base practices and the associated work products.

Annex B.1 contains a list of generic work products together with the work product characteristics.

Annex B.2 contains a complete list of specific work products, with the generic work products for completeness. Similar to the concept of modularity in object orientation, the shared characteristics of a group of work products have been extracted into a generic work product. An assessor would refer to both the specific work product and the generic work product in the context of the specific work product (e.g. 02-01 Commitment / agreement characteristics + 02-00 Contract characteristics) when performing an assessment.

4.4 Measuring process capability

The process performance and process capability indicators in this model give examples of evidence that an assessor might obtain, or observe, in the performance of an assessment. The evidence obtained in the assessment, through observation of the implemented process, can be mapped onto the set of indicators to enable correlation between the implemented process and the processes defined in this assessment model. These indicators provide guidance for assessors in accumulating the necessary objective evidence to support judgments of capability. They are not intended to be regarded as a mandatory set of checklists to be followed.

An indicator is defined as an objective characteristic of a practice or work product that supports the judgment of the performance or capability of an implemented process. The assessment indicators, and their relationship to process performance and process capability, are shown in Figure 5.

Assessment indicators are used to confirm that certain practices were performed, as shown by observable evidence collected during an assessment. All such evidence comes either from the examination of work products of the processes assessed, or from statements made by the performers and managers of the processes.

The existence of base practices, work products, and work product characteristics, provide evidence of the performance of the processes associated with them. Similarly, the existence of process capability indicators provides evidence of process capability.

The evidence obtained should be recorded in a form that clearly relates to an associated indicator so that the support for the assessor's judgment can be readily confirmed or verified as required by ISO/IEC 15504-2.

The output from a process assessment is a set of process profiles, one for each process within the scope of the assessment. A typical process profile is illustrated in ISO/IEC 15504-4. Each process profile consists of a set of the process attribute ratings for an assessed process. Each attribute rating represents a judgment by the assessor of the extent to which the attribute is achieved. To improve the reliability and repeatability of the assessment, the judgments of the assessor are based on a coherent set of recorded objective evidences.

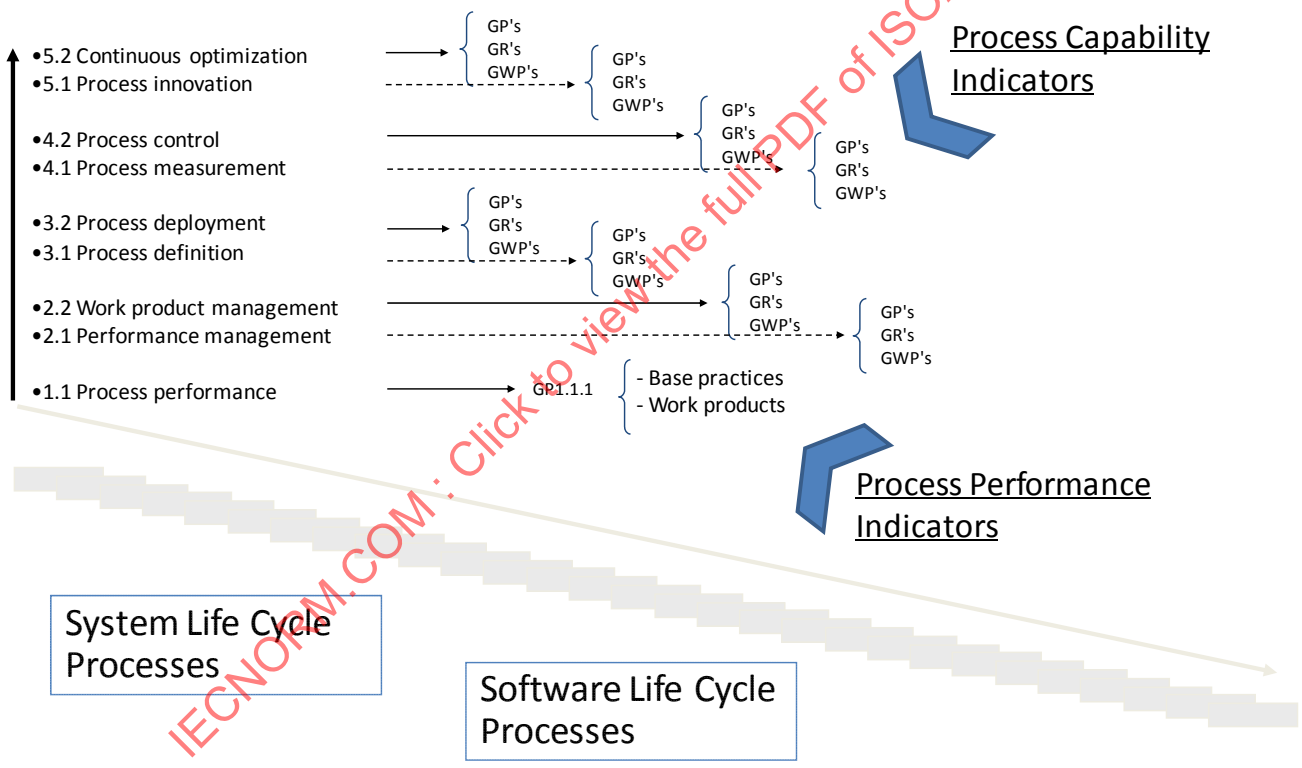

Figure 5 — Relationship between assessment indicators and process capability

5 The process dimension and process performance indicators (level 1)

This clause defines the processes and the process performance indicators, also known as the process dimension, of the Process Assessment Model. The processes in the process dimension can be directly mapped to the processes defined in the Process Reference Model.

The processes are classified (for the purpose of this Process Assessment Model) into Process Categories and Process Groups which are listed in Clause 4.

The individual processes are described in terms of Process Name, Process Purpose, and Process Outcomes as defined in ISO/IEC 12207:2008.

In addition, the process dimension of the Process Assessment Model provides information in the form of:

a) a set of 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 explicitly associated to a process outcome;

b) a number of input and output work products associated with each process and related to one or more of its outcomes; and

c) characteristics associated with each work product.

The process purposes, outcomes, the base practices and the work products associated with the processes are included in this clause. The work product characteristics are contained in Annex B. The base practices and work products constitute the set of indicators of process performance.

The associated work products listed in this clause may be used when reviewing potential inputs and outputs of an organization's process implementation.

The associated work products provide objective guidance for potential inputs and outputs to look for, and objective evidence supporting the assessment of a particular process. 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. This list should not be considered as a checklist of what each organization must have but rather as an example and starting point for considering whether, given the context, the work products are necessary and contributing to the intended purpose of the process.

These work products are identified with their work product identifier number as used in the Annex B.

5.1 Agreement Processes group (AGR)

5.1.1 AGR.1 Acquisition Process

Process ID	AGR.1
Process Name	Acquisition
Process Purpose	The purpose of the Acquisition process is to obtain the product and/or service that satisfies the need expressed by the acquirer. The process begins with the identification of customer needs and ends with the acceptance of the product and/or service needed by the acquirer.
Process Outcomes	As a result of successful implementation of the Acquisition process: a) acquisition needs, goals, product and/or service acceptance criteria and acquisition strategies are defined; b) an agreement is developed that clearly expresses the expectation, responsibilities and liabilities of both the acquirer and the supplier; c) one or more suppliers is selected; d) a product and/or service is acquired that satisfies the acquirer's stated need; e) the acquisition is monitored so that specified constraints such as cost, schedule and quality are met; f) supplier deliverables are accepted; and g) any identified open items have a satisfactory conclusion as agreed to by the acquirer and the supplier.
Base Practices	**AGR.1.BP1: Define acquisition strategy.** Define acquisition needs, goals, sourcing strategy and acceptance criteria. [Outcome: a] **AGR.1.BP2: Establish agreement.** Prepare acquisition by defining product and/or service requirements and communicate it to suppliers. [Outcome: b] **AGR.1.BP3: Select supplier.** Select supplier(s) based on acquisition strategy and needs. [Outcome: c] **AGR.1.BP4: Acquire product and/or service.** Implement acquisition according to strategy, needs and agreement. [Outcome: d] **AGR.1.BP5: Monitor acquisition.** Monitor achievement of agreement and requirements of deliverables and communicate potential deviation and risks. [Outcome: e] **AGR.1.BP6: Accept deliverables.** Accept each delivery according to defined criteria and communicate it to supplier. [Outcome: f] **AGR.1.BP7: Manage open items and changes.** Manage changes in agreement and resolve any open issues together with supplier. [Outcome: g]

Work Products	
Inputs	Outputs
02-00 Contract [Outcome: a, b]	02-00 Contract [Outcome: b]
02-01 Commitment / agreement [Outcome: b]	02-01 Commitment / agreement [Outcome: b]
08-02 Acquisition plan [Outcome: a, b]	08-02 Acquisition plan [Outcome: a, b]
08-19 Risk management plan [Outcome: b]	
11-00 Product [Outcome: d]	11-00 Product [Outcome: d, f]
	13-04 Communication record [Outcome: b, c, e, g]

Work Products	
Inputs	Outputs
	13-05 Contract review record [Outcome: b]
13-09 Meeting support record [Outcome: b, e, g]	13-09 Meeting support record [Outcome: b, e, g]
13-16 Change request [Outcome: g]	13-16 Change request [Outcome: g]
	13-19 Review record [Outcome: f]
15-19 Product needs assessment [Outcome: a]	15-19 Product needs assessment [Outcome: a, b]
	17-09 Product requirements [Outcome: a, b]
	17-10 Service requirements [Outcome: a, b]
	18-01 Acceptance criteria [Outcome: a, b]
	18-08 Supplier selection criteria [Outcome: a, b, c]

5.1.2 AGR.1A Acquisition preparation (subprocess)

Process ID	AGR.1A
Process Name	Acquisition preparation
Process Purpose	The purpose of the Acquisition preparation process is to establish the needs and goals of the acquisition and to communicate these with the potential suppliers.
Process Outcomes	As a result of successful implementation of the Acquisition preparation process: a) the concept or the need for the acquisition, development, or enhancement is established; b) stakeholder requirements are defined; c) an acquisition strategy is developed; and d) supplier selection criteria are defined.
Base Practices	**AGR.1A.BP1: Establish the need**. Establish a need to acquire, develop, or enhance a system, software product or service. [Outcome: a] **AGR.1A.BP2: Define the requirements**. Identify the customer / stakeholder requirements, including acceptance criteria, for a system and/or software product or service. [Outcome: b] **AGR.1A.BP3: Review requirements**. Analyze and validate the defined requirements against the identified needs. Validate the requirements to reduce risk of misunderstanding by the potential suppliers. [Outcome: b] **AGR.1A.BP4: Develop acquisition strategy**. Develop a strategy for the acquisition of the product according to the acquisition needs. [Outcome: c] NOTE: The strategy may include reference to the life cycle model, schedule, budget and selection criteria. **AGR.1A.BP5: Define selection criteria**. Establish and agree on supplier selection criteria and the means of evaluation to be used. [Outcome: c, d] **AGR.1A.BP6 Communicate the need**. Communicate the need for acquisition to interested parties through the identified channels. [Purpose; Outcome: a]

Work Products	
Inputs	Outputs
05-02 Business Goals [Outcome: a]	
	08-02 Acquisition plan [Outcome: c]
	09-04 Supplier selection policy [Outcome: c, d]
	12-01 Request for proposal [Outcome: a, c]
	15-01 Analysis report [Outcome: a, d]
15-04 Market analysis report [Outcome: b]	
15-19 Product needs assessment [Outcome: a]	15-19 Product needs assessment [Outcome: a, b, c]
	17-03 Stakeholder requirements [Outcome: b]
	17-09 Product requirements [Outcome: a, b]
	17-10 Service requirements [Outcome: a, b]
	18-01 Acceptance criteria [Outcome: c, d]
	18-08 Supplier selection criteria [Outcome: d]

5.1.3 AGR.1B Supplier selection (subprocess)

Process ID	AGR.1B
Process Name	Supplier selection
Process Purpose	The purpose of the Supplier selection process is to choose the organization that is to be responsible for the delivery of the requirements of the project.
Process Outcomes	As a result of successful implementation of the Supplier selection process: a) the supplier selection criteria are established and used to evaluate potential suppliers; b) the supplier is selected based upon the evaluation of the supplier's proposals, process capabilities, and other factors; and c) an agreement is established and negotiated between the acquirer and the supplier.
Base Practices	**AGR.1B.BP1: Establish supplier selection criteria**. Define supplier selection criteria based on business goals and acquisition strategy. [Outcome: a] **AGR.1B.BP2: Evaluate stated or perceived supplier capability**. Evaluate stated or perceived supplier capability against the stated requirements, according to the supplier selection criteria. [Outcome: a] NOTE: See Acquisition preparation process (AGR.1) for definition of supplier selection criteria. **AGR.1B.BP3: Select supplier.** Evaluate supplier's proposal against the stated requirements, according to the supplier selection criteria to select supplier. [Outcome: b] **AGR.1B.BP4: Prepare and negotiate agreement**. Negotiate a supplier agreement that clearly expresses the customer expectations and the relative responsibilities of the supplier and customer. [Outcome: c]

Work Products	
Inputs	Outputs
	02-01 Commitment / agreement [Outcome: c]
05-02 Business Goals [Outcome: a]	
	08-02 Acquisition plan [Outcome: a]
09-04 Supplier selection policy [Outcome: a]	09-04 Supplier selection policy [Outcome: a]
12-01 Request for proposal [Outcome: b]	
12-04 Supplier proposal response [Outcome: c]	12-04 Supplier proposal response [Outcome: c]
	13-04 Communication record [Outcome: b, c]
	13-05 Contract review record [Outcome: c]
13-09 Meeting support record [Outcome: b, c]	13-09 Meeting support record [Outcome: b, c]
	13-19 Review record [Outcome: b]
	14-05 Preferred suppliers register [Outcome: a, b]
15-13 Assessment report [Outcome: b]	15-13 Assessment report [Outcome: b]
	15-21 Supplier evaluation report [Outcome: b]
15-24 Audit report [Outcome: b]	15-24 Audit report [Outcome: b]
17-09 Product requirements [Outcome: a, b]	
17-10 Service requirements [Outcome: a, b]	
18-08 Supplier selection criteria [Outcome: a]	18-08 Supplier selection criteria [Outcome: a]

5.1.4 AGR.1C Agreement monitoring (subprocess)

Process ID	AGR.1C
Process Name	Agreement monitoring
Process Purpose	The purpose of the Agreement monitoring process is to track and assess performance of the supplier against agreed requirements.
Process Outcomes	As a result of successful implementation of the Agreement monitoring process: a) joint activities between the acquirer and the supplier are performed as needed; b) information on technical progress is exchanged regularly with the supplier; c) performance of the supplier is monitored against the agreed requirements; and d) agreement changes, if needed, are negotiated between the acquirer and the supplier and documented in the agreement.
Base Practices	**AGR.1C.BP1: Establish and maintain communications link.** Establish and maintain communications link between customer and supplier (i.e. define interfaces, schedule, agenda, messages, documents, meetings, joint review). [Outcome: a, b] **AGR.1C.BP2: Exchange information on technical progress**. Use the communication link to exchange information on technical progress of the supply, including the risks to successful completion. [Outcome: a, b]

	AGR.1C.BP3: Review supplier performance. Review performance aspects of the supplier (technical, quality, cost, and schedule) on a regular basis, against the agreed requirements. [Outcome: c] **AGR.1C.BP4: Monitor the acquisition**. Monitor the acquisition against the agreed acquisition documentation, analyzing information from the reviews with the supplier, so that progress can be evaluated to ensure that specified constraints such as cost, schedule, and quality are met. [Outcome: c] **AGR.1C.BP5: Agree on changes**. Changes proposed by either party are negotiated and the results are documented in the agreement. [Outcome: d] NOTE: The handling of changes will be performed by Contract change management process (AGR.3).

Work Products	
Inputs	Outputs
02-00 Contract [Outcome: a]	
02-01 Commitment / agreement [Outcome: c, d]	02-01 Commitment / agreement [Outcome: d]
	13-01 Acceptance record [Outcome: c]
	13-04 Communication record [Outcome: a]
13-09 Meeting support record [Outcome: a]	13-09 Meeting support record [Outcome: a]
13-14 Progress status record [Outcome: b]	13-14 Progress status record [Outcome: b]
13-16 Change request [Outcome: d]	
13-17 Customer request [Outcome: d]	
	13-19 Review record [Outcome: b]
14-08 Tracking system [Outcome: c]	
	15-01 Analysis report [Outcome: c]
	15-21 Supplier evaluation report [Outcome: c]

5.1.5 AGR.1D Acquirer acceptance (subprocess)

Process ID	AGR.1D
Process Name	Acquirer acceptance
Process Purpose	The purpose of the Acquirer acceptance process is to approve the supplier's deliverable when all acceptance criteria are satisfied.
Process Outcomes	As a result of successful implementation of the Acquirer acceptance process: a) the delivered software product and/or service are evaluated with regard to the agreement; b) the acquirer's acceptance is based on the agreed acceptance criteria; and c) the software product and/or service is accepted by the acquirer.
Base Practices	**AGR.1D.BP1: Evaluate the delivered product**. Carry out the evaluation of the product and/or service using the defined acceptance criteria. [Outcome: a, b]

	AGR.1D.BP2: Resolve noncompliance with agreement. Resolve any acceptance issues in accordance with the procedures established in the agreement and confirm that delivered product or service complies with the agreement. [Outcome: b] **AGR.1D.BP3: Accept product.** Accept the delivered product or service and communicate acceptance to the supplier. [Outcome: c]

Work Products	
Inputs	Outputs
02-00 Contract [Outcome: a]	
02-01 Commitment / agreement [Outcome: a]	
08-01 Acceptance test plan [Outcome: a]	
08-02 Acquisition plan [Outcome: a, b]	
11-00 Product [Outcome: a. c]	
	13-01 Acceptance record [Outcome: c]
	13-07 Problem record [Outcome: a]
	15-10 Test incident report [Outcome: b]
17-03 Stakeholder requirements [Outcome: a, b]	
18-01 Acceptance criteria [Outcome: a]	

5.1.6 AGR.2 Supply

Process ID	AGR.2
Process Name	Supply
Process Purpose	The purpose of the Supply process is to provide a product or service to the acquirer that meets the agreed requirements.
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 an acquirer's request is produced; c) an agreement is established between the acquirer and the supplier for developing, maintaining, operating, packaging, delivering, and installing the product and/or service; d) a product and/or service that meets the agreed requirements are developed by the supplier; e) the product and/or service is delivered to the acquirer in accordance with the agreed requirements; and f) the product is installed in accordance with the agreed requirements.
Base Practices	**AGR.2.BP1: Identify acquirer and needs.** Identify potential customer(s) and market for product and service. [Outcome: a] **AGR.2.BP2: Propose response to customer needs**. Define tender or other response to request of proposal. [Outcome: b] NOTE 1: Response should cover also regulatory and legal requirements.

	AGR.2.BP3: Agree on contract. Negotiate and agree contract with supplier and acquirer to cover development, maintenance, operation and delivery requirements. [Outcome: c] NOTE 2: Changes in contract should be made in an agreed way between supplier and acquirer. **AGR.2.BP4: Execute contract**. Develop and deliver product and/or service according to contractual requirements and criteria. [Outcome: d, e] **AGR.2.BP5: Monitor contract.** Monitor progress and quality of each deliverable. [Outcome: d, e] NOTE 3: See Acquisition process for monitoring of subcontractors. **AGR.2.BP6: Provide support.** Deliver product and/or service support according to contractual requirements. [Outcome: e] **AGR.2.BP7: Close the contract.** Accept the closure of contract and transfer of responsibilities as defined in the contract. [Outcome: e, f]

Work Products	
Inputs	Outputs
01-00 Configuration item [Outcome: d, e, f]	01-00 Configuration item [Outcome: d]
	02-00 Contract [Outcome: c]
	02-01 Commitment / agreement [Outcome: a]
05-02 Business goals [Outcome: c]	
10-03 Customer support procedure [Outcome: e, f]	10-03 Customer support procedure [Outcome: d]
12-01 Request for proposal [Outcome: b]	
	12-04 Supplier proposal response [Outcome: b]
13-04 Communication record [Outcome: d, f]	13-04 Communication record [Outcome: b, c]
	13-05 Contract review record [Outcome: d, e, f]
	13-06 Delivery record [Outcome: e]
	13-08 Installation record [Outcome: f]
15-04 Market analysis report [Outcome: a]	
17-03 Stakeholder requirements [Outcome: a, b, d, e, f]	17-03 Stakeholder requirements [Outcome: c, f]
17-09 Product requirements [Outcome: c, d , e, f]	
17-10 Service requirements [Outcome: c , d, e, f]	

5.1.7 AGR.2A Supplier tendering (subprocess)

Process ID	AGR.2A
Process Name	Supplier tendering
Process Purpose	The purpose of the Supplier tendering process is to establish an interface to respond to acquirer inquiries and requests for proposal, prepare and submit proposals.
Process Outcomes	As a result of successful implementation of the Supplier tendering process: a) a communication interface is established and maintained in order to respond to acquirer inquiries and requests for proposal; b) requests for proposal are evaluated according to defined criteria to determine whether or not to submit a proposal; c) the need to undertake preliminary surveys or feasibility studies is determined; d) suitable resources are identified to perform the proposed work; and e) a supplier proposal is prepared and submitted in response to the acquirer request.
Base Practices	**AGR.2A.BP1: Establish communication interface**. A communication interface is established and maintained in order to respond to customer inquiries or requests for proposal. [Outcome: a] **AGR.2A.BP2: Perform customer enquiry screening.** Perform customer enquiry screening to ensure source of lead is genuine, the nature or type of product or service is clearly established, and the right person is quickly identified to progress the lead. [Outcome: a] **AGR.2A.BP3: Establish customer proposal evaluation criteria**. Establish evaluation criteria to determine whether or not to submit a proposal based on appropriate criteria. [Outcome: b] **AGR.2A.BP4: Evaluate customer request for proposal**. Requests for proposal are evaluated according to appropriate criteria. [Outcome: b] **AGR.2A.BP5: Determine need for preliminary evaluations or feasibility studies.** Determine need for preliminary evaluations or feasibility studies to ensure that a firm quotation can be made based on available requirements. [Outcome: c] **AGR.2A.BP6: Identify and nominate staff.** Identify and nominate staff with appropriate competency for the assignment. [Outcome: d] **AGR.2A.BP7: Perform preliminary overall estimation.** Estimate total costs, resources, and needed delivery date. [Outcome: d, e] **AGR.2A.BP8: Prepare and submit supplier proposal or tender response.** A supplier proposal or tender is prepared and submitted in response to the customer request. [Outcome: e] NOTE 1: This may involve the selection of an appropriate solution (organizational or technical) amongst several alternatives in order to best meet requirements.

Work Products	
Inputs	Outputs
	02-00 Contract [Outcome: e]
	02-01 Commitment / agreement [Outcome: e]
05-02 Business goals [Outcome: b]	

Work Products	
Inputs	Outputs
12-01 Request for proposal [Outcome: a, b]	
	12-04 Supplier proposal response [Outcome: e]
13-04 Communication record [Outcome: a]	13-04 Communication record [Outcome: a]
	13-05 Contract review record [Outcome: e]
13-11 Personnel performance review record [Outcome: d]	
	13-15 Proposal review record [Outcome: b, e]

5.1.8 AGR.2B Contract agreement (subprocess)

Process ID	AGR.2B
Process Name	Contract agreement
Process Purpose	The purpose of Contract agreement process is to negotiate and approve a contract/agreement that clearly and unambiguously specifies the expectations, responsibilities, work products/deliverables and liabilities of both the supplier and the acquirer.
Process Outcomes	As a result of successful implementation of the Contract agreement process: a) a contract/agreement is negotiated, reviewed, approved and awarded to the supplier(s); b) mechanisms for monitoring the capability and performance of the supplier(s) and for mitigation of identified risks are reviewed and considered for inclusion in the contract conditions; c) proposers/tenderers are notified of the result of proposal/tender selection; and d) formal confirmation of agreement is obtained. NOTE: The Contract agreement process is used to obtain formal confirmation of assignments that were offered during the Supplier tendering process.
Base Practices	**AGR.2B.BP1: Negotiate the contract / agreement**. Negotiate all aspects of the contract / agreement with the supplier. [Outcome: a] **AGR.2B.BP2: Approve contract.** The contract is approved by relevant stakeholders. [Outcome: a] **AGR.2B.BP3: Review contract for supplier capability monitoring.** Review and consider a mechanism for monitoring the capability and performance of the supplier in the contract conditions. [Outcome: a] **AGR.2B.BP4: Review contract for risk mitigation actions**. Review and consider a mechanism for the mitigation of identified risk in the contract conditions. [Outcome: b] **AGR.2B.BP5: Award contract.** The contract is awarded to the successful supplier. [Outcome: a] **AGR.2B.BP6: Communicate results to tenderers.** Notify the results of the proposal / tender selection to proposers / tenders. After contract award, inform all tenderers of the decision. [Outcome: c] **AGR.2B.BP7: Establish confirmation of contract / agreement.** Formally confirm the contract / agreement to protect the interests of both parties. [Outcome: d] NOTE 1: The nature of the commitment should be agreed and evidenced in writing. Only authorized signatories should be able to commit to a contract.

Work Products	
Inputs	Outputs
	02-00 Contract [Outcome: a, d]
	02-01 Commitment / agreement [Outcome: a, d]
08-19 Risk management plan [Outcome: b]	
	13-04 Communication record [Outcome: a]
	13-05 Contract review record [Outcome: a]
13-09 Meeting support record [Outcome: a, c]	13-09 Meeting support record [Outcome: a, c]
14-08 Tracking system [Outcome: b, d]	
15-08 Risk analysis report [Outcome: b]	15-08 Risk analysis report [Outcome: b]
17-09 Product requirements [Outcome: a]	
17-10 Service requirements [Outcome: a]	

5.1.9 AGR.2C Product/service delivery and support (subprocess)

Process ID	AGR.2C
Process Name	Product/service delivery and support
Process Purpose	The purpose of the Product/service delivery and support process is to provide the specified product or service to the acquirer with support appropriate to achieve confidence that the requirements have been met.
Process Outcomes	As a result of the successful implementation of the Product/service delivery and support process: a) the contents of the product release are determined; b) the release is assembled from configured items; c) the release documentation is defined and produced; d) the release delivery mechanism and media are determined; e) release approval is effected against defined criteria; f) the product release is made available to the acquirer; g) confirmation of release is obtained; h) the product is completed and delivered to the acquirer; i) acquirer acceptance tests and reviews are supported; j) the product is put into operation in the customers' environment; and k) problems detected during acceptance are identified and communicated to those responsible for resolution. NOTE: Incremental delivery would be in completed increments.
Base Practices	**AGR.2C.BP1: Define release products.** The products associated with the release are defined, on the basis of agreement or development strategy. [Outcome: a] NOTE 1: The software product release may include programming tools where these are stated.

	AGR.2C.BP2: Assemble product for release. Prepare and assemble the deliverable product. Establish baseline for the product including user documentation, designs and the product itself. [Outcome: b, c] NOTE 2: Product release may consist of software and hardware products constituting a system, or just a software product or service. **AGR.2C.BP3: The type, level and duration of support for the release are communicated**. The type, level and duration of a release is identified and communicated. [Outcome: a, b] **AGR.2C.BP4: Determine the delivery mechanism and media type for the release**. The media type for product delivery is determined in accordance with the needs of the end user. [Outcome: d] NOTE 3: The media type for delivery may be intermediate (placed on a media and delivered to customer), or direct (such as delivered in firmware as part of the package) or a mix of both. The release may be delivered electronically by placement on a server. The release may also need to be duplicated before delivery. **AGR.2C.BP5: Identify the packaging for the release media.** The packaging for different types of media is identified. [Outcome: d] NOTE 4: The packaging for certain types of media may need physical or electronic protection, for instance floppy disk mailers or specific encryption techniques. **AGR.2C.BP6: Ensure product release approval before delivery.** Criteria for the release acceptance are satisfied before release takes place. [Outcome: e, f] **AGR.2C.BP7: Deliver the release to the acquirer.** The product is delivered to the acquirer, with positive confirmation of receipt. [Outcome: f, g, h] **AGR.2C.BP8: Adapt product to customer's environment**. The product shall be adapted and evaluated in parallel with the existing systems or processes until the acceptance test is passed. [Outcome: h, i, j] **AGR.2C.BP9: Support acquirer in product evaluation**. Provide support for acquirer during release review and acceptance testing. [Outcome: i, j] NOTE 5: This base practice is closely related to process Software review process (SUP.6). **AGR.2C.BP10:Support acquirer to start operational use.** Give necessary support and training for acquirer in preparing and initiating use of release in operational environment. [Outcome: j] **AGR.2C.BP11: Manage problems during acceptance**. Identify and communicate problems during delivery and acceptance and solve problems as agreed. [Outcome: i, k]

Work Products	
Inputs	Outputs
01-00 Configuration item [Outcome: a, b]	
08-01 Acceptance test plan [Outcome: e, i]	08-01 Acceptance test plan [Outcome: e]
10-03 Customer support procedure [Outcome: i, j]	10-03 Customer support procedure [Outcome: i, j]
11-00 Product [Outcome: a]	11-00 Product [Outcome: j]
	11-03 Product release information [Outcome: a, c]
	11-04 Product release package [Outcome: b, f, h]

Work Products	
Inputs	Outputs
	13-06 Delivery record [Outcome: g, h]
13-07 Problem record [Outcome: k]	13-07 Problem record [Outcome: k]
	13-08 Installation record [Outcome: h, j]
	13-13 Product release approval record [Outcome: i]
	15-03 Configuration status report [Outcome: b, c, h]
17-03 Stakeholder requirements [Outcome: a, i, j]	
	17-04 Delivery instructions [Outcome: f, h, j]
18-06 Product release criteria [Outcome: a, e]	18-06 Product release criteria [Outcome: e]
19-04 Product release strategy [Outcome: e, h, j]	

5.1.10 AGR.3 Contract change management

Process ID	AGR.3
Process Name	Contract change management
Process Purpose	The purpose of the Contract change management process is to develop the new contract contents as agreed by both the acquirer and the supplier when a change request affecting the agreed contract contents is proposed. This process begins with a proposal of the change request by either the acquirer or the supplier and ends with the conclusion acceptable for both parties: withdrawal or overall/partial approval of the change request.
Process Outcomes	As a result of successful implementation of the Contract change management process: a) the change request to the contract is proposed explicitly and formally; b) the roles and responsibilities of both the acquirer and the supplier for the contract change management are established; c) the impact of the change request to the contract on the project plans, costs, benefits, quality and schedule is evaluated; d) the actions against the change request are taken to get agreement and satisfaction of both the acquirer and the supplier; and e) the result of each change request is made known to all affected parties.
Base Practices	**AGR.3.BP1: Define contract change management policy**. Each party is involved and committed to common contract change management policy and mechanism. [Outcome: a, b] **AGR.3.BP2: Request change to the contract.** Make a contract change proposal according to common policy and mechanism. [Outcome: a, c] **AGR.3.BP3: Evaluate the impacts of the change request**. Carry out the evaluation of the change request. [Outcome: c] NOTE 1: Typical impact parameters are responsibilities, costs, benefits, quality and schedule. **AGR.3.BP4: Confirm necessary actions.** Negotiate and agree on necessary actions to find the most appropriate solution in contractual changes. [Outcome: d] **AGR.3.BP5: Modify the contract**. Revise the original contract. [Outcome: d]

	AGR.3.BP6: Incorporate contractual changes in plans. Define new baselines of relevant plans and specifications as needed. [Outcome: d, e] **AGR.3.BP7: Communicate contractual changes.** Communicate contractual changes and new baselines to all affected parties. [Outcome: e]

Work Products	
Inputs	Outputs
02-00 Contract [Outcome: a]	02-00 Contract [Outcome: a, d]
02-01 Commitment / agreement [Outcome: a]	
	02-01 Commitment / agreement [Outcome: a, b, d]
08-19 Risk management plan [Outcome: b]	
	13-04 Communication record [Outcome: e]
	13-05 Contract review record [Outcome: c, d]
13-09 Meeting support record [Outcome: a, c]	13-09 Meeting support record [Outcome: a, c]
13-16 Change request [Outcome: a]	
	13-19 Review record [Outcome: c]
	15-01 Analysis report [Outcome: c]
	15-08 Risk analysis report [Outcome: c]

5.2 Organizational Project-Enabling Processes group (ORG)

5.2.1 ORG.1 Life cycle model management

Process ID	ORG.1
Process Name	Life cycle model management
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 International Standard. This process provides life cycle policies, processes, 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) policies and procedures for the management and deployment of life cycle models and processes are provided; b) responsibility, accountability and authority for life cycle management are defined; c) life cycle processes, models and procedures for use by the organization are defined, maintained and improved; and d) prioritized process improvements are implemented.

Base Practices	**ORG.1.BP1: Develop a life cycle model management strategy.** Define policies, life cycle processes, life cycle models, and procedures for use by the organization. [Outcome: a] **ORG.1.BP2: Organize life cycle model management.** Define and support responsibility, accountability and authority for life cycle management. [Outcome: b] **ORG.1.BP3: Deploy life cycle model management.** Establish, assess and improve life cycle processes, models and procedures. [Outcome: c] **ORG.1.BP4: Implement process improvements**. Prioritize and implement process improvements based on process assessment and review. [Outcome: d]

Work Products	
Inputs	Outputs
03-03 Benchmarking data [Outcome: d]	
03-06 Process performance data [Outcome: d]	
07-04 Process measure [Outcome: c, d]	
07-06 Quality measure [Outcome: c, d]	
08-03 Process assessment plan [Outcome: c]	08-03 Process assessment plan [Outcome: a]
08-29 Improvement plan [Outcome: c, d]	08-29 Improvement plan [Outcome: a]
	09-00 Policy [Outcome: a, b]
10-00 Process description [Outcome: c, d]	10-00 Process description [Outcome: b, c]
	10-01 Life cycle model [Outcome: c]
13-18 Quality record [Outcome: c]	
13-19 Review record [Outcome: d]	
15-16 Improvement opportunity [Outcome: d]	15-16 Improvement opportunity [Outcome: c]
16-06 Process repository [Outcome: c, d]	16-06 Process repository [Outcome: d]
18-02 Assessment method standard [Outcome: c]	18-02 Assessment method standard [Outcome: a]
19-02 Process strategy [Outcome: b, c, d]	19-02 Process strategy [Outcome: a, b]
19-07 Software development methodology [Outcome: c]	19-07 Software development methodology [Outcome: a]

5.2.2 ORG.1A Process establishment (subprocess)

Process ID	ORG.1A
Process Name	Process establishment
Process Purpose	The purpose of the Process establishment process is to establish a suite of organizational processes for all life cycle processes as they apply to its business activities.
Process Outcomes	As a result of successful implementation of Process establishment process: a) a defined and maintained standard set of processes are established, along with an indication of each process's applicability;

	b) the detailed tasks, activities and associated work products of the standard process are identified, together with expected performance characteristics; c) a strategy for tailoring the standard process for the product or service is developed in accordance with the needs of the project; and d) information and data related to the use of the standard process for specific projects exist and are maintained.
Base Practices	**ORG.1A.BP1: Define process architecture.** Define a standard set of processes, purpose of each process and interactions between them. [Outcome: a] **ORG.1A.BP2: Support deployment of processes.** Support the organization-wide use of standard processes according to the purpose of each process. [Outcome: a] **ORG.1A.BP3: Define standard processes**. Define and maintain a description of each standard process according to the needs to establish processes in the organization. [Outcome: b] NOTE: Effective, organization-wide establishment of standard processes may require that they are documented. **ORG.1A.BP4: Identify performance expectations**. Identify expectations for process performance when using the organization's standard processes. [Outcome: b] **ORG.1A.BP5: Establish process tailoring guidelines**. Establish organizational guidelines for tailoring the organization's standard processes to meet the specific needs of projects. [Outcome: c] **ORG.1A.BP6: Maintain process data.** Capture and maintain information and data related to the use of standard processes. [Outcome: d]

Work Products	
Inputs	Outputs
03-03 Benchmarking data [Outcome: b]	
	03-06 Process performance data [Outcome: d]
07-04 Process measure [Outcome: d]	
07-06 Quality measure [Outcome: d]	
	09-00 Policy [Outcome: a, c]
	09-02 Quality policy [Outcome: a, c]
	09-05 Tailoring guidelines [Outcome: c]
10-00 Process description [Outcome: c, d]	10-00 Process description [Outcome: a, b]
	13-18 Quality record [Outcome: d]
	13-19 Review record [Outcome: d]
	15-01 Analysis report [Outcome: d]
16-06 Process repository [Outcome: d]	16-06 Process repository [Outcome: d]
17-00 Requirement specification [Outcome: b]	
	18-03 Coding standard [Outcome: a]
	19-07 Software development methodology [Outcome: b]

5.2.3 ORG.1B Process assessment (subprocess)

Process ID	ORG.1B
Process Name	Process assessment
Process Purpose	The purpose of the Process assessment process is to determine the extent to which the organization's standard processes contribute to the achievement of its business goals and to help the organization focus on the need for continuous process improvement.
Process Outcomes	As a result of successful implementation of the Process assessment process: a) information and data related to the use of the standard process for specific projects exists and is maintained; b) the relative strengths and weaknesses of the organization's standard processes are understood; and c) accurate and accessible assessment records are kept and maintained.
Base Practices	**ORG.1B.BP1: Define assessment goals.** Define and validate the assessment goals based on the organization's business goals. Identify the criteria to verify the achievement of the goals. [Outcome: a] **ORG.1B.BP2: Plan the assessment.** Develop and document a plan for the assessment. [Outcome: a] NOTE 1: Part 3 of this International standard provides guidance about performing an assessment **ORG.1B.BP3: Obtain commitment.** Obtain the commitment of the sponsor and the organisational unit(s) to be assessed to the planned assessment(s), including an agreed schedule and resources. [Outcome: a] **ORG.1B.BP4: Perform the assessment to collect data**. Perform the assessment to collect the data required for evaluating the processes within the scope of the assessment. [Outcome: a] **ORG.1B.BP5: Validate the assessment data.** Validate the assessment data collected as appropriate, ensuring that the data sufficiently covers the assessment goal. [Outcome: c] **ORG.1B.BP6: Analyze the assessment data.** Analyze the validated assessment data to understand the relative strengths and weaknesses of the organization's processes. [Outcome: b] **ORG.1B.BP7: Report the assessment results**. Report the planned assessment outputs to the assessment sponsor. [Outcome: a, c] **ORG.1B.BP8: Maintain assessment record.** Maintain record of the assessment including accurate and current assessment results in an accessible location and format. [Outcome: a, c]

Work Products	
Inputs	Outputs
03-01 Assessment data [Outcome: a]	03-01 Assessment data [Outcome: a]
05-01 Assessment goals [Outcome: a]	05-01 Assessment goals [Outcome: a]
08-03 Process assessment plan [Outcome: a]	08-03 Process assessment plan [Outcome: a]
13-00 Record [Outcome: a, c]	

Work Products	
Inputs	Outputs
	13-03 Back-up / recovery record [Outcome: c]
	13-04 Communication record [Outcome: a, b, c]
	13-19 Review record [Outcome: c]
	13-26 Assessment record [Outcome: c]
	15-13 Assessment report [Outcome: a, b, c]
	15-16 Improvement opportunity [Outcome: b, c]
	16-01 Assessment results repository [Outcome: c]
16-06 Process repository [Outcome: a]	
18-02 Assessment method standard [Outcome: b, c]	
21-00 Work product [Outcome: a, b]	

5.2.4 ORG.1C Process improvement (subprocess)

Process ID	ORG.1C
Process Name	Process Improvement
Process Purpose	The purpose of the Process improvement process is to continually improve the organization's effectiveness and efficiency through the processes used and maintained aligned with the business need.
Process Outcomes	As a result of successful implementation of Process improvement process: a) commitment is established to provide resources to sustain improvement actions; b) issues arising from the organization's internal/external environment are identified as improvement opportunities and justified as reasons for change; c) analysis of the current status of the existing process is performed, focusing on those processes from which improvement stimuli arise; d) improvement goals are identified and prioritized, and consequent changes to the process are defined and implemented; e) the effects of process implementation are monitored and confirmed against the defined improvement goals; f) knowledge gained from the improvements is communicated within the organization; and g) the improvements made are evaluated and consideration given for using solutions elsewhere within the organization. NOTE 1: Information sources providing input for change may include: process assessment results, audits, customer's satisfaction reports, organizational effectiveness/efficiency, cost of quality. NOTE 2: The current status of processes may be determined by process assessment.

Base Practices	**ORG.1C.BP1: Establish commitment.** Commitment is established to provide resources to sustain improvement actions. [Outcome: a] **ORG.1C.BP2: Identify issues.** Issues arising from the organization's internal / external environment are identified as improvement opportunities and with justified reasons for change. [Outcome: b] **ORG.1C.BP3: Establish process improvement objectives**. Analysis of the current status of the existing processes is performed; focusing on those processes from which improvement stimuli arise and/or process based risk is reduced, resulting in improvement objectives for the process being established. [Outcome: c] **ORG.1C.BP4: Prioritize improvements**. The improvement objectives are prioritized. [Outcome: d] **ORG.1C.BP5: Plan process changes.** Consequent changes to the process are defined and planned. [Outcome: d] **ORG.1C.BP6: Implement process changes.** The improvements to the process are implemented. [Outcome: d] **ORG.1C.BP7: Confirm process improvement.** The effects of process implementation are monitored, measured and confirmed against the defined improvement goals. [Outcome: e] **ORG.1C.BP8: Communicate results of improvement.** Knowledge gained from the improvements is communicated outside of the improvement project across relevant parts of the organization. [Outcome: f] **ORG.1C.BP9: Evaluate the results of the improvement project.** Evaluate the results of the improvement project to see if the solution can be used elsewhere in the organization. [Outcome: g]

Work Products	
Inputs	Outputs
	02-01 Commitment / agreement [Outcome: a]
03-03 Benchmarking data [Outcome: b, c, d]	
03-04 Customer satisfaction data [Outcome: b, c, d]	
03-06 Process performance data [Outcome: b, c, d, e, g]	
05-00 Goals [Outcome: d, e]	05-00 Goals [Outcome: d]
	07-04 Process measure [Outcome: f]
08-00 Plan [Outcome: b, c, d, e]	08-00 Plan [Outcome: b, d, g]
	08-29 Improvement plan [Outcome: d]
10-00 Process description [Outcome: c, e]	10-00 Process description [Outcome: d]
13-04 Communication record [Outcome: g]	13-04 Communication record [Outcome: f]
15-05 Evaluation report [Outcome: b, c]	15-05 Evaluation report [Outcome: b, c, d, g]
15-13 Assessment report [Outcome: b, c, d, e, g]	15-13 Assessment report [Outcome: c]
15-16 Improvement opportunity [Outcome: d, f, g]	15-16 Improvement opportunity [Outcome: b, c, d, g]
16-06 Process repository [Outcome: c]	16-06 Process repository [Outcome: d]

5.2.5 ORG.2 Infrastructure management

Process ID	ORG.2
Process Name	Infrastructure management
Process Purpose	The purpose of the Infrastructure management process is to provide the enabling infrastructure and services to projects to support organization and project objectives throughout the life cycle. This process defines, provides and maintains the facilities, tools, and communications and information technology assets needed for the organization's business with respect to the scope of this International Standard.
Process Outcomes	As a result of the successful implementation of the Infrastructure management process: a) the requirements for infrastructure to support processes are defined; b) the infrastructure elements are identified and specified; c) infrastructure elements are acquired; d) the infrastructure elements are implemented; and e) a stable and reliable infrastructure is maintained and improved. NOTE: The infrastructure elements may include hardware, software, methods, tools, techniques, standards, and facilities for development, operation, or maintenance.
Base Practices	**ORG.2.BP1: Identify infrastructure scope**. Identify the procedures, standards, environments, tools, and techniques that the infrastructure process should support. [Outcome: a] NOTE 1: The infrastructure may include hardware, software, methods, tools, techniques, standards, and facilities for development, operation, or maintenance. **ORG.2.BP2: Define the infrastructure requirements.** Define the infrastructure requirements to support the performance of appropriate processes. [Outcome: a, b] NOTE 2: Infrastructure process requirements may include: – security; – throughput and data sharing requirements; – backup and recovery; – remote access facility; – physical workspace and equipment; – user support requirements; and – maintenance requirements. **ORG.2.BP3: Acquire infrastructure**. Acquire an infrastructure, which satisfies the requirements. [Outcome: c] **ORG.2.BP4: Establish the infrastructure**. Assemble and integrate the elements of the infrastructure, providing an effective environment that supports implementation of the organization's processes. [Outcome: d] **ORG.2.BP5: Provide support for the infrastructure.** Provide support for those who utilize the infrastructure. [Outcome: d] **ORG.2.BP6: Maintain the infrastructure.** Perform maintenance on the infrastructure for the purposes of: – correcting defects; and – improving performance. [Outcome: e] NOTE 3: Process improvement process (ORG.1C) can be used to implement each improvement.

Work Products	
Inputs	Outputs
08-02 Acquisition plan [Outcome: c]	
08-05 Development environment plan [Outcome: b, c, d]	08-05 Development environment plan [Outcome: b, d]
08-11 Logistics maintenance plan [Outcome: c]	08-11 Logistics maintenance plan [Outcome: b, c]
09-04 Supplier selection policy [Outcome: c]	
10-00 Process description [Outcome: a, e]	
	13-03 Back-up / recovery record [Outcome: d, e]
13-06 Delivery record [Outcome: d]	13-06 Delivery record [Outcome: d, e]
	14-02 Corrective action register [Outcome: e]
14-03 Hardware assets register [Outcome: b, d]	14-03 Hardware assets register [Outcome: b, d]
14-07 Software assets register [Outcome: b, d]	14-07 Software assets register [Outcome: b, d]
14-08 Tracking system [Outcome: d]	14-08 Tracking system [Outcome: c, d]
17-07 Infrastructure requirements [Outcome: a, b]	17-07 Infrastructure requirements [Outcome: a]

5.2.6 ORG.3 Project portfolio management

Process ID	ORG.3
Process Name	Project portfolio management
Process Purpose	The purpose of the Project portfolio management process is to initiate and sustain necessary, sufficient and suitable projects in order to meet the strategic objectives of the organization. This process commits the investment of adequate organization funding and resources, and sanctions the authorities needed to establish selected projects. It performs continued qualification of projects to confirm they justify, or can be redirected to justify, continued investment.
Process Outcomes	As a result of the successful implementation of the Project portfolio management process: a) business venture opportunities, investments or necessities are qualified, prioritized and selected; b) resources and budgets for each project are identified and allocated; c) project management accountability and authorities are defined; d) projects meeting agreement and stakeholder requirements are sustained; and e) projects not meeting agreement or stakeholder requirements are redirected or terminated.
Base Practices	**ORG.3.BP1: Collect business opportunities, needs and investments.** Collect and analyse business needs and opportunities as items for current and future projects. [Outcome: a] **ORG.3.BP2: Analyze business needs and necessities**. Use organization level criteria to analyze, prioritize and select current and new development items. [Outcome: a] **ORG.3.BP3: Estimate resources and budget for project portfolio**. Calculate and balance resources and budget for the selected development items. [Outcome: b]

	ORG.3.BP4: Define governance mechanism for projects. Define common accountability and authority for projects. [Outcome: c] NOTE 1: Identify expected outcomes of the projects. Common metrics and measurement repository for all projects is an element of governance. **ORG.3.BP5: Define scope for each project**. Define resources, responsibilities, budget, scope, constraints, reporting requirements and review milestones for each project. [Outcome: b, c, d] **ORG.3.BP6: Assess achievement of project goals**. Collect and analyse data to assess project´s progress and achievement of goals. [Outcome: d] **ORG.3.BP7: Control projects**. Use portfolio data to control project against agreements and stakeholder requirements. [Outcome: d, e] **ORG.3.BP8: Act on deviation**. Redirect or terminate project if agreement, stakeholder requirements or business benefits are not expected to be achieved. [Outcome: e]

Work Products	
Inputs	Outputs
	02-01 Commitment / agreement [Outcome: a]
03-06 Process performance data [Outcome: e]	
04-07 Organizational structure [Outcome: a]	
05-02 Business goals [Outcome: a, b, c]	05-02 Business goals [Outcome: a, b]
08-12 Project plan [Outcome: b, c, d, e]	08-12 Project plan [Outcome: b, c, d, e]
08-19 Risk management plan [Outcome: b, d, e]	08-19 Risk management plan [Outcome: d, e]
	13-04 Communication record [Outcome: c, d]
	13-19 Review record [Outcome: d, e]
15-04 Market analysis report [Outcome: a]	15-04 Market analysis report [Outcome: a]
15-06 Project status report [Outcome: d]	15-06 Project status report [Outcome: d]
16-06 Process repository [Outcome: d, e]	16-06 Process repository [Outcome: e]
17-03 Stakeholder requirements [Outcome: a, d, e]	17-03 Stakeholder requirements [Outcome: a, d, e]

5.2.7 ORG.4 Human resource management

Process ID	ORG.4
Process Name	Human resource management
Process Purpose	The purpose of the Human resource management process is to provide the organization with necessary human resources and to maintain their competencies, consistent with business needs. The process assures the providing of a supply of skilled and experienced personnel qualified to perform life cycle processes to achieve organization, project and customer objectives.

Process Outcomes	As a result of the successful implementation of the Human resource management process: a) skills required by projects are identified; b) necessary human resources are provided to projects; c) skills of personnel are developed, maintained or enhanced; d) conflicts in multi-project resource demands are resolved; and e) individual knowledge, information and skills are collected, shared, reused and improved throughout the organization.
Base Practices	**ORG.4.BP1: Collect resource and skill needs from projects**. Identify, collect and analyse human resource needs and required skills in projects. [Outcome: a] **ORG.4.BP2: Define skill development strategy**. Define organizational strategy for skill and competence development. [Outcome: a, b] **ORG.4.BP3: Develop human resources.** Develop, maintain and enhance human resources and their competencies. [Outcome: a, c] **ORG.4.BP4: Provide human resources to projects**. Satisfy human resource needs in projects. [Outcome: b] **ORG.4.BP5: Balance resources between projects.**. Manage conflicts in multi-project resource demands . [Outcome: d] **ORG.4.BP6: Collect common knowledge base**. Create common knowledge management system and repository to collect and share experiences and best practices. [Outcome: e] **ORG.4.BP7: Reuse and improve common knowledge**. Create and manage organisational learning mechanisms so that common knowledge remains relevant and is usable for future projects. [Outcome: e]

Work Products	
Inputs	Outputs
	01-04 Knowledge item [Outcome: e]
	02-01 Commitment / agreement [Outcome: d]
	03-02 Asset use data [Outcome: e]
08-08 Human resource management plan [Outcome: a, b, c]	08-08 Human resource management plan [Outcome: a, c]
	08-24 Training plan [Outcome: b]
09-01 Personnel policy [Outcome: a, b]	
13-12 Personnel record [Outcome: c]	13-12 Personnel record [Outcome: b, c]
13-23 Training record [Outcome: c]	13-23 Training record [Outcome c]
	15-15 Human resource needs analysis [Outcome: a]
16-04 Knowledge repository [Outcome: a, b, c]	16-04 Knowledge repository [Outcome: a, c]
	19-03 Knowledge management strategy [Outcome: c]

5.2.8 ORG.4A Skill development (subprocess)

Process ID	ORG.4A
Process Name	Skill development
Process Purpose	The purpose of the Skill development process is to provide the organization and project with individuals who possess the needed skills and knowledge to perform their roles effectively.
Process Outcomes	As a result of successful implementation of the Skill development process: a) training is developed or acquired to address the organization and project training needs; and b) training is conducted to ensure that all individuals have the skills required to perform their assignments, using mechanisms such as training strategies and materials.
Base Practices	**ORG.4A.BP1: Develop a strategy for skill development.** Develop a strategy for skill development and training including how the competence needs will be identified, how the needed development and training will be developed or acquired, and how the training will be performed. [Outcome: a] **ORG.4A.BP2: Identify new skills and competencies.** Identify and evaluate skills and competencies to be provided or improved through development and training. [Outcome: a] **ORG.4A.BP3: Develop or acquire training**. Develop or acquire training that addresses the common skill development needs. [Outcome: a] NOTE: training may include objectives, syllabus, material and other training resources. **ORG.4A.BP4: Train personnel.** Train personnel to have the knowledge and skills needed to perform their roles, and maintain adequate skill records. [Outcome: b] **ORG.4A.BP5: Evaluate training effectiveness.** Identify and evaluate added value provided by each training session, including the satisfaction in training results. [Outcome: b]

Work Products	
Inputs	Outputs
06-04 Training material [Outcome: b]	06-04 Training material [Outcome: b]
	08-02 Acquisition plan [Outcome a]
08-08 Human resource management plan [Outcome: a]	
08-24 Training plan [Outcome: a, b]	08-24 Training plan [Outcome: a]
09-01 Personnel policy [Outcome: a]	
	13-11 Personnel performance review record [Outcome: b]
	13-23 Training record [Outcome: b]
15-15 Human resource needs analysis [Outcome: a]	
	15-22 Training evaluation report [Outcome: b]
19-08 Training strategy [Outcome: a]	19-08 Training strategy [Outcome: a]

5.2.9 ORG.4B Skill acquisition and provision (subprocess)

Process ID	ORG.4B
Process Name	Skill acquisition and provision
Process Purpose	The purpose of the Skill acquisition and provision process is to provide the organization and projects with individuals who possess skills and knowledge to perform their roles effectively and to work together as a cohesive group.
Process Outcomes	As a result of successful implementation of the Skill acquisition and provision process: a) individuals with the required skills and competencies are identified and recruited; b) effective interaction between individuals and groups are supported; c) the work force have the skills to share information and co-ordinate their activities efficiently; and d) objective criteria are defined against which group and individual performance is monitored to provide performance feedback and to enhance performance.
Base Practices	**ORG.4B.BP1: Identify needed skills and competencies.** Identify and evaluate skills and competencies needed by the organization to achieve its goals. [Outcome: a] **ORG.4B.BP2: Define evaluation criteria.** Define objective criteria that can be used to evaluate candidates and assess staff performance. [Outcome: a, d] **ORG.4B.BP3: Recruit qualified staff.** Establish a systematic program for recruitment of staff competent to meet the needs of the organization. [Outcome: a] **ORG.4B.BP4: Develop staff skills and competencies.** Define and provide opportunities for development of the skills and competencies of staff. [Outcome: a, c] **ORG.4B.BP5: Define team organization for projects and tasks.** Define the structure and operating rules under which teams undertaking projects and/or tasks operate. [Outcome: b] **ORG.4B.BP6: Empower project teams**. Empower teams to perform their job, by ensuring that they have: - an understanding of their job; - a shared vision or sense of common interest; - appropriate mechanisms or facilities for communication; and - support from management for what they are trying to accomplish. [Outcome: b] **ORG.4B.BP7: Maintain project team interactions.** Obtain and maintain agreement on the management of interactions between teams. [Outcome: b] **ORG.4B.BP8: Evaluate staff performance.** Evaluate the performance of staff, in respect of their contributions to the goals of the organization as a whole. Ensure that feedback is discussed with the staff. [Outcome: a, d] **ORG.4B.BP9: Provide feedback on performance.** Ensure that feedback is provided to staff on the results of any performance evaluations performed. [Outcome: d] **ORG.4B.BP10: Maintain staff records.** Maintain adequate records of staff, including not only personnel details, but also information on skills, training completed, and performance evaluations. [Outcome: d]

Work Products	
Inputs	Outputs
	02-01 Commitment / agreement [Outcome: a]
08-08 Human resource management plan [Outcome: b]	08-08 Human resource management plan [Outcome: a, b]
	08-24 Training plan [Outcome: c]
09-01 Personnel policy [Outcome: a]	
	13-04 Communication record [Outcome: b]
	13-11 Personnel performance review record [Outcome: c, d]
13-12 Personnel record [Outcome: c]	13-12 Personnel record [Outcome: a]
13-23 Training record [Outcome: c]	13-23 Training record [Outcome c]
	15-15 Human resource needs analysis [Outcome: a]
	15-17 Personnel performance evaluation [Outcome: d]
15-22 Training evaluation report [Outcome: c, d]	
	18-05 Personnel performance criteria [Outcome: d]

5.2.10 ORG.4C Knowledge management (subprocess)

Process ID	ORG.4C
Process Name	Knowledge management
Process Purpose	The purpose of the Knowledge management process is to ensure that individual knowledge, information and skills are collected, shared, reused and improved throughout the organization.
Process Outcomes	As a result of successful implementation of Knowledge management process: a) infrastructure is established and maintained for sharing common and domain information across the organization; b) knowledge is readily available and shared throughout the organization; and c) the organization will select an appropriate knowledge management strategy.
Base Practices	**ORG.4C.BP1: Establish a knowledge management system.** Establish and maintain a knowledge management infrastructure and mechanism to support the activities to identify, classify, exchange and use knowledge assets. [Outcome: a, b] **ORG.4C.BP2: Create the network of knowledge contributors**. Establish the network of experts and their mutual interaction. [Outcome: b, c] **ORG.4C.BP3: Develop a knowledge management strategy.** Define an appropriate knowledge management strategy based on organizational, individual, domain and project needs. [Outcome: c] **ORG.4C.BP4: Capture knowledge.** Identify and record each knowledge item according to the classification schema and asset criteria. [Outcome: b, c] **ORG.4C.BP5: Disseminate knowledge assets.** Share knowledge assets with experts, users and projects. [Outcome: c] **ORG.4C.BP6: Improve knowledge assets.** Validate and enrich knowledge assets to ensure their appropriateness and value to the organization. [Outcome: b, c]

Work Products	
Inputs	Outputs
	01-04 Knowledge item [Outcome: b]
	03-02 Asset use data [Outcome: b]
05-02 Business goals [Outcome: c]	
13-04 Communication record [Outcome: b]	13-04 Communication record [Outcome: b]
16-04 Knowledge repository [Outcome: a, b, c]	16-04 Knowledge repository [Outcome: a, c]
	19-03 Knowledge management strategy [Outcome: c]

5.2.11 ORG.5 Quality management

Process ID	ORG.5
Process Name	Quality management
Process Purpose	The purpose of the Quality management process is to assure that products, services and implementations of life cycle processes meet organizational quality objectives and achieve customer satisfaction.
Process Outcomes	As a result of the successful implementation of the Quality management process: a) organization quality management policies and procedures are defined; b) organization quality objectives are defined; c) accountability and authority for quality management are defined; d) the status of customer satisfaction is monitored; and e) appropriate action is taken when quality objectives are not achieved.
Base Practices	**ORG.5.BP1: Define quality policy.** Based on the customer's stated requirements for quality and implicit quality requirements relevant to the customer's environment, establish organization quality policy. [Outcome: a] NOTE 1: Customer environment may include all affected parties, society at large, relevant legislation and regulations. **ORG.5.BP2: Define organization quality procedures.** Define organization level quality procedures including necessary resources and responsibilities. [Outcome: a, c] **ORG.5.BP3: Set quality objectives.** Set verifiable quality objectives for processes and projects, based on business goals. [Outcome: b, c] **ORG.5.BP4: Establish criteria for accountability.** Identify and define standards, references and metrics that will measure and verify whether the relevant quality objectives have been achieved. [Outcome: b, c] **ORG.5.BP5: Assess achievement of quality objectives.** Review regularly the achievement of quality objectives at higher management level using defined criteria and take appropriate action. [Outcome: c] **ORG.5.BP6: Collect customer satisfaction data**. Collect satisfaction data from customer to verify continuous improvement of quality situation at organizational and project level. [Outcome: d] **ORG.5.BP7: Monitor actual performance of quality management.** Measure and monitor actual performance of quality management against the quality objectives. [Outcome: e]

	ORG.5.BP8: Take preventive or corrective action. When defined quality objectives are not achieved, take corrective or preventive action both at the project and organizational level. [Outcome: d, e] NOTE 2: The corrective action can involve fixing the product generated by a particular project activity or changing the planned set of activities in order to better achieve the quality objectives or both. The preventive action can involve modifying product specifications or process definitions, or both, to prevent recurrence of the non-achievement.

Work Products	
Inputs	Outputs
02-00 Contract [Outcome: d]	
03-01 Assessment data [Outcome: d, e]	
03-03 Benchmarking data [Outcome: e]	
03-04 Customer satisfaction data [Outcome: d]	
03-06 Process performance data [Outcome: e]	
	05-06 Quality goals [Outcome: b]
	07-06 Quality measure [Outcome: b, e]
08-12 Project plan [Outcome: d, e]	
08-13 Quality plan [Outcome: b, c, e]	08-13 Quality plan [Outcome: c, e]
08-18 Review plan [Outcome: e]	08-18 Review plan [Outcome: e]
08-29 Improvement plan [Outcome: a, e]	
	09-02 Quality policy [Outcome: a]
	10-04 Quality Manual [Outcome: a, b, c, d]
13-07 Problem record [Outcome: e]	
13-14 Progress status record [Outcome: e]	
13-18 Quality record [Outcome: e]	
13-19 Review record [Outcome: e]	13-19 Review record [Outcome: e]
	14-02 Corrective action register [Outcome: e]
	15-01 Analysis report [Outcome: d, e]
15-13 Assessment report [Outcome: e]	
15-24 Audit report [Outcome: e]	
16-06 Process repository [Outcome: a]	16-06 Process repository [Outcome: a]
17-03 Stakeholder requirements [Outcome: a, d]	
18-01 Acceptance criteria [Outcome: c, d]	18-01 Acceptance criteria [Outcome: a, e]
18-07 Quality criteria [Outcome: b, c]	18-07 Quality criteria [Outcome: a, b, c]

5.2.12 ORG.6 Organizational alignment

Process ID	ORG.6
Process Name	Organizational alignment
Process Purpose	The purpose of the Organizational alignment process is to enable the software processes needed by the organization to provide software products and services, to be consistent with its business goals.
Process Outcomes	As a result of the successful implementation of Organizational alignment process: a) the organization's business goals are identified; b) the process framework is identified and defined that includes a set of software processes needed to achieve the business goals of the organization; c) a strategy is defined for process definition, implementation and improvement; d) support is provided to enable this strategy; e) the organization's mission, core values, vision, goals and objectives is made known to all employees; f) individuals in the organization share a common vision, culture, and understanding of the business goals to empower them to function effectively; and g) everyone in the organization understands their role in achieving the goals of the business and is able to perform that role
Base Practices	**ORG.6.BP1: Develop a strategic vision.** Develop a strategic vision for the organization identifying its business goals and the relationship of system and software engineering functions to the core activities of the organization. [Outcome: a] **ORG.6.BP2: Define the process framework.** Identify the processes that need to be performed in order to achieve the business goals. [Outcome: b] **ORG.6.BP3: Define a strategy for process deployment.** Define a strategy for process deployment, implementation, and improvement in the organizational unit. [Outcome: c, d] **ORG.6.BP4: Provide management support**. Provide management support for process deployment, implementation, and improvement to enable achievement of business goals. [Outcome: d, e] NOTE: One way to perform this practice would be to implement a Quality Management System in accordance with ISO 9001. **ORG.6.BP5: Communicate the vision and goals.** Explain the organization strategic vision and goals to all individuals working for the organization, using appropriate management and communication mechanisms. [Outcome: e, f] **ORG.6.BP6: Ensure sharing of common vision.** Ensure that each individual in the organization understands the common vision and is committed and empowered to perform their function effectively. [Outcome: f] **ORG.6.BP7: Enable active participation.** Enable each individual to contribute to the achievement of business goals and related process improvement initiatives. [Outcome: f, g]

Work Products	
Inputs	Outputs
	02-01 Commitment / agreement [Outcome: d]
03-06 Process performance data [Outcome: c]	
04-07 Organizational structure [Outcome: a, b, c]	
05-02 Business goals [Outcome: a, b, c]	05-02 Business goals [Outcome: a]
05-03 Core values statement [Outcome: a, d, e]	05-03 Core values statement [Outcome: e]
05-04 Mission statement [Outcome: a, d, e]	05-04 Mission statement [Outcome: e]
05-05 Vision statement [Outcome: a, d, e]	05-05 Vision statement [Outcome: e]
09-01 Personnel policy [Outcome: f, g]	09-01 Personnel policy [Outcome: e, f, g]
09-02 Quality policy [Outcome: c, e]	
10-01 Life cycle model [Outcome: b]	10-01 Life cycle model [Outcome: b]
13-04 Communication record [Outcome: e]	13-04 Communication record [Outcome: e, g]
15-04 Market analysis report [Outcome: a]	15-04 Market analysis report [Outcome: a]
15-13 Assessment report [Outcome: b, c]	
15-14 Customer satisfaction report [Outcome: a]	
	15-19 Product needs assessment [Outcome: a]
15-24 Audit report [Outcome: b, c]	
16-06 Process repository [Outcome: b, c]	16-06 Process repository [Outcome: b]
18-05 Personnel performance criteria [Outcome: f]	
	19-02 Process strategy [Outcome: b, c]

5.2.13 ORG.7 Organization management

Process ID	ORG.7
Process Name	Organization management
Process Purpose	The purpose of the Organization management process is to establish and perform software management practices, during the performance of the processes needed for providing software products and services, that are consistent with the business goals of the organization. NOTE: Although organizational operations in general have a much broader scope than that of software process, software processes are implemented in a business context and to be effective, require an appropriate organizational environment.
Process Outcomes	As a result of the successful implementation of Organization management process: a) the organization will invest in the appropriate management infrastructure; b) the best practices are identified to support the implementation of effective organization and project management; and

	c) a basis for evaluating the achievement of organization business goals based on these management practices is provided.
Base Practices	**ORG.7.BP1: Identify management infrastructure**. Identify management infrastructure appropriate to perform software management practices that are consistent with the business goals of the organization. [Outcome: a] NOTE 1: Management infrastructure may include organizational roles and responsibilities, decision-making system, communication mechanisms and planning / monitoring of business operations. **ORG.7.BP2: Provide management infrastructure**: Provide the identified management infrastructure appropriate in organization's broader scope. [Outcome: a] **ORG.7.BP3: Identify and implement software management practices.** Identify and implement effective software management practices to implement and improve competitive software processes and to construct effective organization and project management. [Outcome: b] **ORG.7 BP4: Perform identified management practices.** Perform management practices using management infrastructure. [Outcome: b] **ORG.7.BP5: Evaluate effectiveness.** Evaluate the effectiveness of implemented software management practices to achieve the related organization business goals. [Outcome: c] **ORG.7.BP6: Provide support to adopt best practices**. Use incentive approaches and software management infrastructure to support implementation of effective software management practices. [Outcome: b, purpose] NOTE 2: Best practice may be related to the achieved or next capability level. See Knowledge management process (ORG.4C) to manage and disseminate best practices as part of organizational knowledge assets.

Work Products	
Inputs	Outputs
03-03 Benchmarking data [Outcome: c]	
	03-06 Process performance data [Outcome: c]
04-07 Organizational structure [Outcome: c]	04-07 Organizational structure [Outcome: a]
05-02 Business goals [Outcome: b, c]	
	07-04 Process measure [Outcome: c]
	10-00 Process description [Outcome: b]
	15-05 Evaluation report [Outcome: c]
07-04 Process measure [Outcome: b, c]	
15-13 Assessment report [Outcome: b, c]	15-13 Assessment report [Outcome: b, c]
15-24 Audit report [Outcome: b, c]	
	16-06 Process repository [Outcome: b]
19-00 Strategy [Outcome a]	19-00 Strategy [Outcome: a]

5.3 Project Processes group (PRO)

5.3.1 PRO.1 Project planning

Process ID	PRO.1
Process Name	Project planning
Process Purpose	The purpose of the Project planning process is to produce and communicate effective and workable project plans. This process determines the scope of the project management and technical activities, identifies process outputs, project tasks and deliverables, establishes schedules for project task conduct, including achievement criteria, and required resources to accomplish project tasks.
Process Outcomes	As a result of successful implementation of the Project planning process: a) the scope of the work for the project is defined; b) the feasibility of achieving the goals of the project with available resources and constraints are evaluated; c) the tasks and resources necessary to complete the work are sized and estimated; d) interfaces between elements in the project, and with other project and organizational units, are identified; e) plans for the execution of the project are developed; and f) plans for the execution of the project are activated.
Base Practices	**PRO.1.BP1: Define the scope of work**. Identify the project's objectives, motivation and boundaries and define the work to be undertaken by the project. [Outcome: a] **PRO.1.BP2: Define life cycle model for the project.** Define a life cycle and strategy for the project, appropriate to its scope, context, magnitude and complexity. [Outcome: a] **PRO.1.BP3 Evaluate feasibility of the project.** Evaluate the feasibility of achieving the goals of the project with available resources and constraints. [Outcome: b] **PRO.1.BP4: Determine and maintain estimates for project attributes.** Define and maintain baselines for project attributes. [Outcome: b, c] NOTE 1: Project attributes may include 1) business and quality goals for the project, 2) size and complexity of the project and 3) project effort, schedule and budget. NOTE 2: Project quality goals and risks should be considered when estimating project attributes. See Quality management process (ORG.5) and Risk management process (PRO.4) for details. **PRO.1.BP5: Define project activities and tasks.** Identify project activities and tasks according to defined project lifecycle, and define dependencies between them. [Outcome: c] **PRO.1.BP6: Define needs for experience, knowledge and skills**. Identify the experience, knowledge and skill requirements of the project and apply them to the selection of individuals and teams. [Outcome: c] **PRO.1.BP7: Identify and monitor project interfaces.** Identify and agree interfaces of the project with other projects, organizational units and other affected parties. [Outcome: d] **PRO.1.BP8: Define project schedule.** Determine the sequence and schedule of performance of activities within the project. [Outcome: e]

	PRO.1.BP9: Allocate resources and responsibilities. Identify the specific individuals and groups contributing to, and impacted by, the project, allocate them their specific responsibilities, and ensure that the commitments are understood and accepted, funded and achievable. [Outcome: c, e] **PRO.1.BP10: Establish project plan**. Define and maintain project master plan and other relevant plans to cover the project scope and goals, resources, infrastructure, interfaces and communication mechanisms. [Outcome: e] **PRO.1.BP11: Activate the project plan.** Initiate planned activities of the projects and share planning data within the project. [Outcome: f] NOTE 3: Project kick-off meeting is a way to activate project plan.

Work Products	
Inputs	Outputs
02-00 Contract [Outcome: a, b]	
03-06 Process performance data [Outcome: c]	
08-06 Project activity network [Outcome: e]	08-06 Project activity network [Outcome: d, e]
08-08 Human resource management plan [Outcome: c, e]	
08-12 Project plan [Outcome: c, d, e]	08-12 Project plan [Outcome: a, b, c, d, e]
08-19 Risk management plan [Outcome: b, d, e]	08-19 Risk management plan [Outcome: d, e]
10-01 Life cycle model [Outcome: a, b, c]	10-01 Life cycle model [Outcome: d, e]
12-01 Request for proposal [Outcome: a]	
	13-04 Communication record [Outcome: d, f]
13-16 Change request [Outcome: a, d]	13-16 Change request [Outcome: e]
13-17 Customer request [Outcome: a]	
14-06 Schedule [Outcome: a, b, c, d, e]	14-06 Schedule [Outcome: e]
14-09 Work breakdown structure [Outcome: c, d, e]	14-09 Work breakdown structure [Outcome: d, e]
17-03 Stakeholder requirements [Outcome: a, b]	
19-07 Software development methodology [Outcome: b, d, e]	

5.3.2 PRO.2 Project assessment and control

Process ID	PRO.2
Process Name	Project assessment and control
Process Purpose	The purpose of the project assessment and control process is to determine the status of the project and ensure that the project performs according to plans and schedules, and within projected budgets, and that it satisfies technical objectives. This process includes redirecting the project activities, as appropriate, to correct identified deviations and variations from other project management or technical processes. Redirection may include replanning as appropriate.

Process Outcomes	As a result of the successful implementation of the Project assessment and control process: a) progress of the project is monitored and reported; b) interfaces between elements in the project, and with other project and organizational units, are monitored; c) actions to correct deviations from the plan and to prevent recurrence of problems identified in the project are taken when project targets are not achieved; and d) project objectives are achieved and recorded.
Base Practices	**PRO.2.BP1: Monitor project attributes.** Monitor project scope, budget, cost, resources and other necessary attributes and document significant deviations of them against the project baseline. [Outcome: a] **PRO.2.BP2: Monitor project interfaces.** Monitor status and changes between project elements, and with other projects and organizational units. [Outcome: b] **PRO.2.BP3: Report progress of the project**. Regularly report the status of the project performance against the project plan. [Outcome: a, b] **PRO.2.BP4: Act to correct deviations.** Take action when project goals are not achieved, to correct deviations from the plan and to prevent recurrence of problems identified in the project. [Outcome: c] NOTE 1: Project plan is typically updated to prevent recurrence of problems, see PRO.1. **PRO.2.BP5: Perform project review**. Perform a review of the achievement of project objectives to initiate necessary corrective and preventive actions. [Outcome: a, c, d] **PRO.2.BP6: Collect project experiences.** Record project experiences and data to be available for future projects and process improvement. [Outcome: d]

Work Products	
Inputs	Outputs
03-06 Process performance data [Outcome: a, d]	
07-05 Project measure [Outcome: a, d]	
08-12 Project plan [Outcome: c]	08-12 Project plan [Outcome: c, d]
	13-04 Communication record [Outcome: a, b, c]
13-07 Problem record [Outcome: c]	
13-14 Progress status record [Outcome: a, b]	13-14 Progress status record [Outcome: a, b]
13-16 Change request [Outcome: c]	13-16 Change request [Outcome: c]
	13-19 Review record [Outcome: d]
	14-02 Corrective action register [Outcome: c]
14-08 Tracking system [Outcome: a, b, c, d]	
15-06 Project status report [Outcome: a, b, d]	15-06 Project status report [Outcome: a, b, d]

5.3.3 PRO.3 Decision management

Process ID	PRO.3
Process Name	Decision management
Process Purpose	The purpose of the Decision management process is to select the most beneficial course of project action where alternatives exist. This process responds to a request for a decision encountered during the system life cycle, whatever its nature or source, in order to reach specified, desirable or optimized outcomes. Alternative actions are analyzed and a course of action selected and directed. Decisions and their rationale are recorded to support future decision-making.
Process Outcomes	As a result of the successful implementation of the Decision management process: a) a decision-making strategy is defined; b) alternative courses of action are defined; c) a preferred course of action is selected; and d) the resolution, decision rationale and assumptions are captured and reported.
Base Practices	**PRO.3.BP1: Define a decision making strategy.** Identify responsibilities, authorities and organizational mechanisms needed for effective decision making. [Outcome: a] **PRO.3.BP2: Involve relevant parties.** Involve relevant parties in the decision-making in order to draw on experience and knowledge. [Outcome: a] **PRO.3.BP3: Define alternative courses of action.** Identify, categorize and define alternative actions and decision alternatives in each decision situation. [Outcome: a, b] **PRO.3.BP4: Define decision criteria.** Define and use objective criteria to analyse each decision alternative. [Outcome: b] **PRO.3.BP5: Select preferred course of action.** Select preferred course of action using criteria. [Outcome: c] **PRO.3.BP6: Record decision.** Record each decision, including criteria, rationale and relevant assumptions. [Outcome: d]

Work Products	
Inputs	Outputs
08-12 Project plan [Outcome: b, c]	08-12 Project plan [Outcome: b, c]
12-05 Decision criteria [Outcome: b, c]	12-05 Decision criteria [Outcome: b, c]
12-06 Decision alternative [Outcome: c]	12-06 Decision alternative [Outcome: b]
12-07 Decision [Outcome: b, c]	12-07 Decision [Outcome: c]
13-07 Problem record [Outcome: b, c]	
	13-15 Proposal review record [Outcome: c]
19-13 Decision-making strategy [Outcome: a]	19-13 Decision-making strategy [Outcome: a]

5.3.4 PRO.4 Risk management

Process ID	PRO.4
Process Name	Risk management
Process Purpose	The purpose of the Risk management process is to identify, analyze, treat and monitor the risks continuously. The Risk management process is a continuous process for systematically addressing risk throughout the life cycle of a system or software product or service. It can be applied to risks related to the acquisition, development, maintenance or operation of a system..
Process Outcomes	As a result of successful implementation of the Risk management process: a) the scope of risk management to be performed is determined; b) appropriate risk management strategies are defined and implemented; c) risks are identified as they develop *and* during the conduct of the project; d) risks are analyzed, and the priority in which to apply resources to treatment of these risks is determined; e) risk measures are defined, applied, and assessed to determine changes in the status of risk and the progress of the treatment activities; and f) appropriate treatment is taken to correct or avoid the impact of risk based on its priority, probability, and consequence or other defined risk threshold.
Base Practices	**PRO.4.BP1: Establish risk management scope.** Determine the scope of risk management to be performed. [Outcome: a] **PRO.4.BP2: Define risk management strategies.** Define appropriate strategies and risk measures to identify, analyze, treat and monitor each risk or set of risks, both at the project and organizational level. [Outcome: b, e] **PRO.4.BP3: Identify risks.** Identify risks to the project both initially within the project strategy and as they develop during the conduct of the project. [Outcome: c] NOTE 1: Examples of project level risks include cost, schedule, effort, resource, and technical risks. **PRO.4.BP4: Analyze risks**. Analyze risks and apply risk measures to determine priority in which to apply resources to monitor risks. [Outcome: d, e] NOTE 2: Issues to be considered in risk analysis include the probability and the impact of occurrence of each identified risk. **PRO.4.BP5: Define and perform risk treatment actions.** For each risk (or set of risks) define and perform the appropriate actions to reduce the risks to an acceptable level. [Outcome: e, f] **PRO.4.BP6: Monitor risks**. Monitor the current state of each risk, determine changes in the status of risk and assess the effectiveness of risk treatment actions. [Outcome: e, f] **PRO.4.BP7: Take preventive or corrective action**. When expected progress in risk mitigation is not achieved, take appropriate preventive action to further reduce or avoid the impact of each risk. Where risk mitigation cannot reduce or avoid the risk, plan corrective action to resolve the problem arising from the risk. [Outcome: f] NOTE 3: Preventive action may involve developing and implementing new treatment strategies or adjusting the existing strategies.

Work Products	
Inputs	Outputs
	07-07 Risk measure [Outcome: e]
08-12 Project plan [Outcome: a]	
	08-14 Recovery plan [Outcome: d, f]
08-19 Risk management plan [Outcome: d, e]	08-19 Risk management plan [Outcome: All]
08-20 Risk mitigation plan [Outcome: f]	08-20 Risk mitigation plan [Outcome: c, d]
13-20 Risk action request [Outcome: d]	13-20 Risk action request [Outcome: b, f]
	14-02 Corrective action register [Outcome: f]
14-08 Tracking system [Outcome: c, d, e, f]	14-08 Tracking system [Outcome: b, c, d, e, f]
	15-08 Risk analysis report [Outcome d]
	15-09 Risk status report [Outcome d, e]

5.3.5 PRO.5 Configuration management

Process ID	PRO.5
Process Name	Configuration management
Process Purpose	The purpose of the Configuration management process is to establish and maintain the integrity of all identified outputs of a project or process and make them available to concerned parties.
Process Outcomes	As a result of the successful implementation of the Configuration management process: a) a configuration management strategy is defined; b) items requiring configuration management are defined; c) configuration baselines are established; d) changes to items under configuration management are controlled; e) the configuration of released items is controlled; and f) the status of items under configuration management is made available throughout the life cycle. NOTE: The Software configuration management process is a specialization of the Configuration management process and is included in the Software support process group.
Base Practices	**PRO.5.BP1: Develop configuration management strategy.** Determine configuration management strategy, including configuration management activities and schedule for performing these activities. Develop a branch management strategy when appropriate. [Outcome: a] NOTE 1: Parallel development efforts may require a branch management strategy that includes branch management, merging strategies, file versioning in a branching system, branch parenting strategies and tagging strategies. **PRO.5.BP2: Identify configuration items**. Identify configuration items that need to be independently identified, stored, tested, reviewed, used, changed, delivered and/or maintained. [Outcome: b]

	PRO.5.BP3: Establish baselines. Establish the internal and delivery baselines. Baselines are achieved by the accumulation of all the necessary configuration items. [Outcome: c] **PRO.5.BP4: Maintain configuration item description**. Maintain an up-to-date description of each configuration item. [Outcome: c, d] **PRO.5.BP5: Control modifications and releases.** Establish a mechanism for logging the items, submitting and releasing them; and maintaining a history of each configuration item to recover a previously baselined version when required. [Outcome: d, e] **PRO.5.BP6: Manage the backup, storage, archiving, handling and delivery of configured items**. Ensure the integrity and consistency of configured items through appropriate scheduling and resourcing of backup, storage and archiving. Control the handling and delivery of configured items. [Outcome: d, e] **PRO.5.BP7: Verify the information about configured items**. Verify that the information about configured items and their structures, supplied through status accounting reporting is complete and ensure the consistency of the items. [Outcome: e, f] **PRO.5.BP8: Report configuration status.** Report status of each configuration item and their relationship in the current system integration. [Outcome: f]

Work Products	
Inputs	Outputs
01-00 Configuration item [Outcome: c, d, e, f]	01-00 Configuration item [Outcome: b, c, f]
01-01 Product configuration [Outcome: a]	01-01 Product configuration [Outcome: b]
06-02 Handling and storage guide [Outcome: f]	
08-04 Configuration management plan [Outcome: b, c, d, e, f]	08-04 Configuration management plan [Outcome: a, b]
08-16 Release plan [Outcome: a, e]	
	13-06 Delivery record [Outcome: e, f]
	13-10 Configuration management record [Outcome: c, d, e, f]
	13-13 Product release approval record [Outcome: f]
	14-01 Change history [Outcome: d]
14-08 Tracking system [Outcome: e, f]	
	15-03 Configuration status report [Outcome: f]
16-03 Configuration management library [Outcome: f]	

5.3.6 PRO.6 Information Management

Process ID	PRO.6
Process Name	Information management
Process Purpose	The purpose of the Information management process is to provide relevant, timely, complete, valid and, if required, confidential information to designated parties during and, as appropriate, after the system life cycle. This process generates, collects, transforms, retains, retrieves, disseminates and disposes of information. It manages designated information, including technical, project, organizational, agreement and user information.
Process Outcomes	As a result of the successful implementation of the Information management process: a) information to be managed is identified; b) the forms of the information representations are defined; c) information is transformed and disposed of as required; d) the status of information is recorded; e) information is current, complete and valid; and f) information is made available to designated parties. NOTE: The Software documentation management process is a specialization of the Information management process and is included in the Software Support Processes group.
Base Practices	**PRO.6.BP1: Identify information to be managed**. Define the items of information that will be managed during the system life cycle and, according to organizational policy or legislation, maintained for a defined period beyond. [Outcome: a] **PRO.6.BP2: Specify requirements for information representation.** Define the content, semantics, formats and medium for the representation, retention, transmission and retrieval of information. [Outcome: b] **PRO.6.BP3: Maintain information items.** Maintain information items and their storage records according to integrity, security and privacy requirements. [Outcome: c] **PRO.6.BP4: Review information**. Control the status of the information; consider needs for replication or transformation to an alternative media. [Outcome: d, e] **PRO.6.BP5: Distribute information.** Retrieve and distribute information to designated parties as required by agreed schedules or defined circumstances.. [Outcome: f]

Work Products	
Inputs	Outputs
08-18 Review plan [Outcome: e]	
	08-26 Documentation plan [Outcome: a]
09-00 Policy [Outcome: a]	
10-01 Life cycle model [Outcome: a]	
13-00 Record [Outcome: a, c]	13-00 Record [Outcome: d]
	13-19 Review record [Outcome: e]
14-00 Register [Outcome: a, c]	

Work Products	
Inputs	Outputs
	14-01 Change history [Outcome: c]
15-00 Report [Outcome: a]	
17-05 Documentation requirements [Outcome: c]	17-05 Documentation requirements [Outcome: b]
21-00 Work product [Outcome: a, e]	

5.3.7 PRO.7 Measurement

Process ID	PRO.7
Process Name	Measurement
Process Purpose	The purpose of the Measurement process is to collect, analyze, and report data relating to the products developed and processes implemented within the organizational unit, to support effective management of the processes, and to objectively demonstrate the quality of the products.
Process Outcomes	As a result of successful implementation of the Measurement process: a) the information needs of technical and management processes are identified; b) an appropriate set of measures, driven by the information needs are identified and/or developed; c) measurement activities are identified and planned; d) the required data are collected, stored, analyzed, and the results interpreted; e) information products are used to support decisions and provide an objective basis for communication; f) the Measurement Process and measures are evaluated; and g) improvements are communicated to the Measurement process owner.
Base Practices	**PRO.7.BP1: Develop a measurement strategy**. Define an appropriate measurement strategy to identify, perform and evaluate measurement activities and results, based on organizational and project needs. [Outcome: a, c] **PRO.7.BP2: Identify measurement information needs**. Identify the measurement information needs of organizational and management processes. [Outcome: a] **PRO.7.BP3: Specify measures**. Identify and develop an appropriate set of measures based on measurement information needs. [Outcome: b] **PRO.7.BP4: Collect and store measurement data**. Identify, collect and store measurement data, including context information necessary to verify, understand and evaluate data. [Outcomes c, d] **PRO.7.BP5: Analyze measurement data**. Analyze and interpret measurement data, and develop information products. [Outcome: d] **PRO.7.BP6: Use measurement information products for decision-making**. Make accurate and current measurement information products accessible for any decision-making and communication processes for which it is relevant. [Outcome: e] **PRO.7.BP7: Communicate measurement results.** Disseminate measurement information products to all parties who will be using them and collect feedback to evaluate the appropriateness for intended use. [Outcome: e]

	PRO.7.BP8: Evaluate and communicate information products and measurement activities to process owners. Evaluate information products and measurement activities against the identified information needs and measurement strategy, identify potential improvements in measurements, and communicate any identified potential improvement to the process owners. [Outcome: f, g]

Work Products	
Inputs	Outputs
03-01 Assessment data [Outcome: f, g]	
03-03 Benchmarking data [Outcome: d, e, f]	03-03 Benchmarking data [Outcome: e]
03-04 Customer satisfaction data [Outcome: d]	03-04 Customer satisfaction data [Outcome: d]
03-06 Process performance data [Outcome: d]	03-06 Process performance data [Outcome: d]
07-01 Customer satisfaction survey [Outcome: d, e]	07-01 Customer satisfaction survey [Outcome: d, e]
07-02 Field measure [Outcome: b, d]	07-02 Field measure [Outcome: d]
07-04 Process measure [Outcome: d]	07-04 Process measure [Outcome: d, e]
07-05 Project measure [Outcome: d	07-05 Project measure [Outcome: d, e]
07-06 Quality measure [Outcome: d]	07-06 Quality measure [Outcome: d, e]
07-08 Service level measure [Outcome: d]	07-08 Service level measure [Outcome: d, e]
09-02 Quality policy [Outcome: a]	
10-00 Process description [Outcome: a, c, f]	10-00 Process description [Outcome: f, g]
	13-07 Problem record [Outcome f]
13-17 Customer request [Outcome: a, b]	
14-10 Work product distribution register [Outcome: e]	
	15-01 Analysis report [Outcome: d, e]
	15-05 Evaluation report [Outcome: d, e]
	15-18 Process performance report [Outcome: d]

5.4 Technical Processes group (ENG)

5.4.1 ENG.1 Stakeholder requirements definition

Process ID	ENG.1
Process Name	Stakeholder requirements definition
Process Purpose	The purpose of the Stakeholder requirements definition process is to define the requirements for a system that can provide the services needed by users and other stakeholders in a defined environment. It identifies stakeholders, or stakeholder classes, involved with the system throughout its life cycle, and their needs and desires. It analyzes and transforms these into a common set of stakeholder requirements that express the intended interaction the system will have with its

	operational environment and that are the reference against which each resulting operational service is validated in order to confirm that the system fulfils needs.
Process Outcomes	As a result of successful implementation of the Stakeholder requirements definition process: a) the required characteristics and context of use of services are specified; b) the constraints on a system solution are defined; c) traceability of stakeholder requirements to stakeholders and their needs is achieved; d) the basis for defining the system requirements is described; e) the basis for validating the conformance of the services is defined; and f) a basis for negotiating and agreeing to supply a service or product is provided.
Base Practices	**ENG.1.BP1: Identify stakeholders.** Identify the individual stakeholders or stakeholder classes who have a legitimate interest in the system throughout its life cycle. [Outcome: a] **ENG.1.BP2: Obtain requirements.** Elicit stakeholder requirements that describe the needs, wants, desires, expectations and perceived constraints of identified stakeholders. [Outcome: a, b] **ENG.1.BP3: Define constraints.** Define the constraints on a system solution that are unavoidable consequences of existing agreements, management decisions and technical decisions. [Outcome: b] **ENG.1.BP4: Define user interaction.** Identify the interaction between users and the system, taking into the account human capabilities and skills limitations. [Outcome: a, b] NOTE 1: Usability requirements are determined, establishing, as a minimum, the most effective, efficient, and reliable human performance and human-system interaction. Applicable standards, e.g., ISO 9241, and accepted professional practices can be used. **ENG.1.BP5: Identify critical requirements.** Specify health, safety, security, environment and other stakeholder requirements and functions that relate to critical qualities and shall address possible adverse effects of use of the system on human health and safety. [Outcome: a, b] **ENG.1.BP6: Evaluate requirements.** Analyze the complete set of elicited requirements. Analysis includes identifying and prioritizing the conflicting, missing, incomplete, ambiguous, inconsistent, incongruous or unverifiable requirements. [Outcome: d] **ENG.1.BP7: Agree on requirements.** Obtain agreement across teams on the stakeholder requirements, obtaining the appropriate sign-offs by representatives of all teams and other parties contractually bound to work to these requirements. [Outcome: f] **ENG.1.BP8: Establish stakeholder requirements baseline.** Record the stakeholder requirements in a form suitable for requirements management through the life cycle and beyond. Establish requirements as a baseline for project use and monitoring against stakeholder needs. [Outcome: d, e, f] **ENG.1.BP9: Manage stakeholder requirements changes.** Maintain stakeholder requirements traceability to the sources of stakeholder need. The stakeholder requirements are reviewed at key decision times in the life cycle to ensure that account is taken of any changes of need. [Outcome: c, f]

Work Products	
Inputs	Outputs
02-01 Commitment / agreement [Outcome: a, b]	
	13-00 Record [Outcome: d, f]
	13-04 Communication record [Outcome: a, c, f]
13-16 Change request [Outcome: f]	
13-17 Customer request [Outcome: a, b, f]	
	13-21 Change control record [Outcome: f]
	13-22 Traceability record [Outcome: c]
	15-01 Analysis report [Outcome: d]
17-03 Stakeholder requirements [Outcome: a, c, d, e]	17-03 Stakeholder requirements [Outcome: a, b, d, f]

5.4.2 ENG.2 System requirements analysis

Process ID	ENG.2
Process Name	System requirements analysis
Process Purpose	The purpose of the System requirements analysis process is to transform the defined stakeholder requirements into a set of desired system technical requirements that will guide the design of the system.
Process Outcomes	As a result of successful implementation of System requirements analysis process: a) a defined set of system functional and non-functional requirements describing the problem to be solved are established; b) the appropriate techniques are performed to optimize the preferred project solution; c) system requirements are analyzed for correctness and testability; d) the impact of the system requirements on the operating environment are understood; e) the requirements are prioritized, approved and updated as needed; f) consistency and traceability are established between the system requirements and the customer's requirements baseline; g) changes to the baseline are evaluated for cost, schedule and technical impact; and h) the system requirements are communicated to all affected parties and baselined.
Base Practices	**ENG.2.BP1: Establish system requirements**. Use the stakeholder requirements as the basis for defining the required functions and capabilities of the system and document in a system requirements baseline. Consider feasibility of the project solution using appropriate techniques. [Outcome: a, b] NOTE 1: Appropriate techniques for solution analysis may include: feasibility studies, case studies, prototyping, formal languages and workshops. **ENG.2.BP2: Optimize project solution.** Appropriate techniques are performed to optimize the preferred solution. Consider and analyze alternative solutions to achieve an optimum project solution. [Outcome: b]

	ENG.2.BP3: Analyze system requirements. Prioritize requirements and analyze the prioritized requirements for correctness, completeness, consistency, feasibility and testability, identifying the necessary elements of the system. Identify changes to the operating environment. [Outcome: c, d] NOTE 2: Any derived requirements are also identified. **ENG.2.BP4: Evaluate and update system requirements**. Evaluate the impact of proposed changes and new requirements for cost, schedule, risk and technical impact, approve or reject changes and new requirements, and update the system requirements baseline. [Outcome: e, g] **ENG.2.BP5: Ensure consistency.** Ensure consistency of requirements elicitation to system requirements analysis. Consistency is supported by establishing and maintaining traceability between customer requirements and the system requirements when needed. [Outcome: f] **ENG.2.BP6: Communicate system requirements**. Establish communication mechanisms for dissemination of system requirements, and updates to requirements to all parties who will be using them. [Outcome: h]

Work Products	
Inputs	Outputs
	13-04 Communication record [Outcome: h]
13-16 Change request [Outcome: g]	
13-17 Customer request [Outcome: g]	
	13-21 Change control record [Outcome: g]
	13-22 Traceability record [Outcome: f]
	15-01 Analysis report [Outcome: b, c, d, g]
17-03 Stakeholder requirements [Outcome: a, f]	
	17-08 Interface requirements [Outcome: d]
	17-12 System requirements [Outcome: a, e]

5.4.3 ENG.3 System architectural design

Process ID	ENG.3
Process Name	System architectural design
Process Purpose	The purpose of the System architectural design process is to identify which system requirements should be allocated to which elements of the system.
Process Outcomes	As a result of successful implementation of the System architectural design process: a) a system architecture design is defined that identifies the elements of the system and meets the defined requirements; b) the system's functional and non-functional requirements are addressed; c) the requirements are allocated to the elements of the system; d) internal and external interfaces of each system element are defined;

	e) verification between the system requirements and the system architecture is performed; f) the requirements allocated to the system elements and their interfaces are traceable to the customer's requirements baseline; g) consistency and traceability between the system requirements and system architecture design is maintained; and h) the system requirements, the system architecture design, and their relationships are baselined and communicated to all affected parties; i) human factors and ergonomic knowledge and techniques are incorporated in system design; and j) human-centred design activities are identified and performed.
Base Practices	**ENG.3.BP1: Evaluate alternative system architectures.** Define evaluation criteria for architecture design. Evaluate alternative system architectures according to the defined criteria. Record the rationale for choosing the current system architecture. [Outcome: a] NOTE: Evaluation criteria may include quality characteristics (modularity, maintainability, expandability, scalability, reliability, security and usability) and results of make-buy-reuse analysis. **ENG.3.BP2: Describe system architecture.** Establish the top-level system architecture that identifies elements of hardware, software and manual-operations. [Outcome: a] **ENG.3.BP3: Allocate requirements.** Allocate all system requirements to the elements of the top-level system architecture. [Outcome: b, c] **ENG.3.BP4: Define interfaces.** Develop and document the internal and external interfaces of each system element. [Outcome: d] **ENG.3.BP5: Verify system architecture.** Ensure that the system architecture meets all stakeholder and system requirements. [Outcome: e, f] **ENG.3.BP6: Ensure consistency**. Ensure consistency of system requirements analysis to system architectural design. Consistency is supported by establishing and maintaining traceability between system requirements and the system architecture design when needed. [Outcome: g] **ENG.3.BP7: Communicate system architecture design.** Establish communication mechanisms for dissemination of the system architecture design to all parties who will be using them. [Outcome: h] **ENG.3.BP8: Perform human-centred design activities.** Identify and perform human-centred design activities considering human factors and ergonomic knowledge and techniques in system design. [Outcome: i, j]

Work Products	
Inputs	Outputs
01-01 Product configuration [Outcome: a]	
	04-06 System architecture design [Outcome: a, b, c, d, i]
	11-08 System element [Outcome: a, c, f]
	13-04 Communication record [Outcome: h]
	13-22 Traceability record [Outcome: f, g]

Work Products	
Inputs	Outputs
	13-25 Verification results [Outcome: e]
17-03 Stakeholder requirements [Outcome: f, j]	
17-08 Interface requirements [Outcome: d, f]	
17-12 System requirements [Outcome: a, b, c, e, f, g, i, j]	

5.4.4 ENG.4 Software implementation

Process ID	ENG.4
Process Name	Software implementation
Process Purpose	The purpose of the Software implementation process is to produce a specified system element implemented as a software product or service. This process transforms specified behaviour, interfaces and implementation constraints into actions that create a system element implemented as a software product or service, otherwise known as a "software item." This process results in a software item that satisfies architectural design requirements through verification and stakeholder requirements through validation.
Process Outcomes	As a result of the successful implementation of the Software implementation process: a) an implementation strategy is defined; b) implementation technology constraints on the design are identified; c) a software item is realized; and d) a software item is packaged and stored in accordance with an agreement for its supply.
Base Practices	**ENG.4.BP1: Plan software implementation.** Define or select a life cycle model appropriate to the scope, magnitude, and complexity of the project. Plan stages, activities, tasks and outcomes according to the life cycle model. [Outcome: a] **ENG.4.BP2: Establish software requirements**. Analyze the requirements of the software elements of the system. [Outcome: b, c] **ENG.4.BP3: Design software**. Provide a design for the software that implements and can be verified against the requirements. [Outcome: c] **ENG.4.BP4: Construct software.** Produce executable software units that properly reflect the software design. Test and document software units. [Outcome: c] **ENG.4.BP5: Test integrated software against requirements.** Combine the software units and software components, producing integrated software items, consistent with the software design, that demonstrate that the functional and non-functional software requirements are satisfied. [Outcome: c, d] **ENG.4.BP6: Prepare software for release.** Package and store software item in accordance with an agreement for its supply. [Outcome: d]

Work Products	
Inputs	Outputs
01-03 Software item [Outcome: d]	01-03 Software item [Outcome: c]
02-01 Commitment / agreement [Outcome: a, b, d]	
03-07 Test data [Outcome: c]	
	04-04 High level software design [Outcome: c]
	04-05 Low level software design [Outcome: c]
	06-01 Customer manual [Outcome: c]
08-12 Project plan [Outcome: a]	08-12 Project plan [Outcome: a]
	08-21 Software test plan [Outcome: c]
	08-25 Unit test plan [Outcome: c]
10-01 Life cycle model [Outcome: a]	10-01 Life cycle model [Outcome: a]
11-02 Software element [Outcome: a]	11-02 Software element [Outcome: a]
11-05 Software unit [Outcome: c, d]	11-05 Software unit [Outcome: b]
	13-22 Traceability record [Outcome: c]
17-02 Build list [Outcome: d, g]	17-02 Build list [Outcome: a]
17-11 Software requirements [Outcome: c, d]	17-11 Software requirements [Outcome: b, c]
17-12 System requirements [Outcome: b]	
18-03 Coding standard [Outcome: c]	

NOTE: The Software Implementation Processes (DEV), described in Clause 5.5, are lower-level processes of the ENG.4 Software implementation process.

5.4.5 ENG.5 System integration

Process ID	ENG.5
Process Name	System integration
Process Purpose	The purpose of the System integration process is to integrate the system elements (including software items, hardware items, manual operations, and other systems, as necessary) to produce a complete system that will satisfy the system design and the customers' expectations expressed in the system requirements.
Process Outcomes	As a result of successful implementation of the System integration process: a) a strategy is developed to integrate the system according to the priorities of the system requirements; b) criteria are developed to verify compliance with the system requirements allocated to the system elements, including the interfaces between system elements; c) the system integration is verified using the defined criteria; d) a regression strategy is developed and applied for re-testing the system when changes are made;

	e) consistency and traceability are established between the system design and the integrated system elements; f) an integrated system is constructed that demonstrates compliance with the system design; and g) an integrated system is constructed that demonstrates that a complete set of usable deliverable system elements exists.
Base Practices	**ENG.5.BP1: Develop system integration and regression test strategies**. Develop strategies for integrating system elements consistent with the system architecture and requirements, and for re-testing system elements should a given system element be changed. [Outcome: a, d] **ENG.5.BP2: Develop tests for system elements.** Describe the tests to run against each system element, indicating requirements being checked, input data, system elements needed to perform the test, and verification criteria. [Outcome: b] **ENG.5.BP3: Integrate system elements.** Integrate system elements according to the system integration strategy. [Outcome: c] **ENG.5.BP4: Verify system elements.** Verify each system element and ensure that it satisfies its requirements, and document the results. [Outcome: c] **ENG.5.BP5: Regression test system elements**. If changes are made to system elements, carry out regression testing as defined in the regression test strategy. [Outcome: d] **ENG.5.BP6: Ensure consistency**. Ensure consistency of system architectural design to system integration. Consistency is supported by establishing and maintaining traceability between system designs and the system elements when needed. [Outcome: e] **ENG.5.BP7: Build complete system of system elements.** Identify and integrate system elements to produce a complete system ready for system testing according to the system integration strategy. [Outcome: f, g]

Work Products	
Inputs	Outputs
03-07 Test data [Outcome: c]	03-07 Test data [Outcome: b]
04-06 System architecture design [Outcome: a, b, d, e]	
	08-07 System integration test plan [Outcome: a, b]
08-15 Regression test plan [Outcome: d]	08-15 Regression test plan [Outcome: d]
	08-22 System test plan [Outcome: a, b]
	10-02 Test procedure [Outcome: a, b, d]
11-01 Software product [Outcome: c, f, g]	
11-06 System [Outcome: c]	11-06 System [Outcome: f]
11-08 System element [Outcome: d, e, f, g]	
	13-19 Review record [Outcome: c]
	13-22 Traceability record [Outcome: e]
	14-04 Test log [Outcome: c, d]

Work Products	
Inputs	Outputs
	15-10 Test incident report [Outcome: c, d]
	15-11 Defect report [Outcome: c, d]
	15-23 Test item transmittal report [Outcome: b]
17-02 Build list [Outcome: c, d, f, g]	17-02 Build list [Outcome: a]
17-12 System requirements [Outcome: a, b]	
17-13 Test design specification [Outcome: a]	17-13 Test design specification [Outcome: a]
17-14 Test case specification [Outcome: b]	17-14 Test case specification [Outcome: b]

5.4.6 ENG.6 System qualification testing

Process ID	ENG.6
Process Name	System qualification testing
Process Purpose	The purpose of the System qualification testing process is to ensure that the implementation of each system requirement is tested for compliance and that the system is ready for delivery.
Process Outcomes	As a result of successful implementation of System qualification testing process: a) criteria for evaluating compliance with system requirements are developed; b) the integrated system is tested using the defined criteria; c) test results are recorded; and d) readiness of the system for delivery is assured.
Base Practices	**ENG.6.BP1: Develop tests for system**. Describe the tests to be run against the complete system, indicating system requirements being checked, input data, and validation criteria. [Outcome: a] NOTE: This can be performed during System requirements analysis process (ENG.2). **ENG.6.BP2: Test integrated system.** Test the integrated system and ensure that it satisfies the system requirements, and record the results. [Outcome: b, c] **ENG.6.BP3: Confirm system readiness**. Ensure that the system is ready for delivery and communicate system test results to all affected parties. [Outcome: d]

Work Products	
Inputs	Outputs
03-07 Test data [Outcome: b]	03-07 Test data [Outcome: a]
06-01 Customer manual [Outcome: b]	
08-22 System test plan [Outcome: b]	08-22 System test plan [Outcome: a]
10-02 Test procedure [Outcome: b]	10-02 Test procedure [Outcome: a]
11-06 System [Outcome: b, d]	11-06 System [Outcome: d]
	14-04 Test log [Outcome: c]

Work Products	
Inputs	Outputs
	15-10 Test incident report [Outcome: c]
	15-11 Defect report [Outcome: c]
15-23 Test item transmittal report [Outcome: b]	
17-02 Build list [Outcome: b, d]	
17-12 System requirements[Outcome: a, d]	
17-13 Test design specification [Outcome: a]	
17-14 Test case specification [Outcome: b]	17-14 Test case specification [Outcome: b]

5.4.7 ENG.7 Software installation

Process ID	ENG.7
Process Name	Software installation
Process Purpose	The purpose of the Software installation process is to install the software product that meets the agreed requirements in the target environment.
Process Outcomes	As a result of successful implementation of the Software installation process: a) a software installation strategy is developed; b) criteria for software installation are developed that demonstrate compliance with the software installation requirements; c) the software product is installed in the target environment; and d) readiness of the software product for use in its intended environment is assured.
Base Practices	**ENG.7.BP1: Develop installation strategy.** Develop a software installation strategy to install the software product in the target environment in agreement with the customer and the operating organization. [Outcome: a] NOTE 1: An important part of developing an installation strategy is to develop a strategy to return to the last working system version. In order to be able to re-install the last working version, a complete backup of the system should be made before starting the installation. **ENG.7.BP2: Establish installation criteria.** Based on the installation requirements, develop criteria for the environment where the software will be installed. [Outcome: b] **ENG.7.BP3: Specify the requirements for adaptation.** Specify the requirements for adaptation of the system for its intended environment. [Outcome: b] **ENG.7.BP4: Adapt the system.** Adapt the system to meet the requirements for operation. [Outcome: b] **ENG.7.BP5: Install software product**. Install the software product according to the software installation strategy. Document the events and results. [Outcome: c] **ENG.7.BP6: Confirm product readiness.** Assure that the software product is ready for use in its intended environment. [Outcome: d] NOTE 2: Software installation process is linked Product/service delivery and support process (AGR.2C).

Work Products	
Inputs	Outputs
04-06 System architecture design [Outcome: a, c]	
06-03 Installation guide [Outcome: c]	06-03 Installation guide [Outcome: a]
08-09 Installation and maintenance plan [Outcome: c]	08-09 Installation and maintenance plan [Outcome: a, b]
10-02 Test procedure [Outcome: c, d]	10-02 Test procedure [Outcome: a, b]
11-01 Software product [Outcome: a, c, d]	
	13-01 Acceptance record [Outcome: d]
	13-07 Problem record [Outcome: d]
	13-08 Installation record [Outcome: c]
	13-19 Review record [Outcome: d]
13-27 Retirement notification [Outcome: a]	
	15-10 Test incident report [Outcome: d]
17-11 Software requirements [Outcome: a, b]	
17-12 System requirements [Outcome: a, b, d]	

5.4.8 ENG.8 Software acceptance support

Process ID	ENG.8
Process Name	Software acceptance support
Process Purpose	The purpose of the Software acceptance support process is to assist the acquirer to achieve confidence that the product meets requirements.
Process Outcomes	As a result of the successful implementation of the Software acceptance support process: a) the product is completed and delivered to the acquirer; b) acquirer acceptance tests and reviews are supported; c) the product is put into operation in the customers' environment; and d) problems detected during acceptance are identified and communicated to those responsible for resolution. NOTE: Incremental delivery would be in completed increments.
Base Practices	**ENG.8.BP1: Deliver software to customer**. Software is completed and handed over to the acquirer with detailed configurations and technical / operational documents. [Outcome: a] **ENG.8.BP2: Support customer in software evaluation**. Provide support for customer reviews and software acceptance testing. [Outcome: b] **ENG.8.BP3:Support acquirer to start operational use of software.** Give necessary support and training for acquirer in preparing and initiating use of software in operational environment. [Outcome: c] **ENG.8.BP4: Manage problems during software acceptance**. Identify and communicate problems during delivery and acceptance of software and solve problems as agreed. [Outcome: d]

Work Products	
Inputs	Outputs
	01-01 Product configuration [Outcome: a]
02-00 Contract [Outcome: a]	
06-03 Installation guide [Outcome: b]	
08-01 Acceptance test plan [Outcome: b]	08-01 Acceptance test plan [Outcome: b]
08-24 Training plan [Outcome: c]	
10-03 Customer support procedure [Outcome: b, c]	10-03 Customer support procedure [Outcome: b, c]
11-04 Product release package [Outcome: a]	
	13-01 Acceptance record [Outcome: b]
	13-06 Delivery record [Outcome: a]
13-07 Problem record [Outcome: d]	13-07 Problem record [Outcome: d]
	13-08 Installation record [Outcome: b]
	13-19 Review record [Outcome: b]
17-03 Stakeholder requirements [Outcome: b]	

5.4.9 ENG.9 Software operation

Process ID	ENG.9
Process Name	Software operation
Process Purpose	The purpose of the Software operation process is to operate the software product in its intended environment and to provide support to the customers of the software product.
Process Outcomes	As a result of the successful implementation of the Software operation process: a) an operation strategy is defined; b) conditions for correct operation of the software in its intended environment are identified and evaluated; c) the software is tested and determined to operate in its intended environment; d) the software is operated in its intended environment; and e) assistance and consultation is provided to the customers of the software product in accordance with the agreement.
Base Practices	**ENG.9.BP1: Define strategy for operation and support of software**. Define responsibilities, environments and constraints for software operation and support for use. [Outcome: a] **ENG.9.BP2: Create operation environment**. Define conditions and environment for operation. [Outcome: b] **ENG.9.BP3: Test and accept software for operation**. Test and accept software to be operated in its intended environment. [Outcome: c]

	ENG.9.BP4: Operate software. Operate software in its intended environment and in the specified way. [Outcome: d] **ENG.9.BP5: Meet support needs.** Provide training, assistance, consultation, documentation and other support in accordance with the agreement. [Outcome: e]

Work Products	
Inputs	Outputs
06-01 Customer manual [Outcome: c]	
06-05 Product operation guide [Outcome: d, e]	06-05 Product operation guide [Outcome: d, e]
07-08 Service level measure [Outcome: e]	07-08 Service level measure [Outcome: e]
	08-01 Acceptance test plan [Outcome: c]
10-03 Customer support procedure [Outcome: c]	10-03 Customer support procedure [Outcome: c]
11-03 Product release information [Outcome: c]	
	13-01 Acceptance record [Outcome: c]
	13-06 Delivery record [Outcome: c]
	13-08 Installation record [Outcome: c, d]
17-03 Stakeholder requirements [Outcome: b, c]	
17-10 Service requirements [Outcome: a, c]	17-10 Service requirements [Outcome: a, c]
	18-07 Quality criteria [Outcome: c]

5.4.10 ENG.9A Operational use (subprocess)

Process ID	ENG.9A
Process Name	Operational use
Process Purpose	The purpose of the Operational use process is to ensure the correct and efficient operation of the product for the duration of its intended usage and in its installed environment.
Process Outcomes	As a result of successful implementation of Operational use process: a) operational risks for the product introduction and operation are identified and monitored; b) the product is operated in its intended environment according to requirements; and c) criteria for the operational use are developed that demonstrates compliance with the agreed requirements.
Base Practices	**ENG.9A.BP1: Identify operational risks**. Identify and monitor risks to product operation. [Outcome: a] **ENG.9A.BP2: Perform operational testing.** Perform operational testing of each release of the product, assessing satisfaction against specified criteria. [Outcome: b] **ENG.9A.BP3: Operate the product**. Operate the product in its intended environment and in the specified way. [Outcome: b] **ENG.9A.BP4: Develop criteria for operational use.** Criteria for operational use are developed such that compliance with the agreed requirements can be demonstrated. [Outcome: c]

	ENG.9A.BP5: Monitor operational use. Provide the capability to monitor operational service on a regular basis, where appropriate against defined criteria. [Outcome: c]

Work Products	
Inputs	Outputs
06-01 Customer manual [Outcome: b]	
06-05 Product operation guide [Outcome: a, b]	06-05 Product operation guide [Outcome: b, c]
07-02 Field measure [Outcome: b]	07-02 Field measure [Outcome: a, b, c]
07-07 Risk measure [Outcome: a]	
07-08 Service level measure [Outcome: b, c]	07-08 Service level measure [Outcome: b, c]
11-03 Product release information [Outcome: a, c]	
14-08 Tracking system [Outcome: a]	
	15-08 Risk analysis report [Outcome: a]
	15-09 Risk status report [Outcome a]
17-03 Stakeholder requirements [Outcome: b, c]	
	18-07 Quality criteria [Outcome: c]

5.4.11 ENG.9B Customer support (subprocess)

Process ID	ENG.9B
Process Name	Customer support
Process Purpose	The purpose of the Customer support process is to establish and maintain an acceptable level of service through assistance and consultation to the customer to support effective use of the product.
Process Outcomes	As a result of successful implementation of Customer support process: a) service needs for customer support are identified and monitored on an ongoing basis; b) customer satisfaction with both the support services being provided and the product itself is evaluated on an ongoing basis; c) operational support is provided by handling customer inquiries and requests and resolving operational problems; and d) customer support needs are met through delivery of appropriate services.
Base Practices	**ENG.9B.BP1: Establish product support**. Establish a service by which the customer can raise problems and questions encountered in use of the product and receive help in resolving them. [Outcome: a, c] **ENG.9B.BP2: Meet support needs.** Provide training, documentation and other support services, as appropriate, to the user so that the product can be effectively used. [Outcome: d] **ENG.9B.BP3: Monitor performance.** Monitor the operational performance of the product in order to be aware of problems which might impact level of service.[Outcome: a, b]

	ENG.9B.BP4: Determine customer product satisfaction. Determine the level of customer satisfaction with the products received. [Outcome: b] NOTE 1: This may involve, as appropriate, field performance data, surveys, interviews, and studies. In some instances the end-user of the product may be different from the customer of the product. In this case, both the customer and end-user satisfaction levels should be determined. **ENG.9B.BP5: Determine customer service satisfaction**. Determine the level of customer satisfaction with the services received. [Outcome: b] **ENG.9B.BP6: Communicate customer satisfaction.** Communicate customer satisfaction data throughout the supplier organization, in a manner appropriate to the staff involved and the nature of the findings, and communicate to the customer. [Outcome: b]

Work Products	
Inputs	Outputs
02-00 Contract [Outcome: a]	
	03-04 Customer satisfaction data [Outcome: b]
	07-01 Customer satisfaction survey [Outcome: b]
07-08 Service level measure [Outcome: a]	
10-03 Customer support procedure [Outcome: c]	
	12-02 Retirement request [Outcome: b]
13-07 Problem record [Outcome: c]	13-07 Problem record [Outcome: b]
13-17 Customer request [Outcome: c]	
	15-14 Customer satisfaction report [Outcome: b]
	15-20 Service level performance [Outcome: d]
17-10 Service requirements [Outcome: a, c]	17-10 Service requirements [Outcome: a, c]

5.4.12 ENG.10 Software maintenance

Process ID	ENG.10
Process Name	Software maintenance
Process Purpose	The purpose of the Software maintenance process is to provide cost-effective support to a delivered software product. NOTE: Pre-delivery Software maintenance activities include planning for post-delivery operations, supportability, and logistics determination. Post-delivery activities include software modification and operational support, such as training or operating a help desk.
Process Outcomes	As a result of successful implementation of the Software maintenance process: a) a maintenance strategy is developed to manage modification and migration of products according to the release strategy; b) the impact of changes to the existing system on organization, operations or interfaces are identified;

	c) affected system and software documentation is updated as needed; d) modified products are developed with associated tests that demonstrate that requirements are not compromised; e) product upgrades are migrated to the customer's environment; and f) the system software modification is communicated to all affected parties.
Base Practices	**ENG.10.BP1: Develop maintenance strategy.** Develop the strategy for managing modification and migration of products consistent with the maintenance requirements, release strategy and possible warranty policies. [Outcome: a] **ENG.10.BP2: Analyze user problems and changes.** Analyze user problems and requests and required changes, evaluating the possible impact of different options for modifying the existing system and software, system interfaces, and requirements. Document the selected solution. [Outcome: b] NOTE: This Base Practice links to the Software problem resolution process (SUP.8). **ENG.10.BP3: Implement and test modifications**. Determine which products need to be changed. Implement, test and document the selected modifications, demonstrating that the system and software requirements and integrity will not be compromised by the upgrade. [Outcome: c, d] **ENG.10.BP4: Upgrade user system**. Migrate the upgraded system and software with applied modifications to the user's environment. Provide for, as appropriate: notification of the migration plans and activities; parallel operation of the old and new systems; and user training. Perform a post-operation review to assess the impact of the modification. [Outcome: e] **ENG.10.BP5: Communicate modifications.** Establish communication mechanisms for dissemination of system and software modifications to all parties who will be affected. [Outcome: f]

Work Products	
Inputs	Outputs
06-01 Customer manual [Outcome: c]	
	08-01 Acceptance test plan [Outcome: c]
	08-09 Installation and maintenance plan [Outcome: a, e]
08-16 Release plan [Outcome: a]	08-16 Release plan [Outcome: a, e]
08-22 System test plan [Outcome: d]	08-22 System test plan [Outcome: d]
	11-03 Product release information [Outcome: f]
	11-04 Product release package [Outcome: e, f]
11-06 System [Outcome: a, c, d]	11-06 System [Outcome: c, d]
	13-01 Acceptance record [Outcome: f]
	13-04 Communication record [Outcome: f]
13-07 Problem record [Outcome: b]	
13-16 Change request [Outcome: c, d]	
13-17 Customer request [Outcome: b]	

Work Products	
Inputs	Outputs
	13-21 Change control record [Outcome: b, f]
	13-22 Traceability record [Outcome: d]
	14-01 Change history [Outcome: f]
	15-01 Analysis report [Outcome: b]
	15-10 Test incident report [Outcome: d]
17-03 Stakeholder requirements [Outcome: b]	
17-05 Documentation requirements [Outcome: c, d]	
17-11 Software requirements [Outcome: b]	
17-12 System requirements [Outcome: b]	
19-04 Product release strategy [Outcome: a]	19-04 Product release strategy [Outcome: a, e]
19-06 Maintenance strategy [Outcome: b, c]	19-06 Maintenance strategy [Outcome: a]

5.4.13 ENG.11 Software disposal

Process ID	ENG.11
Process Name	Software disposal
Process Purpose	The purpose of the Software disposal process is to end the existence of a system's software entity. This process ends active support by the operation and maintenance organization, or deactivates, disassembles and removes the affected software products, consigning them to a final condition and leaving the environment in an acceptable condition. This process destroys or stores system software elements and related products in a sound manner, in accordance with legislation, agreements, organizational constraints and stakeholder requirements. Where required, it maintains records that may be monitored. NOTE: The objective is to retire a system's existing software products or services while preserving the integrity of organizational operations.
Process Outcomes	As a result of successful implementation of the Software disposal process: a) a software disposal strategy is defined; b) disposal constraints are provided as inputs to requirements; c) the system's software elements are destroyed or stored; d) the environment is left in an agreed-upon state; and e) records allowing knowledge retention of disposal actions and any analysis of long-term impacts are available.
Base Practices	**ENG.11.BP1: Plan software disposal.** Define and document the strategy for software disposal. Plan to remove active support by the operation and maintenance organizations. [Outcome: a] **ENG.11.BP2: Consider disposal constraints.** Provide any disposal constraints as inputs to requirements for the planned disposal activities. [Outcome: b]

	ENG.11.BP3: Execute software disposal. Dispose of software according to the plan. Provide support for transition to the new system, when needed. [Outcome: c, d] **ENG.11.BP4: Notify the users**. Inform the users of the plans and activities for the retirement of software products and services. [Outcome: b, c] **ENG.11.BP5: Record the disposal.** Place in archives all associated development documentation, logs, and code, when appropriate. Data used by, or associated with, the retired software product shall be accessible in accordance with the contract requirements for data protection and audit applicable to the data. [Outcome: d, e]

Work Products	
Inputs	Outputs
06-01 Customer manual [Outcome: a]	
	08-31 Software disposal plan [Outcome: a, b]
11-03 Product release information [Outcome: a, b]	
11-06 System [Outcome: c, e]	
12-02 Retirement request [Outcome: a, b]	
	13-01 Acceptance record [Outcome: e]
	13-04 Communication record [Outcome: d, e]
13-17 Customer request [Outcome: a, d]	
	13-27 Retirement notification [Outcome: c]
	14-01 Change history [Outcome: c, e]
	15-01 Analysis report [Outcome: e]
17-12 System requirements [Outcome: a, b]	
19-04 Product release strategy [Outcome: a]	
19-06 Maintenance strategy [Outcome: a, c, d]	

5.5 Software Implementation Processes group (DEV)

NOTE: The Software Implementation Processes (DEV), described in Clause 5.5, are lower-level processes of the ENG.4 Software implementation process.

5.5.1 DEV.1 Software requirements analysis

Process ID	DEV.1
Process Name	Software requirements analysis
Process Purpose	The purpose of the Software requirements analysis process is to establish the requirements of the software elements of the system.
Process Outcomes	As a result of successful implementation of Software requirements analysis process: a) the requirements allocated to the software elements of the system and their interfaces are defined;

	b) software requirements are analyzed for correctness and testability; c) the impact of software requirements on the operating environment are understood; d) consistency and traceability are established between the software requirements and system requirements; e) prioritization for implementing the software requirements is defined; f) the software requirements are approved and updated as needed; g) changes to the software requirements are evaluated for cost, schedule and technical impact; and h) the software requirements are baselined and communicated to all affected parties.
Base Practices	**DEV.1.BP1: Specify software requirements**. Define and prioritize functional and nonfunctional requirements of the software elements of the system and their interfaces and document them in a software requirements specification. Analyze the software requirements for correctness, completeness, consistency, feasibility and testability. Identify any derived requirements. [Outcome: a, b, e] NOTE 1: Software quality characteristics are described in ISO/IEC 25010. **DEV.1.BP2: Determine operating environment impact**. Determine the interfaces between the software requirements and other elements of the operating environment, and the impact that the requirements will have. [Outcome: c] NOTE 2: The operating environment includes tasks performed by, or other systems used by, the intended users of the software product. **DEV.1.BP3: Develop criteria for software testing.** Use the software requirements to define acceptance criteria for the software product tests. Software product tests should demonstrate compliance with the software requirements. [Outcome: b] **DEV.1.BP4: Ensure consistency**. Ensure consistency of system requirements analysis to software requirements analysis. Consistency is supported by establishing and maintaining traceability between system requirements and the software requirements when needed. [Outcome: d] **DEV.1.BP5: Evaluate and update software requirements.** Evaluate the requirements with the customer, evaluate the impact of proposed changes for cost, schedule and technical impact, approve or reject changes, and update the software requirements specification. [Outcome: f, g] **DEV.1.BP6: Communicate software requirements**. Establish communication mechanisms for dissemination of software requirements, and updates to requirements to all parties who will be using them. [Outcome: h]

Work Products	
Inputs	Outputs
04-06 System architecture design [Outcome: a]	
	13-04 Communication record [Outcome: h]
13-16 Change request [Outcome: f, g]	
13-17 Customer request [Outcome: f, g]	
	13-21 Change control record [Outcome: g]

Work Products	
Inputs	Outputs
	13-22 Traceability record [Outcome: d]
	15-01 Analysis report [Outcome: b, c, g]
	17-08 Interface requirements [Outcome: a]
	17-11 Software requirements [Outcome: a, b, d, e, f]
17-12 System requirements [Outcome: a, d]	

5.5.2 DEV.2 Software architectural design

Process ID	DEV.2
Process Name	Software architectural design
Process Purpose	The purpose of the Software architectural design process is to provide a design for the software that implements and can be verified against the requirements.
Process Outcomes	As a result of successful implementation of the Software architectural design process: a) a software architectural design is developed and baselined that describes the software items that will implement the software requirements; b) internal and external interfaces of each software item are defined; and c) consistency and traceability are established between software requirements and software design.
Base Practices	**DEV.2.BP1: Describe software architecture.** Transform the software requirements into a software architecture design that describes the top-level structure and identifies its major software items. [Outcome: a] NOTE 1: Examples of major software items include data storage and access (e.g. Database), communication mechanism, business logic and user interface. NOTE 2: In transforming software requirements into a software architecture design, alternative software architectures should be evaluated according to defined criteria. The rationale for choosing the current software architecture should be recorded. Evaluation criteria may include software quality characteristics (modularity, maintainability, expandability, scalability, reliability, security and usability) and results of make-buy-reuse analysis. **DEV.2.BP2: Define interfaces for software items.** Specify and document the external and internal interfaces between the software items. [Outcome: b] **DEV.2.BP3: Analyze the architectural design.** Analyze the architectural design for correctness and testability to ensure that the software items can be built and tested. [Outcome: a] **DEV.2.BP4: Ensure consistency**. Ensure consistency of software requirements analysis to software design. Consistency is supported by establishing and maintaining traceability between software requirements and the software design when needed. [Outcome: c]

Work Products	
Inputs	Outputs
	01-03 Software item [Outcome: a]
	04-01 Database design [Outcome: a]
	04-04 High level software design [Outcome: a, b, c]
	13-22 Traceability record [Outcome: c]
17-08 Interface requirements [Outcome: b]	
17-11 Software requirements [Outcome: a, c]	

5.5.3 DEV.3 Software detailed design

Process ID	DEV.3
Process Name	Software detailed design
Process Purpose	The purpose of the Software detailed design process is to provide a design for the software that implements and can be verified against the requirements and the software architecture and is sufficiently detailed to permit coding and testing.
Process Outcomes	As a result of successful implementation of the Software detailed design process: a) a detailed design of each software component, describing the software units to be built, is developed; b) external interfaces of each software unit are defined; and c) consistency and traceability are established between the detailed design and the requirements and architectural design.
Base Practices	**DEV.3.BP1: Develop detailed design.** Decompose the software architectural design into a detailed design for each software component describing all software units to be produced and tested. Document software units in a software design document. [Outcome: a] **DEV.3.BP2: Define interfaces for software units.** Specify and document the external interfaces between the software units. [Outcome: b] **DEV.3.BP3: Analyze the design for testability.** Analyze the design for correctness and testability to ensure that the software units can be built and tested. [Outcome: a] **DEV.3.BP4: Ensure consistency**. Ensure consistency of software requirements analysis and software architectural design to software detailed design. Consistency is supported by establishing and maintaining traceability between the requirements and architectural design and the detailed design when needed. [Outcome: c]

Work Products	
Inputs	Outputs
	04-01 Database design [Outcome: a]
04-04 High level software design [Outcome: a, b]	
	04-05 Low level software design [Outcome: a, b]
	13-22 Traceability record [Outcome: c]

Work Products	
Inputs	Outputs
17-08 Interface requirements [Outcome: b]	
17-11 Software requirements [Outcome: a, c]	
	17-13 Test design specification [Outcome: c]

5.5.4 DEV.4 Software construction

Process ID	DEV.4
Process Name	Software construction
Process Purpose	The purpose of the Software construction process is to produce executable software units that properly reflect the software design.
Process Outcomes	As a result of successful implementation of Software construction process: a) verification criteria are defined for all software units against their requirements; b) software units defined by the design are produced; c) consistency and traceability are established between software units and requirements and design; and d) verification of the software units against the requirements and the design is accomplished.
Base Practices	**DEV.4.BP1: Develop unit verification procedures**. Develop and document procedures and criteria for verifying that each software unit satisfies its design requirements. The verification procedure includes unit test cases, unit test data and code review. [Outcome: a] **DEV.4.BP2: Develop software units.** Develop and document the executable representations of each software unit. Update test requirements and user documentation. [Outcome: b] NOTE 1: User documentation includes preliminary versions of installation, operation and maintenance documentation. **DEV.4.BP3: Ensure consistency.** Ensure consistency of software design to software construction. Consistency is supported by establishing and maintaining traceability between software requirements and design and the software units when needed. [Outcome: c] **DEV.4.BP4: Verify software units.** Verify that each software unit satisfies its design requirements by executing the specified unit verification procedures and document the results. [Outcome: d] NOTE 2: Code can be verified by various techniques such as static code analysis, code review, etc.

Work Products	
Inputs	Outputs
03-07 Test data [Outcome: d]	03-07 Test data [Outcome: a]
04-05 Low level software design [Outcome: b, c]	
	06-01 Customer manual [Outcome: b]
	08-25 Unit test plan [Outcome: a]
	10-02 Test procedure [Outcome: a]

Work Products	
Inputs	Outputs
11-05 Software unit [Outcome: c, d]	11-05 Software unit [Outcome: b]
	13-19 Review record [Outcome: d]
	13-22 Traceability record [Outcome: c]
	14-04 Test log [Outcome: d]
	15-10 Test incident report [Outcome: d]
17-08 Interface requirements [Outcome: a, c]	
17-11 Software requirements [Outcome: a, c]	
17-13 Test design specification [Outcome: a]	
17-14 Test case specification [Outcome: b]	17-14 Test case specification [Outcome: b]
18-03 Coding standard [Outcome: b, c, d]	

5.5.5 DEV.5 Software integration

Process ID	DEV.5
Process Name	Software integration
Process Purpose	The purpose of the Software integration process is to combine the software units, producing integrated software items, consistent with the software design, that demonstrate that the functional and non-functional software requirements are satisfied on an equivalent or complete operational platform.
Process Outcomes	As a result of successful implementation of Software integration process: a) an integration strategy is developed for software units consistent with the software design and the prioritized software requirements; b) verification criteria for software items are developed that ensure compliance with the software requirements allocated to the items; c) software items are verified using the defined criteria; d) software items defined by the integration strategy are produced; e) results of integration testing are recorded; f) consistency and traceability are established between software design and software items; and g) a regression strategy is developed and applied for re-verifying software items when a change in software units (including associated requirements, design and code) occur.
Base Practices	**DEV.5.BP1: Develop software integration strategy**. Develop the strategy for integrating software units considering the software requirements. Identify software items based on the software architecture and define a sequence or order for integrating and testing them. [Outcome: a] NOTE: Examples for the order of software item integration include top-level items, bottom-level items, critical items, functional items, complete skeleton first and items as-available.

	DEV.5.BP2: Develop tests for integrated software items. Describe the tests to be run against each integrated software item, including the verification of the interfaces, indicating software requirements, input data and verification criteria being checked. [Outcome: b] **DEV.5.BP3: Integrate software item.** Integrate the software units according to the integration strategy to form a software item. [Outcome: d] **DEV.5.BP4: Test integrated software items.** Test each integrated software item on an operational platform or suitable equivalent platform, against the verification criteria, and record the results. Update user documentation as necessary. [Outcome: c, e] **DEV.5.BP5: Ensure consistency**. Ensure consistency of software design to software integration. Consistency is supported by establishing and maintaining traceability between software design and the software items when needed. [Outcome: f] **DEV.5.BP6: Regression test integrated software items**. Develop a software regression test strategy for re-testing the integrated software items. If changes are made to software units, designs or requirements, carry out regression testing according to this strategy. [Outcome: g]

Work Products	
Inputs	Outputs
01-03 Software item [Outcome: f]	01-03 Software item [Outcome: d]
03-07 Test data [Outcome: c]	03-07 Test data [Outcome: b]
04-04 High level software design [Outcome: a, f, g]	
04-06 System architecture design [Outcome: a, f, g]	
08-10 Software integration test plan [Outcome: c, d]	08-10 Software integration test plan [Outcome: a, b]
08-15 Regression test plan [Outcome: b, g]	08-15 Regression test plan [Outcome: b, g]
10-02 Test procedure [Outcome: c, g]	10-02 Test procedure [Outcome: b]
	11-01 Software product [Outcome: d, g]
11-05 Software unit [Outcome: d, g]	
	13-19 Review record [Outcome: c]
	13-22 Traceability record [Outcome: f]
	14-04 Test log [Outcome: c, e, g]
	15-10 Test incident report [Outcome: c, e, g]
15-23 Test item transmittal report [Outcome: c]	15-23 Test item transmittal report [Outcome: b, d]
17-02 Build list [Outcome: d, g]	17-02 Build list [Outcome: a]
17-11 Software requirements [Outcome: a, b, g]	
17-13 Test design specification [Outcome: b]	17-13 Test design specification [Outcome: b]
17-14 Test case specification [Outcome: c, g]	17-14 Test case specification [Outcome: b]

5.5.6 DEV.6 Software qualification testing

Process ID	DEV.6
Process Name	Software qualification testing
Process Purpose	The purpose of the Software qualification testing process is to confirm that the integrated software product meets its defined requirements.
Process Outcomes	As a result of successful implementation of the Software qualification testing process: a) criteria for the integrated software is developed that demonstrates compliance with the software requirements; b) integrated software is verified using the defined criteria; c) test results are recorded; and d) a regression strategy is developed and applied for re-testing the integrated software when a change in software items is made. NOTE: A regression strategy should be developed, to be applied for re-testing the integrated software when a change is made to software items.
Base Practices	**DEV.6.BP1: Develop tests for integrated software product.** Describe the tests to be run against the integrated software product, indicating software requirements being checked, input data, and verification criteria. The set of tests should demonstrate compliance with the software requirements. [Outcome: a] NOTE: Tests and test data can be developed during Software requirements analysis process (DEV.1), Software detailed design process (DEV.3) and Software construction process (DEV.4). **DEV.6.BP2: Test integrated software product.** Test the integrated software product against the verification criteria, and record the results. Update user documentation as necessary. [Outcome: b, c] **DEV.6.BP3: Regression test integrated software.** Develop a software regression test strategy for re-testing the integrated software product. If changes are made to software items, carry out regression testing according to the strategy. [Outcome: d]

Work Products	
Inputs	Outputs
03-07 Test data [Outcome: b]	
04-04 High level software design [Outcome: a]	
06-01 Customer manual [Outcome: b]	06-01 Customer manual [Outcome: c]
08-15 Regression test plan [Outcome: d]	08-15 Regression test plan [Outcome: d]
08-21 Software test plan [Outcome: b]	08-21 Software test plan [Outcome: a]
10-02 Test procedure [Outcome: b]	10-02 Test procedure [Outcome: a, d]
11-01 Software product [Outcome: b, d]	
	14-04 Test log [Outcome: c, d]
	15-10 Test incident report [Outcome: c, d]

Work Products	
Inputs	Outputs
	15-11 Defect report [Outcome: c, d]
15-23 Test item transmittal report [Outcome: b]	
17-02 Build list [Outcome: b, d]	
17-11 Software requirements [Outcome: a, d]	
17-13 Test design specification [Outcome: a]	
17-14 Test case specification [Outcome: b]	17-14 Test case specification [Outcome: b]

5.6 Software Support Processes group (SUP)

5.6.1 SUP.1 Software documentation management

Process ID	SUP.1
Process Name	Software documentation management
Process Purpose	The purpose of the Software documentation management process is to develop and maintain the recorded software information produced by a process. NOTE: ISO/IEC 15289 provides more detailed content for life cycle process information items (documentation).
Process Outcomes	As a result of successful implementation of the Software documentation management process: a) a strategy identifying the documentation to be produced during the life cycle of a product or service is developed; b) the standards to be applied for the development of the documentation are identified; c) documentation to be produced by the process or project is identified; d) the content and purpose of all documentation is specified, reviewed and approved; e) documentation is developed and made available in accordance with identified standards; and f) documentation is maintained in accordance with defined criteria.
Base Practices	**SUP.1.BP1: Develop documentation management strategy.** Determine documentation management strategy which addresses what should be documented within which organizational entity, at which stages in the lifecycle of the product / service. [Outcome: a] NOTE 1: Refer to ISO/IEC 9294 for guidelines for management of software documentation. **SUP.1.BP2: Establish standards for documents.** Establish standards for developing, modifying and maintaining documents. [Outcome: b] **SUP.1.BP3: Specify document requirements.** Specify requirements for documents such as format, title, date, identifier, version history, author[s], reviewer, authorizer, outline of contents, purpose and distribution list. [Outcome: b, d] **SUP.1.BP4: Identify the documents to be produced**. For any given life cycle development, identify the documents to be produced. [Outcome: c] **SUP.1.BP5: Develop documents**. Develop documents at required process points according to established standards and policy. [Outcome: e]

	SUP.1.BP6: Check documents. Review documents before distribution, and authorize documents before distribution or release. [Outcome: d, e] NOTE 2: Documents should be checked through Software Verification process (SUP.4) and Software Validation process (SUP.5) with stakeholders. **SUP.1.BP7: Distribute documents.** In order to make document available, distribute documents according to determined modes of distribution via appropriate media to specified audiences, confirming delivery of documents, where necessary. [Outcome: e] **SUP.1.BP8: Maintain documents**. Maintain documents in accordance with the determined documentation strategy. [Outcome: f] NOTE 3: If the document is part of a product baseline or if its control and stability are important, it should be modified and distributed in accordance with Configuration management process (PRO.5). If the document is part of a product baseline under maintenance, its maintenance is covered by Software maintenance process (ENG.10).

Work Products	
Inputs	Outputs
	08-26 Documentation plan [Outcome: a, b]
10-00 Process description [Outcome: a, b, c]	
10-01 Life cycle model [Outcome: a]	
	13-01 Acceptance record [Outcome: d, e]
13-16 Change request [Outcome: f]	
13-17 Customer request [Outcome: a, b, d]	
	13-19 Review record [Outcome: d, e]
	14-01 Change history [Outcome: e, f]
	14-10 Work product distribution register [Outcome: b, d]
	14-11 Work product list [Outcome: c]
17-05 Documentation requirements [Outcome: e, f]	17-05 Documentation requirements [Outcome: a, b, c]
18-00 Standard [Outcome: b]	
18-07 Quality criteria [Outcome: d]	
	20-00 Template [Outcome: b]
	21-00 Work product [Outcome: e, f]

5.6.2 SUP.2 Software configuration management

Process ID	SUP.2
Process Name	Software configuration management
Process Purpose	The purpose of the Software configuration management process is to establish and maintain the integrity of the software items of a process or project and make them available to concerned parties.

Process Outcomes	As a result of successful implementation of the Software configuration management process: a) a software configuration management strategy is developed; b) items generated by the process or project are identified, defined and baselined; c) modifications and releases of the items are controlled; d) modifications and releases are made available to affected parties; e) the status of the items and modifications are recorded and reported; f) the completeness and consistency of the items is ensured; and g) the storage, handling and delivery of the items are controlled.
Base Practices	**SUP.2.BP1: Develop software configuration management strategy.** Determine software configuration management strategy, including software configuration management activities and schedule for performing these activities. [Outcome: a] NOTE 1: Parallel development efforts may require a branch management strategy that includes branch management, merging strategies, file versioning in a branching system, branch parenting strategies and tagging strategies. **SUP.2.BP2: Identify software configuration items**. Identify configuration items that need to be independently identified, stored, tested, reviewed, used, changed, delivered and/or maintained. [Outcome: b] NOTE 2: In order to provide an efficient means of accessing and storing the entities required, a file and directory structure and hierarchies may be established. **SUP.2.BP3: Establish baselines.** Establish the internal and delivery baselines. Baselines are achieved by the accumulation of all the necessary configuration items. [Outcome: b] NOTE 3: Baselines cover all related work products, including requirements, design documentation, user documentation and test specifications where appropriate. Examples of work products which should be baselined include requirements, designs, plans, and products. **SUP.2.BP4: Maintain configuration item description**. Maintain an up-to-date description of each configuration item. [Outcome: b, c] **SUP.2.BP5: Control modifications and releases.** Establish a mechanism for logging the items, submitting and releasing them; and maintaining a history of each configuration item to recover a previously baselined version when required. [Outcome: c, d, e, f] **SUP.2.BP6: Report configuration status.** Report status of each configuration item and their relationship in the current system integration. [Outcome: d, e] **SUP.2.BP7: Verify the information about configured items**. Verify that the information about configured items and their structures, supplied through status accounting reporting is complete and ensure the consistency of the items. [Outcome: f, g] **SUP.2.BP8: Manage the backup, storage, archiving, handling and delivery of configured items**. Ensure the integrity and consistency of configured items through appropriate scheduling and resourcing of backup, storage and archiving. Control the handling and delivery of configured items. [Outcome: f, g] NOTE 4: Backups are maintained under the Infrastructure management process (ORG.2).

Work Products	
Inputs	Outputs
01-00 Configuration item [Outcome: c, d, e, f, g]	01-00 Configuration item [Outcome: b, c, e]
01-01 Product configuration [Outcome: a]	01-01 Product configuration [Outcome: b]
	06-02 Handling and storage guide [Outcome: g]
08-04 Configuration management plan [Outcome: b, c, d, e, f, g]	08-04 Configuration management plan [Outcome: a, b]
08-16 Release plan [Outcome: a, d]	
	13-06 Delivery record [Outcome: c, d, e, g]
	13-10 Configuration management record [Outcome: b, c, e, g]
	13-13 Product release approval record [Outcome: g]
	14-01 Change history [Outcome: c]
14-08 Tracking system [Outcome: e, f, g]	
	15-03 Configuration status report [Outcome: e]
16-03 Configuration management library [Outcome: g]	

5.6.3 SUP.3 Software quality assurance

Process ID	SUP.3
Process Name	Software quality assurance
Process Purpose	The purpose of the Software quality assurance process is to provide assurance that work products and processes comply with predefined provisions and plans.
Process Outcomes	As a result of successful implementation of the Software quality assurance process: a) a strategy for conducting quality assurance is developed; b) evidence of software quality assurance is produced and maintained; c) problems and/or non-conformance with requirements are identified and recorded; and d) adherence of products, processes and activities to the applicable standards, procedures and requirements are verified.
Base Practices	**SUP.3.BP1: Develop a strategy for product and process quality assurance.** A project level strategy for conducting quality assurance is developed. [Outcome: a] NOTE 1: Consideration should be given to development of a project level strategy consistent with the organizational quality management strategy. NOTE 2: Software quality assurance process determines the objectives for, and monitors the execution of the related processes: Software verification process (SUP.4), Software validation process (SUP.5), Software review process (SUP.6), and Software audit process (SUP.7). **SUP.3.BP2: Define quality records.** Quality records which demonstrate conformance of process and work products to their quality requirements are defined. [Outcome: c] **SUP.3.BP3: Assure the quality of project process activities and project work products.** Carry out a series of activities to provide assurance, with the required level of confidence, that

	the project processes have followed specified standards and that the work products meet the quality requirements. [Outcome: b, d] **SUP.3.BP4: Identify and record problems and non-conformances.** Problems and non-conformances are identified and recorded and then reported to appropriate stakeholders for information and action. [Outcome: c] **SUP.3.BP5: Act on non-conformances.** Deviations or non-conformance with agreed requirements or organizational quality goals are analyzed and resolved. [Outcome: d]

Work Products	
Inputs	Outputs
03-06 Process performance data [Outcome: b, d]	03-06 Process performance data [Outcome: b, d]
05-06 Quality goals [Outcome: b, c, d]	05-06 Quality goals [Outcome: a]
07-04 Process measure [Outcome: b, c, d]	
07-06 Quality measure [Outcome: b, c, d]	
08-13 Quality plan [Outcome: a]	08-13 Quality plan [Outcome: a]
09-02 Quality policy [Outcome: a]	
10-00 Process description [Outcome: d]	10-00 Process description [Outcome: b]
	13-07 Problem record [Outcome: c, d]
13-18 Quality record [Outcome: b, c, d]	13-18 Quality Record [Outcome: b, c, d]
	13-19 Review Record [Outcome: b, c, d]
14-02 Corrective action register [Outcome: c]	14-02 Corrective action register [Outcome: c]
14-08 Tracking system [Outcome: c, d]	
18-00 Standard [Outcome: d]	
18-07 Quality criteria [Outcome: d]	18-07 Quality criteria [Outcome: d]
21-00 Work product [Outcome: d]	

5.6.4 SUP.4 Software verification

Process ID	SUP.4
Process Name	Software verification
Process Purpose	The purpose of the Software Verification Process is to confirm that each software work product and/or service of a process or project properly reflects the specified requirements.
Process Outcomes	As a result of successful implementation of the Software verification process: a) a verification strategy is developed and implemented; b) criteria for verification of all required software work products is identified; c) required verification activities are performed; d) defects are identified and recorded; and e) results of the verification activities are made available to the customer and other involved parties.

Base Practices	**SUP.4.BP1: Develop verification strategy.** Develop and implement a verification strategy, including verification activities with associated methods, techniques, and tools; work product or processes under verification; degrees of independence for verification and schedule for performing these activities. [Outcome: a] NOTE: Software verification provides objective evidence that the design outputs of a particular phase of the software development life cycle meet all of the specified requirements for that phase. **SUP.4.BP2: Develop criteria for verification.** Develop the criteria for verification of all required work products. [Outcome: b] **SUP.4.BP3: Conduct verification.** Verify identified work products according to specified strategy. [Outcome: c] **SUP.4.BP4: Determine actions for verification results.** Defects detected by the verification should be identified, recorded and entered into the Software problem resolution process (SUP.8). [Outcome: d] **SUP.4.BP5: Make verification results available to the stakeholders**. The verification results should be made available to the stakeholders, including the customers and other involved parties. [Outcome: e]

Work Products	
Inputs	Outputs
07-06 Quality measure [Outcome: b]	
08-13 Quality plan [Outcome: a]	
	08-30 Verification Plan [Outcome: a]
09-02 Quality policy [Outcome: a]	
	13-04 Communication record [Outcome: e]
	13-07 Problem record [Outcome: c, d, e]
	13-16 Change request [Outcome: c, d]
13-18 Quality record [Outcome: c, d]	13-18 Quality record [Outcome: d, e]
13-22 Traceability record [Outcome: c]	
	13-25 Verification results [Outcome: b, c, d, e]
14-02 Corrective action register [Outcome: d]	14-02 Corrective action register [Outcome: d]
14-08 Tracking system [Outcome: d]	
15-10 Test incident report [Outcome: b, c]	
18-07 Quality criteria [Outcome: b]	18-07 Quality criteria [Outcome: b]
	19-10 Verification strategy [Outcome: a]

5.6.5 SUP.5 Software validation

Process ID	SUP.5
Process Name	Software validation
Process Purpose	The purpose of the Software validation process is to confirm that the requirements for a specific intended use of the software work product are fulfilled.
Process Outcomes	As a result of successful implementation of the Software validation process: a) a validation strategy is developed and implemented; b) criteria for validation of all required work products are identified; c) required validation activities are performed; d) problems are identified and recorded; e) evidence is provided that the software work products as developed are suitable for their intended use; and f) results of the validation activities are made available to the customer and other involved parties.
Base Practices	**SUP.5.BP1: Develop validation strategy.** Develop and implement a validation strategy, including validation activities with associated methods, techniques, and tools; service, software or system under validation; degrees of independence for validation and schedule for performing these activities. [Outcome: a] NOTE: Validation aims to confirm by examination and provision of objective evidence that software or system specifications conform to user needs and intended uses, and the particular requirements implemented by the software product can be consistently fulfilled. **SUP.5.BP2: Develop validation criteria**. Develop the criteria for validation of service, software or system. [Outcome: b] **SUP.5.BP3: Perform validation activities.** Conduct validation activities using identified techniques, processes, and test cases against requirements and quality standards. The results of validation activities are recorded. [Outcome: c] **SUP.5.BP4: Identify problems.** Issues detected by the validation process should be identified, recorded and entered into the Software problem resolution process (SUP.8). [Outcome: d] **SUP.5.BP5: Provide validation data.** Provide validation data resulting from carrying out validation activities. Validate that the product satisfies its intended use by review of validation activities results, and the resolution of issues raised. [Outcome: e] **SUP.5.BP6: Make validation results available to the customer and other involved parties**. The validation results should be made available to the customer and other involved parties. [Outcome: f]

Work Products	
Inputs	Outputs
08-13 Quality plan [Outcome: a]	
	08-23 Validation test plan [Outcome: a]
09-02 Quality policy [Outcome: a]	

Work Products	
Inputs	Outputs
	13-04 Communication record [Outcome: f]
13-07 Problem record [Outcome: d]	13-07 Problem record [Outcome: d]
	13-16 Change request [Outcome: c, d]
	13-18 Quality record [Outcome: b, c]
13-22 Traceability record [Outcome: c, e]	
	13-24 Validation results [Outcome: c, d, e, f]
14-02 Corrective action register [Outcome: c, d, e]	
14-08 Tracking system [Outcome: c, d, e]	
17-00 Requirement specification [Outcome: e]	
18-07 Quality criteria [Outcome: b]	18-07 Quality criteria [Outcome: b]
	19-11 Validation strategy [Outcome: a]

5.6.6 SUP.6 Software review

Process ID	SUP.6
Process Name	Software review
Process Purpose	The purpose of the Software review process is to maintain a common understanding with the stakeholders of the progress against the objectives of the agreement and what should be done to help ensure development of a product that satisfies the stakeholders. Software reviews are at both project management and technical levels and are held throughout the life of the project.
Process Outcomes	As a result of successful implementation of the Software review process: a) management and technical reviews are held based on the needs of the project; b) the status and products of an activity of a process are evaluated through review activities between the stakeholders; c) review results are made known to all affected parties; d) action items resulting from reviews are tracked to closure; and e) risks and problems are identified and recorded.
Base Practices	**SUP.6.BP1: Identify reviews.** Identify the schedule, scope and participants of management and technical reviews, based on the needs of the project. [Outcome: a] **SUP.6.BP2: Prepare review.** Collect, prepare and distribute review material as appropriate in preparation for the review. [Outcome: a] **SUP.6.BP3: Conduct reviews.** Conduct joint management and technical reviews. Record the review results as planned. [Outcome: b] **SUP.6.BP4: Distribute the results.** The review results should be made available to all affected parties. [Outcome: c] **SUP.6.BP5: Determine actions for review results.** Analyze review report; identify and record the problems; propose resolution(s) for the review results; determine priority for actions. [Outcome: e]

	SUP.6.BP6: Track actions for review results. Track actions for resolution of identified problems in a review; report and document changes to work products and processes. [Outcome: d]

Work Products	
Inputs	Outputs
02-00 Contract [Outcome: a, b]	
07-06 Quality measure [Outcome: b]	
08-13 Quality plan [Outcome: a, b]	
08-18 Review plan [Outcome: a, b]	
08-19 Risk management plan [Outcome: a, b]	
08-20 Risk mitigation plan [Outcome: a, b]	
09-02 Quality policy [Outcome: a, b]	
	13-01 Acceptance record [Outcome: c, d, e]
	13-04 Communication record [Outcome: c]
	13-05 Contract review record [Outcome: a, b, c]
13-07 Problem record [Outcome: b]	13-07 Problem record [Outcome: c, e]
	13-09 Meeting support record [Outcome: a, b]
13-14 Progress status record [Outcome: b]	
13-17 Customer request [Outcome: a, b]	
13-19 Review record [Outcome: b]	13-19 Review record [Outcome: a, b, c, d, e]
	14-02 Corrective action register [Outcome: c, d, e]
14-08 Tracking system [Outcome: c, d, e]	
	15-01 Analysis report [Outcome: c, e]

5.6.7 SUP.7 Software audit

Process ID	SUP.7
Process Name	Software audit
Process Purpose	The purpose of the Software audit process is to independently determine compliance of selected products and processes with the requirements, plans and agreement, as appropriate.
Process Outcomes	As a result of successful implementation of the Software audit process: a) an audit strategy is developed and implemented; b) compliance of selected software work products and/or services or processes with requirements, plans and agreement is determined according to the audit strategy; c) audits are conducted by an appropriate independent party; and

	d) problems detected during an audit are identified and communicated to those responsible for corrective action, and resolution.
Base Practices	**SUP.7.BP1: Develop and implement an audit strategy.** An audit strategy is implemented defining purpose, scope, milestones, audit criteria and audit team. [Outcome: a] **SUP.7.BP2: Select auditors**. Independent, impartial and objective auditors are selected. [Outcome: c] **SUP.7.BP3: Audit for conformance against the requirements**. Selected work products, services or processes are audited to determine their conformance with their requirements and planned arrangements. Non-conformances are recorded. [Outcome: b] **SUP.7.BP4: Prepare and distribute an audit report.** Auditor develops and distributes an audit report. [Outcome: c, d] **SUP.7.BP5: Take corrective action.** Corrective action is taken to address non-conformances by the assigned responsible person. The corrective action may result in immediate action to resolve the non-conformity. It may also result in other corrective action after root cause analysis has been undertaken. [Outcome: d] **SUP.7.BP6: Track resolution.** Corrective actions are tracked to resolution. The auditor may review non-conformance resolutions and their results. [Outcome: d]

Work Products	
Inputs	Outputs
08-13 Quality plan [Outcome: a]	
09-02 Quality policy [Outcome: a]	
10-00 Process description [Outcome: b]	
13-00 Record [Outcome: c, d]	
	13-04 Communication record [Outcome: d]
13-07 Problem record [Outcome: c, d]	
13-22 Traceability record [Outcome: b]	
14-02 Corrective action register [Outcome: d]	14-02 Corrective action register [Outcome: d]
	15-01 Analysis report [Outcome: b, d]
	15-24 Audit report [Outcome: c, d]
18-07 Quality criteria [Outcome: b]	
19-12 Audit strategy [Outcome: a]	19-12 Audit strategy [Outcome: a]

5.6.8 SUP.8 Software problem resolution

Process ID	SUP.8
Process Name	Software problem resolution
Process Purpose	The purpose of the Software problem resolution process is to ensure that all discovered problems are identified, analyzed, managed and controlled to resolution.
Process Outcomes	As a result of successful implementation of the Software problem resolution process: a) a problem management strategy is developed; b) problems are recorded, identified and classified; c) problems are analyzed and assessed to identify acceptable solution(s); d) problem resolution is implemented; e) problems are tracked to closure; and f) the status of all problems reported is known. NOTE: The Software problem resolution process could be used or easily adapted to manage, track and control software change requests.
Base Practices	**SUP.8.BP1: Develop problem resolution strategy.** Determine the problem resolution strategy for ensuring that problems are described, recorded, analyzed, and corrected. [Outcome: a] **SUP.8.BP2: Identify and record the problem.** Each problem is uniquely identified, and recorded. [Outcome: b] **SUP.8.BP3: Provide initial support and classification.** Provide initial support and feedback on reported problems and classify problems according to the severity. [Outcome: b] NOTE 1: Classification of problems may be in terms of criticality, urgency, relevance etc. **SUP.8.BP4: Investigate and diagnose the cause of the problem**. Analyze problems in order to identify the cause of the problem. [Outcome: c] NOTE 2: A problem may be a known error or may impact application installed on multiple platforms. **SUP.8.BP5: Assess the impact of the problem to determine solution**. Assess the impact of the problem to determine appropriate actions, and to determine and agree on a solution. [Outcome: c] **SUP.8.BP6: Execute urgent resolution action, where necessary.** If the problem warrants immediate resolution pending an actual change, it obtains authorization for immediate fix. [Outcome: d] **SUP.8.BP7: Raise alert notifications, where necessary**. If the problem is of high severity and impacts other systems or users, an alert notification may need to be raised, pending a fix or change. [Outcome: d, f] **SUP.8.BP8: Implement problem resolution.** Implement problem resolution actions to resolve the problem and review the implementation. [Outcome: d] **SUP.8.BP9: Initiate change request**. Initiate change request for diagnosed errors. [Outcome: e] **SUP.8.BP10: Track problem status.** Track to closure the status of identified problems. [Outcome: e, f]

Work Products	
Inputs	Outputs
	08-27 Problem management plan [Outcome: a]
13-07 Problem record [Outcome: c]	13-07 Problem record [Outcome: c, e]
13-16 Change request [Outcome: b]	13-16 Change request [Outcome: e]
14-08 Tracking system [Outcome: d, e, f]	
	15-01 Analysis report [Outcome: c]
	15-05 Evaluation report [Outcome: c]
	15-12 Problem status report [Outcome: f]

5.7 Software Reuse Processes group (REU)

5.7.1 REU.1 Domain engineering

Process ID	REU.1
Process Name	Domain engineering
Process Purpose	The purpose of the Domain engineering process is to develop and maintain domain models, domain architectures and assets for the domain.
Process Outcomes	As a result of successful implementation of the Domain engineering process: a) the representation forms for the domain models and the domain architectures are selected; b) the boundaries of the domain and its relationships to other domains are established; c) a domain model that captures the essential common and different features, capabilities, concepts, and functions in the domain are developed; d) a domain architecture describing the family of systems within the domain, including their commonalities and variabilities, is developed; e) assets belonging to the domain are specified; f) assets belonging to the domain are acquired or developed and maintained throughout their life cycles; and g) the domain models and architectures are maintained throughout their life cycles. NOTE 1: Domain engineering is a reuse-based approach to defining the scope (i.e., domain definition), specifying the structure (i.e., domain architecture), and building the assets (e.g., requirements, designs, software code, documentation) for a class of systems, subsystems, or applications. NOTE 2: The Domain engineering process may overlap with development and maintenance processes that use assets produced by the Domain engineering process.
Base Practices	**REU.1.BP1: Define criteria for domain definitions**. Select the domain representation forms, domain classifications and other needed description templates to be used for the domain models and domain architectures, in accordance with the organization's reuse standards. [Outcome: a] **REU.1.BP2: Define domain models.** Develop domain descriptions according to the representation forms. [Outcome: b, c, d]

	REU.1.BP3: Define domain architectures. Develop domain architectures and their technical interfaces with other domains. [Outcome: b, d] NOTE 1: This base practice can be performed by executing System requirements analysis process (ENG.2) and/or Software requirements analysis process (DEV.1). **REU.1.BP4: Develop asset specifications.** Asset specifications are developed for reuse and then maintained during design changes. [Outcome: e] NOTE 2: This base practice can be performed by executing Software requirements analysis process (DEV.1) and/or Software architectural design process (DEV.2). **REU.1.BP5: Provide domain assets**. Submit specified domain assets for use in products. [Outcome: f] NOTE 3: This base practice can be performed by executing acquisition processes (AGR.1A…AGR.1D) and/or in development processes (DEV.1…DEV.6). **REU.1.BP6: Maintain domain assets**. Analyse and monitor change requests to maintain domain assets and perform required technical implementation activities. [Outcome: f] NOTE 4: This base practice can be performed by executing Software maintenance process (ENG.10) and/or Software problem resolution process (SUP.8). **REU.1.BP7: Maintain domain models and architectures.** Analyse and monitor change requests to maintain domain models and architectures and perform required technical implementation activities. [Outcome: g]

Work Products	
Inputs	Outputs
01-02 Reusable object [Outcome: f]	01-02 Reusable object [Outcome: f]
04-02 Domain architecture [Outcome: a, b, g]	04-02 Domain architecture [Outcome: a, b, d, g]
04-03 Domain model [Outcome: g]	04-03 Domain model [Outcome: c, g]
08-02 Acquisition plan [Outcome: f]	
08-12 Project plan [Outcome: f]	
13-16 Change request [Outcome: f, g]	
	13-21 Change control record [Outcome: f, g]
14-03 Hardware assets register [Outcome: e]	
14-07 Software assets register [Outcome: e]	
17-01 Asset specification [Outcome: f]	17-01 Asset specification [Outcome: e]
17-06 Domain interface specification [Outcome: b, f, g]	17-06 Domain interface specification [Outcome: b]
18-04 Domain representation standard [Outcome: a]	18-04 Domain representation standard [Outcome: a]

5.7.2 REU.2 Reuse asset management

Process ID	REU.2
Process Name	Reuse asset management
Process Purpose	The purpose of the Reuse asset management process is to manage the life of reusable assets from conception to retirement.
Process Outcomes	As a result of successful implementation of the Reuse asset management process: a) an asset management strategy is documented; b) an asset classification scheme is established; c) criteria for asset acceptance, certification and retirement are defined; d) an asset storage and retrieval mechanism is operated; e) the use of assets are recorded; f) changes to the assets are controlled, and g) users of assets are notified of problems detected, modifications made, new versions created and deletion of assets from the storage and retrieval mechanism.
Base Practices	**REU.2.BP1: Define and document an asset management strategy**. Define and document an asset management strategy for reuse. [Outcome: a] **REU.2.BP2: Establish a classification scheme for assets.** Provide a classification scheme for assets to support their reuse. [Outcome: b] NOTE: example of classification may define software COTS, specific software, hardware COTS, and reusable library/components. **REU.2.BP3: Define criteria for assets**. Define acceptance, certification and retirement criteria for assets. [Outcome: c] **REU.2.BP4: Establish the asset storage and retrieval mechanisms.** Establish the asset storage and retrieval mechanisms, and make them available to users for storing and retrieving and for providing information on reusable assets. [Outcome: d] **REU.2.BP5: Identify reusable assets**. Identify assets to be made available for reuse. [Outcome: b] **REU.2.BP6: Accept reusable assets.** Certify, classify, record and baseline assets that are submitted for storage and make them available for reuse. [Outcome: c, d] **REU.2.BP7: Operate asset storage**. Provide and control operation of asset storage, retrieval and distribution mechanisms. [Outcome: d, f] **REU.2.BP8: Record use of assets**. Keep track of each reuse of assets, record information and collect feedback about actual reuse of assets. [Outcome: e] **REU.2.BP9: Notify re-users of asset status.** Notify all asset re-users of any problems detected in the assets, modifications, new versions, and deletions from the asset storage and retrieval mechanism. [Outcome: g] **REU.2.BP10: Retire assets.** Retire assets from the asset storage and retrieval mechanism following the defined asset management strategy. [Outcome: c, f, g]

Work Products	
Inputs	Outputs
	01-02 Reusable object [Outcome: f, g]
	03-02 Asset use data [Outcome: e]
05-02 Business goals [Outcome: a]	
	13-04 Communication record [Outcome: g]
13-07 Problem record [Outcome: g]	
13-21 Change control record [Outcome: f, g]	13-21 Change control record [Outcome: f]
14-03 Hardware assets register [Outcome: a, e, g]	14-03 Hardware assets register [Outcome: e, g]
14-07 Software assets register [Outcome: a, e, g]	14-07 Software assets register [Outcome: e, g]
15-03 Configuration status report [Outcome: g]	15-03 Configuration status report [Outcome: f]
16-02 Asset repository [Outcome: d, f]	16-02 Asset repository [Outcome: b, d, e]
	16-05 Re-use library [Outcome: d]
	17-01 Asset specification [Outcome: b, c]
19-01 Asset management strategy [Outcome: b, c]	19-01 Asset management strategy [Outcome: a]

5.7.3 REU.3 Reuse program management

Process ID	REU.3
Process Name	Reuse program management
Process Purpose	The purpose of the Reuse program management process is to plan, establish, manage, control, and monitor an organization's reuse program and to systematically exploit reuse opportunities.
Process Outcomes	As a result of successful implementation of Reuse program management process: a) the organization's reuse strategy, including its purpose, scope, goals and objectives, is defined; b) the domains for potential reuse opportunities are identified; c) the organization's systematic reuse capability is assessed; d) the reuse potential of each domain is assessed; e) reuse proposals are evaluated to ensure the reuse product is suitable for the proposed application; f) the reuse strategy is implemented in the organization; g) feedback, communication, and notification mechanisms are established, that operate between affected parties; and h) the reuse program is monitored and evaluated. NOTE: The affected parties may include reuse program administrators, asset managers, domain engineers, developers, operators and maintainers.

Base Practices	**REU.3.BP1: Define organizational reuse strategy.** Define the reuse program and necessary supporting infrastructure for the organization. [Outcome: a] **REU.3.BP2: Identify domains for potential reuse**. Identify set(s) of systems and their components in terms of common properties that can be organized into a collection of reusable assets that may be used to construct systems in the domain. [Outcome: b] **REU.3.BP3: Assess reuse capability**. Gain an understanding of the reuse readiness and capability of the organization, to provide a baseline and success criteria for reuse program management. [Outcome: c] **REU.3.BP4: Assess domains for potential reuse**. Assess each domain to identify potential use and applications of reusable components and products. [Outcome: d] **REU.3.BP5: Evaluate reuse proposals**. Evaluate suitability of the provided reusable components and product(s) to proposed use. [Outcome: e] **REU.3.BP6: Implement the reuse program.** Perform the defined activities identified in the reuse program. [Outcome: f] **REU.3.BP7: Collect and manage learning.** Collect learning and information from project and related processes, analyze them and store them into the process repository. [Outcome: g] **REU.3.BP8: Get feedback from reuse.** Establish feedback, assessment, communication and notification mechanism to control the progress of the reuse program. [Outcome: g, h] **REU.3.BP9: Monitor reuse**. Monitor the implementation of the reuse program periodically and evaluate its suitability to actual needs. [Outcome: f, h]

Work Products	
Inputs	Outputs
03-02 Asset use data [Outcome: d]	
04-02 Domain architecture [Outcome: b, d]	04-02 Domain architecture [Outcome: b]
04-03 Domain model [Outcome: b]	04-03 Domain model [Outcome: b]
05-02 Business goals [Outcome: a]	
08-03 Process assessment plan [Outcome: c]	
08-17 Reuse plan [Outcome: e]	08-17 Reuse plan [Outcome: e, f]
09-03 Reuse policy [Outcome: f]	09-03 Reuse policy [Outcome: a]
12-03 Reuse proposal [Outcome: e]	12-03 Reuse proposal [Outcome: d]
	13-04 Communication record [Outcome: g]
14-03 Hardware assets register [Outcome: a]	
14-07 Software assets register [Outcome: a]	
	15-07 Reuse evaluation report [Outcome: e, f, h]
	15-13 Assessment report [Outcome: c, d]
	15-24 Audit report [Outcome: c, d]
16-05 Reuse library [Outcome: c, d]	
19-05 Reuse strategy [Outcome: b, f, g, h]	19-05 Reuse strategy [Outcome: a]

6 Process capability indicators (level 1 to 5)

This clause presents the process capability indicators related to the process attributes associated with capability levels 1 to 5 defined in the capability dimension of the Process Assessment Model. Process capability indicators are the means of achieving the capabilities addressed by the considered process attributes. Evidence of process capability indicators support the judgment of the degree of achievement of the process attribute.

The capability dimension of the Process Assessment Model consists of six capability levels matching the capability levels defined in Part 2 of this International Standard. This clause describes the process capability indicators for the nine process attributes included in the capability dimension for levels 1 to 5. Clause 5 describes the assessment indicators for process performance which is characterized by Level 1 process capability.

Level 0 does not include any type of indicators. Level 0 reflects a non-implemented process or a process which fails to achieve its outcomes.

NOTE 1: In the next paragraphs, ISO/IEC 15504-2 process attribute definitions and attribute achievements are identified with italic font.

NOTE 2: Following each generic resource and generic work product is '[PA x.y Achievement 1]'. This refers to process attribute x.y achievement 1 which is satisfied by this indicator.

6.1 Level 1: Performed process

6.1.1 PA 1.1 Process performance attribute.

The process performance attribute is a measure of the extent to which the process purpose is achieved. As a result of full achievement of this attribute:

a) the process achieves its defined outcomes.

6.1.1.1 Generic Practices for PA 1.1

GP 1.1.1 Achieve the process outcomes
Perform the intent of the base practices.
Produce work products that evidence the process outcomes.

NOTE: The assessment of a performed process is based on process performance indicators, which are defined in Clause 5 of this document.

6.1.1.2 Generic Resources for PA 1.1

— Resources are used to perform the intent of process specific base practices. [PA 1.1 Achievement a]

6.1.1.3 Generic Work Products for PA 1.1

21-00 Work product [PA 1.1 Achievement a]

— Work products exist that provide evidence of the achievement of the process outcomes.

6.2 Level 2: Managed process

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

The following attributes of the process demonstrate the achievement of this level:

6.2.1 PA 2.1 Performance management attribute

The performance management attribute is a measure of the extent to which the performance of the process is managed. As a result of full achievement of this attribute:

a) objectives for the performance of the process are identified;

b) performance of the process is planned and monitored;

c) performance of the process is adjusted to meet plans;

d) responsibilities and authorities for performing the process are defined, assigned and communicated;

e) resources and information necessary for performing the process are identified, made available, allocated and used;

f) interfaces between the involved parties are managed to ensure both effective communication and also clear assignment of responsibility.

6.2.1.1 Generic Practices for PA 2.1

GP 2.1.1 Identify the objectives for the performance of the process. NOTE: Performance objectives may include – (1) quality of the artefacts produced, (2) process cycle time or frequency, (3) resource usage and (4) boundaries of the process. Performance objectives are identified based on process requirements. The scope of the process performance is defined. Assumptions and constraints are considered when identifying the performance objectives.
GP 2.1.2 Plan and monitor the performance of the process to fulfil the identified objectives. Plan(s) for the performance of the process are developed. The process performance cycle is defined. Key milestones for the performance of the process are established. Estimates for process performance attributes are determined and maintained. Process activities and tasks are defined. Schedule is defined and aligned with the approach to performing the process. Process work product reviews are planned. The process is performed according to the plan(s). Process performance is monitored to ensure planned results are achieved.
GP 2.1.3 Adjust the performance of the process. Process performance issues are identified. Appropriate actions are taken when planned results and objectives are not achieved. The plan(s) are adjusted, as necessary. Rescheduling is performed as necessary.
GP 2.1.4 Define responsibilities and authorities for performing the process. Responsibilities, commitments and authorities to perform the process are defined, assigned and communicated. Responsibilities and authorities to verify process work products are defined and assigned. The needs for process performance experience, knowledge and skills are defined.

GP 2.1.5 Identify and make available resources to perform the process according to plan. The human and infrastructure resources necessary for performing the process are identified, made available, allocated and used. The information necessary to perform the process is identified and made available.
GP 2.1.6 Manage the interfaces between involved parties. The individuals and groups involved in the process performance are determined. Responsibilities of the involved parties are assigned. Interfaces between the involved parties are managed. Communication is assured between the involved parties. Communication between the involved parties is effective.

6.2.1.2 Generic Resources for PA 2.1

Human resources with identified objectives, responsibilities and authorities; [PA 2.1 Achievement a, d, e, f]

Facilities and infrastructure resources; [PA 2.1 Achievement a, d, e, f]

- Project planning, management and control tools, including time and cost reporting; [PA 2.1 Achievement b, c]
- Workflow management system; [PA 2.1 Achievement d, f]
- Email and/or other communication mechanisms; [PA 2.1 Achievement d, f]
- Information and/or experience repository; [PA 2.1 Achievement b, e]
- Problem and issue management mechanisms. [PA 2.1 Achievement c]

6.2.1.3 Generic Work Products for PA 2.1

08-00 Plan [PA 2.1 Achievement a, b, c, d, e, f]

- Defines objectives to perform the process.
- Describes assumptions and constraints considered in defining the objectives.
- Includes milestones and timetable to produce the work products of the process.
- Identifies tasks, resources, responsibilities and infrastructure needed to perform the process.
- Considers risks related to fulfil defined objectives.
- Identifies stakeholders and communication mechanisms to be used.
- Describes how the plan is controlled and adjusted when needed.

13-00 Record [PA 2.1 Achievement d, e, f]

- States results achieved or provides evidence of activities performed in a process.
- Provides evidence of communication, meetings, reviews and corrections.

14-00 Register [PA 2.1 Achievement c, e]

- Contains status information about corrections; schedule and work breakdown structure.
- Monitors identified risks.

15-00 Report [PA 2.1 Achievement b, c]

- Monitors process performance against defined objectives and plans.
- Identifies deviations in process performance.
- Describes results and status of the process.
- Provides evidence of management activities.

6.2.2 PA 2.2 Work product management attribute

The work product management attribute is a measure of the extent to which the work products produced by the process are appropriately managed. As a result of full achievement of this attribute:

a) requirements for the work products of the process are defined;

b) requirements for documentation and control of the work products are defined;

c) work products are appropriately identified, documented, and controlled;

d) work products are reviewed in accordance with planned arrangements and adjusted as necessary to meet requirements.

NOTE 1: Requirements for documentation and control of work products may include requirements for the identification of changes and revision status, approval and re-approval of work products, and the creation of relevant versions of applicable work products available at points of use.

NOTE 2: The work products referred to in this clause are those that result from the achievement of the process outcomes.

6.2.2.1 Generic Practices for PA 2.2

GP 2.2.1 Define the requirements for the work products. The requirements for the work products to be produced are defined. Requirements may include defining contents and structure. Quality criteria of the work products are identified. Appropriate review and approval criteria for the work products are defined.
GP 2.2.2 Define the requirements for documentation and control of the work products**.** Requirements for the documentation and control of the work products are defined. Such requirements may include requirements for (1) distribution, (2) identification of work products and their components (3) traceability Dependencies between work products are identified and understood. Requirements for the approval of work products to be controlled are defined.

GP 2.2.3 Identify, document and control the work products.
The work products to be controlled are identified.
Change control is established for work products.
The work products are documented and controlled in accordance with requirements.
Versions of work products are assigned to product configurations as applicable.
The work products are made available through appropriate access mechanisms.
The revision status of the work products may readily be ascertained.
GP 2.2.4 Review and adjust work products to meet the defined requirements.
Work products are reviewed against the defined requirements in accordance with planned arrangements.
Issues arising from work product reviews are resolved.

6.2.2.2 Generic Resources for PA 2.2

- Requirement management method / toolset; [PA 2.2 Achievement a, b, c]
- Configuration management system; [PA 2.2 Achievement b, c]
- Documentation elaboration and support tool; [PA 2.2 Achievement b, c]
- Document identification and control procedure; [PA 2.2 Achievement b, c]
- Work product review methods and experiences; [PA 2.2 Achievement d]
- Review management method / toolset; [PA 2.2 Achievement d]
- Intranets, extranets and/or other communication mechanisms; [PA 2.2 Achievement b, c]
- Problem and issue management mechanisms. [PA 2.2 Achievement d]

6.2.2.3 Generic Work Products for PA 2.2

08-00 Plan [PA 2.2 Achievement b]

- Expresses selected policy or strategy to manage work products.
- Describes requirements to develop, distribute, and maintain the work products.
- Defines quality control actions needed to manage the quality of the work product.

13-00 Record [PA 2.2 Achievement d]

- Demonstrates work product reviews and contributes to traceability.
- Describes non-conformance detected during work product reviews.
- Provides evidence that the changes are under control.

14-00 Register [PA 2.2 Achievement c]

- Records the status of documentation or work product.

16-00 Repository [PA 2.2 Achievement c]

- Contains and makes available work products and/or configuration items.
- Supports monitoring of changes to work products.

18-00 Standard [PA 2.2 Achievement a]

- Defines the functional and non-functional requirements for work products.
- Identifies work product dependencies.
- Identifies approval criteria for documents.

20-00 Template [PA 2.2 Achievement a, b]

- Defines the attributes associated with a work product to be created.

21-00 Work product [PA 2.2 Achievement a, b, c, d]

- Demonstrates process specific work products to be managed.

6.3 Level 3: Established process

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

The following attributes of the process demonstrate the achievement of this level:

6.3.1 PA 3.1 Process definition attribute

The process definition attribute is a measure of the extent to which a standard process is maintained to support the deployment of the defined process. As a result of full achievement of this attribute:

a) a standard process, including appropriate tailoring guidelines, is defined that describes the fundamental elements that must be incorporated into a defined process;

b) the sequence and interaction of the standard process with other processes are determined;

c) required competencies and roles for performing a process are identified as part of the standard process;

d) required infrastructure and work environment for performing a process are identified as part of the standard process;

e) suitable methods for monitoring the effectiveness and suitability of the process are determined.

NOTE: A standard process may be used as-is when deploying a defined process, in which case tailoring guidelines would not be necessary.

6.3.1.1 Generic Practices for PA 3.1

GP 3.1.1 Define the standard process that will support the deployment of the defined process.
A standard process is developed that includes the fundamental process elements.
The standard process identifies the deployment needs and deployment context.
Guidance and/or procedures are provided to support implementation of the process as needed.
Appropriate tailoring guideline(s) are available as needed.

GP 3.1.2 Determine the sequence and interaction between processes so that they work as an integrated system of processes. The standard process's sequence and interaction with other processes are determined. Deployment of the standard process as a defined process maintains integrity of processes.
GP 3.1.3 Identify the roles and competencies for performing the standard process. Process performance roles are identified Competencies for performing the process are identified.
GP 3.1.4 Identify the required infrastructure and work environment for performing the standard process. Process infrastructure components are identified (facilities, tools, networks, methods, etc). Work environment requirements are identified.
GP 3.1.5 Determine suitable methods to monitor the effectiveness and suitability of the standard process. Methods for monitoring the effectiveness and suitability of the process are determined. Appropriate criteria and data needed to monitor the effectiveness and suitability of the process are defined. The need to establish the characteristics of the process is considered. The need to conduct internal audit and management review is established. Process changes are implemented to maintain the standard process.

6.3.1.2 Generic Resources for PA 3.1

- Process modelling methods / tools; [PA 3.1 Achievement a, b, c, d]
- Training material and courses; [PA 3.1 Achievement a, b, c]
- Resource management system; [PA 3.1 Achievement b, c]
- Process infrastructure; [PA 3.1 Achievement a, b]
- Audit and trend analysis tools; [PA 3.1 Achievement e]
- Process monitoring method. [PA 3.1 Achievement e]

6.3.1.3 Generic Work Products for PA 3.1

09-00 Policy [PA 3.1 Achievement a, b, c, d, e]

- Provides evidence of organizational commitment to maintain a standard process to support the deployment of the defined process.

10-00 Process description [PA 3.1 Achievement a, b, c, e]

- Describes the standard process, including the fundamental process elements, interactions with other processes and appropriate tailoring guidelines.
- Addresses the performance, management and deployment of the process, as described by capability levels 1 and 2 and the PA 3.2 Process deployment attribute.
- Addresses methods to monitor process effectiveness and suitability.
- Identifies data and records to be collected when performing the defined process, in order to improve the standard process.
- Identifies and communicates the personnel competencies, roles and responsibilities for the standard and defined process.

— Identifies the personnel performance criteria for the standard and defined process.

— Identifies the tailoring guidelines for the standard process.

16-00 Repository [PA 3.1 Achievement d]

— Is used to support and maintain the standard process assets.

18-00 Standard [PA 3.1 Achievement a]

— Provides reference for the standards used by the standard process and identification about how they are used.

19-00 Strategy [PA 3.1 Achievement c, d]

— Identifies approaches for defining, maintaining and supporting a standard process, including infrastructure, work environment, training, internal audit and management review.

6.3.2 PA 3.2 Process deployment attribute

The process deployment attribute is a measure of the extent to which the standard process is effectively deployed as a defined process to achieve its process outcomes. As a result of full achievement of this attribute:

a) a defined process is deployed based upon an appropriately selected and/or tailored standard process;

b) required roles, responsibilities and authorities for performing the defined process are assigned and communicated;

c) personnel performing the defined process are competent on the basis of appropriate education, training, and experience;

d) required resources and information necessary for performing the defined process are made available, allocated and used;

e) required infrastructure and work environment for performing the defined process are made available, managed and maintained;

f) appropriate data are collected and analysed as a basis for understanding the behaviour of, and to demonstrate the suitability and effectiveness of the process, and to evaluate where continuous improvement of the process can be made.

NOTE: Competency results from a combination of knowledge, skills and personal attributes that are gained through education, training and experience.

6.3.2.1 Generic Practices for PA 3.2

GP 3.2.1 Deploy a defined process that satisfies the context specific requirements of the use of the standard process. The defined process is appropriately selected and/or tailored from the standard process. Conformance of defined process with standard process requirements is verified.
GP 3.2.2 Assign and communicate roles, responsibilities and authorities for performing the defined process. The roles for performing the defined process are assigned and communicated. The responsibilities and authorities for performing the defined process are assigned and communicated.

GP 3.2.3 Ensure necessary competencies for performing the defined process. Appropriate competencies for assigned personnel are identified. Suitable training is available for those deploying the defined process.
GP 3.2.4 Provide resources and information to support the performance of the defined process. Required human resources are made available, allocated and used. Required information to perform the process is made available, allocated and used.
GP 3.2.5 Provide adequate process infrastructure to support the performance of the defined process. Required infrastructure and work environment is available. Organizational support to effectively manage and maintain the infrastructure and work environment is available. Infrastructure and work environment is used and maintained.
GP 3.2.6 Collect and analyse data about performance of the process to demonstrate its suitability and effectiveness. Data required to understand the behaviour, suitability and effectiveness of the defined process are identified. Data are collected and analysed to understand the behaviour, suitability and effectiveness of the defined process. Results of the analysis are used to identify where continual improvement of the standard and/or defined process can be made.

6.3.2.2 Generic Resources for PA 3.2

- Feedback mechanisms (customer, staff, other stakeholders); [PA 3.2 Achievement f]
- Process repository; [PA 3.2 Achievement a, b]
- Resource management system; [PA 3.2 Achievement b, c, d]
- Knowledge management system; [PA 3.2 Achievement d]
- Problem and change management system; [PA 3.2 Achievement f]
- Working environment and infrastructure; [PA 3.2 Achievement e]
- Data collection analysis system: [PA 3.2 Achievement f]
- Process assessment framework; [PA 4.1 Achievement f]
- Audit / review system. [PA 3.2 Achievement f]

6.3.2.3 Generic Work Products for PA 3.2

03-00 Data [PA 3.2 Achievement f]

- Provides evidence that the project's defined process performance data was collected.

07-00 Measure [PA 3.2 Achievement f]

- Provides a basis to analyse data associated with the performance of the defined process.

08-00 Plan [PA 3.2 Achievement a, b, f]

- Expresses the strategy for the organizational support, allocation and use of the process infrastructure.

— Describes the project's resources and the elements of the infrastructure needed to deploy the defined process.

— Expresses the strategy to satisfy the project's training needs.

— Identifies process improvement proposal(s) based on analysis of suitability and effectiveness.

10-00 Process description [PA 3.2 Achievement a]

— Describes the defined process for use by the project.

— Describes the verification activities needed to ensure the conformance of the project's defined process with the organization's standard process.

— Represents the interactions of the project's defined process with other processes.

13-00 Record [PA 3.2 Achievement b, c, d, e]

— Provides evidence that the project personnel possess the required authorities, skills, experience and knowledge.

— Provides evidence that project personnel have received the required training to satisfy the needs of the project.

— Provides evidence that project infrastructure and working environment are made available and maintained for performing the defined process.

14-00 Register [PA 3.2 Achievement a, f]

— Records the status of required corrective actions.

— Captures the project's work breakdown structure needed to define the tasks and their dependencies.

15-00 Report [PA 3.2 Achievement f]

— Provides results of the analysis, recommended corrective action, feedback to the process owner and to the organization's standard process.

— Identifies improvement opportunities of the defined process.

— Provides evidence on the suitability and effectiveness of the defined process.

16-00 Repository [PA 3.2 Achievement d]

– Provides evidence that information is made available for performing the defined process.

6.4 Level 4: Predictable process

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

The following attributes of the process demonstrate the achievement of this level:

6.4.1 PA 4.1 Process measurement attribute

The process measurement attribute is a measure of the extent to which measurement results are used to ensure that performance of the process supports the achievement of relevant process performance objectives in support of defined business goals. As a result of full achievement of this attribute:

a) process information needs in support of relevant business goals are established;

b) process measurement objectives are derived from identified process information needs;

c) quantitative objectives for process performance in support of relevant business goals are established;

d) measures and frequency of measurement are identified and defined in line with process measurement objectives and quantitative objectives for process performance;

e) results of measurement are collected, analysed and reported in order to monitor the extent to which the quantitative objectives for process performance are met;

f) measurement results are used to characterise process performance.

NOTE 1: Information needs may typically reflect management, technical, project, process or product needs.

NOTE 2: Measures may be either process measures or product measures or both.

6.4.1.1 Generic Practices for PA 4.1

GP 4.1.1 Identify process information needs, in relation with business goals. Business goals relevant to establishing quantitative process measurement objectives for the process are identified. Process stakeholders are identified and their information needs are defined. Information needs support the relevant business goals.
GP 4.1.2 Derive process measurement objectives from process information needs. Process measurement objectives to satisfy defined process information needs are defined.
GP 4.1.3 Establish quantitative objectives for the performance of the defined process, according to the alignment of the process with the business goals. Process performance objectives are defined to explicitly reflect the business goals. Process performance objectives are verified with organizational management and process owner(s) to be realistic and useful.
GP 4.1.4 Identify product and process measures that support the achievement of the quantitative objectives for process performance. Detailed measures are defined to support monitoring, analysis and verification needs of process and product goals. Measures to satisfy process measurement and performance objectives are defined. Frequency of data collection is defined. Algorithms and methods to create derived measurement results from base measures are defined, as appropriate. Verification mechanism for base and derived measures is defined.
GP 4.1.5 Collect product and process measurement results through performing the defined process. Data collection mechanism is created for all identified measures. Required data is collected in an effective and reliable manner. Measurement results are created from the collected data within defined frequency. Analysis of measurement results is performed within defined frequency. Measurement results are reported to those responsible for monitoring the extent to which qualitative objectives are met.

GP 4.1.6 Use the results of the defined measurement to monitor and verify the achievement of the process performance objectives.

Statistical or similar techniques are used to quantitatively understand process performance and capability within defined control limits.

Trends of process behaviour are identified.

6.4.1.2 Generic Resources for PA 4.1

- Management information (cost, time, reliability, profitability, customer benefits, risks etc.); [PA 4.1 Achievement a, c, d, e, f]
- Applicable measurement techniques; [PA 4.1 Achievement d]
- Product and process measurement tools and results databases; [PA 4.1 Achievement d, e, f]
- Process measurement framework; [PA 4.1 Achievement d, e, f]
- Tools for data analysis and measurement. [PA 4.1 Achievement b, c, d, e]

6.4.1.3 Generic Work Products for PA 4.1

03-00 Data [PA 4.1 Achievement e]

- Defines data to be collected as specified in plans and measures.

07-00 Measure [PA 4.1 Achievement a, b, d]

- Describes information needs and performance objectives.
- Provides a basis for analyzing process performance.
- Defines explicit criteria for data validation.
- Defines frequency of data collection.

08-00 Plan [PA 4.1 Achievement b, c]

- Defines quantitative objectives for process performance.
- Specifies measures for the process.
- Defines tasks and schedules to collect and analyse data.
- Allocates responsibilities and resources for measurement.

10-00 Process description [PA 4.1 Achievement a, d]

- Defines information needs for the process.
- Specifies candidate measures.

15-00 Report [PA 4.1 Achievement e, f]

- Provides results of process data analysis to identify process performance parameters.
- Monitors process performance based on results of measurement.

6.4.2 PA 4.2 Process control attribute

The process control attribute is a measure of the extent to which the process is quantitatively managed to produce a process that is stable, capable, and predictable within defined limits. As a result of full achievement of this attribute:

a) suitable analysis and control techniques where applicable, are determined and applied;

b) control limits of variation are established for normal process performance;

c) measurement data are analysed for special causes of variation;

d) corrective actions are taken to address special causes of variation;

e) control limits are re-established (as necessary) following corrective action.

6.4.2.1 Generic Practices for PA 4.2

GP 4.2.1 Determine analysis and control techniques, appropriate to control the process performance. Process control analysis methods and techniques are defined. Selected techniques are validated against process control objectives.
GP 4.2.2 Define parameters suitable to control the process performance. Standard process definition is modified to include selection of parameters for process control. Control limits for selected base and derived measurement results are defined.
GP 4.2.3 Analyse process and product measurement results to identify variations in process performance. Measures are used to analyse process performance. All situations are recorded when defined control limits are exceeded. Each out-of-control case is analysed to identify potential cause(s) of variation. Special causes of variation in performance are determined. Results are provided to those responsible for taking action.
GP 4.2.4 Identify and implement corrective actions to address assignable causes. Corrective actions are determined to address each assignable cause. Corrective actions are implemented to address assignable causes of variation. Corrective action results are monitored. Corrective actions are evaluated to determine their effectiveness.
GP 4.2.5 Re-establish control limits following corrective action. Process control limits are re-calculated (as necessary) to reflect process changes and corrective actions.

6.4.2.2 Generic Resources for PA 4.2

- Process control and analysis techniques; [PA 4.2 Achievement a, c]
- Statistical analysis tools / applications; [PA 4.2 Achievement b, c, e]
- Process control tools / applications. [PA 4.2 Achievement d, e]

6.4.2.3 Generic Work Products for PA 4.2

03-00 Data [PA 4.2 Achievement c]

- Provides measurement data to identify special causes of variation.

08-00 Plan [PA 4.2 Achievement a]

- Defines analysis methods and techniques at detailed level.

10-00 Process description [PA 4.2 Achievement b, e]

- Defines parameters for process control.
- Defines and maintains control limits for selected base and derived measurement results.

13-00 Record [PA 4.2 Achievement c, d]

- Provides information on defects and problems.
- Records the changes.

14-00 Register [PA 4.2 Achievement d]

- Documents corrective actions to be implemented.
- Monitors the status of corrective actions.

15-00 Report [PA 4.2 Achievement a, c, d, e]

- Provides analyzed measurement results of process performance.
- Identifies corrective actions to address assignable causes of variation.
- Ensures that selected techniques are effective and measures are validated.

16-00 Repository [PA 4.2 Achievement a, b, c, d, e]

- Collects the data and provides the basis for analysis, corrective actions and results reporting.

6.5 Level 5: Optimizing process

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

The following attributes of the process demonstrate the achievement of this level:

6.5.1 PA 5.1 Process innovation attribute

The process innovation attribute is a measure of the extent to which changes to the process are identified from analysis of common causes of variation in performance, and from investigations of innovative approaches to the definition and deployment of the process. As a result of full achievement of this attribute:

a) process improvement objectives for the process are defined that support the relevant business goals;

b) appropriate data are analysed to identify common causes of variations in process performance;

c) appropriate data are analysed to identify opportunities for best practice and innovation;

d) improvement opportunities derived from new technologies and process concepts are identified;

e) an implementation strategy is established to achieve the process improvement objectives.

6.5.1.1 Generic Practices for PA 5.1

GP 5.1.1 Define the process improvement objectives for the process that support the relevant business goals. Directions to process innovation are set. New business visions and goals are analyzed to give guidance for new process objectives and potential areas of process change. Quantitative and qualitative process improvement objectives are defined and documented.
GP 5.1.2 Analyse measurement data of the process to identify real and potential variations in the process performance. Measurement data are analysed and made available. Causes of variation in process performance are identified and classified. Common causes of variation are analysed to get quantitative understanding of their impact.
GP 5.1.3 Identify improvement opportunities of the process based on innovation and best practices. Industry best practices are identified and evaluated. Feedback on opportunities for improvement is actively sought. Improvement opportunities are identified.
GP 5.1.4 Derive improvement opportunities of the process from new technologies and process concepts. Impact of new technologies on process performance is identified and evaluated. Impact of new process concepts are identified and evaluated. Improvement opportunities are identified, Emergent risks are considered in identifying improvement opportunities
GP 5.1.5 Define an implementation strategy based on long-term improvement vision and objectives. Commitment to improvement is demonstrated by organizational management and process owner(s). Proposed process changes are evaluated and piloted to determine their benefits and expected impact on defined business objectives. Changes are classified and prioritized based on their impact on defined improvement objectives**.** Measures that validate the results of process changes are defined to determine expected effectiveness of the process change. Implementation of the approved change(s) is planned as an integrated program or project. Implementation plan and impact on business goals are discussed and reviewed by organizational management.

6.5.1.2 Generic Resources for PA 5.1

- Process improvement framework; [PA 5.1 Achievement a, d, e]
- Process feedback and analysis system (measurement data, causal analysis results etc.); [PA 5.1 Achievement b, c]
- Piloting and trialing mechanism. [PA 5.1 Achievement c, d]

6.5.1.3 Generic Work Products for PA 5.1

03-00 Data [PA 5.1 Achievement b, c]

- Provides analytical data to identify common causes of variation.
- Provides analytical data to identify opportunities for best practice and innovation.

05-00 Goals [PA 5.1 Achievement a]

- Define and maintain business goals.
- Provides evidence of management commitment.

08-00 Plan [PA 5.1 Achievement a, e]

- Defines improvement objectives for the process
- Allocates resources for improvement activities.
- Schedules activities for root cause analysis.

09-00 Policy [PA 5.2 Achievement a]

- Establishes expectations for conduct and evaluation of pilot improvements.

10-00 Process description [PA 5.1 Achievement c, d]

- Identifies potential areas of innovation and new technology.
- Incorporates approaches to root cause analysis.

13-00 Record [PA 5.1 Achievement b]

- Records data relevant to root cause analysis.

14-00 Register [PA 5.1 Achievement c, d]

- Identifies potential improvement opportunities.

15-00 Report [PA 5.1 Achievement b, d]

- Identifies potential innovations and process changes.
- Provides information for an analysis to identify common causes of variation in performance.
- Identifies common causes of defects and appropriate corrective actions.

16-00 Repository [PA 5.1 Achievement c, d]

- Records information on new technology and techniques.

19-00 Strategy [PA 5.1 Achievement e]

- Defines an approach to implementing selected improvements.
- Identifies scope of pilot improvement activities.

6.5.2 PA 5.2 Process optimization attribute

The process optimization attribute is a measure of the extent to which changes to the definition, management and performance of the process result in effective impact that achieves the relevant process improvement objectives. As a result of full achievement of this attribute:

a) impact of all proposed changes is assessed against the objectives of the defined process and standard process;

b) implementation of all agreed changes is managed to ensure that any disruption to the process performance is understood and acted upon;

c) effectiveness of process change on the basis of actual performance is evaluated against the defined product requirements and process objectives to determine whether results are due to common or special causes.

6.5.2.1 Generic Practices of PA 5.2

GP 5.2.1 Assess the impact of each proposed change against the objectives of the defined and standard process. Objective priorities for process improvement are established. Specified changes are assessed against product quality and process performance requirements and goals. Impact of changes to other defined and standard processes is considered.
GP 5.2.2. **Manage the implementation of agreed changes** to selected areas of the defined and standard process according to the implementation strategy. A mechanism is established for incorporating accepted changes into the defined and standard process (es) effectively and completely. The factors that impact the effectiveness and full deployment of the process change are identified and managed, such as: • Economic factors (productivity, profit, growth, efficiency, quality, competition, resources, and capacity); • Human factors (job satisfaction, motivation, morale, conflict / cohesion, goal consensus, participation, training, span of control); • Management factors (skills, commitment, leadership, knowledge, ability, organisational culture and risks); • Technology factors (sophistication of system, technical expertise, development methodology, need of new technologies). Training is provided to users of the process. Process changes are effectively communicated to all affected parties. Records of the change implementation are maintained.
GP 5.2.3 Evaluate the effectiveness of process change on the basis of actual performance against process performance and capability objectives and business goals. Performance and capability of the changed process are measured and compared with historical data. A mechanism is available for documenting and reporting analysis results to management and owners of standard and defined process. Measures are analysed to determine whether results are due to common or special causes. Other feedback is recorded, such as opportunities for further improvement of the standard process.

6.5.2.2 Generic Resources for PA 5.2

- Change management system; [PA 5.2 Achievement a, b, c]
- Process evaluation system (impact analysis, etc.). [PA 5.2 Achievement a, c]

6.5.2.3 Generic Work Products for PA 5.2

07-00 Measure [PA 5.2 Achievement c]

- Specifies measures derived from process improvement objectives.

08-00 Plan [PA 5.2 Achievement a, b]

- Defines activities and schedule for pilot change implementation.
- Allocates resources for pilot implementation.
- Assigns responsibility for pilot implementation.
- Defines activities and schedule for organizational implementation of process change.
- Allocates resources and responsibilities for organizational implementation.
- Specifies scope of pilot implementation of proposed change.

10-00 Process description [PA 5.2 Achievement b]

- Documents changes as a result of process improvement actions.

13-00 Record [PA 5.2 Achievement b]

- Contains records of all completed and in-progress pilot implementations.
- Records history of and justification for changes.

15-00 Report [PA 5.2 Achievement a, b, c]

- Describes results of pilot implementation of process change.
- Evaluates effectiveness of process compared to process improvement objectives.
- Provides details on implementation of organizational changes.
- Describes proposed changes to standard and defined process.

6.6 Related Processes for Process Attributes

Certain processes support achievement of the capabilities addressed by a process attribute. Table 11 lists those processes and indicates the relation between those processes and each Process Attribute (PA). This information can be used in planning process assessments and in analysis and validation of the assessment results.

Table 11 — Related Processes for Process Attributes

Related processes	Process attributes							
	PA 2.1	PA 2.2	PA 3.1	PA 3.2	PA 4.1	PA 4.2	PA 5.1	PA 5.2
SUP.1 Software documentation management		◆						
SUP.2 Software configuration management		◆						
SUP.3 Software quality assurance	◆	◆						
SUP.4 Software verification		◆						
SUP.6 Software review	◆	◆						
SUP.7 Software audit			◆	◆				
SUP.8 Software problem resolution	◆	◆						
ORG.1 Life cycle model management			◆	◆				
ORG.1A Process establishment			◆					
ORG.1B Process assessment				◆	◆	◆	◆	
ORG.1C Process improvement				◆			◆	◆
ORG.2 Infrastructure management			◆	◆		◆		
ORG.3 Project portfolio management	◆		◆	◆				
ORG.4 Human resource management	◆		◆	◆				
ORG.4A Skill development				◆				
ORG.4B Skill acquisition and provision	◆		◆	◆				
ORG.4C Knowledge management	◆		◆					
ORG.5 Quality management			◆	◆	◆	◆		
ORG.6 Organizational alignment						◆	◆	◆
ORG.7 Organization management			◆	◆				
QNT.1 Quantitative process improvement				◆		◆	◆	
QNT.2 Quantitative performance management					◆	◆	◆	◆
PRO.1 Project planning	◆	◆		◆				
PRO.2 Project assessment and control	◆	◆		◆				
PRO.3 Decision management	◆	◆		◆	◆	◆		
PRO.4 Risk management	◆				◆			
PRO.5 Configuration management		◆						
PRO.6 Information management	◆	◆			◆			
PRO.7 Measurement				◆	◆	◆	◆	
REU.2 Reuse asset management			◆					◆

Annex A
(informative)

Conformity of the exemplar Process Assessment Model

A.1 Introduction

This part of ISO/IEC 15504 sets out a Process Assessment Model that meets the requirements for conformance defined in ISO/IEC 15504-2. The Process Assessment Model can be used in the performance of assessments that meet the requirements of ISO/IEC 15504. It may also be used as an example for a Process Assessment Model developer.

This clause serves as the statement of conformance of the Process Assessment Model to the requirements defined in ISO/IEC 15504-2. For ease of reference, the requirements from Clause 6.3 of ISO/IEC 15504-2 are embedded verbatim in the text of this clause. They should not be construed as normative elements of this part of ISO/IEC 15504.

Since this Process Assessment Model has been explicitly constructed to be an elaboration of the Process Reference Model defined in ISO/IEC 12207:2008, the conformance claim is relatively simple. For other models, particularly ones with a different architecture, the demonstration of conformance may be more difficult requiring more detail in the mapping.

A.2 Requirements for Process Assessment Models (from ISO/IEC 15504-2)

A.2.1 Introduction

In order to assure that assessment results are translatable into an ISO/IEC 15504 process profile in a repeatable and reliable manner, Process Assessment Models shall adhere to certain requirements. A Process Assessment Model shall contain a definition of its purpose, scope and elements; its mapping to the Measurement Framework and specified Process Reference Model(s); and a mechanism for consistent expression of results.

A Process Assessment Model is considered suitable for the purpose of assessing process capability by conforming to 6.3.2, 6.3.3, and 6.3.4.

[ISO/IEC 15504-2, 6.3.1]

The purpose of this Process Assessment Model is to support assessment of process capability in accordance with the requirements of ISO/IEC 15504-2 (Refer Clause 1).

A.2.2 Process Assessment Model scope

6.3.2.1 *A Process Assessment Model shall relate to at least one process from the specified Process Reference Model(s).*

6.3.2.2 *A Process Assessment Model shall address, for a given process, all, or a continuous subset, of the levels (starting at level 1) of the Measurement Framework for process capability for each of the processes within its scope.*

NOTE: It would be permissible for a model, for example, to address solely level 1, or to address levels 1, 2 and 3, but it would not be permissible to address levels 2 and 3 without level 1.

6.3.2.3 *A Process Assessment Model shall declare its scope of coverage in the terms of:*

a) the selected Process Reference Model(s);

b) the selected processes taken from the Process Reference Model(s);

c) the capability levels selected from the Measurement Framework.

[ISO/IEC 15504-2, 6.3.2]

This Process Assessment Model is based upon the Process Reference Model defined in ISO/IEC 12207:2008.

In the capability dimension of this Process Assessment Model, the model addresses all of the capability levels defined in the Measurement Framework in ISO/IEC 15504-2, Clause 5.

A.2.3 Process Assessment Model elements and indicators

A Process Assessment Model shall be based on a set of indicators that explicitly addresses the purposes and outcomes, as defined in the selected Process Reference Model, of all the processes within the scope of the Process Assessment Model; and that demonstrates the achievement of the process attributes within the capability level scope of the Process Assessment Model. The indicators focus attention on the implementation of the processes in the scope of the model.

[ISO/IEC 15504-2, 6.3.3]

The Process Assessment Model provides a two-dimensional view of process capability for the processes in the Process Reference Model, through the inclusion of assessment indicators as shown in Figure 3. The Assessment Indicators used are:

— base practices and work products; and

— generic practices, generic resources and generic work products

as shown in Figure 3. They support the judgment of the performance and capability of an implemented process.

A.2.4 Mapping Process Assessment Models to Process Reference Models

A Process Assessment Model shall provide an explicit mapping from the relevant elements of the model to the processes of the selected Process Reference Model and to the relevant process attributes of the Measurement Framework.

The mapping shall be complete, clear and unambiguous. The mapping of the indicators within the Process Assessment Model shall be to:

a) the purposes and outcomes of the processes in the specified Process Reference Model;

b) the process attributes (including all of the results of achievements listed for each process attribute) in the Measurement Framework.

This enables Process Assessment Models that are structurally different to be related to the same Process Reference Model.

[ISO/IEC 15504-2, 6.3.4]

Each of the Processes in this Process Assessment Model is identical in scope to the Process defined in the Process Reference Model. Each Base Practice and Work Product is cross-referenced to the Process Outcomes it addresses All Work Products relate as Inputs or Outputs to the Process as a whole - see mappings in clause 5.

Each of the Process Attributes in this Process Assessment Model is identical to the Process Attribute defined in the Measurement Framework. The Generic Practices address the characteristics from each Process Attribute. The Generic Resources and Generic Work Products relate to the Process Attribute as a whole.

Table A.1 lists the mappings of the GPs to the achievements associated with each Process Attribute.

Table A.1 — Mapping of Generic Practices

GP	Practice Name	Maps To
PA 1.1: Process performance attribute		
GP 1.1.1	Achieve the process outcomes.	PA.1.1.a
PA 2.1: Performance management attribute		
GP 2.1.1	Identify the objectives for the performance of the process.	PA.2.1.a
GP 2.1.2	Plan and monitor the performance of the process to fulfil the identified objectives.	PA.2.1.b
GP 2.1.3	Control the performance of the process.	PA.2.1.c
GP 2.1.4	Define responsibilities and authorities for performing the process.	PA.2.1.d
GP 2.1.5	Identify and make available resources to perform the process according to plan.	PA.2.1.e
GP 2.1.6	Manage the interfaces between involved parties.	PA.2.1.f
PA 2.2: Work product management attribute		
GP 2.2.1	Define the requirements for the work products.	PA.2.2.a
GP 2.2.2	Define the requirements for documentation and control of the work products.	PA.2.2.b
GP 2.2.3	Identify, document and control the work products.	PA.2.2.c
GP 2.2.4	Review and adjust work products to meet the defined requirements.	PA.2.2.d
PA 3.1: Process definition attribute		
GP 3.1.1	Define the standard process that will support the deployment of the defined process.	PA.3.1.a
GP 3.1.2	Determine the sequence and interaction between processes so that they work as an integrated system of processes.	PA.3.1.b
GP 3.1.3	Identify the roles and competencies for performing the process.	PA.3.1.c
GP 3.1.4	Identify the required infrastructure and work environment for performing the process.	PA.3.1.d
GP 3.1.5	Determine suitable methods to monitor the effectiveness and suitability of the process.	PA.3.1.e
PA 3.2: Process deployment attribute		
GP 3.2.1	Deploy a defined process that satisfies the context specific requirements of the use of the standard process.	PA.3.2.a
GP 3.2.2	Assign and communicate roles, responsibilities and authorities for performing the defined process.	PA.3.2.b
GP 3.2.3	Ensure necessary competencies for performing the defined process.	PA.3.2.c
GP.3.2.4	Provide resources and information to support the performance of the defined process.	PA.3.2.d
GP 3.2.5	Provide process infrastructure to support the performance of the defined process.	PA.3.2.e

GP	Practice Name	Maps To
GP 3.2.6	Collect and analyse data about performance of the process to demonstrate its suitability and effectiveness.	PA.3.2.f
PA 4.1 Process measurement attribute		
GP 4.1.1	Identify process information needs, in relation with business goals.	PA.4.1.a
GP.4.1.2	Derive process measurement objectives from process information needs.	PA.4.1.b
GP 4.1.3	Establish quantitative objectives for the performance of the defined process, according to the alignment of the process with the business goals.	PA.4.1.c
GP 4.1.4	Identify product and process measures that support the achievement of the quantitative objectives for process performance.	PA.4.1.d
GP 4.1.5	Collect product and process measurement results through performing the defined process.	PA.4.1.e
GP 4.1.6	Use the results of the defined measurement to monitor and verify the achievement of the process performance objectives.	PA.4.1.f
PA 4.2 Process control attribute		
GP 4.2.1	Determine analysis and control techniques, appropriate to control the process performance.	PA.4.2.a
GP 4.2.2	Define parameters suitable to control the process performance.	PA.4.2.b
GP 4.2.3	Analyse process and product measurement results to identify variations in process performance.	PA.4.2.c
GP 4.2.4	Identify and implement corrective actions to address assignable causes.	PA.4.2.d
GP.4.2.5	Re-establish control limits following corrective action.	PA.4.2.e
PA 5.1 Process innovation attribute		
GP 5.1.1	Define the process improvement objectives for the process that support the relevant business goals.	PA.5.1.a
GP 5.1.2	Analyse measurement data of the process to identify real and potential variations in the process performance.	PA.5.1.b
GP 5.1.3	Identify improvement opportunities of the process based on innovation and best practices.	PA.5.1.c
GP.5.1.4	Derive improvement opportunities from new technologies and process concepts.	PA.5.1.d
GP 5.1.5	Define an implementation strategy based on long-term improvement vision and objectives.	PA.5.1.e
PA 5.2 Process optimization attribute		
GP 5.2.1	Assess the impact of each proposed change against the objectives of the defined and standard process.	PA.5.2.a
GP 5.2.2	Manage the implementation of agreed changes according to the implementation strategy.	PA.5.2.b
GP 5.2.3	Evaluate the effectiveness of process change on the basis of actual performance against process objectives and business goals.	PA.5.2.c

A.2.5 Expression of assessment results

A Process Assessment Model shall provide a formal and verifiable mechanism for representing the results of an assessment as a set of process attribute ratings for each process selected from the specified Process Reference Model(s).

NOTE: The expression of results may involve a direct translation of Process Assessment Model ratings into a process profile as defined in this international standard, or the conversion of the data collected during the assessment (with the possible inclusion of additional information) through further judgment on the part of the assessor.

[ISO/IEC 15504-2, 6.3.5]

The processes in this Process Assessment Model are identical to those defined in the Process Reference Model. The Process Attributes and the Process Attributes Rating in this Process Assessment Model are identical to those defined in the Measurement Framework. As a consequence, results of assessments based upon this Process Assessment Model are expressed directly as a set of process attribute ratings for each process within the scope of the assessment. No form of translation or conversion is required.

Annex B
(informative)

Work product characteristics

Work product characteristics listed in this Annex can be used when reviewing potential inputs and outputs of process implementation. The characteristics are provided as guidance for the attributes to look for, in a particular sample work product, to provide objective evidence supporting the assessment of a particular process. A documented process and assessor judgment is needed to ensure that the process context (application domain, business purpose, development methodology, size of the organization, etc.) is considered when using this information. Work products are defined using the schema in Table B.1. Work products and their characteristics should be considered as a starting point for considering whether, given the context, they are contributing to the intended purpose of the process, not as a check-list of what every organization must have.

Table B.1 — Work product identification

Work product identifier #	An identifier number for the work product which is used to reference the work product.
Work product name	Provides an example of a typical name associated with the work product characteristics. This name is provided as an identifier of the type of work product the practice or process might produce. Organizations may call these work products by different names. The name of the work product in the organization is not significant. Similarly, organizations may have several equivalent work products which contain the characteristics defined in one work product type. The formats for the work products can vary. It is up to the assessor and the organizational unit coordinator to map the actual work products produced in their organization to the examples given here.
Work product characteristics	Provides examples of the potential characteristics associated with the work product types. The assessor may look for these in the samples provided by the organizational unit.

B.1 Generic Work products

The Generic Work Product Indicators are sets of characteristics that would be expected to be evident in work products of generic types as a result of achievement of an attribute. The generic work products form the basis for the classification of the work products defined as process performance indicators. These work product types are basic input types to process owners of all types of processes.

WP ID	WP Name	WP Characteristics
01-00	Configuration item	– Item which is maintained under configuration control: – – may include modules, subsystems, libraries, test cases, compilers, data, documentation, physical media, and external interfaces – Version identification is maintained – Description of the item is available including: – – type of item – – associated configuration management library, file system – – responsible owner – – date when placed under configuration control – – status information (i.e., development, baselined, released) – – relationship to lower level configured items – – identifies the change control records – – identifies change history – – relationship to previous versions and/or baselines (for recovery, if necessary) – – approval status information (i.e., development, baselined, released) – – revision status information (i.e., checked in, checked out, read only)

WP ID	WP Name	WP Characteristics
02-00	Contract	– Defines what is to be purchased or delivered – Identifies time frame for delivery or contracted service dates – Identifies any statutory requirements – Identifies monetary considerations – Identifies any warranty information – Identifies any copyright and licensing information (patent, copyright, confidentiality, proprietary, usage, ownership, warranty and licensing rights associated with all relevant work products) – Identifies any customer service requirements – Identifies service level requirements – References to any performance and quality expectations / constraints / monitoring – Standards and procedures to be used – Evidence of review and approval by authorised signatories – As appropriate to the contract the following are considered: – – references to any acceptance criteria – – references to any special customer needs (i.e., confidentiality requirements, security, hardware, etc.) – – references to any change management and problem resolution procedures – – identifies any interfaces to independent agents and subcontractors – – identifies customer's role in the development and maintenance process – – identifies resources to be provided by the customer
03-00	Data	– Result of applying a measure – Available to those who need to know within defined timeframe
04-00	Design	– Describes the overall product / system structure – Identifies the required product / system elements – Identifies the relationship between elements – Consideration is given to: – – any required performance characteristics – – any required interfaces – – any required security characteristics
05-00	Goals	– Identifies the objective to be achieved – Identifies who is expected to achieve the goal – Identifies any incremental supporting goals – Identifies any conditions / constraints – Identifies the timeframe for achievement – Are reasonable and achievable within the resources allocated – Are current, established for current project, organization – Are optimized to support known performance criteria and plans

WP ID	WP Name	WP Characteristics
06-00	User documentation	– Identifies: – – external documents – – internal documents – – current site distribution and maintenance list maintained – Documentation kept synchronized with latest product release – Addresses technical issues
07-00	Measure	– Quantitative or qualitative attribute for a product or process. – Defines the method for collecting data – Understood by those expected to use them – Provides value to the organization / project – References any relevant goals – Non-disruptive to the work flow – Appropriate to the process, life cycle model, organization – Has appropriate analysis and commentary to allow meaningful interpretation by users
08-00	Plan	(As appropriate to the application and purpose) – Identifies the plan owner – Includes: – – the objective and scope of what is to be accomplished – – assumptions made – – constraints – – risks – – tasks to be accomplished – – schedules, milestones and target dates – – critical dependencies – – maintenance disposition for the plan – Method / approach to accomplish plan – Identifies: – – task ownership, including tasks performed by other parties (e.g. supplier, customer) – – quality criteria – – required work products – Includes resources to accomplish plan objectives: – – time – – staff (key roles and authorities e.g. sponsor) – – materials / equipment – – budget – Includes contingency plan for non-completed tasks – Plan is approved

WP ID	WP Name	WP Characteristics
09-00	Policy	– Authorized – Available to all personnel impacted by the policy – Establishes practices / rules to be adhered to
10-00	Process description	– A detailed description of the process / procedure which includes: – – tailoring of the standard process (if applicable) – – purpose of the process – – outcomes of the process – – task and activities to be performed and ordering of tasks – – critical dependencies between task activities – – expected time required to execute task – – input / output work products – – links between input and output work products – Identifies process entry and exit criteria – Identifies internal and external interfaces to the process – Identifies process measures – Identifies quality expectations – Identifies functional roles and responsibilities – Approved by authorised personnel
11-00	Product	– Is a result / deliverable of the execution of a process, includes services, systems (software and hardware) and processed materials – Has elements that satisfy one or more aspects of a process purpose – May be represented on various media (tangible and intangible)
12-00	Proposal	– Defines the proposed solution – Identifies the coverage identification of initial proposal: – – the requirements that would be satisfied – – the requirements that could not be satisfied, and provides a justification of variants – Identifies conditions (e.g. time, location) that affect the validity of the proposal – Identifies obligations of the acquirer and the consequences of these not being met – Defines the estimated price of proposed development, product, or service
13-00	Record	– Work product stating results achieved or provides evidence of activities performed in a process – An item that is part of a set of identifiable and retrievable data
14-00	Register	– A register is a compilation of data or information captured in a defined sequence to enable: – – an overall view of evidence of activities that have taken place – – monitoring and analyses – – provides evidence of performance of a process over time

WP ID	WP Name	WP Characteristics
15-00	Report	– A work product describing a situation that: – – includes results and status – – identifies applicable / associated information – – identifies considerations / constraints – – provides evidence / verification
16-00	Repository	– Repository for components – Storage and retrieval capabilities – Ability to browse content – Listing of contents with description of attributes – Sharing and transfer of components between affected groups – Effective controls over access – Maintain component descriptions – Recovery of archive versions of components – Ability to report component status – Changes to components are tracked to change / user requests
17-00	Requirement specification	– Each requirement is identified – Each requirement is unique – Each requirement is verifiable or can be assessed – Includes statutory and regulatory requirements – Includes issues / requirements from (contract) review
18-00	Standard	– Identifies who / what they apply to – Expectations for conformance are identified – Conformance to requirements can be demonstrated – Provisions for tailoring or exception to the requirements are included
19-00	Strategy	– Identifies what needs and objectives or goals there are to be satisfied – Establishes the options and approach for satisfying the needs, objectives, or goals – Establishes the evaluation criteria against which the strategic options are evaluated – Identifies any constraints / risks and how these will be addressed
20-00	Template	– Defines the attributes associated with a work product to be created as a consequence of a process execution – Identifies technical elements typically associated with this product type – Defines expected form and style
21-00	Work product	– Defines the attributes associated with an artefact from a process execution: – – key elements to be represented in the work product

B.2 Generic and specific work products

Specific work product types are typically created by process owners and applied by process deployers in order to satisfy an outcome of a particular process purpose.

NOTE: Generic work product types are included in the list for completeness.

WP ID	WP Name	WP Characteristics
01-00	Configuration item	– Item which is maintained under configuration control: – – may include modules, subsystems, libraries, test cases, compilers, data, documentation, physical media, and external interfaces – Version identification is maintained – Description of the item is available including: – – type of item – – associated configuration management library, file, system – – responsible owner – – date when placed under configuration control – – status information (i.e., development, baselined, released) – – relationship to lower level configured items – – identification of the change control records – – identification of change history – – relationship to previous versions and/or baselines (for recovery, if necessary) – – approval status information (i.e., development, baselined, released) – – revision status information (i.e., checked in, checked out, read only)
01-01	Product configuration	– Overview of the system's configuration – Defines each element and their position in the architecture of the system – Defines the key system interfaces – Defines any network considerations – Defines the hardware configuration – Defines any system performance / parameter settings
01-02	Reusable object	– Developed to be: – – reliable – – data encapsulated – An asset and elementary component – Designed for interoperability – Versions traceable to point of usage – Contains status and classification – Modification controlled – Modifications are downward compatible – Specification for usage defined – Specification for tailoring defined

WP ID	WP Name	WP Characteristics
01-03	Software item	– Integrated software consisting of: – – source code – – software elements – – executable code – – configuration files – Documentation, which: – – describes and identifies source code – – describes and identifies software elements – – describes and identifies configuration files – – describes and identifies executable code – – describes software life-cycle status – – describes archive and release criteria – – describes compilation of software units – – describes building of software item
01-04	Knowledge item	– Explicit piece of experience: – – documented for sharing – – controlled and maintained
02-00	Contract	– Defines what is to be purchased or delivered – Identifies time frame for delivery or contracted service dates – Identifies any statutory requirements – Identifies monetary considerations – Identifies any warranty information – Identifies any copyright and licensing information (patent, copyright, confidentiality, proprietary, usage, ownership, warranty and licensing rights associated with all relevant work products) – Identifies any customer service requirements – Identifies service level requirements – References to any performance and quality expectations / constraints / monitoring – Standards and procedures to be used – Evidence of review and approval by authorised signatories – As appropriate to the contract the following are considered: – – references to any acceptance criteria – – references to any special customer needs (i.e., confidentiality requirements, security, hardware, etc.) – – references to any change management and problem resolution procedures – – identifies any interfaces to independent agents and subcontractors – – identifies customer's role in the development and maintenance process – – identifies resources to be provided by the customer

WP ID	WP Name	WP Characteristics
02-01	Commitment / agreement	– Signed off by all parties involved in the commitment / agreement – Establishes what the commitment is for – Establishes the resources required to fulfil the commitment, such as: – – time – – people – – budget – – equipment – – facilities – Demonstrates sponsorship and acceptance of the resulting change
03-00	Data	– Result of applying a measure – Available to those who need to know within defined timeframe
03-01	Assessment data	– Identifies the objective evidence gathered – Rationale for the attribute achievement ratings – The set of process profiles resulting from the assessment (i.e. one profile for each process assessed with attributes ratings) – The identification of any additional information collected during the assessment that was identified in the assessment input to support process improvement or process capability determination
03-02	Asset use data	– Identifies used times and dates – Identifies the description of the asset, name of the asset or a unique identifier
03-03	Benchmarking data	– Results of measurement of current performance that allow comparison against historical or target values – Relates to key goals / process / product / market need criteria and information to be benchmarked
03-04	Customer satisfaction data	– Relates to levels of customer satisfaction with products and services – Results of applying field measures – Results of customer satisfaction survey – Interview notes – Meeting minutes from customer meetings
03-06	Process performance data	– Appropriate to compare process performance against expected values – May include records, such as: – – meeting minutes – – change records^ – – quality records – May include data on: – – resource usage – – process adherence – – extent to which quality criteria are met – – extent to which task completion criteria are met

WP ID	WP Name	WP Characteristics
03-07	Test data	– Set of input values that are associated with a set of test cases or test procedures – Indicate scope of validity – Identifies associated test cases
04-00	Design	– Describes the overall product / system structure – Identifies the required product / system elements – Identifies the relationship between elements – Consideration is given to: – – any required performance characteristics – – any required interfaces – – any required security characteristics
04-01	Database design	– Definition of design characteristics: – – database management system used – – type of system (relational, hierarchical, object oriented, networked) – – format of records, tables, objects – – database access mode – – associated software (programs, user screen formats, reports) – – supported database language – Definition of logical and physical views, models: – – records (data layouts, fields, tables, structures) – – field names and definitions – – data definitions, classes, structure, etc. – – entity / relationships – – classes, inheritance scheme – Definition of user views: – – screen layouts – – field access – – data access – – commands – Input / output interface considerations – Database usage information (contents, application systems, usage restrictions, etc.) – Identifies constraints: – – security considerations – – data access considerations – – back-up and recovery considerations – – system restart considerations – – system generations considerations – – performance considerations

WP ID	WP Name	WP Characteristics
04-02	Domain architecture	– Identifies domain model(s) tailored from – Identifies asset specifications – Definition of boundaries and relationships with other domains (Domain Interface Specification) – Identifies domain vocabulary – Identifies the domain representation standard – Provide an overview of the functions, features capabilities and concepts in the domains
04-03	Domain model	– Must provide a clear explanation and description, on usage and properties, for reuse purposes – Identifies the management and structures used in the model – Includes features, capabilities, concepts, and functions
04-04	High level software design	– Describes the overall software structure – Identifies the required software elements – Identifies the relationship between software elements – Consideration is given to: – – any required software performance characteristics – – any required software interfaces – – any required security characteristics required – – any database design requirements – – any required error handling and recovery attributes
04-05	Low level software design	– Provides detailed design (could be represented as a prototype, flow chart, entity relationship diagram, pseudo code, etc.) – Provides format of input / output data – Provides specification of data storage needs – Establishes required data naming conventions – Defines the format of required data structures – Defines the data fields and purpose of each required data element – Provides the specifications of the program structure

WP ID	WP Name	WP Characteristics
04-06	System architecture design	– Provides an overview of all system design – Describes the interrelationship between system elements – Describes the relationship between the system elements and the software – Specifies the design for each required system element, consideration is given to things like: – – memory / capacity requirements – – hardware interfaces requirements – – user interfaces requirements – – external system interface requirements – – performance requirements – – commands structures – – security / data protection characteristics – – system parameter settings – – manual operations – – reusable components – Mapping of requirements to system elements
04-07	Organizational structure	– Describes an organization: – – structure – – roles – – responsibilities
05-00	Goals	– Identifies the objective to be achieved – Identifies who is expected to achieve the goal – Identifies any incremental supporting goals – Identifies any conditions / constraints – Identifies the timeframe for achievement – Are reasonable and achievable within the resources allocated – Are current, established for current project, organization – Are optimized to support known performance criteria and plans
05-01	Assessment goals	No characteristics additional to Goals (Generic)
05-02	Business goals	– Contains a description of the goal – Identifies a requirement specification for the business need – Identifies association and interfaces to other goals – Identifies the level of degree of the need and effect on the business of not having that need.
05-03	Core values statement	– Defines the values that govern the relationships between internal and external stakeholders – Is authorized at the highest level

WP ID	WP Name	WP Characteristics
05-04	Mission statement	– Identifies the reasons for the existence of the enterprise – Informs the development of the core values and vision statement – Is authorised at the highest level
05-05	Vision statement	– Identifies the main objectives to be achieved – Provides information on the overall strategy for the organizational unit, organization, or business – Is authorized at the highest level
05-06	Quality goals	– Establishes goals related to: – – project / process effectiveness, – – customer satisfaction – – product quality – – people satisfaction
05-07	Process performance goal	– Process performance goals aligned with business goals and context-specific other relevant goals like: – – Project / process effectiveness – – Baselines for process performance and product quality
06-00	User documentation	– Identifies: – – external documents – – internal documents – – current site distribution and maintenance list maintained – Documentation kept synchronized with latest product release – Addresses technical issues
06-01	Customer manual	– Takes account of: – – audience and task profiles – – the environment in which the information will be used – – convenience to users – – the range of technical facilities, including resources and the product, available for developing and delivering on-screen documentation – – information characteristics – – cost of delivery and maintainability – Includes information needed for operation of the system, including but not limited to: – – product and version information – – instructions for handling the system – – initial familiarisation information – – non-trivial examples of the use – – structured reference material, particularly for advanced features of the software – – checklists – – guides to use input devices

WP ID	WP Name	WP Characteristics
06-02	Handling and storage guide	– Defines the tasks to perform in handling and storing products including: – – providing for master copies of code and documentation – – disaster recovery – – addressing appropriate critical safety and security issues – Provides a description of how to store the product including: – – storage environment required – – the protection media to use – – packing materials required – – what items need to be stored – – assessments to be done on stored product – Provides retrieval instructions
06-03	Installation guide	– Tasks for loading / installing product sequentially, order by execution requirements: – – downloading of software from delivery files – – up-loading to appropriate software to files, folders, libraries, etc. – – partial or upgrade installation instructions, where applicable – – initialization procedures – – conversion procedures – – customization / configuration procedures – – verification procedures – – bring-up procedures – – operations instructions – Installation requirements identified: – – associated hardware, software, customer documentation – – conversion programs and instructions – – initialization programs, system generation information – – components and descriptions – – minimum configuration of hardware / software required – – backup / recovery instructions – – validation programs – – configuration parameters (e.g. size requirements, memory) – Customer / technical support contacts – Troubleshooting guide – Rollback plan
06-04	Training material	– Updated and available for new releases – Coverage of system, application, operations, maintenance as appropriate to the application – Courses listings and availability

WP ID	WP Name	WP Characteristics
06-05	Product operation guide	– Criteria for operational use – Provides a description of how to operate the product including: – – operational environment required – – supporting tools and material (e.g. user manuals) required – – possible safety warnings – – start-up preparations and sequence – – frequently asked questions (FAQ) – – sources of further information and help to operate the product – Certification and safety approvals – Warranty and replacement instructions – Guidance for trouble shooting – Adequate information to contact support personnel
07-00	Measure	– Quantitative or qualitative attribute for a product or process. – Defines the method for collecting data – Understood by those expected to use them – Provides value to the organization / project – References any relevant goals – Non-disruptive to the work flow – Appropriate to the process, life cycle model, organization – Has appropriate analysis and commentary to allow meaningful interpretation by users
07-01	Customer satisfaction survey	– Mechanism to collect data on customer satisfaction: – Identifies customers to be contacted – Identifies the data to be collected from the customer – Target date for responses – Identifies products/services under investigation – Methods to analyze feedback
07-02	Field measure	– Identifies attributes of system's operation at field locations, such as: – – field defects – – performance against defined service level measures – – system ability to meet defined customer requirements – – support time required – – user complaints (may be third party users) – – customers requests for help – – performance trends – – problem reports – – enhancements requested

WP ID	WP Name	WP Characteristics
07-04	Process measure	– Includes measures related to the performance of a process, such as: – – size and number of work products produced – – adherence to the process – – time needed to perform process – – effort needed to perform process – – number of defects related to the process – Measures the impact of process change – Measures the efficiency of the process
07-05	Project measure	– Appropriate to monitor key processes and critical tasks of a project – Includes measures related to the project on: – – project performance against established plan – – resource utilization against established plan – – time schedule against established plan – – process quality against quality expectations and/or criteria – – product quality against quality expectations and/or criteria – – highlight product performance problems, trends – – amount of work scheduled – – actual cost against tasks completed
07-06	Quality measure	– Measures quality attributes of the work products defined, such as: – – functionality – – reliability – – usability – – efficiency – – maintainability – – portability – Measures quality attributes of the "end customer" product quality and reliability NOTE: Refer ISO/IEC 25010 for detailed information on measurement of product quality.
07-07	Risk measure	– Identifies the probability of risk occurring – Identifies the impact of risk occurring – Identifies the change in the risk state – Identifies the timeframe of the risk

WP ID	WP Name	WP Characteristics
07-08	Service level measure	– Real time measures taken while a system is operational, it measures the system's performance or expected service level – Identifies things like: – – capacity – – throughput – – operational performance – – operational service – – service outage time – – up time – – job run time
07-09	Quantitative analysis technique	– Guidelines to determine which issues or problems are subject to a quantitative analysis – Measures and historical data required in quantitative analysis technique – Appropriate analysis technique considering the measures as well as the purpose – Assumptions of selected technique – Contribution to measurement repository
07-10	Process performance model	– Purpose of analysis – Measures related to the purpose of analysis – Operational definition of the measures – An model appropriate to the process context – Model Calibration – Assumptions and limitations of the model – Baseline update – Distribution to relevant stakeholders – Contribution to measurement repository

WP ID	WP Name	WP Characteristics
08-00	Plan	(As appropriate to the application and purpose) – Identifies the plan owner – Includes: – – the objective and scope of what is to be accomplished – – assumptions made – – constraints – – risks – – tasks to be accomplished – – schedules, milestones and target dates – – critical dependencies – – maintenance disposition for the plan – Method / approach to accomplish plan – Identifies: – – task ownership, including tasks performed by other parties (e.g. supplier, customer) – – quality criteria – – required work products – Includes resources to accomplish plan objectives: – – time – – staff (key roles and authorities e.g. sponsor) – – materials / equipment – – budget – Includes contingency plan for non-completed tasks – Plan is approved
08-01	Acceptance test plan	– Identified activities to be performed to test "deliverable" end customer product – Identifies who has responsibility for performance of acceptance test activities (supplier or customer) – Identifies the system configuration requirements for site – Identifies the installation requirements for site – Identifies how to validate installation activities were performed correctly – Identifies how to validate that the deliverables (hardware / software / product) satisfied the customer requirements – Identifies associated test scripts / test cases – Identifies actions to be take upon acceptance of product – Refers to Quality plan

WP ID	WP Name	WP Characteristics
08-02	Acquisition plan	– Identifies what needs to be acquired – Establishes the approach for acquiring the product or service; options might include: – – off-the-shelf – – develop internally – – develop through contract – – enhance existing product or combination of these – Establishes the evaluation and supplier selection criteria – Acceptance strategy
08-03	Process assessment plan	– The identity of the sponsor of the assessment and the sponsor's relationship to the organizational unit being assessed – The assessment purpose including alignment with business goals – The assessment scope including: – – the processes to be investigated within the organizational unit – – the highest capability level to be investigated for each process within the assessment scope – – the organizational unit that deploys these processes – The context which, as a minimum, includes: – – the size of the organizational unit – – the demographics of the organizational unit – – the application domain of the products or services of the organizational unit – – the size, criticality and complexity of the products or services – – the quality characteristics of the products – The assessment constraints which may include: – – availability of key resources – – the maximum amount of time to be used for the assessment – – specific processes or organizational units to be excluded from the assessment – – the minimum, maximum or specific sample size or coverage that is desired for the assessment – – the ownership of the assessment outputs and any restrictions on their use – – controls on information resulting from a confidentiality agreement – The identity of the model(s) used within the assessment – The assessment approach or methodology – The identity of the assessors, including the competent assessor with specific responsibilities for the assessment – the criteria for competence of the assessor who is responsible for the assessment – The identity of assessees and support staff with specific responsibilities for the assessment – Any additional information to be collected during the assessment to support process improvement or process capability determination

WP ID	WP Name	WP Characteristics
08-04	Configuration management plan	– Defines or references the procedures to control changes to configuration items – Defines measurements used to determine the status of the configuration management activities – Defines configuration management audit criteria – Approved by the configuration management function – Identifies configuration library tools or mechanism – Includes management records and status reports that show the status and history of controlled items – Specifies the location and access mechanisms for the configuration management library – Storage, handling and delivery (including archival and retrieval) mechanisms specified
08-05	Development environment plan	– Floor plan – Environmental safety considerations – Regulatory requirements – Contractual requirements – Security considerations – Facility configuration – Special environmental requirements (e.g. air conditioning, raised floor, power) – Individual workspace needs defined – Workstations requirements – Supporting hardware / software / product – Tools – Communication equipment – Disaster recovery plan
08-06	Project activity network	– A graphic illustration of a project as a network diagram showing all of the project's activities, their attributes, and the relationships between them; the most common form is the PERT chart – Activity attributes include: – – activity name – – estimated duration – – planned and actual start date – – planned and actual completion date – – resource requirements – The relationships between the activities may include: – – predecessor activities – – successor activities – – dependency delays

WP ID	WP Name	WP Characteristics
08-07	System integration test plan	– Purpose of integration defined: – – validation of the integrated elements of the system – – validation of the integration of the system elements (hardware, support equipment, interfaced system)
08-08	Human resource management plan	– Human resource objectives / goals / policies – Satisfaction of human resource needs: – – required skills identified – – required competencies identified – – skills acquisition and retention strategy – – staff availability and project allocation – Human resource management: – – statutory and regulatory requirements – – conditions and benefits – – organization reporting and communication structure – – staff development – – performance evaluation criteria

WP ID	WP Name	WP Characteristics
08-09	Installation and maintenance plan	– Identifies impacted site locations – Identifies the required components for the installation with appropriate version information (consideration given to at least the following): – – released software – – type of media – – required maintenance fixes – – support software required (conversion programs, validation routines, associated system interfaces, data base management system) – – required customer documentation – – installation instructions – – required hardware and peripheral equipment – Identifies supporting information or materials required: – – parameter information – – operation and maintenance information – – pre-conversion information, materials or installed equipment – Type of installation (new vs. conversion of existing system, maintenance) – Custody of master and backup copies – Identifies go / no-go decision criteria – Identifies verification process: – – of required tasks to prepare deliverables required – – of components required at site – – of installation procedures – – of pre-installation construction or conversion activities – – of system integration, release builds, etc. – Identifies customer acceptance requirements – Identifies any safety and security requirements
08-10	Software integration test plan	– Purpose of integration defined: – – validation of a subset of the system (all programs required to make a sub-system work, a feature work, etc.) – – validation of the integration of software to other system elements (hardware, support equipment, interfaced system)
08-11	Logistics maintenance plan	– Identifies impacted site locations – Identifies backup and recovery procedures – Identifies customer contacts and technical support personnel – Identifies customer acceptance requirements – Identifies any safety and security requirements

WP ID	WP Name	WP Characteristics
08-12	Project plan	– Defines: – – work products to be developed – – life cycle model and methodology to be used – – customer requirements related to project management – – tasks to be accomplished – – task ownership – – project resources – – schedules, milestones and target dates – – estimates – – quality criteria – Identifies: – – critical dependencies – – required work products – – project risks and risk mitigation plan – – contingency actions for non-completed tasks
08-13	Quality plan	– Objectives / goal for quality – Defines the activities tasks required to ensure quality – References related work products – Method of assessment / assuring quality – References any regulatory requirements, standards, customer requirements – Identifies the expected quality criteria – Specifies the monitoring timeframe and quality checkpoints for the defined life cycle and associated activities planned – Target timeframe to achieve desired quality – Method to achieved goals: – – tasks to be performed – – ownership for tasks – – audit to be performed – – resource commitments – Identifies the quality criteria for work products and process tasks – Specifies the threshold / tolerance level allowed prior to requiring corrective actions – Defines quality measurements and benchmark data – Defines the quality record collection mechanism and timing of the collection – Specifies mechanism to feed collected quality record back into process impacted by poor quality – Approved by the quality responsible organization / function

WP ID	WP Name	WP Characteristics
08-14	Recovery plan	– Identifies what is to be recovered: – – procedures / methods to perform the recovery – – schedule for recovery – – time required for the recovery – – critical dependencies – – resources required for the recovery – – list of backups maintained – – staff responsible for recovery and roles assigned – – special materials required – – required work products – – required equipment – – required documentation – – locations and storage of backups – – procedure for retrieving backup media – – contact information on who to notify about the recovery – – verification procedures – – cost estimation for recovery
08-15	Regression test plan	– Plan for validating that existing systems / features-functions have not been impacted by a change – Plan for validating that change has not impacted working elements of the system (interfaces, operations, etc.) – Plan for validating that change is compatible with existing system requirements (downward compatible) – Identifies the requirements for system element not changed – Identifies what system elements are to be regression tested (i.e., features, functions, interfaces, fixes) – Identifies the changes made – Identifies the regression test cases to be executed – Conditions for execution of regression testing
08-16	Release plan	– Identifies the functionality to be included in each release – Identifies the associated elements required (i.e., hardware, software, documentation etc.) – Mapping of the customer requests, requirements satisfied to particular releases of the product

WP ID	WP Name	WP Characteristics
08-17	Reuse plan	– Defines the policy about what items to be reused – Defines standards for construction of reusable objects: – – defines the attributes of reusable components – – quality / reliability expectations – – standard naming conventions – Defines the reuse repository (library, CASE tool, file, data base, etc.) – Identifies reusable components: – – directory of components – – description of components – – applicability of their use – – method to retrieve and use them – – restrictions for modifications and usage – Method for using reusable components – Establishes goal for reusable components
08-18	Review plan	– Defines: – – what to be reviewed – – roles and responsibilities of reviewers – – criteria for review (check-lists, requirements, standards) – – expected preparation time – – schedule for reviews – Identifies: – – procedures for conducting review – – review inputs and outputs – – expertise expected at each review – – review records to keep – – review measurements to keep – – resources, tools allocated to the review
08-19	Risk management plan	– Project risks identified and prioritized – Mechanism to track the risk – Threshold criteria to identify when corrective action required – Proposed ways to mitigate risks: – – risk mitigator – – work around – – corrective actions activities / tasks – – monitoring criteria – – mechanisms to measure risk – Proposed contingency measures for applicable risks

WP ID	WP Name	WP Characteristics
08-20	Risk mitigation plan	– Planned risk treatment activities and tasks: – – describes the specifics of the risk treatment selected for a risk or combination of risks found to be unacceptable – – describes any difficulties that may be found in implementing the treatment – Treatment schedule – Treatment resources and their allocation – Responsibilities and authority: – – describes who is responsible for ensuring that the treatment is being implemented and their authority – Treatment control measures: – – defines the measures that will be used to evaluate the effectiveness of the risk treatment – Treatment cost – Interfaces among parties involved: – – describes any coordination among stakeholders or with the project's master plan that must occur for the treatment to be properly implemented – Environment / infrastructure: – – describes any environmental or infrastructure requirements or impacts (e.g., safety or security impacts that the treatment may have) – Risk treatment plan change procedures and history
08-21	Software test plan	– Identifies strategy for verifying that features and/or functions operate as defined in the requirements
08-22	System test plan	– Identifies strategy for verifying the integration of system elements as defined in the system architecture specification – Identifies compliance criteria for system requirements – Provides test coverage for all elements of the system: – – software – – hardware – – interfaces – – customer documentation – – installation activities – – initialization – – conversion programs

WP ID	WP Name	WP Characteristics
08-23	Validation test plan	– Identifies the approach to performing the test – Identifies elements to be tested – Identify aggregates and sequence for testing – Identify urgent release – Identifies required system configuration (software, hardware, interface elements) – Identifies the associated development owner for elements to be tested – Identifies associated test scripts / test cases – Sequence ordering of how testing will be executed – Identifies requirements which will be validated by tests (i.e., customer requirements, regulatory requirements and system requirements – Identifies the problem reporting mechanism – Identifies the test tools and resources required (test channels, analyzers, test emulators, etc.) – Identifies the test schedule – Identifies the test completion criteria – Identifies audits to be performed – Official source libraries and versions of hardware / software / product defined
08-24	Training plan	– Defines current staff capabilities – Defines the skills required – Outlines means available to achieve training goals
08-25	Unit test plan	– Identifies strategy for verifying unit functionality and non-functional requirements (i.e., a program, a block, a module, a routine) against the requirements and design – Specifies how requirements will be verified
08-26	Documentation plan	– Identifies documents to be produced – Defines the documentation activities during the life cycle of the software product or service – Identifies any applicable standards and templates – Defines requirements for documents – Review and authorization practices – Document update/review/acceptance time constraints – Distribution of the documents – Maintenance and disposal of the documents
08-27	Problem management plan	– Defines problem resolution activities including identification, recording, description and classification – Problem resolution approach: evaluation and correction of the problem – Defines problem tracking – Any timing constraints – Mechanism to collect and distribute problem resolutions

WP ID	WP Name	WP Characteristics
08-28	Change management plan	– Defines change management activities including identification, recording, description, analysis and implementation – Defines approach to track status of change requests – Defines verification and validation activities – Change approval and implication review
08-29	Improvement plan	– Improvement objectives derived from organizational business goals – Organizational scope – Process scope, the processes to be improved – Key roles and responsibilities – Appropriate milestones, review points and reporting mechanisms – Activities to be performed to keep all those affected by the improvement programme informed of progress
08-30	Verification plan	– Presents how verification activities will be conducted based on the verification strategy.
08-31	Software disposal plan	– Identifies termination of full or partial support after a certain period of time. – Instructs on archiving of the software product and its associated documentation. – Defines transition to the new software product, if applicable. – Defines accessibility of archive copies of data.
09-00	Policy	– Authorized – Available to all personnel impacted by the policy – Establishes practices / rules to be adhered to
09-01	Personnel policy	– Defines recruitment policy – Defines training policy – Defines career opportunities for individuals in the organization – Defines team building strategy – Defines reward and recognition strategy – Defines performance appraisal strategy
09-02	Quality policy	– Established by the top management – Appropriate to the organisation – Aligned to organization's business objectives – Addresses product and process quality goals – Supports the establishment and review of quality objectives – Commitment to comply with requirements – Commitment to improve the effectiveness of the quality management system

WP ID	WP Name	WP Characteristics
09-03	Reuse policy	– Identifies reuse requirements – Establishes the rules of reuse – Documents the reuse adoption strategy including goals and objectives – Identifies the reuse program – Identifies the name of the reuse sponsor – Identifies the reuse program participants – Identifies the reuse steering function – Identifies reuse program support functions
09-04	Supplier selection policy	– Establishes practices / rules to be adhered to: – – to evaluate and select subcontractors on the basis of their ability to meet subcontract requirements – Defines the type and extent of control exercised over suppliers – Establishes the need for, and maintenance requirements of, records associated with supplier selection
09-05	Tailoring guidelines	– Defines guidelines for tailoring the standard process for the product or service
10-00	Process description	– A detailed description of the process / procedure which includes: – – tailoring of the standard process (if applicable) – – purpose of the process – – outcomes of the process – – task and activities to be performed and ordering of tasks – – critical dependencies between task activities – – expected time required to execute task – – input / output work products – – links between input and output work products – Identifies process entry and exit criteria – Identifies internal and external interfaces to the process – Identifies process measures – Identifies quality expectations – Identifies functional roles and responsibilities – Approved by authorised personnel
10-01	Life cycle model	– High level description of activities performed at each life cycle phase – Sequencing of the life cycle phases – Identifies critical life cycle phase dependencies – Identifies required inputs, outputs to each life cycle phase – Identifies the key decision points (milestones) in the model – Identifies the quality control points in the model

WP ID	WP Name	WP Characteristics
10-02	Test procedure	– Identifies: – – test name – – test description – – test completion date – Identifies potential implementation issues – Identifies the person who completed the test procedure – Identifies prerequisites – Identifies procedure steps including the step number, the required action by the tester and the expected results – Used in testing related to: – – software and system installation – – software integration – – software – – system integration – – system

WP ID	WP Name	WP Characteristics
10-03	Customer support procedure	– Defines the availability and coverage support provided: – – hot-line number – – hours of availability – – appropriate expertise – – cost – Defines a schema for classification of customer request and/or problems: – – definition of request type – – definition of priority / severity – – definition of response time expectations, by type and severity – Standards for what information to retain from a customer, such as: – – company and location – – contact information details – – description of the request – – reference to supporting information sent (dumps, files) – – customer system site configuration information (product, release, version, last update) – – impacted system(s) – – impact to operations of existing systems – – criticality of the request – – expected customer response / closure requirements – Definition of customer escalation procedures – Identifies customer support tools available and procedures for using them, such as: – – mechanism used to record customer requests – – status reports – – ability to reproduce customers hardware / software / product environment – – ability to reproduce problems, including available systems – – test emulators – – test scripts – – telecommunication connections – – dump analysis tools
10-04	Quality manual	– Provide consistent information, both internally and externally, about the organization's quality management system – Scope of the quality management system, including details of and justification for any exclusions, – Identifies the documented procedures established for the quality management system, or reference to them – Description of the interaction between the processes of the quality management system

WP ID	WP Name	WP Characteristics
10-05	New process concept	– Potential improvement: – – advances in related hardware products – – new techniques, methodologies, processes, or lifecycle models – – new quality-improvement techniques – – new process development and deployment support tools – Expected benefits, costs, and risks
10-06	Process control limit	– Guideline to determine which issues of process or product are subject to process control – Characteristics of process or products subject to control chart – Selection of an appropriate control chart – Initial control limit – Control chart monitored – Special causes identified and its sources – Validated result after remedial activities of special causes – Control limits re-established – Distribution to relevant stakeholders
11-00	Product	– Is a result / deliverable of the execution of a process, includes services, systems (software and hardware) and processed materials – Has elements that satisfy one or more aspects of a process purpose – May be represented on various media (tangible and intangible)
11-01	Software product	– An aggregate of software items – A set of computer programs, procedures, and possibly associated documentation and data
11-02	Software element	– Combination of software units as defined in software design

WP ID	WP Name	WP Characteristics
11-03	Product release information	– Coverage for key elements (as appropriate to the application): – Description of what is new or changed (including features removed) – System information and requirements – Identifies conversion programs and instructions – Release numbering implementation may include: – – the major release number – – the feature release number – – the defect repair number – – the alpha or beta release; and the iteration within the alpha or beta release – Identifies the component list (version identification included): – – hardware / software / product elements, libraries, etc. – – associated documentation list – New / changed parameter information and/or commands – Backup and recovery information – List of known problems, faults, warning information, etc. – Identifies verification and diagnostic procedures – Technical support information – Copyright and license information – The release note may include an introduction, the environmental requirements, installation procedures, product invocation, new feature identification and a list of defect resolutions, known defects and workarounds
11-04	Product release package	– Includes the hardware / software / product – Includes and associated release elements such as: – – system hardware / software / product elements – – associated customer documentation – – parameter definitions defined – – command language defined – – installation instructions – – release letter
11-05	Software unit	– Follows established coding standards (as appropriate to the language and application) – Follows data definition standards (as appropriate to the language and application): – Entity relationships defined – Data base layouts are defined – File structures and blocking are defined – Data structures are defined – Algorithms are defined – Functional interfaces defined

WP ID	WP Name	WP Characteristics
11-06	System	– All elements of the product release are included – Any required hardware – Integrated product – Customer documentation – Fully configured set of the system elements: – – parameters defined – – commands defined – – data loaded or converted
11-07	Temporary solution	– Problem identification – Release and system information – Temporary solution, target date for actual fix identified – Description of the solution: – – limitations, restriction on usage – – additional operational requirements – – special procedures – – applicable releases – Backup / recovery information – Verification procedures – Temporary installation instructions
11-08	System element	– A discrete part of a system – Implemented to fulfil specified requirements – May include software items, hardware items, manual operations, and other systems, as necessary
12-00	Proposal	– Defines the proposed solution – Identifies the coverage identification of initial proposal: – – the requirements that would be satisfied – – the requirements that could not be satisfied, and provides a justification of variants – Identifies conditions (e.g. time, location) that affect the validity of the proposal – Identifies obligations of the acquirer and the consequences of these not being met – Defines the estimated price of proposed development, product, or service

WP ID	WP Name	WP Characteristics
12-01	Request for proposal	– Reference to the requirements specifications – Identifies supplier selection criteria – Identifies desired characteristics, such as: – – system architecture, configuration requirements or the requirements for service (consultants, maintenance, etc.) – – quality criteria or requirements – – project schedule requirements – – expected delivery / service dates – – cost / price expectations – – regulatory standards / requirements – Identifies submission constraints: – – date for resubmission of the response – – requirements with regard to the format of response
12-02	Retirement request	– Identifies the name of the component / project for retirement – Identifies a basic description – Identifies the proposed date of retirement – Identifies the duration of the life of the component / project – Identifies the person who will approve the retirement
12-03	Reuse proposal	– Identifies the project name – Identifies the project contact – Identifies the reuse goals and objectives – Identifies the list of reuse assets – Identifies the issues / risks of reusing the component including specific requirements (hardware, software, resource and other reuse components) – Identifies the person who will be approving the reuse proposal
12-04	Supplier proposal response	– Defines the suppliers proposed solution – Defines the suppliers proposed delivery schedule – Identifies the coverage identification of initial proposal: – – identifies the requirements that would be satisfied – – identifies the requirements that could not be satisfied, and provides a justification of variants – Defines the estimated price of proposed development, product, or service
12-05	Decision criteria	– Defines objective criteria as a basis for analysis
12-06	Decision alternative	– Defines an alternative course of action
12-07	Decision	– Defines the selected proposal/course of action
13-00	Record	– Work product stating results achieved or provides evidence of activities performed in a process – An item that is part of a set of identifiable and retrievable data

WP ID	WP Name	WP Characteristics
13-01	Acceptance record	– Record of the receipt of the delivery – Identifies the date received – Identifies the delivered components – Records the verification of any customer acceptance criteria defined – Signed by receiving customer
13-03	Back-up / recovery record	– Date of back-up – Listing of what was backed-up with associated versions – Listing of where it was backed-up to – Identifies associated system attributes and configuration at time of back-up – Identifies associated recovery procedures
13-04	Communication record	– All forms of interpersonal communication, including: – – letters – – faxes – – e-mails – – voice recordings – – collaboration and social networking messages
13-05	Contract review record	– Scope of contract and requirements – Possible contingencies or risks – Alignment of the contract with the strategic business plan of the organization – Protection of proprietary information – Requirements which differ from those in the original documentation – Capability to meet contractual requirements – Responsibility for subcontracted work – Terminology – Customer ability to meet contractual obligations.
13-06	Delivery record	– Record of items shipped / delivered electronically to customer – Identifies: – – who it was sent to – – address where delivered – – the date delivered – Record receipt of delivered product

WP ID	WP Name	WP Characteristics
13-07	Problem record	– Identifies the name of submitted and associated contact details – Identifies the group / person(s) responsible for providing a fix – Includes a description of the problem – Identifies classification of the problem (criticality, urgency, relevance etc.) – Identifies the severity of the problem (critical, major, minor) – Identifies the status of the reported problem – Identifies the target release(s) problem will be fixed in – Identifies the date "opened" – Identifies the expected closure date – Identifies any closure criteria – Identifies re-inspection actions – Describes a defect (a non-fulfilment of a requirement related to an intended or specified use) – Identifies system configuration information (such as: release versions, system software, hardware configuration, etc.) – Identifies any associated defect reports, customer requests, duplicate problems, associated fixes – Identifies the components of the product affected – Identifies any associated support information (dumps, files, etc.) – Identifies the applicable software product release and version information
13-08	Installation record	– Record of what was installed – Release and system configuration information recorded – Special site specific information recorded – Identifies any acceptance testing performed – Installation performance information captured: – – number of faults found after the installation or conversion – – time to install – Ability to bring up system after installation conversion – Record of customer approval
13-09	Meeting support record	– Agenda and minutes that are records that define: – – purpose of meeting – – attendees – – date, place held – – reference to previous minutes – – what was accomplished – – identifies issues raised – – any open issues – – next meeting, if any