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AMENDMENT 1
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Information technology — Software life cycle processes

AMENDMENT 1

Technologies de l'information — Processus du cycle de vie du logiciel

AMENDEMENT 1

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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 3.

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 Amendment may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

Amendment 1 to International Standard ISO/IEC 12207:1995 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software engineering*.

Introduction

ISO/IEC 12207 was published on 1 August 1995 and is the first international standard to provide a comprehensive set of life cycle processes, activities and tasks for software that is part of a larger system, stand alone software product, and software services. The standard provides common software process architecture for the acquisition, supply, development, operation and maintenance of software. The standard also provides the necessary supporting processes, activities and tasks, and organizational processes, activities and tasks for managing and improving the processes.

This Amendment provides an interim revision to ISO/IEC 12207 that establishes a co-ordinated set of software process information that can be used for process definition and process assessment and improvement. The Amendment accommodates the requirements of current and developing SC 7 standards and technical reports, notably ISO/IEC 12207 and ISO/IEC/TR 15504, and considers other standards, e.g., ISO/IEC 14598 and ISO/IEC 15939. Experience in using ISO/IEC 12207 as the basis for organizations' software life cycle process and in two-party situations, has resulted in some lessons learned and has provided some valuable inputs to the update process.

During the development of ISO/IEC/TR 15504-2, issues were highlighted in regard to the granularity of the process definition in ISO/IEC 12207, i.e.; it was difficult to derive a process rating component for the purpose of process assessment and improvement. This Amendment resolves this granularity issue and provides process purpose and outcomes to establish a Process Reference Model in accordance with the requirements of ISO/IEC 15504-2. A Process Reference Model provides definitions of processes in a life cycle described in terms of process purpose and outcomes, together with an architecture describing relationships between the processes. A Process Reference Model provides the mechanism whereby externally defined assessment models are related to the assessment framework defined by ISO/IEC 15504.

The current ISO/IEC 12207 process architecture defines the hierarchical relationship among processes, activities and tasks and the invocation rules for the software life cycle processes. Inclusion of a process, an activity, or a task for the Amendment is in accordance and consistent with the existing architecture of ISO/IEC 12207.

Information technology — Software life cycle processes

AMENDMENT 1

Throughout the text:

Change the name of the “Training”process to the “Human Resource”process.

Modify the last sentence of the Foreword to read as follows:

“Annexes A and F form an integral part of this International Standard. Annexes B, C, D, E, G and H are for information only.”

Modify subclause 1.2, paragraph 4, to read as follows:

1.2 Field of Application

This clause does not prevent the use of ISO/IEC 12207 by suppliers or developers of off-the-shelf software.

In subclause 1.4, change “compliance” to read “conformance”.

Add the following text to subclause 1.4:

1.4.1 Conformance to Purposes and Outcomes

Annex F provides an alternative form of conformance useful in situations where implemented processes are intended to achieve the same goals of those described in this standard, but which may not implement the detailed provisions prescribed in the body of this standard. To claim conformance, it shall be demonstrated that, for any process from the set of processes declared by the organization, implementation of the processes results in the realization of the corresponding Purpose and Outcomes provided in Annex F. Any organization shall define the set of processes applicable for it, taking into account the proposed set of processes described in Annex F and its own environmental parameters. Application of the standard allows the creation of additional outcomes.

NOTE In ISO/IEC 12207:1995, the term “compliance”is used in clause 1.4, however, in accordance with ISO/IEC Guide 2, *Standardization and Related Activities — General Vocabulary*, conformance is the appropriate term for this clause. Conformance is the fulfilment by a product, process or service of specified requirements.

Modify subclause 1.5, paragraph 6, to read as follows:

1.5 Limitations

In this International Standard, there are a number of lists for tasks; none of these is presumed to be exhaustive — they are intended as examples unless introduced by a clause containing a “shall”or a “will.”

Add the following reference to clause 2:

ISO/IEC 15504-2, *Software Engineering — Software process assessment — Part 2: Performing an assessment*

Add the following definitions to clause 3:

3.38 Process Purpose: The high level objective of performing the process and the likely outcomes of effective implementation of the process. The implementation of the process should provide tangible benefits to the stakeholders.

3.39 Process Outcome: an observable result of the successful achievement of the process purpose.

NOTE An outcome statement describes one of the following:

- Production of an artefact;
- A significant change in state;
- Meeting of specified constraints, e.g., requirements, goals, etc.

NOTE A list of the principal process outcomes forms part of the description of each process in the reference model.

Add the following subclause to clause 4:

4.2 Relationship of Annex F to the main text of this International Standard

Annex F defines a Process Reference Model (PRM) at a level of abstraction higher than that of the detailed requirements contained in the main text of this International Standard. The PRM is applicable to an organization that is assessing its processes in order to determine the capability of these processes. The Purpose and Outcomes provided in Annex F are a statement of the goals of the performance of each process. This statement of goals permits assessment of the effectiveness of the processes in ways other than simple conformity evaluation. For example, novel process definitions can be evaluated against the statements of Purpose and Outcomes in Annex F rather than against the detailed provisions in the main text of this International Standard.

NOTES

1) The term “process reference model”is used with the same meaning as the planned revision of ISO/IEC 15504-2.

2) The PRM is intended to be used to develop assessment model(s) for assessing processes using ISO/IEC 15504-2

3) The processes described in Annex F contain extensions, elaborations and some new processes where there is no corresponding development of activities and tasks in ISO/IEC 12207:1995. This will be rectified during the full revision of ISO/IEC 12207:1995. In the meantime, new subclauses 6.9, 7.1.6 and 7.4 to 7.7 provide activities and tasks for the “new”processes of Annex F.

Add the following text to subclause 5.1.1.5:

The acquirer may use Requirements Elicitation sub-process described in Annex F to establish the customer requirements.

Modify subclause 5.1.3.5, sentence 2, as follows:

Subclause 5.1.3.5, “Shall” should be changed to “will”

Add the following text to subclause 5.3.1.2, list item e):

e) Establish baselines for each configuration item at appropriate times, as determined by the acquirer and the supplier.

Delete sentence 2 of subclause 5.3.4.3.

Delete subclause 5.3.9.5.b.

Delete subclause 5.3.11.4.b.

Add the following text as a second paragraph to the preamble of subclause 6.1:

Execution of this process by an organization results in the establishment of internal documentation standards (such as standards for program management plan and software design document) in a suitable media. The terms used in this process need to be interpreted accordingly for a given media or domain.

Modify line 2 of the preamble of subclause 6.2 as follows:

"Baseline" should be deleted. The resulting sentence should read as follows:

The Configuration Management Process is a process of applying administrative and technical procedures to support the software life cycle to: identify and define software items in a system; control modifications and releases of the items; record and report the status of the items and modification requests; ensure the completeness, consistency, and correctness of the items, and control storage, handling, and delivery of the items.

Replace subclause 6.3.4.1 with the following:

Additional quality management activities can be assured in accordance with the clauses of ISO 9001.

Add the following note to subclause 6.5.2:

NOTE Other means besides testing (such as, analysis, modelling, simulation, etc.) may be employed for validation.

Replace list item e) in subclause 6.6.3.1 with the following:

e) They are ready for the next planned activity.

Add the following references to annex D:

IEEE Std 1517 — 1999, *IEEE Standard for Information Technology — Software Life Cycle Processes — Reuse Processes*

ISO 9000-3, *Quality management and quality assurance standards -- Part 3: Guidelines for the application of ISO 9001:1994 to the development, supply, installation and maintenance of computer software*

ISO 9000: 2000, *Quality management systems — Concepts and vocabulary*

ISO 9001: 2000, *Quality management systems — Requirements*

ISO 9004: 2000, *Quality management systems — Guidance for performance improvement*

ISO/IEC 9126:1991, *Software Product Evaluation — Quality Characteristics and Guidelines for their Use*

ISO 13407:1999, *Ergonomics — Ergonomics of human-system interaction — Human-centred design process for interactive systems*

ISO/IEC 14598:1998, *Software Engineering — Product Evaluation*

ISO/IEC/TR 15504:(all parts), *Information technology — Software process assessment*

ISO/IEC 15504-1, (to be published) *Software Engineering — Software process assessment — Part 1: Concepts and Vocabulary*

ISO/TR 18529, *Ergonomics — Ergonomics of human-system interaction — Human-centred lifecycle process descriptions*

ISO/IEC 15939 *Software Engineering — Software process measurement*

Add the following annexes E, F, G and H:

Annex E
(informative)

Relationship to ISO 12207:1995

E.1 Relationship of Purpose and Outcomes to ISO/IEC 12207:1995

ISO/IEC 12207:1995 documents the set of software engineering processes that are fundamental to good software engineering and cover best practices. The Processes of the Life Cycle are described in Annex F in terms of the achievement of defined Purposes and Outcomes; these descriptions constitute a reference model, which describes processes that an organization can use to acquire, supply, develop, operate and maintain software. The reference model is also used to provide a common basis for different models and methods for software process assessment, ensuring that the results of the assessments can be reported in a common context. The substantive part of ISO/IEC 12207:1995 sets out the activities and tasks required to implement the high level life cycle processes to achieve desirable capability for acquirers, suppliers, developers, maintainers and operators of systems containing software.

Annex F groups the Purposes and Outcomes into the three life cycle process categories of ISO/IEC 12207:1995, i.e., Organizational, Primary and Supporting. Within each of the process categories are descriptions in terms of a purpose statement, which comprise unique functional objectives when instantiated in a particular environment. The purpose statement includes additional material identifying the outcomes of successful implementation.

Annex F does not define how, or in what order, the elements of the purpose statements are to be achieved. The outcomes will be achieved in an organization through various detailed practices being carried out to produce work products. These performed practices, and the characteristics of the work products produced, are indicators that demonstrate whether the specific purpose is being achieved.

The structure of Annex F and its relationship to the existing International Standard, ISO/IEC 12207:1995, is depicted in Table E-1. For those Purpose and Outcomes that are an “new” to ISO/IEC 12207:1995, descriptions of their activities and/or tasks are provided in new subclauses 6.9, 7.1.6 and 7.4 to 7.7. The activity and task descriptions provided in these new subclauses are in accordance with process structure of ISO/IEC 12207:1995.

E.2 Purpose and Outcomes

The Purpose and Outcomes in Annex F are at the appropriate process, activity or task level to align with the process structure of ISO/IEC 12207. The definition of purpose and outcomes is provided in clause 1.1.2 of this Amendment.

E.3 Process Type

Table E-1 provides a detailed mapping of the content of Annex F to the existing International Standard, ISO/IEC 12207:1995, the source of the information, the structure of the content and the content type. The process structure relationship of Annex F to ISO/IEC 12207 :1995 is defined by process type as follows:

- Basic — These processes and sub-processes are identical to the processes and activities of ISO/IEC 12207:1995.
- New — These processes and sub-processes are an expansion to the process definition of ISO/IEC 12207:1995.
- Extended — These processes and sub-processes are elaborations of the existing processes and activities of ISO/IEC 12207:1995.
- Component — These are groupings of existing activities of ISO/IEC 12207:1995.

Table E.1 — Correlation of ISO/IEC 12207:1995 to Annex F

12207	12207 Processes & activities	Annex F Source	Annex F Process Structure	Process Type
5.	*Primary life cycle processes*			
5.1	Acquisition process	ISO/IEC 12207	Acquisition process	basic
		ISO/IEC/TR 15504-2	Acquisition preparation	component
		ISO/IEC/TR 15504-2	Supplier selection	component
		ISO/IEC/TR 15504-2	Supplier monitoring	component
		ISO/IEC/TR 15504-2	Customer acceptance	component
5.2	Supply process	ISO/IEC 12207	Supply process	basic
5.3	Development process	ISO/IEC 12207	Development process	basic
5.3.1	Process implementation			
		ISO/IEC/TR 15504-2	Requirements elicitation	extended
5.3.2	System requirements analysis	ISO/IEC 12207	System requirements analysis	basic
5.3.3	System architectural design	ISO/IEC 12207	System architectural design	basic
5.3.4	Software requirements analysis	ISO/IEC 12207	Software requirements analysis	basic
5.3.5	Software architectural design	ISO/IEC/TR 15504-2	Software design	component
5.3.6	Software detailed design	ISO/IEC/TR 15504-2	Software design	component
5.3.7	Software coding and testing	ISO/IEC/TR 15504-2	Software construction	component
5.3.8	Software integration	ISO/IEC 12207	Software integration	basic
5.3.9	Software qualification testing	ISO/IEC/TR 15504-2	Software testing	component
5.3.10	System integration	ISO/IEC/TR 15504-2	System integration	component
5.3.11	System qualification testing	ISO/IEC/TR 15504-2	System testing	component
5.3.12	Software installation	ISO/IEC 12207	Software installation	basic
5.3.13	Software acceptance support	ISO/IEC 12207	Supply process	basic
5.4	Operation process	ISO/IEC 12207	Operation process	basic
		ISO/IEC/TR 15504-2	Operational use	extended
		ISO/IEC/TR 15504-2	Customer support	extended
5.5	Maintenance process	ISO/IEC 12207	Maintenance process	basic
6.	*Supporting life cycle processes*			
6.1	Documentation process	ISO/IEC 12207	Documentation process	basic
6.2	Configuration management process	ISO/IEC 12207	Configuration management process	basic
6.3	Quality assurance process	ISO/IEC 12207	Quality assurance process	basic
6.4	Verification process	ISO/IEC 12207	Verification process	basic
6.5	Validation process	ISO/IEC 12207	Validation process	basic
6.6	Joint review process	ISO/IEC 12207	Joint review process	basic
6.7	Audit process	ISO/IEC 12207	Audit process	basic
6.8	Problem resolution process	ISO/IEC12207	Problem resolution process	basic
		ISO 13407	Usability process	new
		ISO/IEC 14598	Product evaluation process	extended

Table E.1 — *(continued)*

12207	12207 Processes & activities	Annex F Source	Annex F Process Structure	Process Type
7.	*Organizational life cycle processes*			
7.1	Management process	ISO/IEC 12207	Management process	basic
		ISO/IEC/TR 15504-2	Organizational alignment	extended
		ISO/IEC 12207	Organizational management	basic
		ISO/IEC/TR 15504-2	Project management	extended
		ISO/IEC/TR 15504-2	Quality Management	extended
		ISO/IEC/TR 15504-2	Risk Management	extended
		ISO/IEC 15939	Measurement	new
7.2	Infrastructure process	ISO/IEC 12207	Infrastructure process	basic
7.3	Improvement process	ISO/IEC 12207	Improvement process	basic
7.3.1	Process establishment	ISO/IEC/TR 15504-2	Process establishment	component
7.3.2	Process assessment	ISO/IEC/TR 15504-2	Process assessment	component
7.3.3	Process improvement	ISO/IEC/TR 15504-2	Process improvement	component
7.4	Training process	ISO/IEC/TR 15504-2	Human Resource process	new
		ISO/IEC/TR 15504-2	Human resource management	new
		ISO/IEC 12207	Training	basic
			Knowledge management	new
7.5		IEEE 1517	Asset management process	new
7.6		IEEE 1517	Reuse program management process	new
7.7		IEEE 1517	Domain engineering process	new

Annex F
(normative)

Purpose and Outcomes

Annex F provides a process reference model that is characterized in terms of process purposes and outcomes, together with an architecture describing the relationships between processes, that describe the expected results from the implementation of this Annex by an organization or a project. The process reference model is applicable to an organization that is assessing processes needed for business success and the subsequent continuous improvement of these processes.

The process model does not represent a particular process implementation approach nor does it prescribe a system/software life cycle model, methodology or technique. Instead the reference model is intended to be tailored by an organization based on its business needs and application domain. The organization's defined process is adopted by the organization's projects in the context of the customer requirements.

The reference model's purpose and outcomes are indicators that demonstrate whether the organization's processes are being achieved. These indicators are useful to process assessors to determine the capability of the organization's implemented process and to provide source material to plan organizational process improvement. The reference model is strongly aligned with ISO/IEC 12207:1995, provides detailed process expectations and includes additional processes determined as essential to enable a reliable and repeatable assessments of software organizations.

NOTE Copyright release: Users may freely reproduce the detailed descriptions of process purpose and outcomes in this annex as part of any Assessment Model based upon the Process Reference Model, or as part of any demonstration of compatibility with the Process Reference Model, so that it can be used for its intended purpose.

F.1 Primary Life Cycle Processes

F.1.1 Acquisition Process

Purpose:

The purpose of the Acquisition Process is to obtain the product and/or service that satisfies the need expressed by the customer. The process begins with the identification of a customer need and ends with the acceptance of the product and/or service needed by the customer.

NOTE Annex H provides an extension of the acquisition process that may be used in lieu of the acquisition process provided in Annex F.

Outcomes:

As a result of successful implementation of the *Acquisition Process* :

1) acquisition needs, goals, product and/or service acceptance criteria and acquisition strategies are defined;
2) an agreement is developed that clearly expresses the expectation, responsibilities and liabilities of both the customer and the supplier;
3) a product and/or service is acquired that satisfies the customer's stated need;
4) the acquisition is monitored so that specified constraints such as cost, schedule and quality are met;
5) supplier deliverables are accepted;
6) any identified open items have a satisfactory conclusion as agreed to by the customer and the supplier.

NOTE Numbering of outcomes is for identification only and does not imply priority or sequence.

The *Acquisition Process* includes purposes and outcomes for the following sub-processes:

- Acquisition Preparation
- Supplier Selection
- Supplier Monitoring
- Customer Acceptance

F.1.1.1 Acquisition preparation

Purpose:

The purpose of *Acquisition preparation* is to establish the needs and goals of the acquisition and to communicate these with the potential suppliers.

Outcomes:

As a result of successful implementation of *Acquisition preparation*:

1) the concept or the need for the acquisition, development, or enhancement is established;

2) the needed acquisition requirements defining the project needs are defined and validated;

3) the customer's known requirements are defined and validated;

4) an acquisition strategy is developed; and

5) supplier selection criteria are defined.

F.1.1.2 Supplier selection

Purpose:

The purpose of *Supplier selection* is to choose the organization that is to be responsible for the delivery of the requirements of the project.

Outcomes:

As a result of successful implementation of *Supplier selection*:

1) the supplier selection criteria are established and used to evaluate potential suppliers;

2) the supplier is selected based upon the evaluation of the supplier's proposals, process capabilities, and other factors; and

3) an agreement is established and negotiated between the customer and the supplier.

F.1.1.3 Supplier monitoring

Purpose:

The purpose of *Supplier monitoring* is to track and assess performance of the supplier against agreed requirements.

Outcomes:

As a result of successful implementation of *Supplier monitoring*:

1) joint activities between the customer and the supplier are performed as needed;

2) information on technical progress is exchanged regularly with the supplier;

3) performance of the supplier is monitored against the agreed requirements; and

4) agreement changes, if needed, are negotiated between the acquirer and the supplier and documented in the agreement.

F.1.1.4 Customer acceptance

Purpose:

The purpose of *Customer acceptance* is to approve the supplier's deliverable when all acceptance criteria are satisfied.

Outcomes:

As a result of successful implementation of *Customer acceptance*:

1) the delivered software product and/or service are evaluated with regard to the agreement

2) the customer's acceptance is based on the agreed acceptance criteria; and

3) the software product and/or service is accepted by the customer.

F.1.2 Supply Process

Purpose:

The purpose of the *Supply process* is to provide a product or service to the customer that meets the agreed requirements.

Outcomes:

As a result of successful implementation of the *Supply process*:

1) a response to customer's request is produced;

2) an agreement is established between the customer and the supplier for developing, maintaining, operating, packaging, delivering, and installing the product and/or service;

3) a product and/or service that meets the agreed requirements are developed by the supplier; and

4) the product and/or service is delivered to the customer in accordance with the agreed requirements.

F.1.3 Development Process

Purpose:

The purpose of the *Development Process* is to transform a set of requirements into a software product or software-based system that meets the customer's stated needs. The activities of the Development Process are composed for Systems Developer role and Software Developer role.

Outcomes:

As a result of the successful implementation of the *Development Process* :

1) requirements for the development of software are gathered and agreed;

2) a software product or software-based system is developed;

3) intermediate work products are developed that demonstrate that the end product is based upon the requirements;

4) consistency is established between the products of the development process;

5) system quality factors are optimized against system requirements, e.g., speed, development cost, usability, etc.;

6) evidence (for example, testing evidence) is provided that demonstrates that the end product meets the requirements; and

7) the end product is installed in accordance with the agreed requirements.

The *Development Process* includes purposes and outcomes for the following sub-processes:

- Requirements Elicitation
- System Requirements Analysis
- System Architecture Design
- Software Requirements Analysis
- Software Design
- Software Construction (Code and Unit Test)
- Software Integration
- Software Testing
- System Integration
- System Testing
- Software Installation

F.1.3.1 Requirements elicitation

Purpose:

The purpose of R*equirements elicitation* is to gather, process, and track evolving customer needs and requirements throughout the life of the product and/or service so as to establish a requirements baseline that serves as the basis for defining the needed work products. *Requirements elicitation* may be performed by the acquirer or the developer of the system.

Outcomes:

As a result of successful implementation of *Requirements elicitation:*

1) continuing communication with the customer is established;

2) agreed customer requirements are defined and baselined;

3) a change mechanism is established to evaluate and incorporate changes to customer requirements into the baselined requirements based on changing customer needs;

4) a mechanism is established for continuous monitoring of customer needs;

5) a mechanism is established for ensuring that customers can easily determine the status and disposition of their requests; and

6) enhancements arising from changing technology and customer needs are identified and there impact managed.

F.1.3.2 System requirements analysis

Purpose:

The purpose of *System requirements analysis* is to transform the defined stakeholder requirements into a set of desired system technical requirements that will guide the design of the system.

Outcomes:

As a result of successful implementation of *System requirements analysis*:

1) a defined set of system functional and non-functional requirements describing the problem to be solved are established;

2) the appropriate techniques are performed to optimize the preferred project solution;

3) system requirements are analyzed for correctness and testability;

4) the impact of the system requirements on the operating environment are understood;

5) the requirements are priortized, approved and updated as needed;

6) consistency and traceability is established between the system requirements and the customer's requirements baseline;

7) changes to the baseline are evaluated for cost, schedule and technical impact; and

8) the system requirements are communicated to all affected parties and baselined.

F.1.3.3 System architectural design

Purpose:

The purpose of *System architectural design* is to identify which system requirements should be allocated to which elements of the system.

Outcomes:

As a result of successful implementation of *System architectural design*:

1) a system architecture design is defined that identifies the elements of the system and meets the defined requirements;

2) the system's functional and non-functional requirements are addressed;

3) the requirements are allocated to the elements of the system;

4) internal and external interfaces of each system element are defined;

5) verification between the system requirements and the system architecture is performed;

6) the requirements allocated to the system elements and their interfaces are traceable to the customer's requirements baseline;

7) consistency and traceability between the system requirements and system architecture design is maintained; and

8) the system requirements, the system architecture design, and their relationships are baselined and communicated to all affected parties.

F.1.3.4 Software requirements analysis

Purpose:

The purpose of *Software requirements analysis* is to establish the requirements of the software elements of the system.

Outcomes:

As a result of successful implementation of *Software requirements analysis*:

1) the requirements allocated to the software elements of the system and their interfaces are defined;

2) software requirements are analyzed for correctness and testability;

3) the impact of software requirements on the operating environment are understood;

4) consistency and traceability are established between the software requirements and system requirements;

5) prioritization for implementing the software requirements is defined;

6) the software requirements are approved and updated as needed;

7) changes to the software requirements are evaluated for cost, schedule and technical impact; and

8) the software requirements are baselined and communicated to all affected parties.

F.1.3.5 Software design

Purpose:

The purpose of *Software design* is to provide a design for the software that implements and can be verified against the requirements.

Outcomes:

As a result of successful implementation of *Software design*:

1) a software architectural design is developed and baselined that describes the software elements that will implement the software requirements;

2) internal and external interfaces of each software elements are defined;

3) a detailed design is developed that describes software units that can be built and tested; and

4) consistency and traceability are established between software requirements and software design.

F.1.3.6 Software construction

Purpose:

The purpose of *Software construction* is to produce executable software units that properly reflect the software design.

Outcomes:

As a result of successful implementation of *Software construction*:

1) verification criteria are defined for all software units against their requirements;

2) software units defined by the design are produced;

3) consistency and traceability are established between software requirements and design and software units; and

4) verification of the software units against the requirements and the design is accomplished.

F.1.3.7 Software integration

Purpose:

The purpose of *Software integration* 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.

Outcomes:

As a result of successful implementation of *Software integration*:

1) an integration strategy is developed for software units consistent with the software design and the prioritized software requirements;

2) verification criteria for software items are developed that ensure compliance with the software requirements allocated to the items;

3) software items are verified using the defined criteria;

4) software items defined by the integration strategy are produced;

5) results of integration testing are recorded;

6) consistency and traceability are established between software design and software items; and

7) 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.

F.1.3.8 Software testing

Purpose:

The purpose of *Software testing* is to confirm that the integrated software product meets its defined requirements.

Outcomes:

As a result of successful implementation of *Software testing*:

1) criteria for the integrated software is developed that demonstrates compliance with the software requirements;

2) integrated software is verified using the defined criteria;

3) test results are recorded; and

4) a regression strategy is developed and applied for re-testing the integrated software when a change in software items is made.

F.1.3.9 System integration

Purpose:

The purpose of *System integration* 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.

Outcomes:

As a result of successful implementation of *System integration*:

1) a strategy is developed to integrate the system according to the priorities of the system requirements;

2) criteria is developed to verify compliance with the system requirements allocated to the system elements, including the interfaces between system elements;

3) the system integration is verified using the defined criteria;

4) a regression strategy is developed and applied for re-testing the system when changes are made;

5) consistency and traceability are established between the system design and the integrated system elements; and

6) an integrated system, demonstrating compliance with the system design and validation that a complete set of useable deliverable system elements exists, is constructed.

F.1.3.10 System testing

Purpose:

The purpose of *Systems testing* is to ensure that the implementation of each system requirement is tested for compliance and that the system is ready for delivery.

Outcomes:

As a result of successful implementation of *System testing* :

1) criteria for the integrated system is developed that demonstrates compliance with system requirements;

2) the integrated system is verified using the defined criteria;

3) test results are recorded; and

4) a regression strategy is developed and applied for re-testing the integrated system should a change be made to existing system elements.

F.1.3.11 Software Installation

Purpose:

The purpose of *Software installation* is to install the software product that meets the agreed requirements in the target environment.

Outcomes:

As a result of successful implementation *Software installation*:

1) a software installation strategy is developed;

2) criteria for software installation is developed that demonstrates compliance with the software installation requirements;

3) the software product is installed in the target environment; and

4) assure that the software product is ready for use in its intended environment.

F.1.4 Operation Process

Purpose:

The purpose of the *Operation Process* is to operate the software product in its intended environment and to provide support to the customers of the software product.

Outcomes:

As a result of the successful implementation of the *Operation Process*:

1) conditions for correct operation of the software in its intended environment are identified and evaluated;

2) the software is operated in its intended environment; and

3) assistance and consultation is provided to the customers of the software product in accordance with the agreement.

The *Operation Process* includes purpose and outcomes for the following sub-processes:

- Operational Use
- Customer Support

F.1.4.1 Operational use

Purpose:

The purpose of *Operational use* is to ensure the correct and efficient operation of the product for the duration of its intended usage and in its installed environment.

Outcomes:

As a result of successful implementation of *Operational use*:

1) operational risks for the product introduction and operation are identified and monitored;

2) the product is operated in its intended environment according to requirements; and

3) criteria for the operational use are developed that demonstrates compliance with the agreed requirements.

F.1.4.2 Customer support

Purpose:

The purpose of *Customer support* is to establish and maintain an acceptable level of service through assistance and consultation to the customer to support effective use of the product.

Outcomes:

As a result of successful implementation of *Customer support*:

1) service needs for customer support are identified and monitored on an ongoing basis;

2) customer satisfaction with both the support services being provided and the product itself is evaluated on an ongoing basis;

3) operational support is provided by handling customer inquiries and requests and resolving operational problems; and

4) customer support needs are met through delivery of appropriate services.

F.1.5 Maintenance Process

Purpose:

The purpose of the *Maintenance process* is to modify a system/software product after delivery to correct faults, improve performance or other attributes, or to adapt to a changed environment.

NOTE The objective is to modify and/or retire existing system/software products while preserving the integrity of organizational operations.

Outcomes:

As a result of successful implementation of the process:

1) a maintenance strategy is developed to manage modification, migration and retirement of products according to the release strategy;

2) the impact of changes to the existing system on organization, operations or interfaces are identified;

3) affected system/software documentation is updated as needed;

4) modified products are developed with associated tests that demonstrate that requirements are not compromised;

5) product upgrades are migrated to the customer's environment;

6) on request, products are retired from use in a controlled manner that minimizes disturbance to the customers; and

7) the system/software modification is communicated to all affected parties.

F.2 Supporting Life Cycle Processes

F.2.1 Documentation Process

Purpose:

The purpose of the *Documentation process* is to develop and maintain the recorded software information produced by a process.

Outcomes:

As a result of successful implementation of the *Documentation process*:

1) a strategy identifying the documentation to be produced during the life cycle of the software product or service is developed;

2) the standards to be applied for the development of the software documentation are identified;

3) documentation to be produced by the process or project is identified;

4) the content and purpose of all documentation is specified, reviewed and approved;

5) documentation is developed and made available in accordance with identified standards; and

6) documentation is maintained in accordance with defined criteria.

F.2.2 Configuration Management Process

Purpose:

The purpose of the *Configuration management process* is to establish and maintain the integrity of all the work products of a process or project and make them available to concerned parties.

Outcomes:

As a result of successful implementation of the *Configuration management process*:

1) a configuration management strategy is developed;

2) all items generated by the process or project are identified, defined and baselined;

3) modifications and releases of the items are controlled;

4) modifications and releases are made available to concerned parties;

5) the status of the items and modification requests are recorded and reported;

6) the completeness and consistency of the items is ensured; and

7) storage, handling and delivery of the items are controlled.

F.2.3 Quality Assurance Process

Purpose:

The purpose of the *Quality assurance process* is to provide assurance that work products and processes comply with predefined provisions and plans.

Outcomes:

As a result of successful implementation of the *Quality assurance process*:

1) a strategy for conducting quality assurance is developed;

2) evidence of quality assurance is produced and maintained;

3) problems and/or non-conformance with agreement requirements are identified and recorded; and

4) adherence of products, processes and activities to the applicable standards, procedures and requirements are verified.

F.2.4 Verification Process

Purpose:

The purpose of the *Verification process* is to confirm that each software work product and/or service of a process or project properly reflects the specified requirements.

Outcomes:

As a result of successful implementation of the *Verification process*:

1) a verification strategy is developed and implemented;

2) criteria for verification of all required software work products is identified;

3) required verification activities are performed;

4) defects are identified and recorded; and

5) results of the verification activities are made available to the customer and other involved parties.

F.2.5 Validation Process

Purpose:

The purpose of the *Validation process* is to confirm that the requirements for a specific intended use of the software work product are fulfilled.

Outcomes:

As a result of successful implementation of the *Validation process*:

1) a validation strategy is developed and implemented;

2) criteria for validation of all required work products is identified;

3) required validation activities are performed;

4) problems are identified and recorded;

5) evidence is provided that the software work products as developed are suitable for their intended use; and

6) results of the validation activities are made available to the customer and other involved parties.

F.2.6 Joint Review Process

Purpose:

The purpose of the *Joint 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. Joint reviews are at both project management and technical levels and are held throughout the life of the project.

Outcomes:

As a result of successful implementation of the *Joint review process*:

1) management and technical reviews are held based on the needs of the project;

2) the status and products of an activity of a process are evaluated through joint review activities between the stakeholders;

3) review results are made known to all affected parties;

4) action items resulting from reviews are tracked to closure; and

5) problems are identified and recorded.

F.2.7 Audit Process

Purpose:

The purpose of the *Audit process* is to independently determine compliance of selected products and processes with the requirements, plans and agreement, as appropriate.

Outcomes:

As a result of successful implementation of the *Audit process*:

1) an audit strategy is developed and implemented;

2) compliance of selected software work products and/or services or processes with requirements, plans and agreement is determined according to the audit strategy;

3) the conduct of audits by an appropriate independent party are performed; and

4) problems detected during an audit are identified and communicated to those responsible for corrective action, and resolution.

F.2.8 Problem Resolution Process

Purpose:

The purpose of the *Problem resolution process* is to ensure that all discovered problems are analyzed and resolved and that trends are recognized.

Outcomes:

As a result of successful implementation of the *Problem resolution process*:

1) problem resolution strategy is developed and implemented to ensure that all discovered problems are analyzed and resolved;

2) problem reports are prepared upon detection of problems (including non-conformances) in a software product or activity;

3) acceptable solutions to recorded problems are identified and acted on; and

4) a mechanism is provided for recognizing root cause, implementing defect prevention, and acting on trends in problems identified.

F.2.9 Usability process

Purpose:

The purpose of the *Usability process* is to ensure the consideration of the interests and needs stakeholders in order to enable optimizing support and training, increased productivity and quality of work, improved human working conditions and reducing the chance of user rejection of the system.

Outcomes:

As a result of successful implementation of the *Usability process*:

1) the system meets the needs of users and takes account of their human capabilities and skill limitations;

2) human factors and ergonomics knowledge and techniques are incorporated in systems design;

3) human-centred design activities are identified and performed;

4) system design will address possible adverse effects of use on human health, safety and performance; and

5) systems will have enhanced user effectiveness, efficiency and satisfaction.

F.2.10 Product Evaluation Process

Purpose:

The purpose of the *Product evaluation process* is to ensure through systematic examination and measurement that a product meets the stated and implied needs of the users of that product.

Outcomes:

As a result of successful implementation of this *Product evaluation process*:

1) the requirements for evaluation are established;

2) the criteria for product evaluation is identified;

3) the methods to be employed for evaluation are defined and the activities needed are identified and performed;

4) measures are collected and the results assessed against defined criteria; and

5) results of the product evaluation activities are made available to the interested parties.

NOTE Requirements for performing product evaluations are found in ISO/IEC 14598, Software product evaluation. Evaluations may be performed by the Acquirer, the Developer, or a third party Evaluator.

F.3 Organizational Life Cycle Processes

F.3.1 Management Process

Purpose:

The purpose of the *Management process* is to organize, monitor, and control the initiation and performance of any processes to achieve their goals in accord with the business goals of the organization. The *Management process* is established by an organization to ensure the consistent application of practices for use by the organization and the projects. While these practices are inherent to the management of an organization, they are intended to be instantiated for use by each of the organization's projects.

Outcomes:

As a result of successful implementation of the *Management process*:

1) the scope of the activity, process to be managed is defined;

2) the activities and tasks that must be performed to achieve the purpose of the process are identified;

3) the feasibility of achieving process goals with available resources and constraints is evaluated;

4) the resources and infrastructure required to perform the identified activities and tasks are established;

5) activities are identified and tasks are implemented;

6) performance of the defined activities and tasks are monitored;

7) work products resulting from the process activities are reviewed and results analyzed and evaluated;

8) action is taken to modify the performance of the process when performance deviates from the identified activities and tasks or fails to achieve their goals; and

9) successful achievement of the purpose of the process is demonstrated.

The Management Process includes purposes and outcomes for the following sub-processes:

- Organizational Alignment
- Organization Management
- Project Management
- Quality Management
- Risk Management
- Measurement

F.3.1.1 Organizational alignment

Purpose:

The purpose of Organizational alignment is to enable the software processes needed by the organization to provided software products and services, to be consistent with its business goals.

Outcomes:

As a result of the successful implementation of *Organizational alignment*:

1) the Organization's business goals are identified

2) the process framework is identified and defined that include a set of software processes needed to achieve the business goals of the organization

3) a strategy is defined for process definition, implementation and improvement

4) support is provided to enable this strategy

5) the organization's mission, core values, vision, goals and objectives is made known to all employees;

6) individuals in the organization share a common vision, culture, and understanding of the business goals to empower them to function effectively

7) everyone in the organization understands their role in achieving the goals of the business and is able to perform that role

F.3.1.2 Organization Management

Purpose:

The purpose *Organization management* 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.

Outcomes:

As a result of the successful implementation of *Organization management*:

1) the organization will invest in the appropriate management infrastructure;

2) the best practices are identified to support the implementation of effective organization and project management; and

3) provide a basis for evaluating the achievement of organization business goals based on these management practices.

F.3.1.3 Project management

Purpose:

The purpose of *Project management* is to identify, establish, co-ordinate, and monitor the activities, tasks, and resources necessary for a project to produce a product and/or service, in the context of the project's requirements and constraints.

Outcomes:

As a result of successful implementation of *Project management*:

1) the scope of the work for the project is defined;

2) the feasibility of achieving the goals of the project with available resources and constraints are evaluated;

3) the tasks and resources necessary to complete the work are sized and estimated;

4) interfaces between elements in the project, and with other project and organizational units, are identified and monitored;

5) plans for the execution of the project are developed and implemented;

6) progress of the project is monitored and reported; and

7) 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.

F.3.1.4 Quality management

Purpose:

The purpose of *Quality management* is to achieve customer satisfaction by monitoring the quality of the products and services, at the organizational and project level, to ensure they meet customer requirements.

Outcomes:

As a result of successful implementation of *Quality management*:

1) quality goals based on the customer's stated and implicit quality requirements are established;

2) an overall strategy is developed to achieve the defined goals;

3) a quality management system is established to implement the strategy;

4) identified quality control and assurance activities is performed and their performance confirmed;

5) actual performance against the quality goals is monitored; and

6) appropriate action is taken when quality goals are not achieved.

F.3.1.5 Risk management

Purpose:

The purpose of *Risk management* is to identify, manage and mitigate the risks continuously, at both the organizational and project level.

Outcomes:

As a result of successful implementation of *Risk management*:

1) the scope of the risk management to be performed is determined;

2) appropriate risk management strategies are defined and implemented;

3) risks to the project are identified in the project's risk management strategy, and as they develop during the conduct of the project;

4) the risks are analyzed and the priority in which to apply resources to monitor these risks are determined;

5) risk monitoring techniques are selected to determine the change in the risk status and the progress of the monitoring activities; and

6) appropriate action is taken to correct or avoid the impact of risk.

F.3.1.6 Measurement

Purpose:

The purpose of *Measurement* is to collect and analyze data relating to the products developed and processes implemented within the organization and its projects, to support effective management of the processes and to objectively demonstrate the quality of the products.

Outcomes:

As a result of successful implementation of *Measurement*:

1) organizational commitment is established and sustained to implement the measurement process;

2) the measurement information needs of organizational and management processes are identified;

3) an appropriate set of measures, driven by the information needs are identified and/or developed;

4) measurement activities are identified and performed;

5) the required data is collected, stored, analyzed, and the results interpreted;

6) information products are used to support decisions and provide an objective basis for communication; and

7) the measurement process and measures are evaluated and communicated to the process owner.

F.3.2 Infrastructure Process

Purpose:

The purpose of the *Infrastructure process* is to maintain a stable and reliable infrastructure that is needed to support the performance of any other process. The infrastructure may include hardware, software, methods, tools, techniques, standards, and facilities for development, operation, or maintenance.

Outcomes:

As a result of successful implementation of the *Infrastructure process*:

1) an infrastructure is established that is consistent with and supportive of the applicable process procedures, standards, tools and techniques;

2) the infrastructure will meet all requirements for functionality, performance, safety, security, availability, space, equipment, cost, time and data integrity.

F.3.3 Improvement Process

Purpose:

The purpose of the *Improvement process* is to establish, assess, measure, control, and improve a software life cycle process.

Outcomes:

As a result of successful implementation of the *Improvement process*:

1) a set of organizational process assets are developed and made available;

2) the organization's process capability are assessed periodically to determine the extent to which process implementation is effective in achieving the organization's goals; and

3) the effectiveness and efficiency of the organization's processes with respect to business goal achievement are improved on an ongoing basis.

The *Improvement Process* contains purpose and outcomes for the following subprocesses:

- Process Establishment
- Process Assessment
- Process Improvement

F.3.3.1 Process establishment

Purpose:

The purpose of *Process establishment* is to establish a suite of organizational processes for all life cycle processes as they apply to its business activities.

Outcomes:

As a result of successful implementation of *Process establishment*:

1) a defined and maintained standard set of processes are established, along with an indication of each process's applicability;

2) the detailed tasks, activities and associated work products of the standard process are identified, together with expected performance characteristics;

3) a strategy for tailoring the standard process for the product or service is developed in accordance with the needs of the project; and

4) information and data related to the use of the standard process for specific projects exist and are maintained.

F.3.3.2 Process assessment

Purpose:

The purpose of *Process assessment* 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.

Outcomes:

As a result of successful implementation of *Process assessment*:

1) information and data related to the use of the standard process for specific projects will exist and be maintained;

2) the relative strengths and weaknesses of the organization's standard processes are understood; and

3) accurate and accessible assessment records are kept and maintained.

F.3.3.3 Process improvement

Purpose:

The purpose of *Process improvement* is to continually improve the organization's effectiveness and efficiency through the processes used and aligned with the business need.

Outcomes:

As a result of successful implementation of *Process improvement*:

1) reviews of the organization's standard processes are carried out at appropriate intervals to ensure their continuing suitability and effectiveness in light of assessment results;

2) changes to standard and defined processes are made in a controlled way, with predictable results;

3) monitored process improvement activities are implemented in a co-ordinated manner across the organization;

4) historical, technical and evaluation data is analyzed and used to improve these processes, to recommend changes in projects, and to determine technology advancement needs; and

5) quality cost data is collected, maintained, and used to improve the organization's processes as a monitoring activity, and to serve to establish the cost of prevention and resolution of problems and non-conformity in products and services.

F.3.4 Human Resource Process

Purpose:

The purpose of the *Human resource process* is to provide the organization adequate human resources and maintaining their competencies, consistent with business needs.

Outcomes:

As a result of the successful implementation of the *Human resource process:*

1) the roles and skills required for the operations of the organization and the project are identified through timely review of the organizational and project requirements;

2) human resources are provided to the organization and the project;

3) a set of common training needs across the organization based on organizational and project inputs are identified and provided; and

4) the intellectual assets of the organization are made available (or "collected") and exploited through an established mechanism.

Human resource process includes purpose and outcomes for the following subprocesses:

- Human Resource Management
- Training
- Knowledge Management

F.3.4.1 Human Resource Management

Purpose:

The purpose of the *Human resource management 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.

Outcomes:

As a result of successful implementation of the *Human resource management:*

1) individuals with the required skills and competencies are identified and recruited;

2) effective interaction between individuals and groups are supported;

3) the work force have the skills to share information and co-ordinate their activities efficiently; and

4) objective criteria are defined against which group and individual performance is monitored to provide performance feedback and to enhance performance.

F.3.4.2 Training

Purpose:

The purpose of *Training* is to provide the organization and project with individuals who possess the needed skills and knowledge to perform their roles effectively.

Outcomes:

As a result of successful implementation of *Training*:

1) training is developed or acquired to address the organization and project training needs; and

2) training is conducted to ensure that all individuals have the skills required to perform their assignments, using mechanisms such as training strategies and materials.

F.3.4.3 Knowledge Management

Purpose:

The purpose of *Knowledge management* is to ensure that individual knowledge, information and skills are collected, shared, reused and improved throughout the organization.

Outcomes:

As a result of successful implementation of the *Knowledge management*:

1) infrastructure is established and maintained for sharing common and domain information across the organization;

2) knowledge is readily available and shared throughout the organization; and

3) the organization will select an appropriate knowledge management strategy.

F.3.5 Asset Management Process

Purpose:

The purpose of the *Asset management process* is to manage the life of reusable assets from conception to retirement.

Outcomes:

As a result of successful implementation of the *Asset management process*:

1) an asset management strategy is documented;

2) an asset classification scheme is established;

3) a criteria for asset acceptance, certification and retirement is defined;

4) an asset storage and retrieval mechanism is operated;

5) the use of assets are recorded;

6) changes to the assets are controlled, and

7) users of assets are notified of problems detected, modifications made, new versions created and deletion of assets from the storage and retrieval mechanism.

F.3.6 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.

Outcomes:

As a result of successful implementation of the *Reuse program management process*:

1) define the organization's reuse strategy including its purpose, scope, goals and objectives;

2) identify the domains in which to investigate reuse opportunities or in which it intends to practice reuse;

3) assess the organization's systematic reuse capability;

4) assess each domain to determine its reuse potential;

5) evaluate reuse proposals to ensure the reuse product is suitable for the proposed application;

6) implement the reuse strategy in the organization;

7) establish feedback, communication, and notification mechanisms that operate between reuse program administrators, asset managers, domain engineers, developers, operators, and maintainers; and

8) monitor and evaluate the reuse program.

F.3.7 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.

Outcomes:

As a result of successful implementation of the *Domain engineering process*:

1) the representation forms for the domain models and the domain architectures are selected;

2) the boundaries of the domain and its relationships to other domains are established;

3) a domain model that captures the essential common and different features, capabilities, concepts, and functions in the domain are developed;

4) a domain architecture describing the family of systems within the domain are developed;

5) assets belonging to the domain are specified;

6) assets belonging to the domain are acquired or developed and maintained throughout their life cycles; and

7) the domain models and architectures are maintained throughout their life cycles.

Annex G
(informative)

ISO/IEC 12207:1995 Process Structure for “New” Processes in Annex F

ISO/IEC 12207:1995 defines the process categories, i.e., Organizational, Primary and Supporting Process, that may be performed during the life cycle of software. Within each process category are processes that are expressed in terms of activities and tasks. The activities within a process provide the structural decomposition of the process and describe the actions that are performed during the execution of the process. The tasks within the software life cycle processes provides the "what" is going to be performed during the implementation of the process.

Annex G provides a description of the activities and tasks for the "new" processes identified in Table E.1. These activities and tasks provide in this annex have been an assigned numbering sequence to correspond to the numbering sequence they would have in the body of ISO/IEC 12207:1995. Furthermore, these activities and tasks are in accordance with the process structure of ISO/IEC 12207:1995.

G.1 Supporting life cycle processes

The following process is added to the supporting life cycle processes:

9) Usability Process

G.1.1 Usability Process Activities and Tasks

6.9 Usability process

The Usability Process contains the activities and tasks of the usability specialist. The process contains the activities which take account of the interests and needs of the individuals and/or groups which will work with or use the output from a system throughout development and operation of the software or system. The usability process ensures the quality in use of the software. Details of human-centred design processes can be found in ISO *13407 Human-centred design processes for interactive systems*. Details of the specification of quality in use can be found in ISO/IEC 9126-1:1999, *Software product quality - Part 1: Quality model*.

The developer manages the Usability Process at the project level. The Usability specialist integrates usability activities and the results from usability activities with the Development (5.3), Operation (5.4) and Supporting (6.3, 6.4, 6.5) lifecycle processes.

List of activities: This process consists of the following activities:

1) Process implementation;

2) Human-centred design;

3) Human aspects of strategy, introduction and support.

NOTE These activities and the associated tasks may overlap or interact and may be performed iteratively or recursively.

6.9.1 Process implementation. This activity consists of the following tasks:

6.9.1.1 Plan and manage the HCD process. Specify how the human-centred activities fit into the whole system lifecycle process and the enterprise.

6.9.1.2 The developer and the usability specialist will:

a) Consult stakeholders and users.

b) Identify and plan user involvement.

c) Select human-centred methods and techniques.

d) Ensure a human-centred approach within the project team.

e) Plan human-centred design activities.

f) Manage human-centred activities.

g) Champion a human-centred approach.

h) Provide support for human-centred design.

6.9.2 Human-centred design. This activity consists of the following tasks:

6.9.2.1 A specification of the stakeholder and organisational requirements is provided. Establish the requirements of the organisation and other interested parties for the system. This task takes full account of the needs, competencies and working environment of each relevant stakeholder in the system.

6.9.2.2 In association with the developer the usability specialist will:

a) Clarify and document system goals.

b) Analyse stakeholders and users.

c) Assess the significance and relevance of the system to each stakeholder group.

d) Assess risk to stakeholders and users.

e) Define the use of the system.

f) Generate the stakeholder and organisational requirements.

g) Set quality in use objectives.

6.9.2.3 An understanding and specification of the context of use is determined. Identify, clarify and record the characteristics of the stakeholders and users, their tasks and the organisational and physical environment in which the system will operate.

6.9.2.4 The usability specialist will:

a) Identify and document user's tasks.

b) Identify and document significant user attributes.

c) Identify and document organisational environment.

d) Identify and document technical environment.

e) Identify and document physical environment.

6.9.2.5 The production of design solutions is created. Create potential design solutions by drawing on established state-of-the-art practice, the experience and knowledge of the participants and the results of the context of use analysis.

6.9.2.6 Assisted by the usability specialist the developer will:

a) Allocate functions.

b) Produce composite task model.

c) Explore system design.

d) Use existing knowledge to develop design solutions.

e) Specify system and use.

f) Develop prototypes.

g) Develop user training.

h) Develop user support.

6.9.2.7 Evaluation of designs against requirements is determined. Collect feedback on the developing design. This feedback will be collected from end users and other representative sources.

6.9.2.8 The usability specialist will:

a) Specify and validate context of evaluation.

b) Evaluate early prototypes in order to define the requirements for the system.

c) Evaluate prototypes in order to improve the design.

d) Evaluate the system in order to check that the stakeholder and organisational requirements have been met.

e) Evaluate the system in order to check that the required practice has been followed.

f) Evaluate the system in use in order to ensure that it continues to meet organisational and user needs.

6.9.3 Human aspects of strategy, introduction and support. This activity consists of the following tasks:

6.9.3.1 Ensure HCD content in systems strategy. Establish and maintain a focus on stakeholder and user issues in each part of the organisation which deal with system markets, concept, development and support.

The usability specialist will work with relevant marketing and strategy specialists to:

a) Represent stakeholders and users.

b) Collect market intelligence.

c) Define and plan system strategy.

d) Collect market feedback.

e) Analyse trends in users.

6.9.3.2 Introduce and operate the system. Establish the human-system aspects of the support and implementation of the system.

6.9.3.3 The usability specialist will work with relevant rollout, training and support specialists to facilitate:

a) Management of change.

b) Determination of impact on organisation and stakeholders and users.

c) Customisation and local design.

d) Deliver user training.

e) Support for users in planned activities.

f) Conformance to workplace ergonomic legislation.

G.2 Management Process

The measurement activity is added to the management process.

G.2.1 Measurement Activity and Tasks

7.1.6 Measurement. This activity consists of the following tasks:

7.1.6.1 The manager will establish and maintain measurement commitment. Ensure that all resource, personnel, and commitment prerequisites for the measurement process have been satisfied. The results of this task provides a commitment from management to support the measurement process, individuals competent in the area of this International Standard have been identified and assigned responsibilities for the measurement process, and resources are made available for measurement planning and performing the process.

7.1.6.2 The manager will plan the measurement process. Develop a detailed plan to initiate, guide, monitor, and evaluate the data collection, analysis, interpretation, and storage tasks. The results of this task provides in planning information that addresses the specific information needs of the organisational unit is defined and any supporting technologies required have been acquired and deployed.

7.1.6.3 The manager will perform measurement in accordance with the plan. Produce information products and performance measures according to the outputs if the measurement planning tasks. The results of this task ensures that data are collected, data are stored in a form suitable for subsequent retrieval and analysis, information products are produced and communicated to the organisational unit, and performance measures are collected.

7.1.6.4 The manager will evaluate measurement. Evaluate the measures and the measurement activities, and store lessons learned from this evaluation in the “Measurement Experience Base”. These task results in measures and the measurement activities are evaluated according to specified criteria and lessons learned from this evaluation are stored in the “Measurement Experience Base.”

G.3 Human Resource Process Activities and Tasks

The Training Process in ISO/IEC 12207:1995 is renamed the Human Resource Process.

7.4 Human Resource Process

The Human Resource Process provides the organization and projects with individuals who possess skills and knowledge to perform their roles effectively and to work together as a cohesive group.

List of activities: This process consists of the following activities:

1) Process Implementation

2) Define Training Requirements

3) Recruit Qualified Staff

4) Evaluate Staff Performance

5) Establish Project Team Requirements

6) Knowledge Management

7.4.1 Process Implementation. This activity consists of the following task:

7.4.1.1 A review of the organization and project requirements shall be conducted to establish and make timely provision for acquiring or developing the resources and skills required by the management and technical staff. These needs may be met through training, recruitment or other staff development mechanisms.

7.4.2 Define Training Requirements. This activity consists of the following tasks:

7.4.2.1 The types and levels of training and knowledge needed to satisfy organization and project requirements shall be determined. A training plan, addressing implementation schedules, resource requirements, and training needs should be developed and documented.

7.4.2.2 Training manuals, including presentation materials used in providing training should be developed or acquired.

7.4.2.3 Train personnel to have the knowledge and skills needed to perform their roles.

7.4.3 Recruit Qualified Staff. This activity consists of the following task:

7.4.3.1 Establish a systematic program for recruitment of staff qualified to meet the needs of the organization and projects. Provide opportunities for the career development of existing staff.

7.4.4 Evaluate Staff Performance. This activity consists of the following tasks:

7.4.4.1 Define objective criteria that can be used to evaluate staff performance.

7.4.4.2 Evaluate the performance of the staff in respect of their contributions to the goals of the organization or project.

7.4.4.3 Ensure that feedback is provided to the staff on the results of any evaluations performed.

7.4.4.4 Maintain adequate records of staff performance including information on skills, training completed, and performance evaluations.

7.4.5 Establish Team Requirements. This activity consists of the following tasks:

7.4.5.1 Define the organization's and project's need for project teams. Define team structure and operating rules.

7.4.5.2 Empower teams to perform their role by ensuring the teams have:

a) an understanding of their role on the project;

b) a shared vision or sense of common interests on the success of the project;

c) appropriate mechanisms or facilities for communication and interactions among teams; and

d) support from appropriate management to accomplish project requirements.

7.4.6 Knowledge Management. This activity consists of the following tasks:

7.4.6.1 The manager will plan the requirements for managing the organization's knowledge assets. The planning will include the definition of the infrastructure and training to support the contributors and the users of the organization's knowledge assets, the classification schema for the assets and the asset criteria.

7.4.6.2 The manager will establish a network of experts within the organization. The network will contain the identification of the organization's experts, a list of their area of expertise and the identification of available information within a classification schema, e.g., knowledge area. The manager will ensure that the network is maintained current.

7.4.6.3 The manager will establish a mechanism to support the exchange of information between the experts and the flow of expert information to the organization's projects. The mechanism will support the organization's access, storage and retrieval requirements.

7.4.6.4 Perform configuration management of assets in accordance with the Configuration Management Process specified in subclause 6.2.

G.4 Asset Management Process Activities and Tasks

7.5 Asset Management Process

Regardless of their overall quality and potential for reuse, assets have little value to an organization unless potential reusers know of their existence and can easily locate and understand them.

This process contains the activities and tasks of the asset manager. Asset Management is the process of applying administrative and technical procedures throughout the life of an asset to identify, define, certify, classify, and baseline the asset; track modifications, migrations, and versions of the asset; record and report the status of the asset; and establish and control storage and handling of the asset, delivery of the asset to its reusers, and retirement of the asset.

List of activities. This process consists of the following activities:

1) Process implementation;

2) Asset storage and retrieval definition;

3) Asset management and control.

7.5.1 Process Implementation. This activity consists of the following tasks:

7.5.1.1 The asset manager will create and document an asset management plan, reusing an applicable asset management plan template, if any exists, to define the resources and procedures for managing assets. The plan should include the following:

a) Defining the requirements for an asset storage and retrieval mechanism;

b) Defining the asset storage and retrieval mechanism;

c) Establishing the asset storage and retrieval mechanism as an integral part of the software life cycle;

d) Naming the organization(s) responsible for managing and maintaining the asset storage and retrieval mechanism;

e) Defining asset acceptance, certification, and retirement procedures;

f) Defining the relationship of the asset manager to other parties such as developers, maintainers, and domain engineers;

g) Promoting the use of the asset storage and retrieval mechanism;

h) Defining an asset management communication mechanism;

i) Defining an asset classification scheme.

7.5.1.2 The asset manager will:

a) Document this activity in accordance with the Documentation Process specified in subclause 6.1;

Perform configuration management of assets in accordance with the Configuration Management Process specified in subclause 6.2;

b) Document and resolve problems and non-conformance found in the assets and the Asset Management in accordance with the Problem Resolution Process specified in subclause 6.8;

c) Conduct reviews of assets in accordance with the Joint Review Process specified in subclause 6.6.

7.5.1.3 The asset management plan will be reviewed in accordance with the Joint Review Process specified in subclause 6.6. Domain engineers and reuse program administrators will be included in the review.

7.5.2 Asset storage and retrieval definition. An asset storage and retrieval mechanism enables reusers to easily and quickly find and understand the assets. This activity consists of the following tasks:

7.5.2.1 The asset manager will implement and maintain an asset storage and retrieval mechanism.

7.5.2.2 The asset manager should develop, document, and maintain a classification scheme to be used in classifying the assets.

7.5.2.3 The asset manager will conduct joint review(s) of the asset storage and retrieval mechanism in accordance with the Joint Review Process specified in subclause 6.6. Reuse program administrators and domain engineers will be included in the review(s).

7.5.3 Asset management and control. For each asset, this activity consists of the following tasks:

7.5.3.1 For each asset submitted to the asset manager, the asset will be evaluated based on the asset acceptance and certification criteria.

7.5.3.2 For each asset accepted, it will be made available for reuse through the asset storage and retrieval mechanism.

7.5.3.3 The asset will be classified in accordance with the reuse classification scheme, if any exists.

7.5.3.4 The asset manager will perform configuration management for the asset using the Configuration Management Process specified in subclause 6.2.

7.5.3.5 The asset manager will keep track of each reuse of the asset and report to the domain engineer information about actual reuses of the asset. Asset reuse information should include the reuser's name, project name, original developer or owner of the asset, cost of reusing the asset, and savings and benefits derived from reusing the asset.

7.5.3.6 The asset manager will forward asset modification requests and problem reports received from asset reusers to the domain engineer for review and correction/modification plans and actions. Actions planned and taken to meet requests or to correct problems will be reported to the asset manager making the request or filing the problem report.

7.5.3.7 The asset manager will monitor and record these asset requests/reports and the subsequent actions taken. Whenever problems with an asset are encountered, they should be recorded and entered into the Problem Resolution Process, as specified in subclause 6.8.

7.5.3.8 The asset manager will notify all asset reusers, and the domain engineer of the problems detected in the asset, modifications made to the asset, new versions of the asset, and deletion of the asset from the asset storage and retrieval mechanism.

7.5.3.9 The asset manager will retire assets from the asset storage and retrieval mechanism according to the asset retirement procedures and criteria.

G.5 Reuse Program Management Process Activities and Tasks

7.6 Reuse Program Management Process

Succeeding with the implementation of systematic reuse at the organization level requires careful planning and proper management. Because business, management, and people challenges often outweigh the technical challenges of implementing reuse, management leadership, commitment, and support, as well as a reuse-positive software culture should be emphasized in a reuse program. All individuals within the scope of the reuse program are expected to cooperate with one another in the establishment of reuse processes and to share reuse expertise and assets with one another.

The Reuse Program Management Process contains the activities and tasks of the reuse program administrator. This process is used to plan, establish, manage, control, and monitor an organization's reuse program.

List of activities: This process consists of the following activities:

1) Initiation;
2) Domain identification;
3) Reuse assessment;
4) Planning;
5) Execution and control;
6) Review and evaluation.

7.6.1 Initiation. This activity consists of the following tasks:

7.6.1.1 The reuse program for an organization will be initiated by establishing the organization's reuse strategy that includes its reuse goals, purposes, objectives, and scope. Elements of the reuse program should address the following:

a) Reuse sponsor;
b) Reuse infrastructure (including hardware, software, tools, techniques, standards, metrics, and facilities for practising reuse);
c) Reuse funding and other resources;
d) Reuse program support function;
e) Reuse communication, feedback, and notification mechanisms.

NOTE The reuse program administrator defines the following mechanisms:

a) Feedback mechanism from each software development project to the domain engineer and the asset manager to communicate the use and impact of software products and assets on each project;
b) Communication mechanism between the software developer, operator, maintainer, domain engineer, asset manager, and the reuse program administrator to resolve problems, answer questions, and make recommendations concerning software products and assets that each project encounters;

c) Notification mechanism that makes the developer, maintainer, asset manager, and domain engineer aware of the prevailing trade laws, the licensing properties of software products and assets, the organization's restrictions that protect its proprietary interests, and the agreement that may restrict or exclude the use of specific software products or assets by each software development, maintenance, or domain engineering project;

d) Mechanism for the domain engineer to obtain the participation and information needed from the appropriate sources to complete domain engineering activities.

7.6.1.2 A reuse sponsor should be named.

7.6.1.3 Reuse program participants will be identified and their roles will be assigned.

7.6.1.4 A reuse steering function will be established to assume the authority and responsibility for the organization's reuse program. Its functions should include the following:

e) Investigation of the practice of reuse in the organization;

f) Identification of the areas in the organization where there are potential reuse opportunities;

g) Assignment of the responsibilities for reuse in the organization;

h) Redefinition of the organization's incentives, disincentives, and culture to support and encourage reuse.

NOTE Members of the reuse steering function include the reuse sponsor, software development manager, operations manager, software maintenance manager, and a reuse expert.

7.6.1.5 A reuse program support function will be established. The responsibilities of the reuse program support function should include the following:

a) Participating in the creation and implementation of a reuse program implementation plan;

b) Identifying, documenting, and conveying to all reuse program participants the reuse strategy;

c) Promoting the practice of reuse to encourage a reuse-positive software culture;

d) Seeking out opportunities to practice reuse in current and future software projects;

e) Establishing and maintaining the reuse infrastructure;

f) Providing reuse consulting support to software projects that practice reuse.

7.6.2 Domain identification

A domain characterizes a set of systems 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. This activity consists of the following tasks:

7.6.2.1 The reuse program administrator, aided by the appropriate manager, domain engineers, users, and software developers, will identify and document the domains in which to investigate reuse opportunities or in which the organization intends to practice reuse.

7.6.2.2 The reuse program administrator, aided by the appropriate managers, domain engineers, users, and software developers, will evaluate the domains to assure that they accurately reflect the organization's reuse strategy. The results of the evaluation will be documented.

7.6.2.3 The reuse program administrator will conduct joint reviews in accordance with the Joint Review Process specified in subclause 6.6. Software developers, domain engineers, and users will be included in the reviews.

7.6.2.4 As more information about the organization's domains and plans for future software products becomes available or when the domains are analyzed, the domains may be refined and rescoped by the reuse program administrator.

7.6.3 Reuse assessment

The reuse assessment provides the baseline against which the practice of reuse in the organization can be measured. Without this reuse assessment, the benefits which result from the practice of reuse in the organization are difficult to measure. The purposes of this activity are to:

a) Gain an understanding of the reuse maturity of the organization;

b) Assess the reuse potential of the target domains of the organization;

c) Make recommendations on how to proceed with the practice of reuse in the organization;

d) Motivate and direct incremental improvements in the many areas of the organization's reuse program, including reuse training and infrastructure.

This activity consists of the following tasks:

7.6.3.1 The reuse program administrator will assess the organization's systematic reuse capability. The results of the assessment will be documented and provided to the reuse steering function.

7.6.3.2 The reuse program administrator will assess each domain being considered for reuse to determine the potential for reuse success in the domain. The results of the assessment will be documented and provided to the reuse steering function.

7.6.3.3 The reuse program administrator will make recommendations for refining the organization's reuse strategy and reuse program implementation plan based on the results of the reuse assessments. The recommendations will be documented and provided to the reuse steering function.

7.6.3.4 The reuse program administrator, in conjunction with the appropriate acquirers, suppliers, developers, operators, maintainers, asset managers, and domain engineers, will use the Improvement Process specified in subclause 7.3 to incrementally improve the skills, technology, reuse processes, organizational structure, and metrics that together comprise the reuse infrastructure.

7.6.4 Planning. This activity consists of the following tasks:

7.6.4.1 A reuse program implementation plan will be created, documented, and maintained, reusing an applicable reuse program plan template, if any exists, to define the resources and procedures for implementing a reuse program. The plan will describe the following:

a) The reuse program activities;

b) Procedures and schedules for performing these activities;

c) The parties responsible for performing these activities;

d) The relationships with other parties, such as software developers or domain engineers;

e) The resources needed for the reuse program;

7.6.4.2 The plan will be reviewed and evaluated considering the following criteria:

a) Completeness;

b) Ability to realize the organization's reuse strategy;

c) Feasibility of implementing the plan.

The results of the evaluation will be documented. Those evaluating the plan should include members of the reuse steering function.

7.6.4.3 Approval and support for the reuse program implementation plan will be obtained from the reuse steering function, and the appropriate managers.

7.6.4.4 The reuse program administrator will conduct joint review(s) in accordance with the Joint Review Process specified in subclause 6.6. Members of the reuse steering function and the appropriate managers will be included in the reviews.

7.6.5 Execution and control. This activity consists of the following tasks:

7.6.5.1 Activities in the reuse program implementation plan will be executed in accordance with the plan.

7.6.5.2 The reuse program administrator will monitor the progress of the reuse program against the organization's reuse strategy, and make and document any necessary adjustments to the plan to realize the strategy.

7.6.5.3 Problems and nonconformances that occur during the execution of the reuse program implementation plan will be recorded and entered into the Problem Resolution Process, as specified in subclause 6.8.

7.6.5.4 The reuse program administrator will periodically reaffirm management sponsorship, support, and commitment to the reuse program.

7.6.6 Review and evaluation. This activity consists of the following tasks:

7.6.6.1 The reuse program administrator will periodically assess the reuse program for achievement of the organization's reuse strategy, and the continued suitability and effectiveness of the reuse program.

7.6.6.2 The reuse program administrator will provide assessment results and lessons learned to the reuse steering function, and to the appropriate managers.

7.6.6.3 The reuse program administrator will recommend and make changes to the reuse program, expand the reuse program, and improve the reuse program in accordance with the Improvement Process specified in subclause 7.3.

G.6 Domain Engineering Process Activities and Tasks

7.7 Domain Engineering Process

The Domain Engineering Process contains the activities and tasks of the domain engineer. The process covers the development and maintenance of the domain models, domain architecture, and other assets for this domain.

List of activities. This process consists of the following activities:

1) Process implementation;

2) Domain analysis;

3) Domain design;

4) Asset provision;

5) Asset maintenance.

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. Domain engineering may include the following activities: domain definition, domain analysis, developing the domain architecture, and domain implementation.

NOTE 2 These activities and tasks may overlap or interact and may be performed iteratively or recursively. Also, the Domain Engineering Process may overlap with development and maintenance processes that use assets produced by the Domain Engineering Process.

7.7.1 Process implementation. This activity consists of the following tasks:

7.7.1.1 The domain engineer will create and document a domain engineering plan, reusing an applicable domain engineering plan template, if any exists, to define the resources and procedures for performing domain engineering. The plan should include standards, methods, tools, activities, assignments, and responsibilities for performing domain engineering. To create the domain engineering plan, the domain engineer should consult the literature and/or data resources about the domain and should consult with domain experts, developers, and users of software products within the domain. The domain engineering plan will be executed.

7.7.1.2 The domain engineer will select the representation forms to be used for the domain models and domain architectures, in accordance with the organization's reuse standards, and by consulting domain experts, developers, and users of software products within the domain.

7.7.1.3 The domain engineer will:

a) Document this process in accordance with the Documentation Process specified in subclause 6.1;

b) Perform configuration management of the domain engineering outputs in accordance the Configuration Management Process specified in subclause 6.2;

c) Document and resolve problems and non-conformance found in the assets and Domain Engineering Process in accordance with the Problem Resolution Process specified in subclause 6.8;

d) Conduct joint reviews in accordance with the Joint Review Process specified in subclause 6.6 and include in the
review experts of the domain, and software developers and users of software products within the domain;

e) Establish procedures for receiving, resolving, and providing feedback to the asset manager whenever problems or change requests occur for assets developed by the domain engineer.

7.7.2 Domain analysis. Domain analysis is the activity that discovers and formally describes the commonalties and variabilities within a domain. The domain engineer captures this information in a set of domain models. This activity consists of the following tasks:

7.7.2.1 The domain engineer will define the boundaries of the domain and the relationships between this domain and other domains.

7.7.2.2 The domain engineer will identify the current and anticipated needs of developers of software products within this domain.

7.7.2.3 The domain engineer will build the domain models using the representation forms selected in the Process Implementation Activity for this process.

7.7.2.4 The domain engineer will construct a vocabulary that provides the terminology to describe the important domain concepts and the relationships among similar or common assets of the domain.

7.7.2.5 The domain engineer will classify and document the domain models.

7.7.2.6 The domain engineer will evaluate the domain models and domain vocabulary in accordance with the provisions of the modelling technique selected and in accordance with the organization's asset acceptance and certification procedures. The results of the evaluation will be documented.

7.7.2.7 The domain engineer will conduct domain analysis joint review(s) in accordance with the Joint Review Process specified in subclause 6.6. Software developers, asset managers, domain experts, and users will be included in the reviews.

7.7.2.8 The domain engineer will submit domain models to the asset manager.

7.7.3 Domain design. The domain design activity defines the domain architecture and specifies the assets that can be used to build software products. The domain architecture is a high-level design in which asset interfaces are formally specified. The domain architecture serves as the framework for reusing assets to construct software products. This activity consists of the following tasks:

7.7.3.1 The domain engineer will create and document the domain architecture, consistent with the domain model and following the organization's standards.

7.7.3.2 The domain architecture will be evaluated in accordance with the provisions of the architecture design technique selected and the organization's asset acceptance and certification procedures. The results of the evaluation will be documented.

7.7.3.3 For each entity selected to be designed for reuse, the domain engineer will develop and document an asset specification.

7.7.3.4 For each asset specified, the specification will be evaluated in accordance with the provisions of subclause 5.3.6.7, and in accordance with the organization's asset acceptance and certification procedures. The results of the evaluation will be documented.

7.7.3.5 The domain engineer will conduct domain design joint review(s) in accordance with the Joint Review Process specified in subclause 6.6. Software developers, domain experts, and asset managers will be included in the reviews.

7.7.3.6 The domain engineer will submit the domain architecture to the asset manager.

7.7.4 Asset provision. The asset provision activity develops or acquires assets that can be used to assemble software products. For each asset developed or acquired, this activity consists of the following tasks:

7.7.4.1 The domain engineer will develop the asset, thus

a) Executing the Acquisition Process (see 5.1) to cause a contract for the asset to be put in place if the asset is to be acquired; or

b) Executing the Development Process (see 5.3) if the asset is to be developed internally.

7.7.4.2 The asset will be documented and classified.

7.7.4.3 The domain engineer will evaluate the asset in accordance with the organization's asset acceptance and certification procedures. The results of the evaluation will be documented.

7.7.4.4 The domain engineer will conduct asset joint review(s) in accordance with the Joint Review Process specified in subclause 6.6. Software developers and asset managers will be included in the reviews.

7.7.4.5 The domain engineer will submit the asset to the asset manager.

7.7.5 Asset maintenance. The asset maintenance activity contains the tasks for modifying assets, including domain models and domain architectures. An asset undergoes modification to correct a deficiency in the asset or to adapt the asset to meet a new or revised requirement. The domain engineer will modify the asset, executing Maintenance Process specified in subclause 5.5. In addition, the following reuse-related tasks are added to this Maintenance Process when it is applied to maintain an asset:

7.7.5.1 When analyzing requests for asset modification and choosing implementation options, the domain engineer will consider

a) Conformance with the domain models and the domain architecture;

b) Impact on the systems and software products that use the asset;

c) Impact on future users of the asset;

d) Impact on the reusability of the asset.

7.7.5.2 The domain engineer will obtain approval for the selected implementation option, schedule, and plans to modify the asset.

7.7.5.3 The domain engineer will notify the asset manager who sent the asset modification request about whether the asset modification was approved and the plans and schedule for those approved modifications. When a modification request is not approved, it will be recorded and entered into the Problem Resolution Process, as specified in subclause 6.8.

7.7.5.4 After approval is obtained, the domain engineer will enter the Domain Engineering Process to implement the modifications to an asset.

7.7.5.5 The domain engineer will send the completed modified asset along with any usage instructions and test assets to the asset manager who sent the asset modification request.