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Systems and software engineering — Life cycle management

Part 3: Guide to the application of
ISO/IEC 12207 (Software life cycle
processes)

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National foreword

This Published Document is the UK implementation of ISO/IEC TR 24748-3:2011. It supersedes BS ISO/IEC TR 15271:1998 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee IST/15, Software and systems engineering.

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TECHNICAL REPORT

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Systems and software engineering — Life cycle management —

Part 3: Guide to the application of ISO/IEC 12207 (Software life cycle processes)

Ingénierie des systèmes et du logiciel — Gestion du cycle de vie —

*Partie 3: Guide pour l'application de l'ISO/CEI 12207 (Processus du
cycle de vie du logiciel)*



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Foreword

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

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

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

In exceptional circumstances, when the joint technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide to publish a Technical Report. A Technical Report is entirely informative in nature and shall be subject to review every five years in the same manner as an International Standard.

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

ISO/IEC TR 24748-3 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*.

This first edition of ISO/IEC TR 24748-3 cancels and replaces ISO/IEC TR 15271:1998, which has been technically revised.

ISO/IEC TR 24748 consists of the following parts, under the general title *Systems and software engineering — Life cycle management*:

- *Part 1: Guide for life cycle management*
- *Part 2: Guide to the application of ISO/IEC 15288 (System life cycle processes)*
- *Part 3: Guide to the application of ISO/IEC 12207 (Software life cycle processes)*

Introduction

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) currently have two International Standards that focus on life cycle processes:

- ISO/IEC 15288:2008, *Systems and software engineering — System life cycle processes*, and
- ISO/IEC 12207:2008, *Systems and software engineering — Software life cycle processes*.

In addition, ISO and IEC have a multi-part International Standard that promotes the adoption of an integrated process approach when establishing, implementing, operating, monitoring, reviewing, maintaining and improving a Service Management System (SMS), to deliver services which meet business needs and customer requirements:

- ISO/IEC 20000, *Information technology — Service management*.

This service management standard may be used in conjunction with ISO/IEC 15288 and ISO/IEC 12207 for the delivery of system services and software services.

The purpose of this part of ISO/IEC TR 24748 is to provide guidance on the application of the software life cycle processes standard, ISO/IEC 12207:2008. Taken together, the parts of ISO/IEC TR 24748 are intended to facilitate the joint usage of the process content of the two high-level life cycle process standards, which in turn may be used together with related standards such as the one for service management, and various other lower-level process standards. In this way, ISO/IEC TR 24748 provides unified and consolidated guidance on the life cycle management of systems and software. Its purpose is to help ensure consistency in system concepts and life cycle concepts, models, stages, processes, process application, key points of view, adaptation and use in various domains as the two standards (and others) are used in combination. It should help a project design a life cycle model for managing progress on a project.

Whereas ISO/IEC TR 24748-1 addresses in generic terms the purpose stated above of guidance for the life cycle management of systems and software, this part of ISO/IEC TR 24748 focuses in on and expands the coverage of those aspects most relevant to software. This part of ISO/IEC TR 24748 will also, in conjunction with ISO/IEC TR 24748-1, aid in identifying and planning the use of the life cycle processes described in ISO/IEC 12207:2008. The proper use of these processes will contribute to a project being completed successfully, meeting its objectives and requirements for each stage and for the overall project.

This part of ISO/IEC TR 24748 elaborates on factors that should be considered when applying ISO/IEC 12207:2008 and does this in the context of the various ways in which ISO/IEC 12207:2008 can be applied. The guidance is not intended to provide the rationale for the requirements of ISO/IEC 12207:2008. Before reading this part of ISO/IEC TR 24748, readers have to understand the relation between system and software, the concept of "system of interest", and the structure of a system. These concepts are described in ISO/IEC TR 24748-1.

Systems and software engineering — Life cycle management —

Part 3:

Guide to the application of ISO/IEC 12207 (Software life cycle processes)

1 Scope

This part of ISO/IEC TR 24748 is a guide for the application of ISO/IEC 12207:2008. It addresses system, life cycle, process, organizational, project, and adaptation concepts, principally through reference to ISO/IEC TR 24748-1 and ISO/IEC 12207:2008. It gives guidance on applying ISO/IEC 12207:2008 from the aspects of strategy, planning, application in organizations, and application on projects.

This part of ISO/IEC TR 24748 is intentionally aligned with both ISO/IEC TR 24748-1 and ISO/IEC TR 24748-2 (*Guide to the application of ISO/IEC 15288*) in its terminology, structure and content.

2 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 12207:2008, ISO/IEC 15288:2008 and ISO/IEC TR 24748-1:2010, apply.

3 Overview of ISO/IEC 12207:2008

3.1 General

ISO/IEC 12207:2008, *Systems and software engineering — Software life cycle processes*, establishes a common framework for software life cycle processes, with well-defined terminology, that can be referenced by the software industry. It applies to the acquisition of systems and software products and services, to the supply, implementation, operation, maintenance, and disposal of software products and the software portion of a system, whether performed internally or externally to an organization. Those aspects of system definition needed to provide the context for software products and services are included. Software includes the software portion of firmware.

ISO/IEC 12207:2008 may be used stand alone or jointly with other International Standards, such as ISO/IEC 15288:2008, and supplies a process reference model that supports process capability assessment in accordance with ISO/IEC 15504-2, *Information technology — Process assessment — Part 2: Performing an assessment*.

The purpose of ISO/IEC 12207:2008 is to provide a defined set of processes to facilitate communication among acquirers, suppliers and other stakeholders in the life cycle of a software product. ISO/IEC 12207:2008 is written for acquirers of systems and software products and services and for suppliers, implementers, operators, maintainers, managers, quality assurance managers, and users of software products.

3.2 Structure of ISO/IEC 12207:2008

ISO/IEC 12207:2008 contains requirements in four clauses.

- Clause 6, which defines the requirements for the system life cycle processes,
- Clause 7, which defines the requirements for specific software life cycle processes,
- Clauses of Annex A, which provides requirements for tailoring of ISO/IEC 12207:2008, and
- Clauses of Annex B, which provides a Process Reference Model (PRM) which may be used for assessment purposes.

Five informative annexes support the use of ISO/IEC 12207:2008 or its harmonization with ISO/IEC 15288:2008:

- Annex C expands on the history and rationale for the changes to achieve harmonization, and provides high-level traceability among the International Standards which were used as the inputs to the revision of ISO/IEC 12207:2008.
- Annex D describes the alignment of the processes of ISO/IEC 15288:2008 and ISO/IEC 12207:2008.
- Annex E provides an example of a process view for Usability, intended to illustrate how a project might assemble processes, activities and tasks of ISO/IEC 12207:2008 to provide focused attention to the achievement of product characteristics that have been selected as being of special interest.
- Annex F contains some example process descriptions relating to business goals and contracting that may be considered useful to some readers of ISO/IEC 12207:2008.
- Annex G provides support for IEEE users and describes relationships of ISO/IEC 12207:2008 to IEEE standards.

Readers of ISO/IEC 12207:2008 are advised to consult clause 5 of that International Standard to gain understanding of the key concepts used.

3.3 Context of ISO/IEC 12207:2008

ISO/IEC 12207:2008 has a focus on the processes that are used by or for software-centred projects that exist in a defined relationship with the organization, other projects and enabling systems. A project is assigned responsibility that encompasses one or more life cycle stages of the software system-of-interest. ISO/IEC 12207:2008 is applicable to organizations and projects whether they act as the acquirer or the supplier of a software system and whether the system is comprised of products, services, or a combination of both.

The context of ISO/IEC 12207:2008 is illustrated in Figure 1.

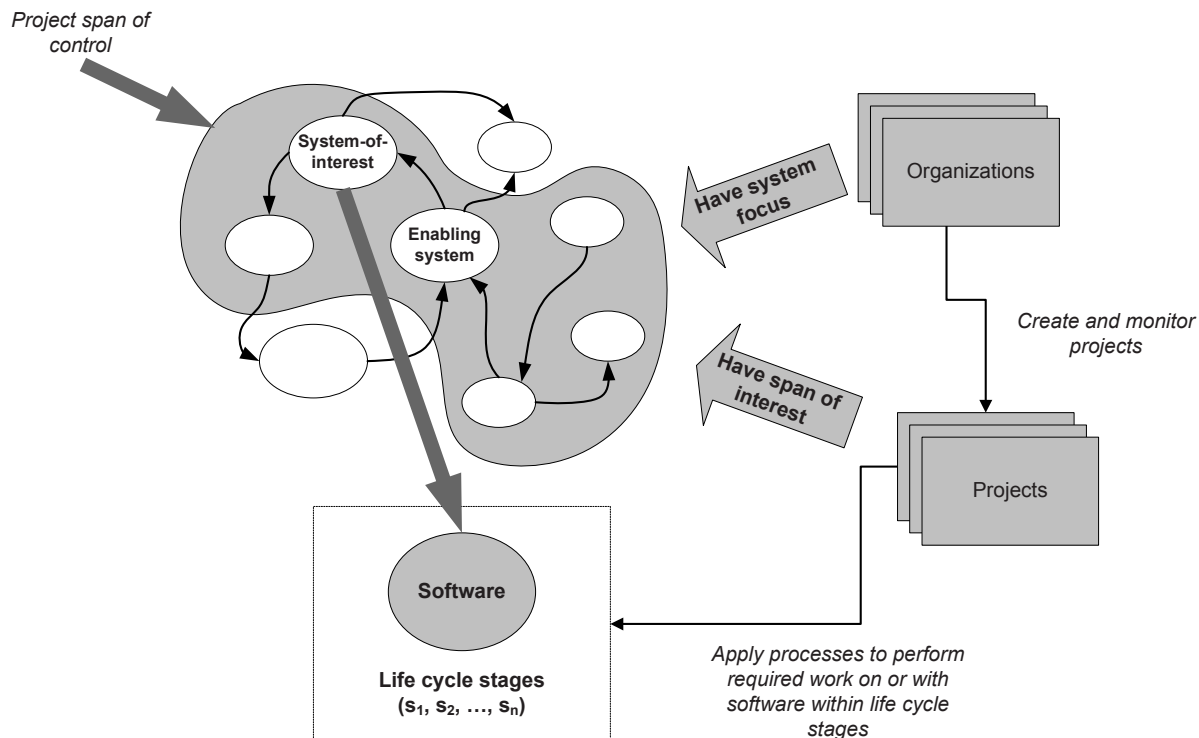


Figure 1 — Context of ISO/IEC 12207:2008

A single project may involve multiple organizations working together as partners. Such a project should use ISO/IEC 12207:2008 to establish common terminology, as well as information flows and interfaces among the organizations to enhance communication.

When an organization applies ISO/IEC 12207:2008 to a particular software system, then that system becomes the system-of-interest. The system-of-interest has a life cycle that consists of multiple stages through which the system passes during its lifetime, denoted $s_1, s_2, \dots, s_n$.

EXAMPLE An example of typical stages is:

- s_1 : concept,
- s_2 : development,
- s_3 : operation, and
- s_4 : maintenance.

NOTE 1 Stages are described in clause 5.1.12 of ISO/IEC 12207:2008 and in clauses 3.2, 4 and 5 of ISO/IEC TR 24748-1.

A number of enabling systems are deployed throughout the software life cycle to provide the system-of-interest with support as needed. Each life cycle stage can require one or more enabling systems. Enabling systems that cooperate with the software during its operation and maintenance stages can be needed, as well. It is important to note that an enabling system has its own life cycle and that when ISO/IEC 12207:2008 (or ISO/IEC 15288:2008, if applicable) is applied to it, it then becomes a system-of-interest.

NOTE 2 The role and use of enabling systems are described in clause 4.6.3 of this Technical Report.

NOTE 3 For related material on enabling systems, see also clause 5.1.4 of ISO/IEC 15288:2008 and clause 3.1.5 of ISO/IEC TR 24748-1.

ISO/IEC 12207:2008 is applicable at any level of the structure associated with a software system. As the software is decomposed recursively into its elements, the processes of ISO/IEC 12207:2008 may be used for each element in the software structure. Each system element has a life cycle of its own and its own set of enabling systems.

NOTE 4 For related material on system structure, see clause 5.1.3 of ISO/IEC 15288:2008 and clause 3.1.4 of ISO/IEC TR 24748-1.

NOTE 5 A view from a project hierarchy perspective is given in clause 4.6.4 of this Technical Report.

In order to perform needed operations and transformations upon software systems during their life cycles, the organization creates and monitors projects. Projects have defined scope, resources (including time) and focus. The scope can involve managing all of the stages of the life cycle, a subset of the stages, one or more defined processes or one or more process activities. The time scale can be of varying duration, for example one hour or tens of years. The focus of the project is related to the software and its elements in some form of system structure or stage partitioning.

NOTE 6 Related project concepts are described in clause 4.6 of this Technical Report.

NOTE 7 System life cycle concepts are described in clause 3.2 of ISO/IEC TR 24748-1.

Organizations focus on software that is created in projects within the organization or in conjunction with other organizations. Projects have a span of interest that includes the software and its related enabling systems. Some enabling systems are under direct control of the project. The software and those enabling systems make up the project span of control.

NOTE 8 The span of interest is described in clause 4.6.3 of this Technical Report.

The work performed in projects is on or with the software within one or more life cycle stages. The scope of ISO/IEC 12207:2008 includes the definition of an appropriate life cycle for software, the selection of processes to be applied throughout the life cycle and the application of these processes to fulfil agreements and achieve customer satisfaction.

ISO/IEC 12207:2008 can be applied to all types of software product-focused or service-focused systems and system elements consisting of software.

The use of ISO/IEC 12207:2008 may be adapted to accommodate the varying project requirements in treating software life cycles.

NOTE 9 This may be performed by adapting the life cycle as described in clauses 6 and 7 of ISO/IEC TR 24748-1 and tailoring described in Annex A of ISO/IEC 12207:2008.

3.4 Comparison to previous versions of ISO/IEC 12207

ISO/IEC 12207 was published on 1 August 1995 and was 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, and for standalone software products and services. That International Standard was followed in November 2002 by ISO/IEC 15288 which addressed system life cycle processes. The ubiquity of the software meant that the software and its design processes should not be considered separately from those systems, but be considered as an integral part of the system and system design processes. The ISO/IEC 12207 Amendments in 2002 and 2004 added process purpose and outcomes to the International Standard and established a Process Reference Model in accordance with the requirements of ISO/IEC 15504-2.

ISO/IEC 12207:2008 integrates ISO/IEC 12207:1995 with its two Amendments and provides better process definition to support consistency and improved usability.

NOTE 1 Clause 9.1 of ISO/IEC TR 24748-1 gives extensive detailed comparison between the versions of ISO/IEC 12207, as well as comparisons between ISO/IEC 15288:2008 and ISO/IEC 12207:2008.

NOTE 2 Figure 18 in ISO/IEC TR 24748-1 shows the process structure changes of the 2008 update.

NOTE 3 Figure 20 in ISO/IEC TR 24748-1 provides information regarding the source of the provisions in the aligned process clause set of ISO/IEC 12207:2008.

NOTE 4 Figure 21 in ISO/IEC TR 24748-1 provides a mapping between ISO/IEC 12207:1995 and ISO/IEC 12207:2008 process clause sets.

NOTE 5 Figure 22 in ISO/IEC TR 24748-1 gives the inverse mapping between ISO/IEC 12207:2008 and ISO/IEC 12207:1995.

4 Application Concepts

4.1 Overview

This Technical Report provides guidelines for life cycle management in the field of software systems. This clause highlights and explains essential concepts on which this Technical Report is based, and introduces key concepts useful in reading and applying ISO/IEC 12207:2008.

NOTE ISO/IEC TR 24748-1 provides more information on concepts related to life cycle management in general.

4.2 Software concepts

4.2.1 System and software concepts

The application of ISO/IEC 12207:2008 presupposes an understanding of system concepts. A system is a combination of interacting elements organized to achieve one or more stated purposes. For the purposes of this Technical Report, systems are considered man-made and utilized to provide services in defined environments for the benefit of users and other stakeholders. These systems may be configured with one or more of the following: hardware, software, services, humans, processes (e.g. review process), procedures (e.g. operator instructions), facilities and naturally occurring entities (e.g. water, organisms, minerals). A system may be considered as a product or as the services it provides. A system element is a member of a set of elements that constitutes a system. A system element is a discrete part of a system that can be implemented to fulfil specified requirements.

NOTE 1 System concepts are introduced in ISO/IEC 15288:2008, clause 5.1. Additional discussion, such as systems and system structure, is provided in ISO/IEC TR 24748-1, clause 3.1.

NOTE 2 ISO/IEC TR 24748-2 provides more information on concepts related to system life cycle management.

Software is the subsystems or elements of a system consisting of computer programs, related procedures, associated documentation, and data pertaining to the operation of the subsystem or element.

System concepts are directly applicable to software. The underlying philosophy of ISO/IEC 12207:2008 is that aspects such as software implementation and maintenance should be conducted in a manner that exhibits engineering discipline. Following this approach allows the establishment of a framework that has clear linkages to the systems engineering environment, i.e. one that includes software, hardware, people and business practices.

Characteristic properties at a system's boundary arise from the interactions between subordinate systems. Whatever the boundaries chosen to define the software system, the concepts and models in this Technical Report are generic and permit a practitioner to correlate or adapt individual instances of life cycles to its software concepts and principles.

NOTE 3 The relationship between systems and software is introduced in ISO/IEC 12207:2008, clause 5.1.2.

Figure 2 illustrates a system as a specific combination of hardware, computers, software, people, and facilities. In the parent system, processes such as business processes exist. Software serves by providing for the execution of certain functions of these processes in computers. The software could be resident in a computer, embedded in a piece of firmware, or integral to a hardware item. In any case, the acquisition, supply, implementation, operation, or maintenance of the software needs to be in coordination and harmony with those of the parent system.

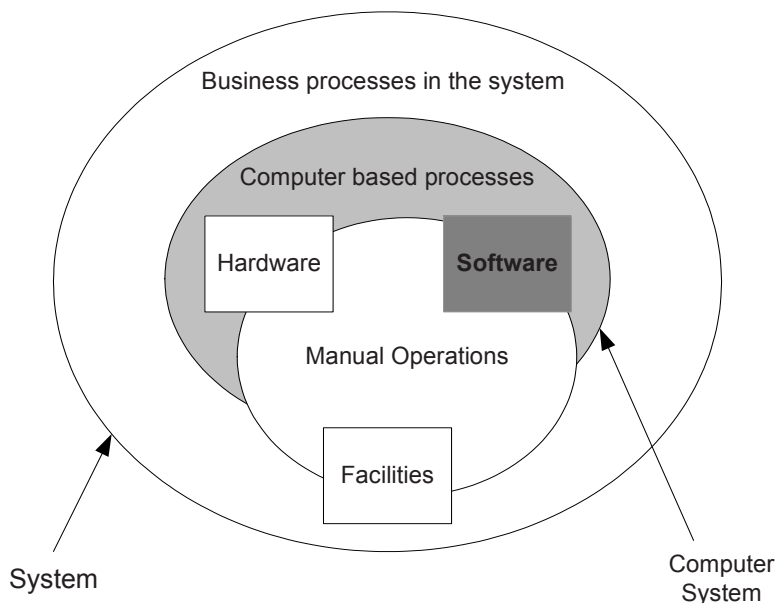


Figure 2 — Software in the system

Within an organization, there may be a number of computer systems supporting the business processes, as shown in Figure 3.

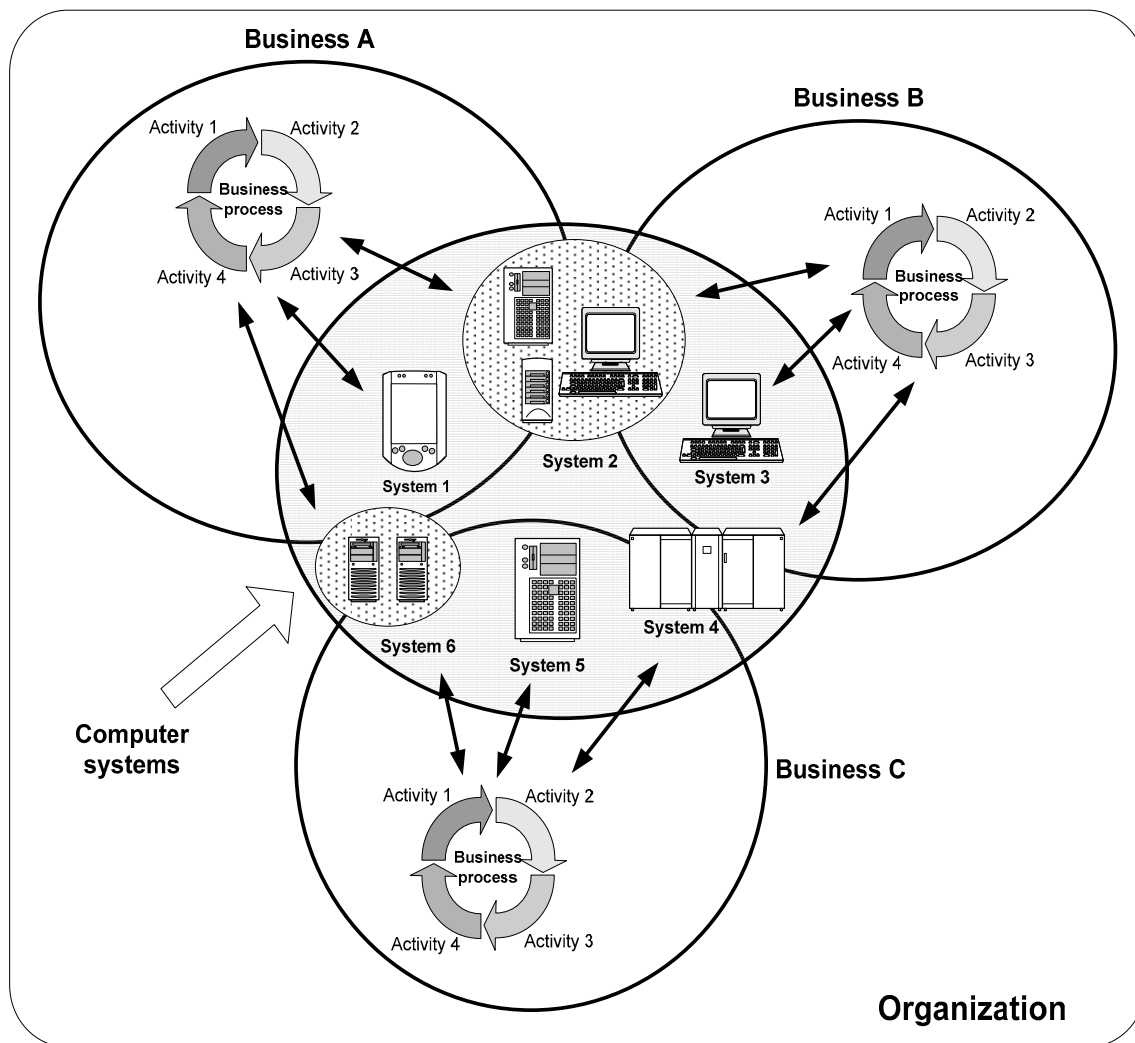


Figure 3 — Computer systems in an organization

4.3 Life cycle concepts

Application of ISO/IEC 12207:2008 presupposes an understanding of life cycle concepts.

NOTE Life cycle concepts are introduced in ISO/IEC 15288:2008, clause 5.2. Additional discussion is in ISO/IEC TR 24748-1 clause 3.2.

4.4 Process concepts

4.4.1 General

4.4.1.1 Introduction

The application of ISO/IEC 12207:2008 presupposes an understanding of process concepts.

NOTE 1 Process concepts are introduced in ISO/IEC 15288:2008, clause 5.3. Additional discussion is in ISO/IEC TR 24748-1, clause 3.3.

The focus of ISO/IEC 12207:2008 is on the processes that are applied within a life cycle. The processes can be used by organizations (for example functional organizations and projects) that play the role of acquirer, supplier (for example main contractor, subcontractor, or service provider) or management to fulfil

responsibilities pertaining to the software system. Additionally, the processes in ISO/IEC 12207:2008 can be used as a reference model for process assessments under ISO/IEC 15504, *Information technology — Process assessment*.

A process is an integrated set of activities that transform inputs (for example a set of data such as requirements) into desired outputs (for example a set of data describing a desired solution). An activity is a set of cohesive tasks. A task is a requirement, recommendation, or permissible action, intended to contribute to the achievement of one or more outcomes of a process.

A task is expressed in the form of a requirement, self-declaration, recommendation, or permissible action. For this purpose, Note 3 of Clause 2.3 in ISO/IEC 15288:2008 carefully employs certain auxiliary verbs to differentiate between the forms of tasks:

- “Shall” is used to express a requirement of the International Standard;
- “Should” to express a recommendation;
- “May” to indicate permission.

Within a life cycle stage, processes are performed as required to achieve stated objectives. The progression of a system through its life is the result of actions managed and performed by people in one or more organizations using the processes selected for a life cycle stage.

NOTE 2 Process concepts are introduced in ISO/IEC 15288:2008, clause 5.3, ISO/IEC 12207:2008, clauses 5.1.9 and 5.1.10, and ISO/IEC TR 24748-1, clause 3.3.

NOTE 3 Criteria for processes are discussed in ISO/IEC 12207:2008, clause 5.1.8, and the decomposition of processes is discussed in clause 5.1.11. ISO/IEC 15288:2008 does not contain corresponding material.

NOTE 4 ISO/IEC TR 24774, *Systems and software engineering — Life cycle management — Guidelines for process definition*, provides guidelines for the description of processes.

Figure 4 illustrates example inputs and outputs of a process for engineering a system. The inputs can be either converted to desired outputs or can enable or control the conversion. Each set of these process inputs and outputs needs to be defined and managed.

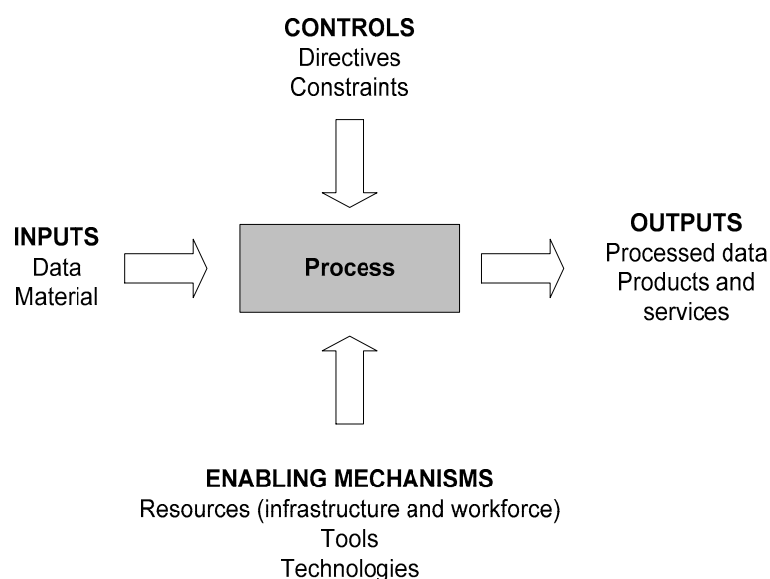


Figure 4 — Example process inputs and outputs

4.4.1.2 Inputs

Inputs can come from outside an organization or project, or from other processes that precede or accompany the process being examined. Examples of inputs to a process include:

- a) Information, such as requirements, interface or architecture definitions.
- b) Data, such as measurements and test reports.
- c) Material that either ends up in the output or is consumed in producing the output.
- d) Services that are part of a chain of services, such as setting up a computer prior to, or coincident with establishing an account.

4.4.1.3 Outputs

Outputs can go to other processes or back to the same process (recursive processing) inside the organization, project (or both), or they can go outside the project or organization, or both. Examples of outputs parallels the examples given for inputs in 4.4.1.1. However, the outputs are often (but not necessarily) transformed in some way by the process being examined.

4.4.1.4 Controls

Processes can be controlled by organizational or organization management directives and constraints and by governmental regulations and laws. Examples of such controls on a process include:

- a) The project agreement.
- b) The interfaces with processes used on other systems for which the project is responsible (see clause 4.6.2 of this Technical Report).
- c) The applicable system life cycle stage or stages.
- d) Internal standard practices of the organization, or the part of the organization that has project responsibility.

4.4.1.5 Enabling Mechanisms

Each process can have a set of process enabling mechanisms such as listed below.

- a) The workforce that performs the tasks related to the process.
- b) Other resources required by the process such as facilities, equipment and funds.
- c) Tools (for example software and hardware, automated, manual) required for performing the process activities.
- d) Technologies required by persons performing the activities including methods, procedures and techniques.

4.4.2 Process principles

4.4.2.1 Introduction

ISO/IEC 12207:2008 establishes a top-level architecture of the life cycle of software from conception through retirement. The architecture is constructed with a set of processes and interrelationships among these processes. The processes are based on two primary principles:

- Modularity; and
- responsibility.

4.4.2.2 Modularity

The processes are modular, in that they are:

- a) Strongly cohesive: All the parts of a process are strongly related. This reduces the dependency of one process on others, which in turn increases the efficiency with which the process can be executed;
- b) Loosely coupled: The number of interfaces among the processes is kept to a minimum, which reduces the amount of communication required for each process to successfully complete.

In principle, each process is dedicated to a unique function at each usage in a given stage of the life cycle and may employ another process for a specialized function. The following presents the rules for identifying, scoping, and structuring processes:

- a) A process is modular i.e. one process should perform one and only one function within the life cycle and the interfaces between any two processes should be minimal;

NOTE The rule that a process should perform one and only function does not imply that a process can only be performed by one part of an organization at one stage of the life cycle. Performing a process is not locked to any one time, part of the life cycle, or performing part of the organization.

- b) Each process is invoked in the architecture;
- c) If process A is invoked by process B and only process B, then A belongs to B;
- d) If a function is invoked by more than one process, then the function becomes a process in itself;
- e) It must be possible to verify any function within the life cycle model;
- f) Each process should have an internal structure defined sufficiently to be executable.

4.4.2.3 Responsibility

The principle of responsibility is closely linked to the concept of an organization. Each process is considered the responsibility of an organization (or party). An organization may perform one or more processes. A process may be performed by one organization or more than one organization, with one of the organizations being identified as the responsible party. A party executing a process has the responsibility for that entire process even though the execution of individual tasks may be by different people.

The responsibility principle facilitates adaptation and application of ISO/IEC 12207:2008 on a project, in which many persons may be legitimately involved.

NOTE 1 ISO/IEC TR 24748-1, clause 3.3.2 provides more information on process responsibility.

NOTE 2 Organizations and parties are discussed in clause 4.5 of this Technical Report.

4.4.3 Process categories of ISO/IEC 12207:2008

4.4.3.1 General

ISO/IEC 12207:2008 groups the activities that may be performed during the life cycle of a software system into seven process groups, four of which are system context process groups, and three of which are software-specific process groups. The system context process groups are similar or identical to those in ISO/IEC 15288:2008.

The system context process groups are:

- Agreement Processes;
- Organizational Project-Enabling Processes;
- Project Processes; and
- Technical Processes.

The software specific process groups are:

- Software Implementation Processes;
- Software Support Processes; and
- Software Reuse Processes.

Each of the life cycle processes within the seven groups is described in terms of its purpose and desired outcomes and lists activities and tasks which need to be performed to achieve those outcomes.

NOTE The life cycle process categories are summarized in ISO/IEC 12207:2008, clause 5.2.1. A summary of the processes are given in clause 5.2.2. In-depth discussions are given in clauses 6 and 7.

4.4.3.2 System context process categories

The system context processes are shown in Figure 5.

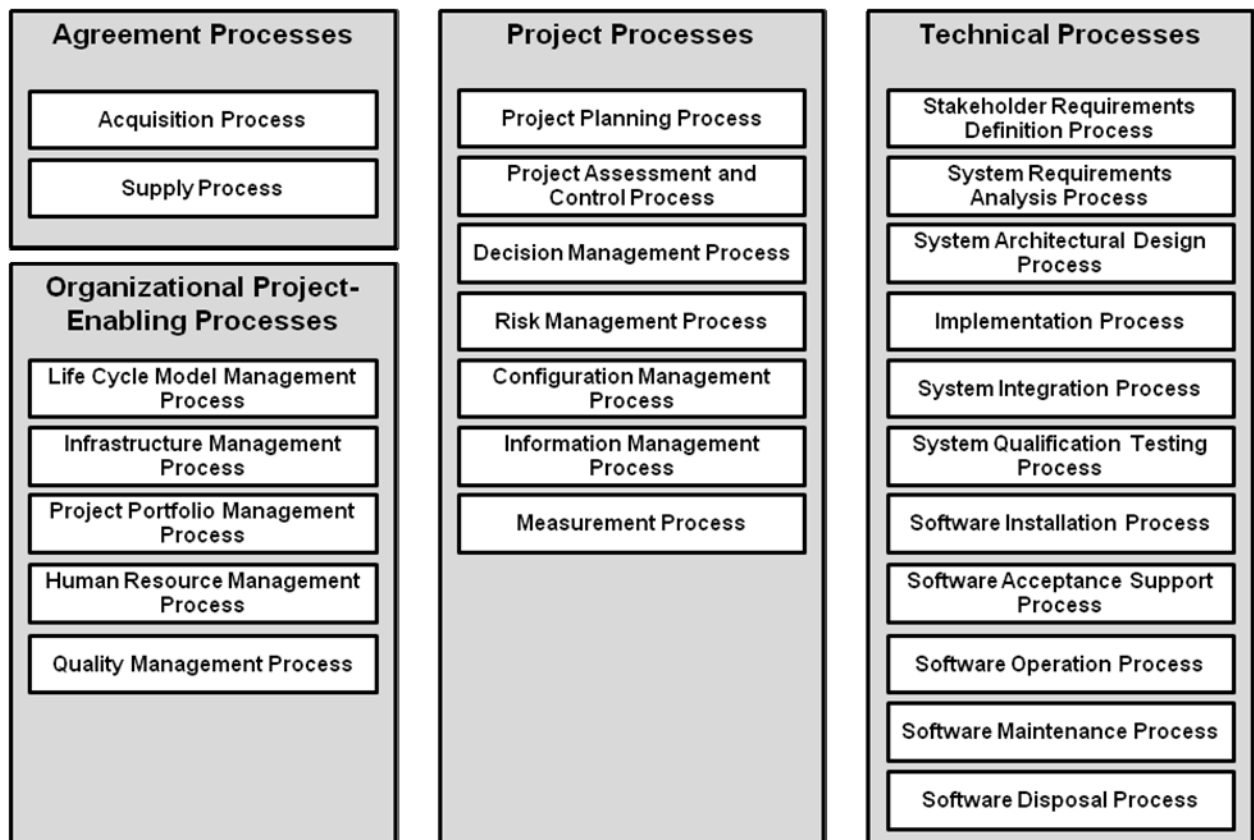


Figure 5 — System context processes

NOTE 1 A summary of the system context processes are given in ISO/IEC 12207:2008, clause 5.2.2.1. An in-depth discussion is given in clause 6.

The four system context process groups of ISO/IEC 12207:2008, as well as the primary relationships between the groups, are portrayed in Figure 6. The role of the Organizational Project-Enabling and Project groups of processes is to achieve the project goals within applicable life cycle stages to satisfy an agreement. Organizational Project-Enabling Processes provide enabling resources and infrastructure that are used to create, support, and monitor projects and to assess project effectiveness. The Project Processes ensure that adequate planning, assessment, and control activities are performed to manage processes and life cycle stages.

Appropriate processes are selected from the Technical Processes and used to populate projects in order for the project to perform work related to the system life cycle.

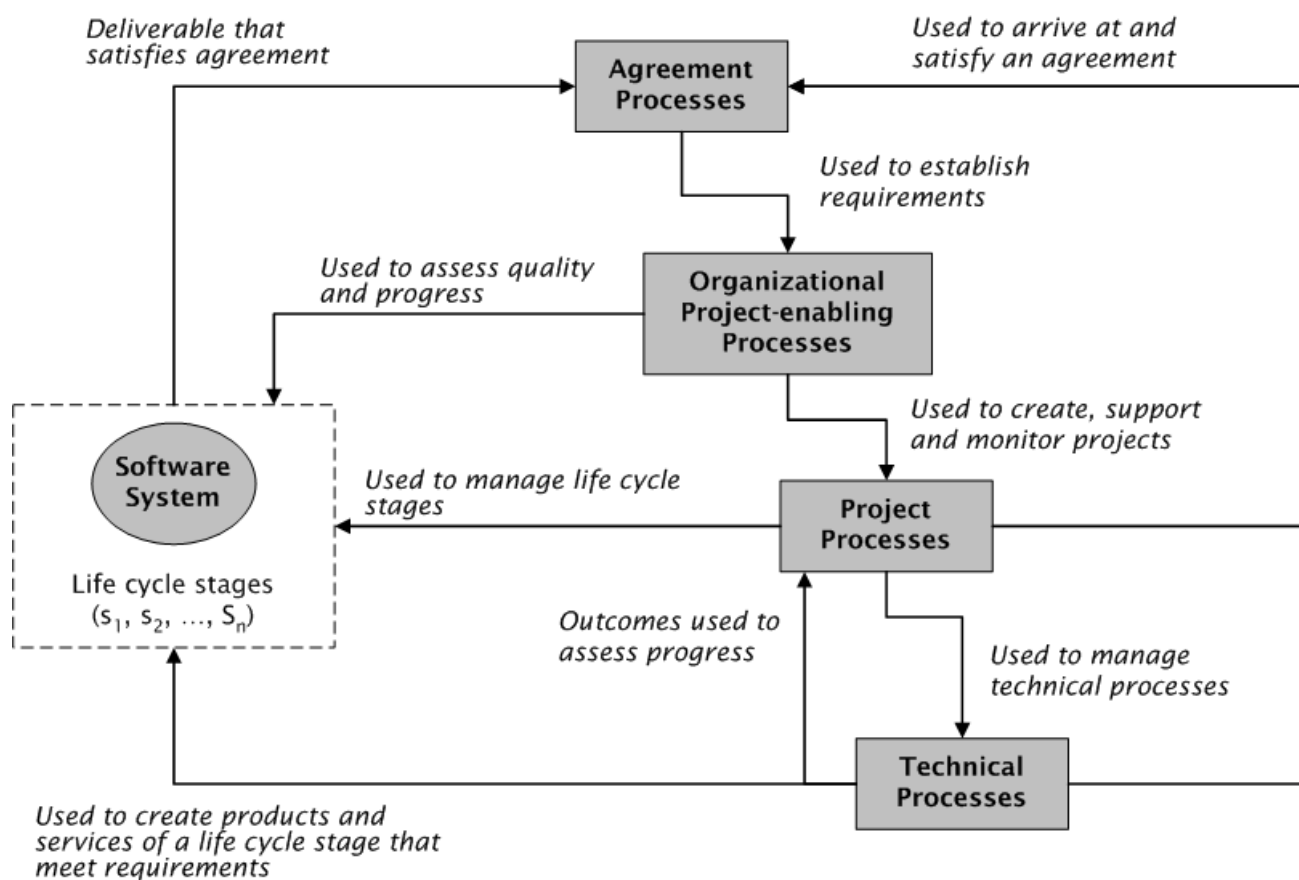


Figure 6 — Role of the system context processes

Projects may need to establish relationships with other projects within the organization, as well as those in other organizations. Such relationships are established through the Agreement Processes of acquisition and supply as shown in Figure 7. The degree of formality of the agreement is adapted to the internal or external business relationships between projects.

NOTE 2 An example and discussion of the use of the Agreement Processes is provided in clause 5.4.2 of this Technical Report.

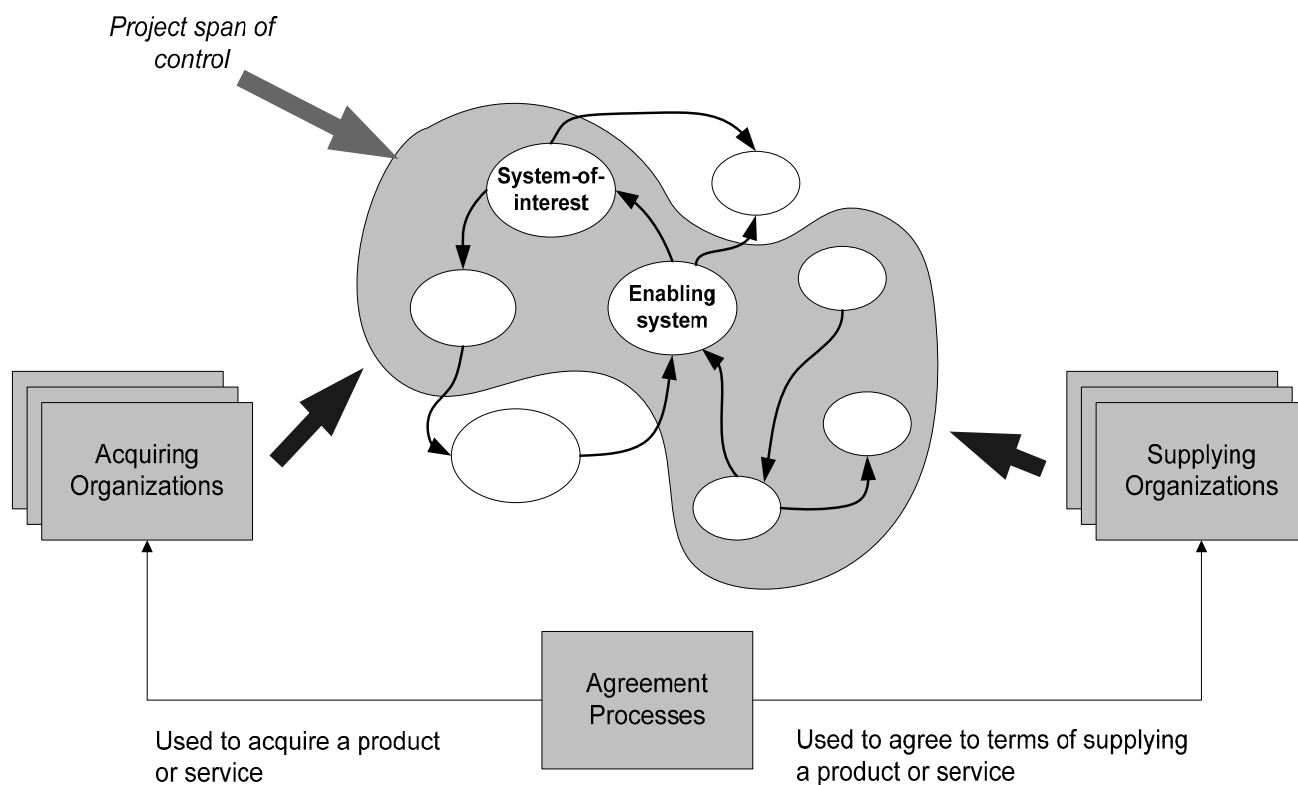


Figure 7 — Use of Agreement Processes

4.4.3.3 Software specific process categories

The software specific processes are shown in Figure 8.

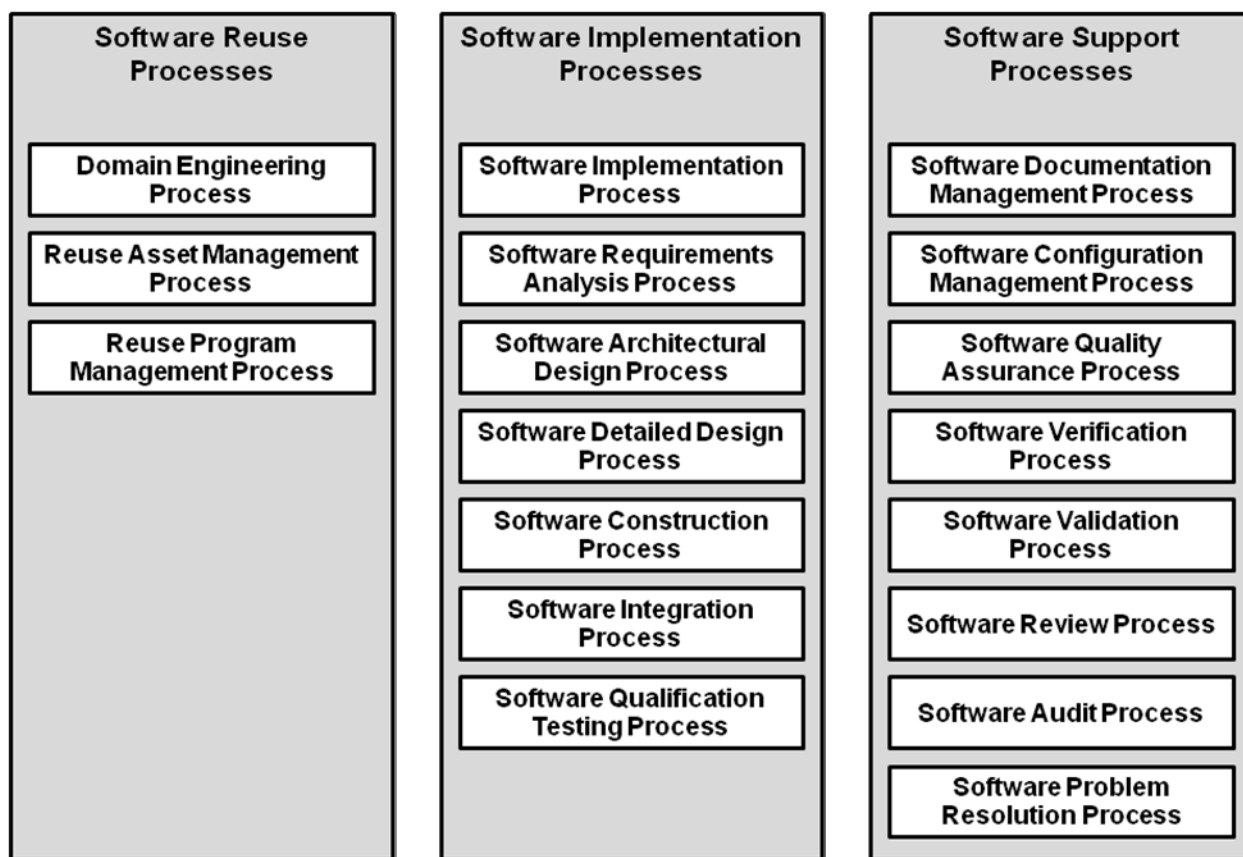


Figure 8 — Software specific processes

NOTE A summary of the software specific processes are given in ISO/IEC 12207:2008, clause 5.2.2.2. An in-depth discussion is given in clause 7.

The three software specific process groups of ISO/IEC 12207:2008, as well as the primary relationships between the groups, are portrayed in Figure 9.

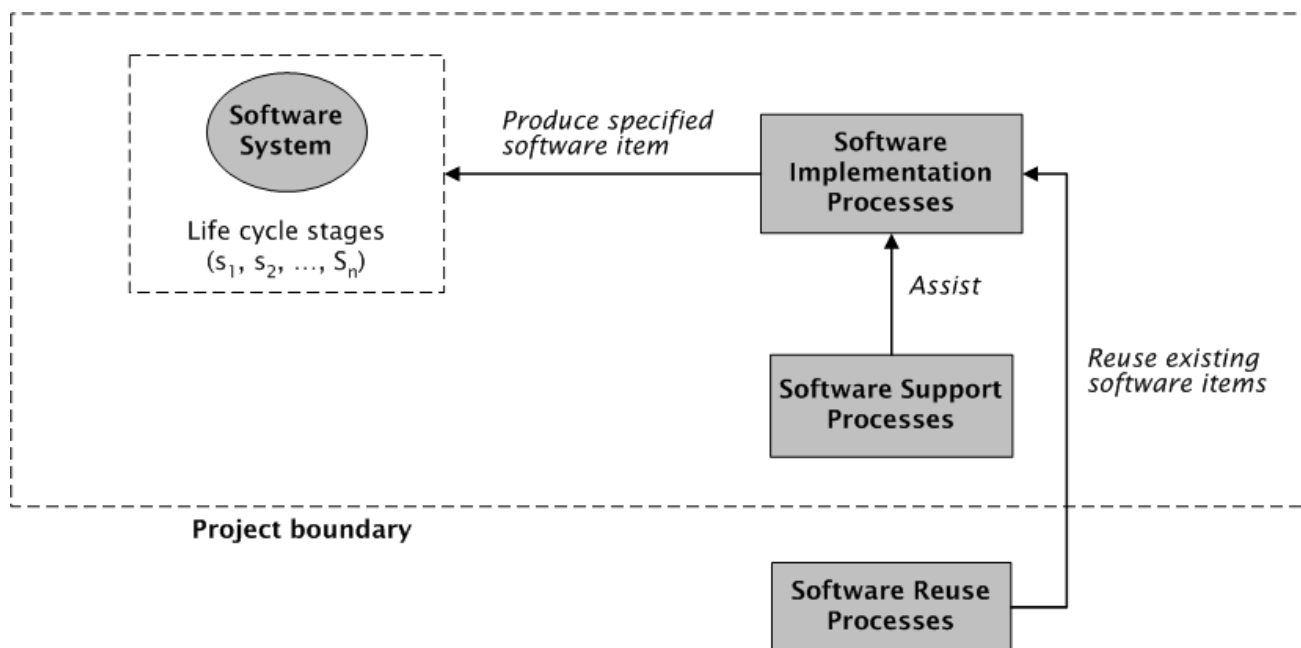


Figure 9 — Role of the software specific processes

4.4.4 Recursive/iterative application of processes

4.4.4.1 General

Two forms of process application are essential and useful for executing the requirements of ISO/IEC 12207:2008:

- recursive; and
- iterative.

4.4.4.2 Recursive application of processes

When the same set of processes or the same set of process activities are applied to successive levels of system elements within the system structure, the application form is referred to as recursive. The outcomes from one application are used as inputs to the next lower (or higher) system element in the system structure to arrive at a more detailed or mature set of outcomes. Such an approach adds value to successive parts of the system structure. Figure 10 illustrates the recursive application of processes to systems from the top down.

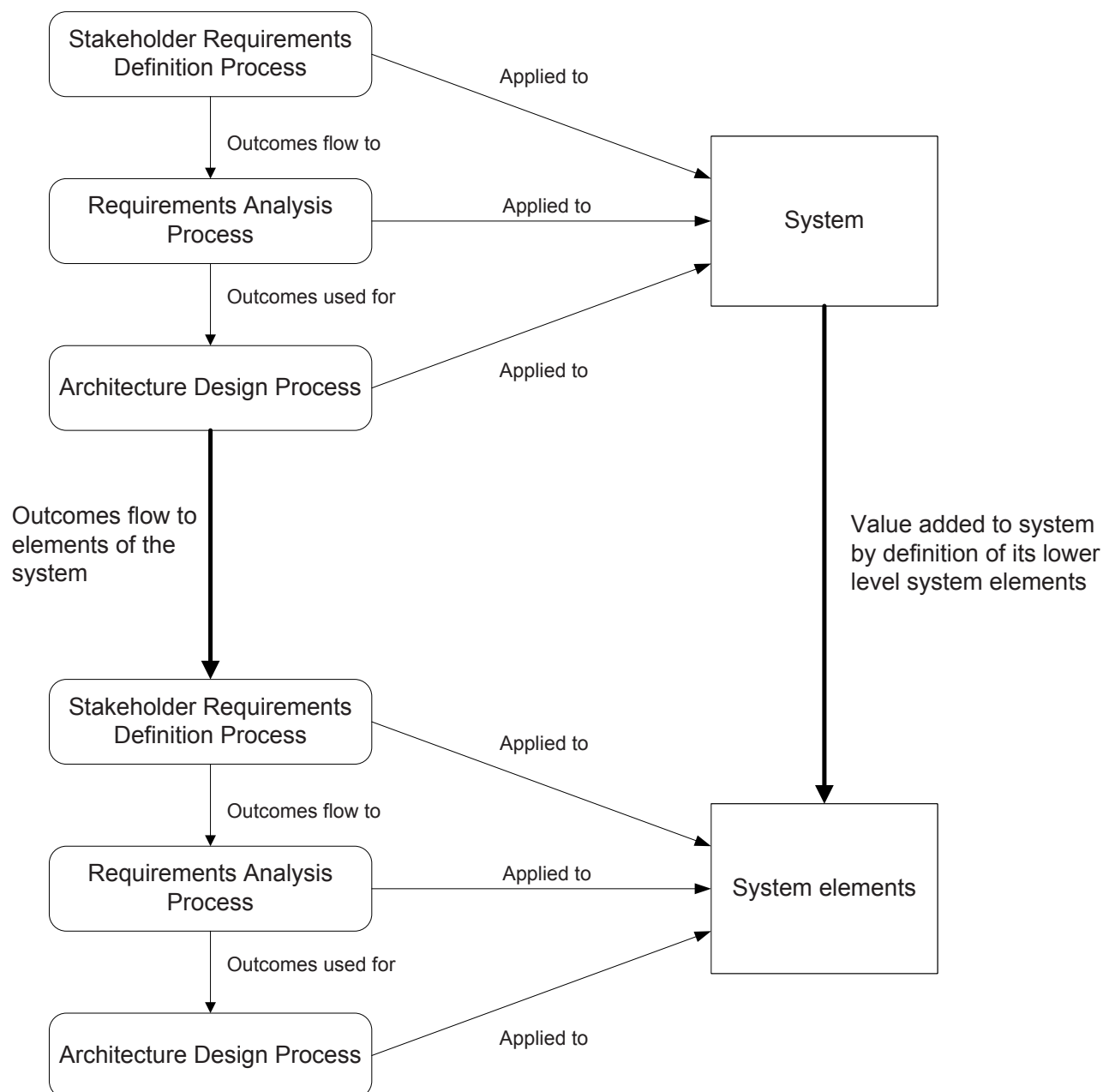


Figure 10 — Recursive application of processes

4.4.4.3 Iterative application of processes

When the application of the same process or set of processes is repeated on the same system, the application is referred to as iterative. Iteration is not only appropriate but also expected. New information is created by the application of a process or set of processes. Typically this information takes the form of questions with respect to requirements, analyzed risks or opportunities. Such questions should be resolved before completing the activities of a process or set of processes. When re-application of activities or processes can resolve the questions, then it is useful to do so. Iteration can be required to ensure that information with admissible quality is used prior to applying the next process or set of activities to a system-of-interest. In this case iteration adds value to the system to which the processes are being used. The iterative application of processes is illustrated in Figure 11.

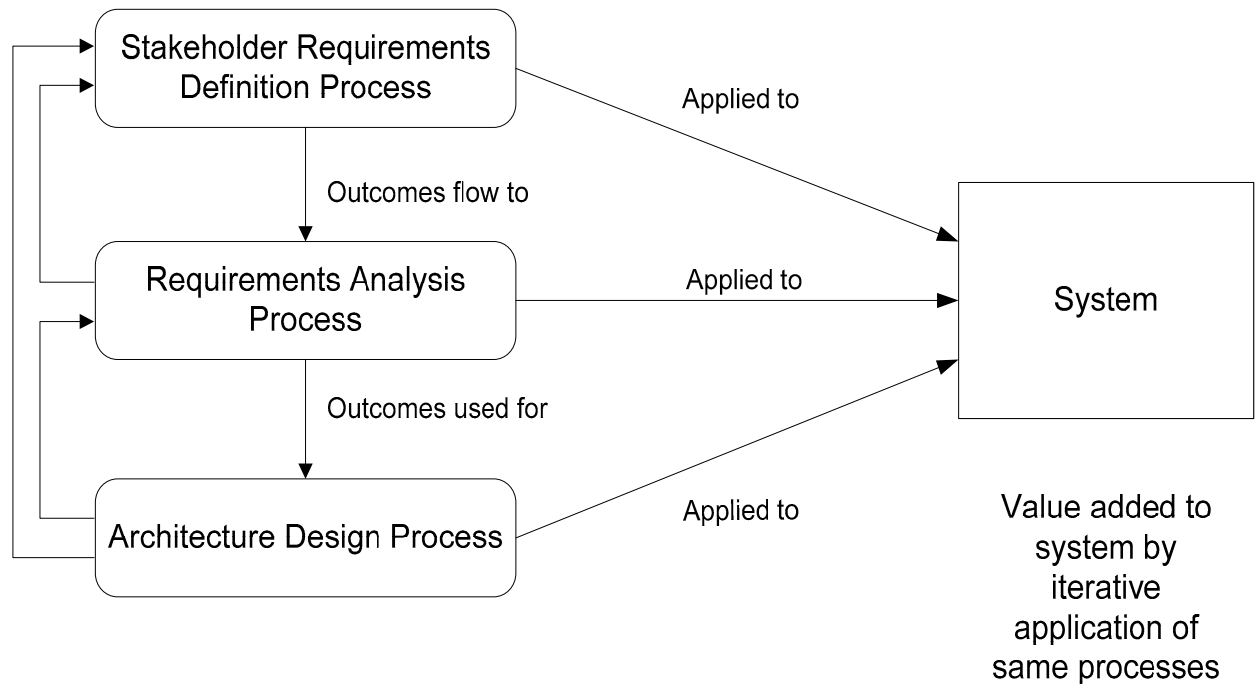


Figure 11 — Iterative application of processes

4.4.4.4 Methods and tools

In practice, there are many situations where software size and complexity, project duration and the number of contributing organizations require process execution to be supported by methods and tools.

The selection of methods and tools depend on many factors including stage in the life cycle, level in the software system's hierarchy and application domain. As a result, neither ISO/IEC 12207:2008, nor this Technical Report, includes discussions of specific methods and tools. Nevertheless, there are some issues that the user of ISO/IEC 12207:2008 should bear in mind when selecting and using methods and tools to accomplish life cycle process activities or related tasks. Four such issues are listed below.

- A method or tool does not pre-empt the process to be followed but should support the set of activities of a selected process. Methods should be selected to fit the software life cycle stage.
- Selection of tools should be based on connectivity to other tools that provide inputs or use outputs of the tool being considered for use. The engineering data produced should be in an appropriate form to enable the data to be captured, stored and available as long as it is needed. Those members of organizations, organizations, projects and other stakeholders who have the need should be given access authority to the data.
- The training requirements for application of the method or tool should be considered. The initial, as well as subsequent training time after a user has not used the tool for a period of time, should be included in the consideration.
- Enabling systems as well as tool administration should be considered.

4.5 Organizational concepts

4.5.1 General

An organization is a person or a group or people and facilities with

- an arrangement of responsibilities,
- authorities, and
- relationships.

An identified part of an organization (even as small as a single individual) or an identified group of organizations can be regarded as an organization, if it has responsibilities, authorities and relationships. In ISO/IEC 12207:2008, the terms "organization" and "party" are closely related. When an organization, as a whole or a part, enters into a contract, it is a party. Organizations are separate bodies, but the parties may be from the same organization or from separate organizations.

NOTE Organizations and parties are introduced in ISO/IEC 12207:2008, clause 5.1.3. Organizational-level and project-level adoption is discussed in clause 5.1.4.

4.5.2 Responsibility

Each process is considered the responsibility of a party. An organization may perform one or more processes. A process may be performed by one organization or more than one organization, with one of the organizations being identified as the responsible party. A party executing a process has the responsibility for that entire process even though the execution of individual tasks may be by different people.

The responsibility feature of the life cycle architecture facilitates adaptation and application of ISO/IEC 12207:2008 on a project, in which many persons may be legitimately involved.

An organization (or a party) derives its name from the process it is currently performing, for example, it is called an acquirer when it performs the Acquisition Process. In ISO/IEC 12207:2008, the agreeing parties are called the acquirer and the supplier.

When the following terms are used in ISO/IEC 12207:2008, they do not have their generic meaning, but instead, refer to the organization or party responsible for executing the process with a similar name:

- acquirer,
- supplier,
- implementer,
- maintainer, and
- operator.

The processes and organizations (or parties) are only related functionally. ISO/IEC 12207:2008 does not dictate or imply a structure for an organization (or a party).

NOTE ISO/IEC TR 24748-1, clause 3.3.2 discusses process responsibilities in organizations.

4.5.3 Organizational relationships

A project has relationships with the organization, the business (or other entity) and other project-enabling structures in which the project resides. The project places certain demands on the organization and the organization places demands on the project. The project requires physical infrastructure, financial and human resource support to carry out project work. The organization both constrains and supports a project. Examples of such organizational constraints and supports are given below:

- a) sets standards, policies, and procedures by which projects are carried out within the organization;
- b) initiates, redirects or terminates projects according to business opportunities and strategies;

- c) provides requested resources including physical and human within availability and financial constraints;
- d) provides infrastructure support;
- e) manages the overall quality of software systems produced by a project for external customers.

A project plan is often used as a basis of an agreement between projects and various organizational elements.

4.5.4 Project organizational structure

The application of ISO/IEC 12207:2008 does not require a specific organizational structure for projects. However, an appropriate organizational structure is essential. It is of particular importance that the appropriate teams or groups be assembled, structured and given the appropriate responsibility and authority for doing the work required to meet the project requirements, for example the activities and tasks of a process. The teams may include representatives from each stage of the life cycle.

Team or group members assigned responsibility for a software system need to be available and competent. In the context of complex software systems this could require that the structure of the teams or groups be multidisciplinary and include skills necessary to do required tasks.

As a rule of thumb, project teams consist of seven plus or minus two members to develop the teamwork necessary for maximizing efficiency and effectiveness. Typically the team needs to rely on the individual specialist or functional groups of the organization to do such tasks as assessments on security, safety, survivability, reliability and effectiveness as well as trade-off studies, risk analyses and design work. In this context the team then becomes the integrated decision-making structure for process activities performed in a software life cycle stage. It is, however, important that individual teams share knowledge and communicate with other teams working on enabling systems for the same system and other adjoining systems. Such communications should be established so that the resultant software is properly integrated from the lowest level up. It is also important so that each system and system element in the system structure is appropriately supported over its life.

4.6 Project concepts

4.6.1 General

A project is an endeavour with defined start and finish dates undertaken to create a product or service in accordance with specified resources and requirements. A project portfolio is a collection of projects that addresses the strategic objectives of the organization.

A project may be viewed as a unique process comprising coordinated and controlled activities and may be composed of activities from the Project Processes and Technical Processes defined in ISO/IEC 12207:2008.

NOTE 1 ISO/IEC TR 24748-1, clause 3.1.4, provides more detail on structure in systems and projects.

NOTE 2 ISO/IEC TR 24748-1, clause 3.1.5, provides more detail on enabling systems.

For the purpose of ISO/IEC 12207:2008, any project is assumed to be conducted within the context of an organization. This is important because a software project is dependent upon various outcomes produced by the business processes of the organization, e.g., employees to staff the project and facilities to house the project. For this purpose, this standard provides a set of Organizational Project-Enabling Processes. It is important to note that the Organizational Project-Enabling Processes are not assumed to be adequate to operate a business, nor are the Project Processes assumed to be adequate to operate a project. Instead, the processes, considered as a collection, are intended to state the minimum set of dependencies that the project places upon the organization.

ISO/IEC 12207:2008 describes the set of processes that comprise the life cycle of any software system. Therefore, ISO/IEC 12207:2008 is designed so that it can be adapted for a software project of any type, size

and complexity, whether focused on tangible products, services, or a mix of both. It is also designed to be used whether the software is considered as a stand-alone entity, or a part of the total system.

The processes, activities, and tasks in ISO/IEC 12207:2008 are arranged in their most general, natural positional sequence. This positional sequence does not dictate the life cycle model sequence. It is intended that the software project select, order, adapt and iterate the processes, activities, and tasks as applicable or appropriate.

On the same project, ISO/IEC 12207:2008 may be separately applied more than once. For example, in a given software implementation project, an acquirer may request a supplier to perform software implementation, with the acquirer and the supplier executing one application of ISO/IEC 12207:2008. The supplier may then request its sub-contractor to perform all or part of the software implementation. The supplier (now in an acquisition mode) and its sub-contractor (in supplier mode) execute a separate application of ISO/IEC 12207:2008. In both situations, it is necessary to adapt ISO/IEC 12207:2008 to reflect the arrangements.

NOTE 3 IEEE Std. 1490-2003, *Adoption of PMI Standard: A Guide to the Project Management Body of Knowledge*, provides more information on projects and project management.

4.6.2 Project relationships

Relationships can exist between a project and other projects, and subprojects. A subproject as used here and in Figure 12 is a set of resources and tasks organized to undertake a portion of a project. A subproject may be considered a project by those assigned the work. Figure 13 illustrates typical roles of agreements that establish project relationships internal and external to the project.

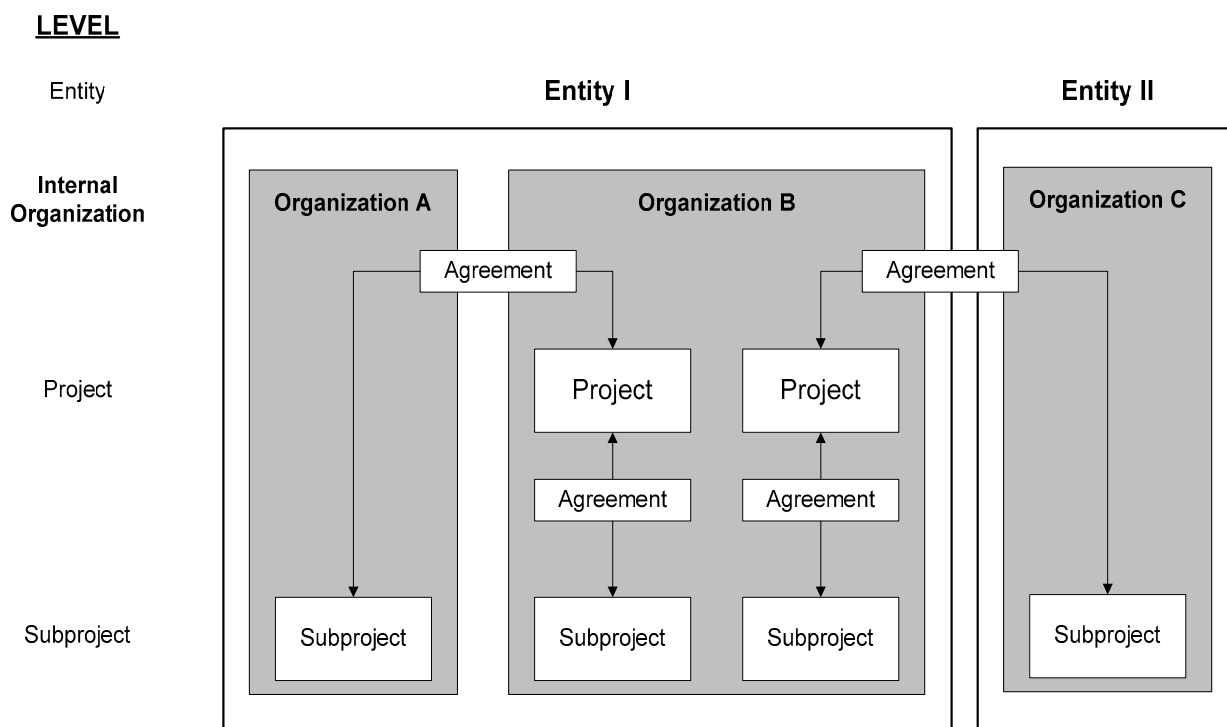


Figure 12 — Roles of agreements

Project relationships are managed through formal or informal agreements in accordance with organizational policies and procedures, as appropriate. Depending on the type of project relationship involved, agreements may exist within a single organization, or may span organizational boundaries. Agreements may be between a project and a specific organizational element or elements, among multiple projects, or among a project and its subprojects. Agreements provide a mutual understanding of the problem to be solved, work to be done, established constraints, deliverables and clearly defined responsibilities and accountability.

Another agreement, not shown in Figure 12, would be applicable when two or more organizations cooperate on a single project. In this case, it is important to define each organization's authorities, responsibilities and rights, including the sharing of proprietary information applicable to the project in an agreement.

Regardless of the kind of agreement, there is some basic information needed to do the work required in ISO/IEC 12207:2008. Each agreement, whether formal or informal, should include the following information to the appropriate level of detail:

- a) responsibilities for the work expected to be done, for example in the form of work statements;
- b) known functional and performance requirements, attributes and characteristics that clearly assign what the software system and its related services are expected to do, be like or contain, including interfaces with other systems, humans and environments. These can be in the form of a set of formal requirement statements or a specification;
- c) deliverables, for example products, services and data;
- d) the stage or stages of the applicable life cycle model, including the related stage entry or exit decision criteria. Criteria provide the basis for determining whether the project is ready to progress to the next applicable life cycle stage;
- e) required technical reviews to track the fulfilment of the agreement and assess the maturity of the system;
- f) other appropriate information such as:
 - 1) cost and schedule constraints;
 - 2) implementation delivery milestones;
 - 3) payment schedules;
 - 4) planning documents including applicable work breakdown or system structure, related configuration documents and acquirer supplied engineering plans;
 - 5) verification and validation responsibilities;
 - 6) acceptance conditions and transition instructions (for example for packaging, handling, delivery and installation); and
 - 7) rights and restrictions associated with technical data (for example for copyright, intellectual property and patents).

NOTE A model is provided in clause 5.4.2 of this Technical Report for the application of ISO/IEC 12207:2008 processes to reach an agreement.

4.6.3 Enabling system relationships

Another relationship among projects is one that involves enabling systems. The project is responsible for ensuring that required enabling systems are available when needed to fulfil the functions of the software or enable the software to be realized. Some or possibly all enabling systems could be outside the direct responsibility (boundary) of the project. Some or all of the enabling systems could already exist within the project's organization. Other enabling systems could be easily made available, for example by rental or purchase. However, one or several enabling systems may not exist, and have to be created and be made available in time to provide required services.

It is within the project's span of interest that not only the software should appropriately be made available but also all enabling systems that are needed throughout the software system life cycle. Thus the project should determine needed enabling systems and take appropriate actions to ensure their availability for use.

Agreements should be established between the project and the internal or external organization or organization, as applicable, to ensure that specified enabling system services are provided when needed. A project span of interest is illustrated in Figure 13.

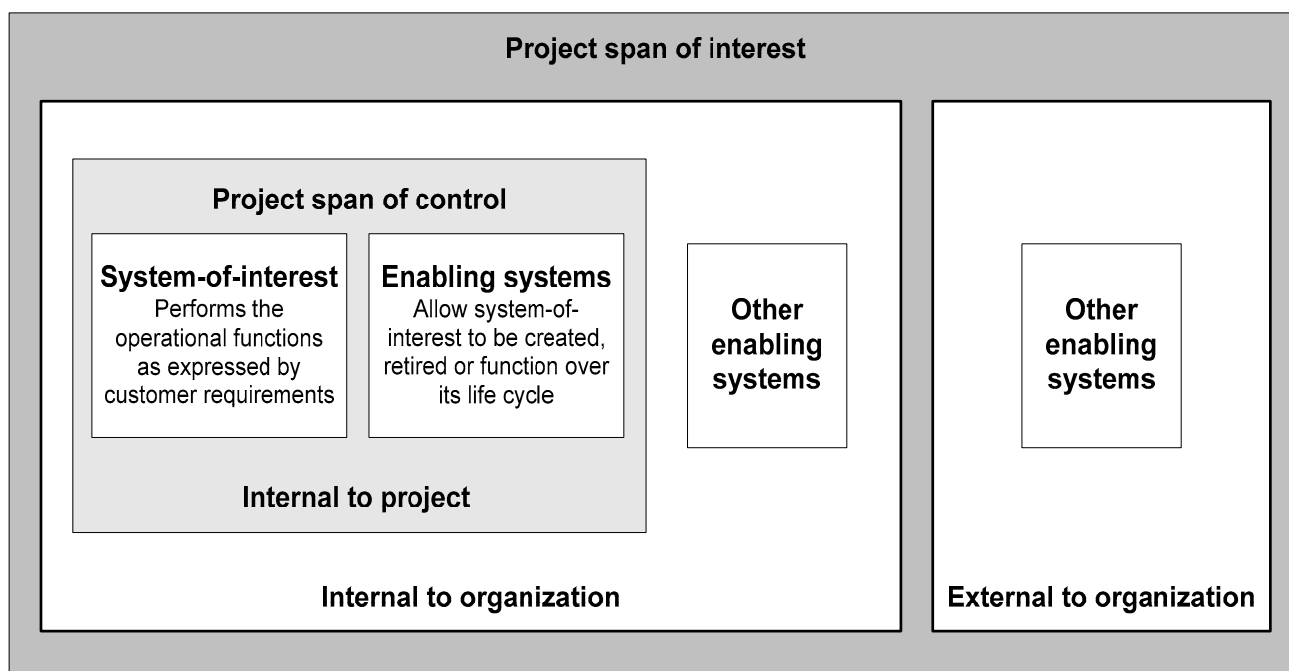


Figure 13 — Project span of interest

4.6.4 Hierarchy of projects

The basic relationship of Figure 13, which illustrates the project span of interest, can be combined with the hierarchical view of a system structure illustrated in Figure 2 of ISO/IEC TR 24748-1 and the system-of-interest structure in Figure 3 of ISO/IEC TR 24748-1 to give a hierarchical view of a project. The system that the project is responsible for is considered a system-of-interest. Each subordinate or sub-project is considered as a project itself. A resultant hierarchy of projects can then be formed. This hierarchy is illustrated in Figure 4 of ISO/IEC TR 24748-1 and is portrayed in more detail in Figure 14 of this Technical Report.

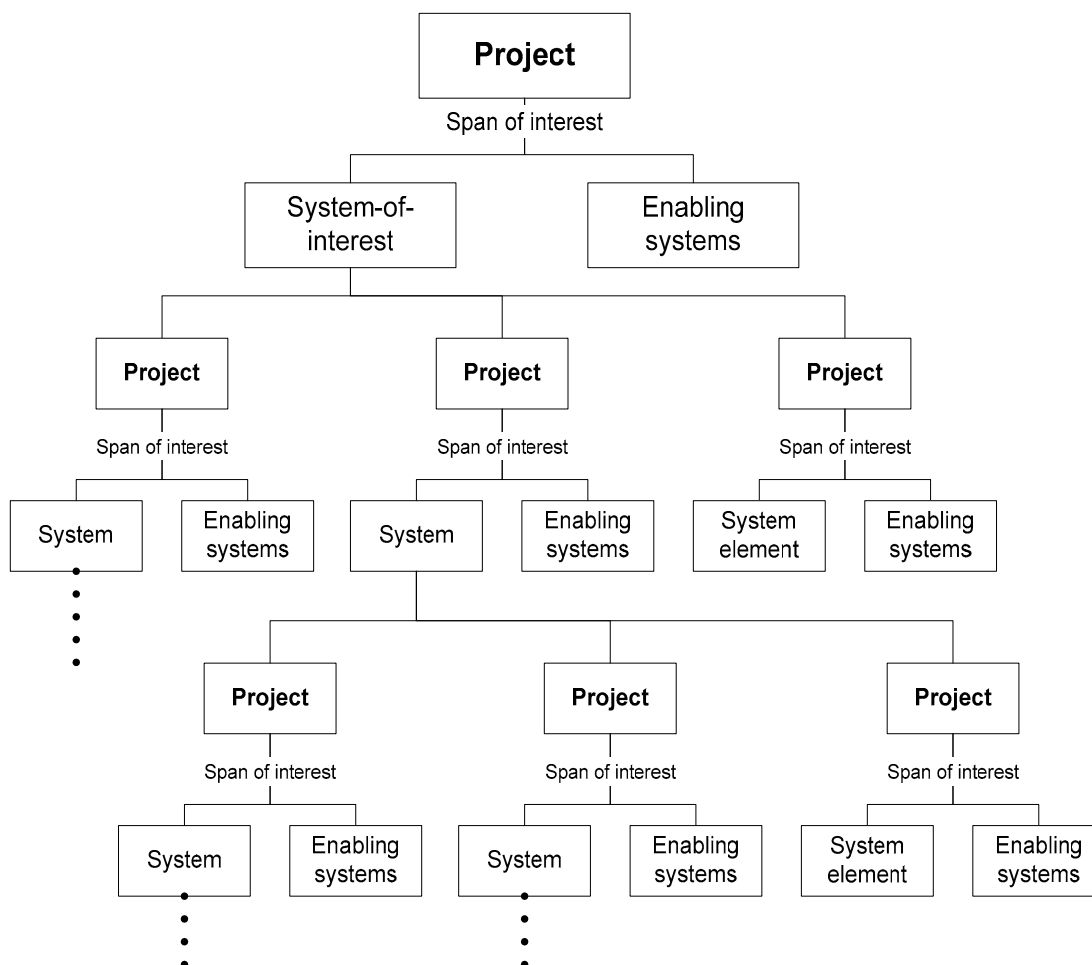


Figure 14 — Hierarchy of projects

Figure 14 shows only the lower level of projects of one system. Each system, however, should be decomposed into lower level projects until each consists of only a system element and its enabling systems. There are two such projects in Figure 14 that end with a system element. Each project should be carried out using applicable system life cycle processes to the extent required by requirements and to satisfy applicable life cycle stage entry or exit criteria.

As explained in Figure 13, the enabling systems of Figure 14 may be under project control or, if external to the project, under the control of other organizations. However, the project should work with these other organizations through agreements to ensure that the required enabling systems are available when needed to support the system-of-interest during its life cycle.

4.7 Adaptation concepts

4.7.1 General

To adapt means to make suitable, or to alter so as to make fit. Adaptation is the act or process of adapting by adding, revising, or removing material. Tailoring is adaptation that only removes conformance material.

NOTE 1 Process tailoring (removal of compliance material) concepts are introduced in ISO/IEC 12207:2008, clause 5.1.5 with further discussion in Annex A.

NOTE 2 ISO/IEC TR 24748-1 adds material on adapting (tailoring or adding material) life cycle models in clause 6 and on adapting processes in clause 9.4.3.

ISO/IEC 12207:2008 provides requirements for a number of processes suitable for usage during the life cycle of a software product or service. It is recognized that particular projects or organizations may not need to use all of the processes provided by ISO/IEC 12207:2008. Therefore, implementation of ISO/IEC 12207:2008 typically involves selecting a set of processes suitable to the organization or project.

NOTE 3 The requirements of ISO/IEC 12207:2008 are contained in clauses 6 and 7, and Annex A of that International Standard.

ISO/IEC 12207:2008 may be conformed to in the following ways:

- a) An organization declares publicly as a condition of trade, a set of processes, activities, and tasks from ISO/IEC 12207:2008, to which suppliers to the organization conform;
- b) A software project adapts appropriate processes, activities, and tasks, which are performed in accordance with contractually established criteria.

NOTE 4 Conformance to the International Standard is discussed in ISO/IEC 12207:2008, clause 5.1.4.

It is important to note that ISO/IEC 12207:2008 is not intended to be in conflict with any organization's policies, procedures, and standards or with any national laws and regulations. Any such conflict should be resolved before using ISO/IEC 12207:2008.

4.7.2 Adaptation

The processes from ISO/IEC 12207:2008, as well as life cycle models, may be adapted for an individual project to reflect the variations appropriate to the organization, project and system. ISO/IEC 12207:2008 provides five primary mechanisms for adaptation:

- a) Process selection: Claims of conformance to ISO/IEC 12207:2008 are made for a declared set of processes. Neither an organization nor a particular project is required to use every process. They may select the processes relevant to their needs and declare that subset as the basis of conformance.
- b) Process substitution: Many of the processes of ISO/IEC 12207:2008 are described as "specializations" of processes in ISO/IEC 15288:2008. Explicit permission is granted to use the system-level process as a basis for conformance rather than the software-level process.
- c) Use of Outcomes: According to the conformance clause of ISO/IEC 12207:2008, "conformance is achieved by demonstrating that all of the requirements of the declared set of processes have been satisfied using the outcomes as evidence." The fact that outcomes are used as evidence of conformance provides that alternative selections of activities and tasks may be performed if the outcomes of the declared set of processes are achieved.
- d) Use of Notes: ISO/IEC 12207:2008 use non-normative notes or other forms of guidance for provisions that are not required for conformance. In specific situations, implementation of selected notes will be appropriate.
- e) Process tailoring: Tailoring of processes is permitted. Tailoring is defined as the deletion of selected outcomes, activities, or tasks.

4.7.3 Life cycle adaptation

Life cycle adaptation is discussed in detail in clause 6 of ISO/IEC TR 24748-1.

4.7.4 Adaptation for domains, disciplines and specialties

Adaptation for domains, disciplines and specialties in ISO/IEC 12207:2008 is written at a general level and with sufficient scope that its normative provisions can be used on systems that are comprised of or include aspects of different domains (e.g. hardware, software, services, facilities, etc.). Standards used in conjunction with ISO/IEC 12207:2008 may have specific instantiations of the processes to provide better linkage to the

International Standards for the practitioners in the domain. Such linkages are advised wherever the domain practitioners deem them helpful.

Disciplines (such as mechanical engineering or facility engineering) and specialties (such as human factors, safety, or security) may find analogous adaptations of their standards to be helpful. One way of making these domain, discipline or specialty adaptations is by including them in agreements of the appropriate form, following the provisions of ISO/IEC 12207:2008, clause 6.1.

NOTE Life cycle model use and adaptation for domains, disciplines and specialties is addressed in clause 7 of ISO/IEC TR 24748-1.

4.7.5 Tailoring

Tailoring is not a requirement for conformance to ISO/IEC 12207:2008. Tailoring is not permitted if a claim of "full conformance" is to be made. If a claim of "tailored conformance" is made, then tailoring is to be performed as required by the tailoring process described in ISO/IEC 12207:2008.

NOTE 1 Tailored conformance is discussed in ISO/IEC 12207:2008, clause 2.3.

NOTE 2 ISO/IEC 12207:2008, Annex A, describes the tailoring process and defines the basic activities needed to perform tailoring of the International Standard.

As stated in ISO/IEC 12207:2008, tailoring may diminish the perceived value of a claim of conformance to the International Standard. This is because it is difficult for other organizations to understand the extent to which tailoring may have deleted desirable provisions. An organization asserting a single-party claim of conformance to ISO/IEC 12207:2008 may find it advantageous to claim absolute conformance to a smaller list of processes rather than tailored conformance to a larger list of processes.

5 Applying ISO/IEC 12207:2008

5.1 Overview

Understanding concepts does not give the ability to immediately apply them without further thought and work. The following clauses give guidance on what is to be done to bridge the gap between concept and practical use in different project, organizational and life cycle environments, starting with planning the application of ISO/IEC 12207:2008.

NOTE The application of ISO/IEC 12207:2008 is introduced in clause 5 of the International Standard.

Modern organizations strive to develop a robust set of life cycle processes that are applied repeatedly to the projects of the organization. To accommodate that need, ISO/IEC 12207:2008 is intended to be useful for application at either the organization level, or at the project level. An organization would adopt ISO/IEC 12207:2008 and supplement it with appropriate procedures, practices, tools and policies. A project of the organization would typically conform to the organization's processes rather than conform directly to ISO/IEC 12207:2008.

In some cases, projects may be executed by an organization that does not have an appropriate set of processes adopted at the organizational level. Such a project may apply the provisions of ISO/IEC 12207:2008 directly to the project.

5.2 Application strategy

5.2.1 Overview

ISO/IEC 12207:2008 may be applied for a variety of reasons, such as:

— To define the processes, activities and tasks required for use on a specific project;

- To improve processes used by an organization across multiple projects;
- To provide guidance on software system life cycle processes usable within a larger process, such as an organization's acquisition process or maintenance process.

Whatever the reason for application of ISO/IEC 12207:2008, a suggested application strategy consists of the following:

- a) Plan the application;
- b) Adapt ISO/IEC 12207:2008, if applicable;
- c) Conduct pilot project(s);
- d) Formalize the approach;
- e) Institutionalize the approach.

This strategy is typical of the approach that is to be followed when introducing changes into an organization or project. The application strategy described above may be repeated several times within a project or across an organization as additional processes are addressed and/or improved.

Whether the existing basis for system life cycle processes is an older version of ISO/IEC 12207 or some other reference point, the fundamental starting point is to identify all the changes needed to go from that basis to ISO/IEC 12207:2008. If the existing process basis is an older version of ISO/IEC 12207, the amount of changes will be noticeably less than if a different process basis is in use.

Bringing all the stakeholders together in this effort is critical: even one area left out that should have been in the planning can materially disrupt applying the new basis. One way of proceeding is for a small group to develop a checklist of things that must be considered in applying ISO/IEC 12207:2008. This may include, and possibly will not be limited to

- a) documentation changes, including flow and nomenclature;
- b) staff training needs;
- c) responsibility changes, including need for new agreements;
- d) impacts on tools and databases; and
- e) changes in the inputs required by and outputs from each process.

The initial checklist should then be used by an immediately following, larger, group of all stakeholders to work through what other items need to be added and what the specific changes are for each item on the checklist. Repeated reviews of checklist drafts should be held to find the final few surprises.

Once there is a detailed listing of the changes derived in this, or equivalent, manner, the time and cost impact of each need to be assessed. Then further analysis of the sequence of implementing the changes is necessary. The group should explore phasing in changes in a way that minimizes cost, project disruption and the potential for adverse human reactions. Readiness criteria should be developed for starting each step of a phase-in, as well as checks for successful completion after each step of phasing in the changes. Quantitative metrics should be developed and used.

Throughout, a core group should be maintained to oversee the change from one basis to another, with periodic meetings of the entire group of stakeholders.

When a project or organization is already in a steady state, i.e. where the processes have been established and institutionalized, then the implementation strategy could be shortened and would probably include the following:

- a) Plan the application;
- b) Adapt ISO/IEC 12207:2008, if applicable (for the risk level of the work);
- c) Conduct the project(s).

5.2.2 Planning the application

Applying ISO/IEC 12207:2008 should be considered as a specific project and planned as such.

The following are examples of items to consider while planning the application project:

- a) Define the scope of the project. Possibilities include:
 - A single project either internal to an organization or as part of a two party contract;
 - Concentration on some key processes or even a single process where there is expected to be some gain for an organization. This approach could be used where a weakness has been detected previously and could lead to a full application of ISO/IEC 12207:2008 at some future point;
 - Adoption of ISO/IEC 12207:2008 across a range of projects with probably a staged introduction. Here the organization would probably have no or few defined processes and would be standardizing on ISO/IEC 12207:2008;
 - Adoption of ISO/IEC 12207:2008 across all projects and within all parts of the organization. It is unlikely that any organization except a very small one would take this approach. It would be relevant though for a new subsidiary of an existing organization that has adopted ISO/IEC 12207:2008 into working practice previously.
- b) Identify the project goals and determine how they fit into the organization-wide business goals. If no obvious link is established between this project and the organization's business focus, then lasting commitment to achieve the application project goals will be difficult if not impossible to maintain;
- c) Identify roles and responsibilities of the project team/organization, assigning a single point of responsibility for each process. In many cases, one individual or organization may be responsible for more than one process, particularly in small projects or organizations;
- d) Identify the resources available for the application of ISO/IEC 12207:2008, such as time, money, people and equipment;
- e) Create and document the project management plan for applying ISO/IEC 12207:2008.

5.2.3 Conduct pilot project(s)

When introducing ISO/IEC 12207:2008 in an organization across many projects, some pilot use in key areas and for key processes will help to limit the exposure of the organization. A successful introduction would usually include such approaches as the following:

- a) Identify pilot projects that can utilize the processes selected. These pilot projects should be chosen on the basis of high priority work, that will result in significant improvements, with a high probability of success, and that can be expected to provide quick, visible results;
- b) Select a team of volunteers to conduct the pilot projects then publicize and reward their efforts;
- c) Train all involved. Awareness can be aided by regular communication of progress in the Implementation Process, in addition to formal training classes;
- d) Plan the pilot projects and identify critical success factors;

- e) For each pilot project, incorporate the selected adapted process or processes into the project management plan. Reference or include as appropriate, the necessary documentation, e.g. the tailoring decisions and rationale;
- f) Execute the pilot project(s), tracking and documenting the performance against the critical success factors. Document lessons learned throughout the pilot project(s). Incorporate the lessons learned into revised processes.

5.2.4 Formalize the approach

Formalizing involves the introduction of a new process across several projects and/or across the organization. Issues such as training, documentation, provision of support tools for the process(es), and the tracking and oversight of the new process(es) use and acceptance. Planning for the transition to the new process(es) for any project that is already up and running should be addressed.

NOTE Improvements may be made within a project by monitoring at the project level. They may also be made by comparing one project against another to determine approaches which were successful and which should be incorporated into future projects.

5.2.5 Institutionalize the approach

Institutionalization focuses on what is involved in ensuring that a process is used consistently and automatically throughout the project or organization. This also involves measuring performance of the process, and implementing process improvement again as necessary.

5.3 Application in organizations

5.3.1 Overview

Organizations are producers and consumers of systems; that is they trade products and services. The processes in ISO/IEC 12207:2008 are used by organizations that acquire and use or create and supply a software system. Any of the processes apply at any level in a software system structure during any applicable stage of the software life cycle and to any organization assigned responsibility for a software system. How they are applied, possibly with adaptation, varies depending on such factors as the project, organization, and life cycle model. The outputs of one level, whether information, products or services, are an input to the level below (and may feed back to the level above) and result in a corresponding response including information, products or services. The use (recursively) of the same underlying set of processes to describe an organization's business, project and technical actions at each level of detail in a system structure is a key aspect of the application of ISO/IEC 12207:2008.

Additionally, a management group of a multi-organization project working on the same software system can use ISO/IEC 12207:2008 to provide a common set of processes, an integrated software life cycle model, and a common basis for communication and for working together.

The processes in ISO/IEC 12207:2008 form a comprehensive set to cater for a wide variety of organizations. An organization, small or large, depending on its business purpose, can select an appropriate subset of the processes (and associated activities and tasks) to fulfil that purpose. ISO/IEC 12207:2008 is intended to be applied internally by an organization or contractually by two or more organizations. In order to facilitate application of ISO/IEC 12207:2008 either internally or contractually, the tasks are expressed in contractual language. When applied internally, the contractual language is interpreted as self-imposed tasks.

ISO/IEC 12207:2008 is to be harmonized with an organization's policies and standards that are already in place. It is usually the case that an organization has been utilizing its own existing standards and specific techniques for software implementation. When applying ISO/IEC 12207:2008 within an organization, it is therefore important to clarify the relationship between the International Standard, the organization's own standards, and the various techniques that have been employed.

Figure 15 shows one possible example of such relationships that may be useful when applying ISO/IEC 12207:2008 within an organization. ISO/IEC 12207:2008 is located at the first level, standards in the organization are located at the second level and the third level is for detailed implementation activities, techniques, and tools that are specific to a project. The terms defined and used in the second and the third levels are required to conform to ISO/IEC 12207:2008.

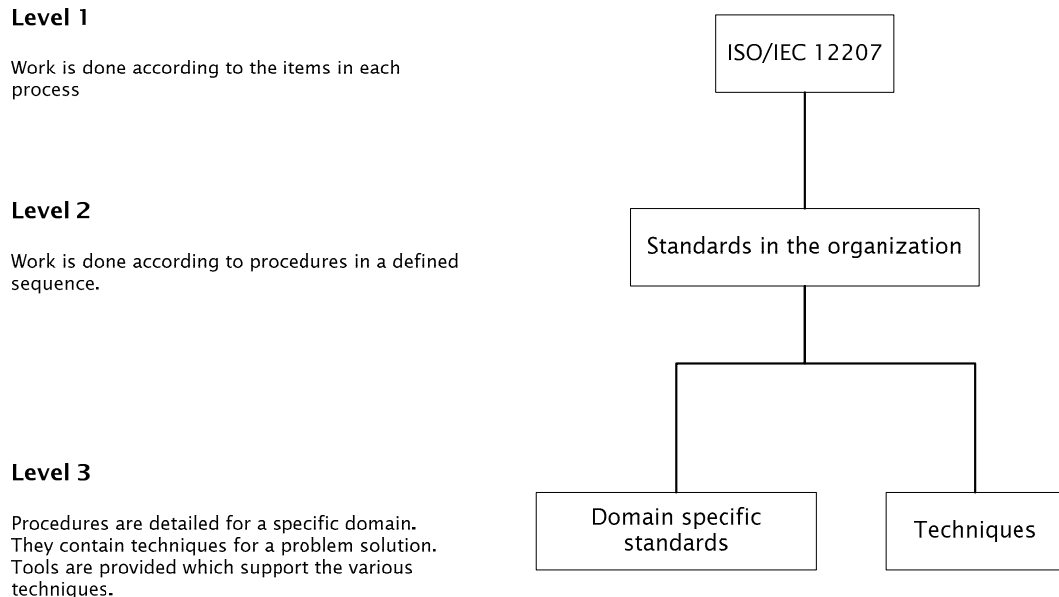


Figure 15 — Relationship with existing documents

Resolution of any conflicts is left to the organization applying ISO/IEC 12207:2008 and may involve developing a mapping and if necessary, filling any gaps.

5.3.2 Considerations and techniques

Organizations would generally use ISO/IEC 12207:2008 as part of an effort to improve software related processes. This may be through standalone use or in conjunction with available process assessment and capability determination methods.

NOTE The application of ISO/IEC 12207:2008 within an organization is based upon the same approaches as are used on projects. In clause 5.2 of this Technical Report, consideration is given to the issues raised and the strategies described. This is followed in clause 5.3 by a discussion of the application in organizations when using ISO/IEC 12207:2008.

5.3.3 Application opportunities

The reasons for applying ISO/IEC 12207:2008 internally within an organization may include such situations as:

- Verifying the thoroughness of an existing method. This would usually be more relevant where the method was developed in-house or adopted and extensively modified;
- Adapting an existing method to cater for the risks associated with moves into new market sectors where more rigor is required because of perceived risks;
- Developing a new method e.g. to meet the needs of a new organization. This includes organizations created through mergers or business alliances. It may be necessary to maintain several process models to suit particular activities;