
**Information technology — Systems
and software engineering —
Application management**

*Technologies de l'information — Gestion d'application — Exigences
pour la gestion d'application*

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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.

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

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

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

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#).

The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*.

Its contents are based on the Dutch national standard, NEN 3434, *Information technology — Application management — Requirements for application management*, which will be withdrawn after publication of this International Standard.

Introduction

Applications can live for decades. Applications that were developed twenty or thirty years ago are still being used and most applications that have recently been developed will still be in use for the many years to come. During their life cycle, these applications and the related data structures will have to be monitored, enhanced, and sometimes renewed or renovated. This means that very often, in total, more money and work is needed for the stage of operation and use than for the initial development stage. But the emphasis very often lies at the initial development stage; there are various frameworks and (international) standards covering initial application development. For the stage of operation and use, there are little frameworks and standards. This International Standard has been developed to fill this gap.

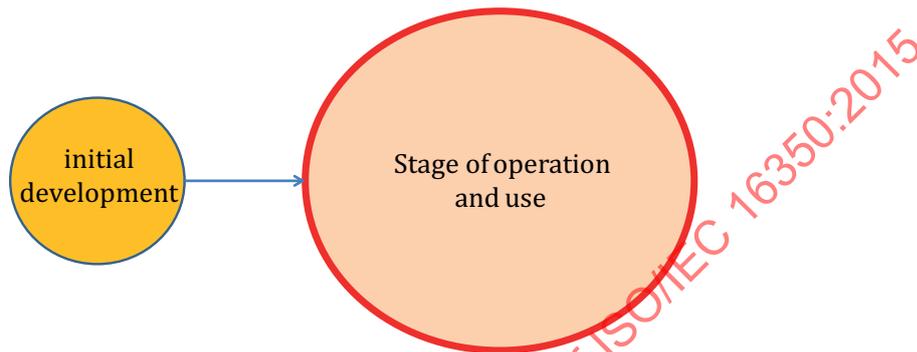


Figure 1 — Stage of the lifecycle in scope

The initial development of applications usually takes place in a rather protected project environment with a relatively small amount of operational interaction with the business processes, as they are not yet supported by the application under development. The project has its own pace and rules, its own governance, and a limited lifespan. In the final development stage, the application is transferred to operation then the rules change. The business processes of the user organizations become largely or fully dependent on the application. In that stage, the following two major types of actions will have to take place:

- a) supporting use and operation of the application;
- b) adapting the application based on changing demands or based on quality improvements (fixes, patches, and releases).

These actions and all the responsibilities, activities, and tasks around it, we call application management and the stage in which a version of an application actually is in use and in operation is the subject of this International Standard.

This International Standard aims to offer application management organizations a well-defined, directly applicable, and complete standard for their specific activities. Although this International Standard is partially overlapping with ISO/IEC 20000 and ISO/IEC 12207, this International Standard is a standard organized from the viewpoint of application management and contributes to the convenience of users who work in that area.

This International Standard provides a common framework for establishing the processes, tasks, and activities of service providers that enhance, maintain, and/or renew applications or application objects after the initial development (that is at the stage of exploitation and use) and that supports other service providers that run the application in production environments and user organizations that use the applications.

This International Standard also supports the definition, control, assessment, and improvement of such processes. These processes can be applied uniquely, in conjunction, sequentially, or in parallel.

Information technology — Systems and software engineering — Application management

1 Scope

1.1 General

This International Standard establishes a common framework for application management processes with well-defined terminology that can be referenced by the software industry. It contains processes, activities, and tasks that apply during the stage of operation and use from the point of view of the supplier organization that enhances, maintains, and renews the application software and the software-related products such as data-structures, architecture, designs, and other documentation.

This International Standard applies to the supply, maintenance, and renewal of applications, whether performed internally or externally with respect to the organization that uses the applications.

Application management comprises all of the tasks, responsibilities, and activities with the aim that the support of business processes by applications continues to meet the requirements and needs of the organizations that use these applications throughout the entire life span of their business processes.

This International Standard therefore focuses on the following:

- day-to-day management of applications (the software) and the related data structures and support of customer organizations, including handling calls such as incidents and service requests;
- maintenance and renewal of applications and data structures in accordance with changing requirements and needs;
- opportunities, threats, and changes in the business and/or technology that influence the future of the applications and, based on that, the strategy for maintaining and renewing the applications;
- organization and strategy of application management organizations.

Before retirement, the life cycle of an application consists of two important stages: the stage of initial development of the application and the stage of operation and use (when the software is in use, in operation, supported, modified, and renewed). This stage of operation and use is the subject of this International Standard. The initial development of an application is not within the scope of this International Standard, however the project that is responsible for the initial development has to take the requirements of the application management organization that will enhance and maintain the application into consideration. This means that the application management organization will ask the project to deliver initial requirements, architecture products, design, standards, and other documentation, in order to use these products during enhancement and maintenance.

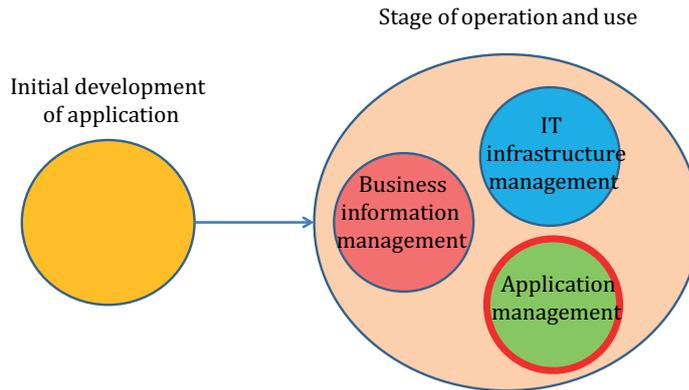


Figure 2 — Domains involved

In the stage of operation and use, the following three domains play a role:

- a) business information management representing the business and end users of the application (use);
- b) IT infrastructure management hosting the application (operation) and maintaining the technical infrastructure;
- c) application management
 - 1) supporting the use and the operation;
 - 2) maintaining and renewing the application software and data structures.

Business information management constitutes the demand side of information technology (IT) and information provisioning. Business information management is responsible for supporting users in the use of the information provisioning and represents the business organization as the client of the IT-suppliers. Business information management acts as the customer of the IT organizations (application management plus IT infrastructure management).

Specific tasks of business information management include the following:

- support of end users in how the information provisioning are to be used;
- define how information and IT are to look like (the functionality, the appearance, etc);
- advise and support business management with the prioritization of requirements and management of their budgets for IT;
- assign work to IT providers and monitor their delivered services;
- define long term policy and plans regarding the information provisioning.

IT infrastructure management is responsible for managing the operation of the information system, including maintaining the infrastructure (e.g. network, hardware), running the software, and data processing. In brief, this is the organization that runs the information systems and aims to keep the infrastructure in good order.

The activities of business information management and IT infrastructure management are closely related to application management but not within the scope of this International Standard.

Application management is responsible for the management and maintenance of the application and definition of the data structures used in databases and data files. This form of management requires knowledge of software programming, information system development, design, day-to-day management of applications, and application maintenance. Core qualities of the application management personnel are in-depth knowledge of the customer or (at least) in-depth knowledge of the customer's business processes and in-depth knowledge of the existing applications (application objects), design, architecture, etc.

This International Standard consists of the following three levels of processes:

- operational;
- managerial;
- strategic.

These process levels and the processes are interconnected with one another.

Figure 3 provides an overview of the processes within each of the process levels.

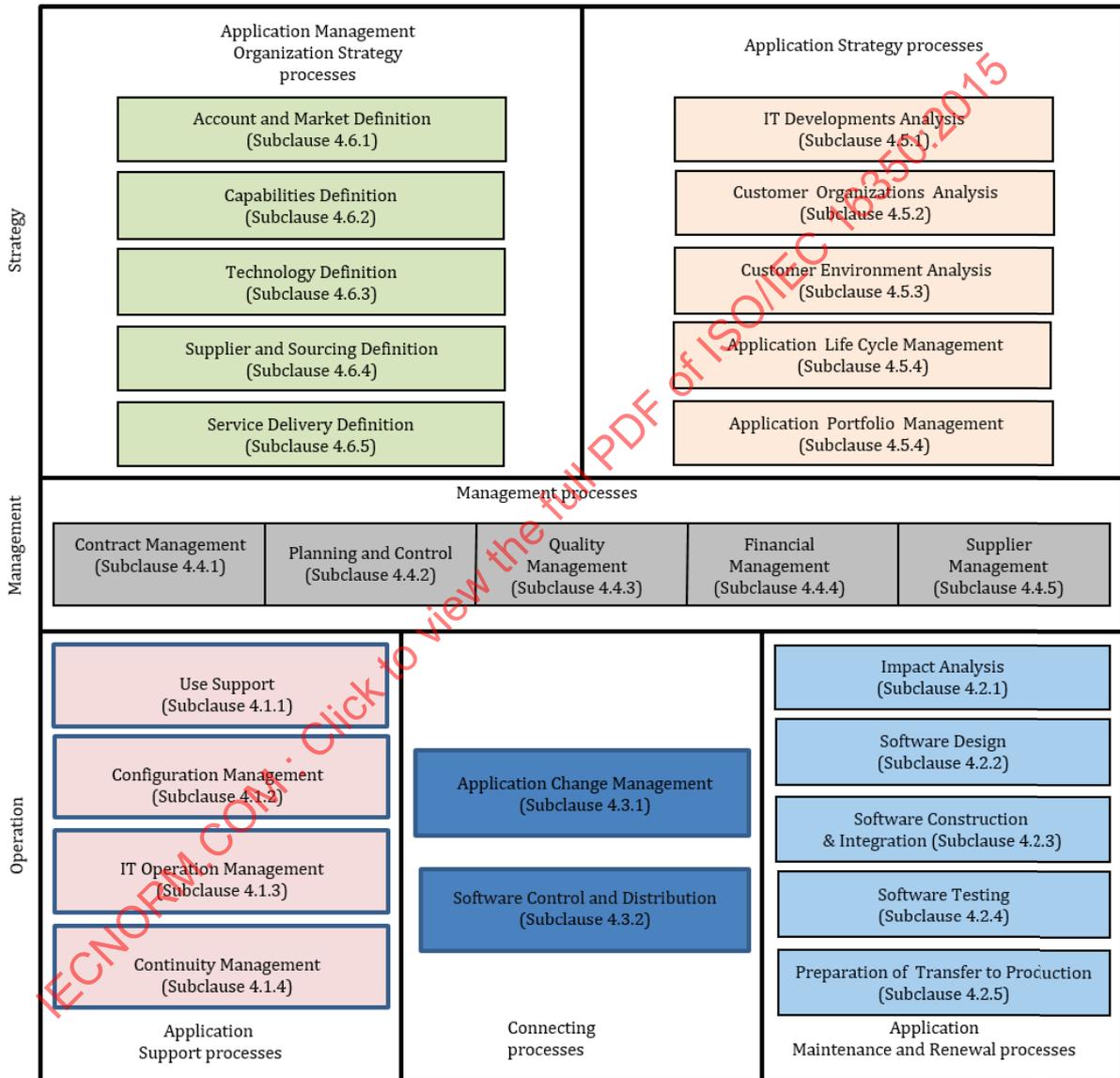


Figure 3 — Process overview

There are no separate processes defined for security, issues, risks, and/or vulnerability. These topics form an important part of the Continuity Management Process, but they are also part of other processes. Security, for instance, is an important part of the functionality of the application, so it is addressed in the Impact Analysis process and dealt with within the specifications of the application and defined in the Software Design Process and also within the service levels and, therefore, specified in the Agreement Management and Supplier Management Processes. Other processes which deal with these topics are the management processes planning and control, quality management and financial management, and, for instance, the strategic process technology definition, where risk and vulnerability are important features.

1.2 Applicability

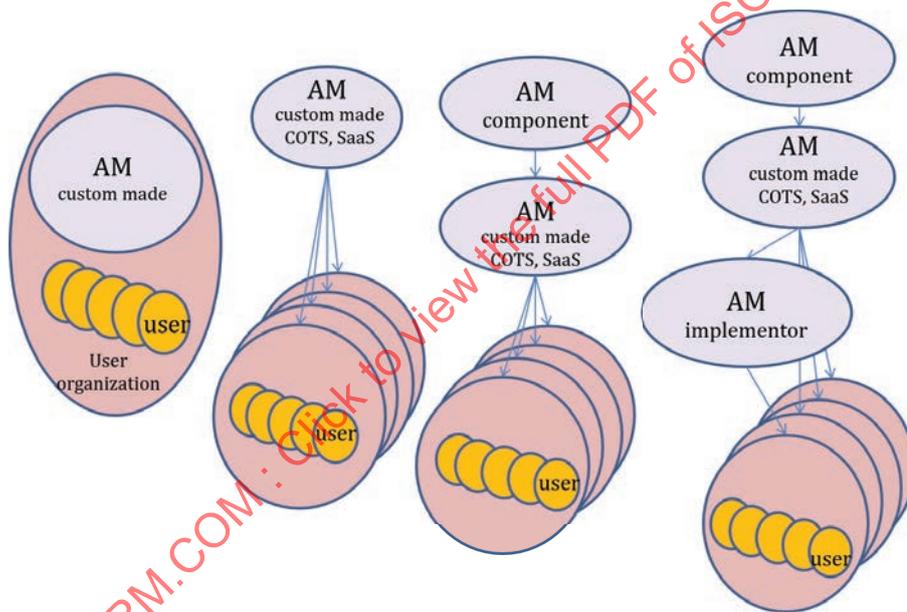
1.2.1 Audience

This International Standard is intended to be used by application management organizations. The application management service providers that enhance, maintain, and/or renew applications or application objects and that support infrastructure management organizations and user organization in the stage operation and use.

Other users of this International Standard can be application software developers, quality assurance managers (or consultants), and customers of application management organizations.

The purpose of this International Standard is to provide a defined set of processes to facilitate communication among all parties involved in application management.

Different parties can carry out different activities in the field of application management. For example, some parties are responsible for maintenance of the application after the development stage while others also support the user organization and the IT infrastructure management organization. Some parties just change the software items while others are responsible for the entire chain of impact analysis, design, build, test, and release of changes. These different parties can be all in one organization or in different internal and external organizations.



Key

- AM application management
- COTS commercial off-the-shelf
- SaaS software as a service

Figure 4 — Examples of application management organizations

The following are examples of different types of application management organizations shown in [Figure 4](#):

- organization that produces and maintains a specific component;
- organization that supplies and maintains standard products or standard components;
- organization that delivers custom services to an individual customer, either with or without integration with other systems or the infrastructure;
- organization that manages and maintains a custom application;

- organization that implements software.

The following are other examples of application management organizations:

- integrator that merges or combines services;
- producer of configurable software platforms;
- organization that configures and maintains such platforms for customers.

These types of application management organizations have a strong impact on the way in which the processes are implemented and operated. The processes shown in [Figure 3](#) therefore vary in importance and characteristics.

1.2.2 Field of application

This International Standard is applicable to all the following organizations using the processes that play a role in application management within the scope mentioned in [1.1](#):

- anyone performing application management activities;
- those responsible for establishing and continuously improving application management processes;
- those responsible for executing application management processes at a project level;
- customers and suppliers involved in subcontracting application management activities;
- those responsible for assessing application management processes.

[Annex C](#) provides information regarding the use of the application management processes as a process reference model. It defines the basic activities needed to perform tailoring of this International Standard. It has to be noted that tailoring might diminish the perceived value of a claim of conformance to this International Standard. An organization asserting a single-party claim of conformance to this International Standard might find it advantageous to claim full conformance to a smaller list of processes rather than tailored conformance to a larger list of processes.

1.3 Limitations

The initial development of an application is not within the scope of this International Standard.

The activities of business information management and IT infrastructure management are not within the scope of this International Standard.

This International Standard does not detail the application management processes in terms of methods or working procedures required to meet the requirements and outcomes of a process.

This International Standard does not detail documentation to be used or produced within the activities described in the processes in [Clause 5](#) in terms of name, format, explicit content, and recording media. The International Standard might require development of documents of similar class or type. The International Standard, however, does not imply that such documents have to be developed or packaged separately or combined in some fashion. These decisions are left to the user of this International Standard.

This International Standard does not prescribe a specific application management methodology, design methodology, development methodology, test methodology, project management method, or other methods, models, or techniques. The users of this International Standard are responsible for selecting these methods and mapping the processes, activities, and tasks in this International Standard onto those methods. The users of this International Standard are also responsible for selecting and applying the methods and for performing the activities and tasks suitable for application management.

This International Standard 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 has to be resolved before using this International Standard.

2 Conformance

2.1 Intended usage

The requirements in this International Standard are contained in [Clause 5](#) and [Annex B](#). This International Standard provides requirements for a number of processes suitable for usage in the field of application management. It is recognized that particular projects or organizations might not need to use all of the processes provided by this International Standard. Therefore, implementation of this International Standard typically involves selecting and declaring a set of processes suitable to the organization or project.

There are two ways that an implementation can be claimed to conform to the provisions of this International Standard: full conformance and tailored conformance.

There are two criteria for claiming full conformance. Achieving either criterion suffices for conformance, although the chosen criterion (or criteria) is to be stated in the claim.

- Claiming “full conformance to tasks” asserts that all of the requirements of the activities and tasks of the declared set of processes are achieved.
- Alternatively, claiming “full conformance to outcomes” asserts that all of the required outcomes of the declared set of processes are achieved.

Full conformance to outcomes permits greater freedom in the implementation of conforming processes and can be useful for implementing processes to be used in the context of an innovative application management organization.

2.2 Full conformance

2.2.1 General

A claim of full conformance declares the set of processes for which conformance is claimed. Full conformance is achieved by demonstrating that all of the requirements of the declared set of processes have been satisfied using the outcomes as evidence.

2.2.2 Full conformance to outcomes

A claim of full conformance declares the set of processes for which conformance is claimed. Full conformance to outcomes is achieved by demonstrating that all of the outcomes of the declared set of processes have been achieved. In this situation, the provisions for activities and tasks of the declared set of processes are guidance rather than requirements, regardless of the verb form that is used in the provision.

2.2.3 Full conformance to tasks

A claim of full conformance declares the set of processes for which conformance is claimed. Full conformance to tasks is achieved by demonstrating that all of the requirements of the activities and tasks of the declared set of processes have been achieved. In this situation, the provisions for the outcomes of the declared set of processes are guidance rather than requirements, regardless of the verb form that is used in the provision.

2.3 Tailored conformance

When this International Standard is used as a basis for establishing a set of processes that do not qualify for full conformance, the clauses of this International Standard are selected or modified in accordance with the tailoring process prescribed in [Annex B](#). The tailored text, for which tailored conformance is

claimed, is declared. Tailored conformance is achieved by demonstrating that the outcomes, activities, and tasks, as tailored, have been achieved.

NOTE 1 When this International Standard is used to help develop an agreement between an acquirer and a supplier, clauses of this International Standard can be selected for incorporation in the agreement with or without modification. In this case, it is more appropriate for the acquirer and supplier to claim compliance with the agreement than conformance with this International Standard.

NOTE 2 Any organization (for example, national, industrial association, company) imposing this International Standard as a condition of trade has to specify and make public the minimum set of required processes, outcomes, activities, and tasks which constitute suppliers' compliance with the conditions of trade.

NOTE 3 Requirements of this International Standard are marked by the use of the verb "shall". Recommendations are marked by the use of the verb "should". Permissions are marked by the use of the verb "may". However, despite the verb that is used, some requirements do not apply depending on which criteria are to be applied in claiming conformance.

NOTE 4 A claim of full conformance to tasks can be appropriate in contractual situations where an acquirer or a regulator requires detailed understanding of the suppliers' processes.

3 Normative references

No normative reference cited in this document.

4 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

4.1 application

system for collecting, storing, processing, and presenting data by means of a computer

[SOURCE: ISO/IEC 24570:2005]

Note 1 to entry: The generic term system in context of this International Standard is used to mean a software system.

4.2 application management

domain responsible for all of the tasks and activities that are aimed at managing, supporting, maintaining, and renewing existing applications and related data structures

Note 1 to entry: Application management includes all of the tasks, responsibilities, and activities that serve to bring applications into a state where they meet the requirements and needs of their owners throughout the entire life cycle of the business processes that are supported by the applications.

4.3 application management organization

organizational unit that is responsible for application management for one or more applications

Note 1 to entry: An application management organization may be an internal or external unit in relation to the user organization.

4.4 application object

component that is directly related to or forms part of an application

EXAMPLE Programs, sources, databases, documentation, data structures, test files, and scripts.

**4.5
application portfolio**

collection of applications managed by an application management organization or an entity within that application management organization

Note 1 to entry: The scope of the application portfolio may be the entire portfolio of that application management organization, but it may also be the applications of one or some customer organizations of entity within part of a certain customer organization.

**4.6
application software**
software of an application

Note 1 to entry: Application software is the software that the application management organization produces, services, and maintains. There is also system software: the software to produce and maintain the application software and to run the application software on its platform. The application management organization is one of the users of the system software.

**4.7
availability**

ability of an application object to perform its required function at an agreed instant or over an agreed period of time

[SOURCE: ISO/IEC 20000-1:2011, modified]

Note 1 to entry: This concerns the start and finish (execution) of the application, the processing at the correct times and in the correct order, the execution of incidental processing, the opening times of online processing, and the storage period of files.

**4.8
business information management**

domain responsible for all of the tasks and activities that are aimed at supporting the end users in the use of the application and at acting as the customer of the IT organizations

Note 1 to entry: Business information management represents the business as the customer organization or client of the application management and IT infrastructure management organizations in maintaining the functionality of the information provisioning and the information systems. It is the demand side of the information provisioning.

Note 2 to entry: An information system may have non-automated elements such as forms and user guides. Those elements are usually maintained by the business information management organization.

**4.9
call**
request for service(s) or action(s) with respect to an application or a related service

Note 1 to entry: A call might concern a

- request for service, information or advice,
- disruption or error reporting (incident),
- request for change,
- assignment(for instance an instruction to start an off-schedule production run), and
- complaint.

**4.10
change package**

collection of objects that have been changed and approved and will be transferred to the production environment

Note 1 to entry: The current system documentation is also included in a change package.

Note 2 to entry: In case of multiple releases, there are (similarly) multiple change packages.

**4.11
change set**

collection of objects which can undergo change as the result of a release

Note 1 to entry: These are the objects that are potentially allocated to a release or change.

**4.12
configuration item
CI**

item or aggregation of software that is designed to be managed as a single entity and its underlying components such as documentation, data structures, scripts, etc

[SOURCE: ISO/IEC 19770-1:2006, modified]

**4.13
configuration management database
CMDB**

database containing all the relevant details of each configuration item and details of the important relationships between them

[SOURCE: ISO/IEC 19770-2:2009]

**4.14
customer**

organization or part of an organization that receives a service or services or products of the application management organization

[SOURCE: ISO 9000:2005, modified]

Note 1 to entry: An application management organization may have the following two types of customers, whether these customers are within the same organization or not is of no importance; in both cases, the application management organization has the role of supplier:

- internal or external business information management organizations;
- other application management organizations.

Note 2 to entry: Sometimes, the term *User* is also used. A user or end user is a person that actually uses the application software, where a customer is a person or organization that decides about and acquires the products or services.

Note 3 to entry: The customer or user organization is, in its relationships with application management, represented by business information management.

**4.15
data model**

graphical and/or lexical representation of data, specifying their properties, structures, and interrelationships

[SOURCE: ISO/IEC 19778-1:2008]

Note 1 to entry: In this International Standard, a distinction is made between a logical (or functional) and a technical data model. A logical data model is a representation of an organization's data, organized in terms of entities and relationships and is independent of any particular data management technology. In a technical data model, it is determined in what form data are recorded in the database and in which way the data are approached.

4.16

data structure

physical or logical relationship among data elements, designed to support specific data manipulation functions

[SOURCE: ISO/IEC/IEEE 24765:2010]

Note 1 to entry: The data structures are usually documented in technical and logical data models.

4.17

efficiency

relationship between the result achieved and the resources used

[SOURCE: ISO 9000:2005]

Note 1 to entry: Efficiency is the degree to which an information system efficiently uses the technical infrastructure and thus becomes useable for the customer. The most important underlying topic here is the capacity of the platform in relation to the demand.

4.18

final transfer set

collection of changed objects that are to be transferred integrally to one or more production environments, including implementation instructions

Note 1 to entry: See also [5.3.2](#) and [Figure 5](#).

Note 2 to entry: Transfer means to transfer from one environment to another. Application management transfers the objects from development environment *A* to development environment *B*, from development to test and from test to the infrastructure management organization(s). Application management doesn't manage the final production environment. Deployment to the production environment is done by the infrastructure management organization. So application management does not deploy (to the user environment) but finally transfers the new release to the various (internal and external) IT infrastructure management organizations.

Note 3 to entry: The distribution to an IT infrastructure management organization that deploys to the production environment can also take place in steps. This means that multiple distributions (transfers) might be necessary or desirable.

4.19

functional system design

specification of the functions of the components of a software system and of the working relationships between them

[SOURCE: ISO/IEC 2382-20:1990, modified]

4.20

information provisioning

collection of all the infrastructure tools, software applications, non-automated elements, data sets, user documentation, and organizational structures which serve to supply information to the business

4.21

information system

all of the functions (input, output, transport, processing, and storage) of an application, databases, technical facilities, and manual procedures which support business processes

4.22

IT infrastructure

all the technical components, system software, databases and data files and deployed application software, technical procedures, and technical documentation used to make the information available

4.23**IT infrastructure management**

domain responsible for all of the tasks and activities aimed at managing, maintaining, and renewing the IT infrastructure of the information system, including the operation of the information system

Note 1 to entry: IT infrastructure management includes all of the tasks, responsibilities and activities that aim for a correct technical operation of the information system, consisting of hardware, (system) software, and data sets.

Note 2 to entry: The IT infrastructure management organization is responsible for running the application software in the production environment.

4.24**manageability**

degree to which IT infrastructure management can attain and keep an application in its operational state

Note 1 to entry: Manageability involves the transparency and manageability of applications from an infrastructure point of view. Production documentation (including the requirements, control and adjustment abilities of the application in processing, and various other aspects) provides much of the information here.

Note 2 to entry: It is a task of the IT infrastructure management organization to keep the software in operation in the production environment. The application management organization delivers software that can be managed by the IT infrastructure organization and supports the IT infrastructure organization, if necessary. Means of support are documentation, scripts, and personal assistance.

4.25**organization chain**

constellation of organizations that have business relationships with one another

Note 1 to entry: The following are two types of chains identified:

- supply chains of the IT organizations that are involved in the management and operation of the application (application manager, computer centre, workspace manager, network manager, business information manager, suppliers, etc.);
- business chains in which the user organization using the application participates (the business process supported by the application forms part of a chain across several organizations; for example the chain of criminal justice, the healthcare chain, etc.).

Note 2 to entry: An organization chain can be a supply chain, but does not necessarily have to be one. For example, a hospital has to report data to, for instance, the National Tax Office, the National Health Office, and the National Bureau of Statistics. These organizations are chain partners but not supply chain partners.

4.26**performance**

extent to which the execution of an application in the production environment achieves its purpose in terms of speed of input, transfer, processing, storage and output (the response speed of an application observed by an end user)

[SOURCE: ISO/IEC 33001, modified]

4.27**problem**

undesirable situation concerning an application, the application management organization, its processes or working methods, which demands structural analysis of the cause and a structural solution

Note 1 to entry: A problem might concern a service or product or a process (-step) or any other element of the application management organization.

4.28
release

set of grouped change requests, established in the Application Change Management Process, that are designed, developed, tested, and deployed as a cohesive whole

Note 1 to entry: The term release is also used for the following:

- work process in which a new release is designed, realized, tested, and introduced;
- new version of the application that is taken into production on a certain date (for example, the release of May 1th.).

4.29
reliability

degree to which an object or an object's services provide agreed or expected functionality during a defined time period under specified conditions

4.30
request for change

proposal for a functional or non-functional change to be made to an existing application

[SOURCE: ISO 20000-1:2011, modified]

Note 1 to entry: Synonyms are change request and modification request.

4.31
service level agreement

SLA
documented agreement between the service provider and customer that identifies services and service targets

[SOURCE: ISO/IEC 20000-1:2011]

Note 1 to entry: In this International Standard, the Application Management organization can be the service provider, but it can also be a customer itself, of another supplier. See also NOTE 3 of [5.4.5.1](#).

4.32
service management

set of capabilities and processes to direct and control the service provider's activities and resources for the design, transition, delivery, and improvement of services to fulfil the service requirements

[SOURCE: ISO 20000-1:2011]

4.33
software product

set of computer programs, procedures, database- and other data structure descriptions and associated documentation

[SOURCE: ISO 12207:2008]

Note 1 to entry: In this International Standard, a software product may vary from large customized application software for one customer to standard software packages that are sold off the shelf to millions of customers.

4.34
supplier

organization or part of an organization or individual that enters into an agreement with the application management organization for the supply of a product, service, materials, or human capacity

[SOURCE: ISO 12207:2008, modified]

Note 1 to entry: The application management organization may have internal or external suppliers. A supplier can be another application management organization, but also IT infrastructure management organizations or consultants. This International Standard makes no distinction between internal or external customers. Similarly, no distinction is made between internal or external suppliers.

5 Application Management Processes

NOTE The outcomes and tasks of ISO/IEC 16350 overlapping with ISO/IEC 20000 and ISO/IEC 12207 which are shown in [Annex E](#) are boxed. The text in the box is the original text of ISO/IEC 20000 or ISO/IEC 12207 which is shown by the clause/subclause number in the box. For the relationship with ISO/IEC 15504-8:2012 see [Annex D](#) (informative)

5.1 Application Support Processes

5.1.1 Use Support

5.1.1.1 Purpose

The purpose of the Use Support Process is to give support to customers in the use of applications through:

- Proactive communication. This is communication from application management to customers in order to improve the use of the applications/applications objects.
- Management of calls.

NOTE 1 This process includes all activities that are meant to support the customer organization and the user representatives once the applications are in use. The reason to include the sub-process of proactive communication, next to incident and service request management, is that there should be emphasis on proactive communication activities, in order to prevent incidents.

NOTE 2 See Annex [A.1](#) for an explanation of the name of the Use Support Process

5.1.1.2 Outcomes

As a result of successful implementation of the Use Support Process:

- a) Customers are proactively informed about the current situation and developments: changes and releases, known problems, workarounds, suggestions regarding the use of the application, changes in services etc.
- b) Incidents and service requests are recorded and classified.
- c) Incidents and service requests are prioritized and analyzed.
- d) A plan including workload estimation to resolve incidents and service requests is developed with users.

NOTE There are some incidents which are not resolved at once. In those cases, it is necessary to adjust the timing and duration for working on them with users.

- e) Incidents and service requests are resolved and closed.
- f) Possible relationships with problems are registered.
- g) Incidents and service requests which are not progressed according to agreed service levels are escalated
- h) Reports on Use Support activities and process results are produced on a regular basis.

5.1.1.3 Activities and tasks

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Use Support Process.

a) Proactive communication.

This activity consists of the following tasks:

- 1) The application management organization shall maintain contact with customers or customer processes regarding the agreed services.
- 2) The application management organization shall provide support to customers with respect to the use of the application.
- 3) The application management organization shall provide information to customers regarding changes in services and the impact of those changes.

b) Incident and service request management.

This activity consists of the following tasks:

- 1) There shall be a documented procedure for all incidents to define:
 - recording;
 - allocation of priority;
 - classification;
 - updating of records;
 - escalation;
 - resolution;
 - closure.
- 2) There shall be a documented procedure for managing the fulfilment of service requests from recording to closure. Incidents and service requests shall be managed according to the procedures.
- 3) When prioritizing incidents and service requests, the service provider shall take into consideration the impact and urgency of the incident or service request.
- 4) The service provider shall ensure that personnel involved in the incident and service request management process can access and use relevant information. The relevant information shall include service request management procedures, known errors, problem resolutions and the CMDB. Information about the success or failure of releases and future release dates, from the release and deployment management process, shall be used by the incident and service request management process.
- 5) The service provider shall document and agree with the customer the definition of a major incident. Major incidents shall be classified and managed according to a documented procedure. Top management shall be informed of major incidents. Top management shall ensure that a designated individual responsible for managing the major incident is appointed. After the agreed service has been restored, major incidents shall be reviewed to identify opportunities for improvement.

[ISO/IEC 20000-1:2011, 8.1.]

- 6) Incidents shall be escalated in to a problem, if necessary.

NOTE Problem management is part of the Quality Management Process.

c) Monitoring and reporting of calls.

This activity consists of the following tasks:

- 1) The progress of the call handling activities shall be monitored.
- 2) Reports shall be made on the statuses of calls and on time aspects: time span, time spent etc.

- 3) The service provider shall keep the customer informed of the progress of their reported incident or service request. If service targets cannot be met, the service provider shall inform the customer and interested parties and escalate according to the procedure.

[ISO/IEC 20000-1:2011, 8.1.]

4) The service provider shall report on the realization of service agreements regarding the Use Support activities.

d) Process control and reporting.

This activity consists of the following tasks:

- 1) The Use Support Process shall be implemented, controlled, monitored, evaluated and improved.
- 2) Quality reports about the Use Support Process shall be provided to the stakeholders and other application management processes.

5.1.2 Configuration Management

5.1.2.1 Purpose

The purpose of the Configuration Management Process is to have continuous insight in the application objects and the application configurations within the responsibility of the application management organization that have been provided to their customers and in the services provided by the application management organization.

NOTE 1 Executables (code suitable for running on hardware) may be distributed to various internal and external organizations. One of the main activities of Configuration Management is managing the CMDB. Within application management a CMDB is neither a software management system nor a software version management system. The CMDB does not store the sources or executables, or information on the software structures. It only contains information on the identification of the application version that is currently in use.

The CMDB contains information about which versions of the application are operational on which platforms.

The executables are generated using underlying sources and components. These sources are stored and controlled in the Software Control and Distribution Process. For every executable on a platform the translation to the sources and or the structure of the executable are be traceable. That is why the method in which the executables are structured to form an executable is recorded. But this information, which is often complex and comprehensive, is not recorded within the Configuration Management Process but within the Software Control and Distribution Process: with the help of the Software Control and Distribution Process, the types of sources, modules, and data used are identified using a specified and verifiable identification scheme.

NOTE 2 CMDB's are also used within the IT infrastructure management domain.

In the Configuration Management Process within the IT infrastructure management domain objects like hardware, system software, networks, etc. are recorded. Application management is only concerned with the application software. So there is a relationship between these types of configuration management. Separate administrations may occur, because separate organizations or organizational units may be responsible for the IT infrastructure and for the application software. This will be the choice of that organization / those organizations.

In the case of commercial off-the-shelf software and distributed systems, the application runs on multiple platforms of multiple customers and in multiple IT infrastructure management organizations. Different versions of the application can be active in these different locations. IT infrastructure management's CMDB can, for that reason, very often not be used by the application management organization. This is why there is a separate administrative system for application management in which references can be made to the technical infrastructures.

NOTE 3 The logistics of application objects between various build/maintenance, test, and acceptance environments is not handled in the Configuration Management Process but in the Software Control and Distribution Process. The Software Control and Distribution Process keeps track of the status of objects in the maintenance stages and of which objects are delivered to production. The Configuration Management Process keeps track of the status of CI's transferred to various customers for deployment in their production environments.

5.1.2.2 Outcomes

As a result of successful implementation of the Configuration Management Process:

- a) a configuration management strategy is defined; [ISO/IEC 12207:2008, 6.3.5.2.]
- b) Items requiring configuration management are identified.
NOTE Configuration items (CI's) include all relevant application objects but also all objects containing information regarding services.
- c) The status of the configuration items and modifications are recorded and reported.
- d) Changes to items under configuration management are controlled.
- e) The integrity of applications, application objects and service components is assured.
- f) The configuration of released items is controlled.
- g) configuration baselines are established. [ISO/IEC 12207:2008, 6.3.5.2.]

5.1.2.3 Activities and tasks

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Configuration Management Process.

- a) **Configuration management planning.**
This activity consists of the following tasks:
 - 1) The project shall define a configuration management strategy. [ISO/IEC 12207:2008, 6.3.5.3.1]

NOTE In the working field of Application Management properties of a configuration item (CI) include subjects such as version, storage location, exploitation platform, relationship(s) with other CI's, relationship(s) with application objects and service components."

NOTE 2 In this International Standard the term "project" should be interpreted as "application management organization".

- b) **Definition of configuration items.**
This activity consists of the following tasks:
 - 1) There shall be a documented definition of each type of CI. The information recorded for each CI shall ensure effective control and include at least:
 - description of the CI;
 - relationship(s) between the CI and other CIs;
 - relationship(s) between the CI and service components;
 - status;
 - version;
 - location.
- [ISO/IEC 20000-1:2011, 9.1.]

— exploitation characteristics, including location of use, platform descriptions, contact person, etc.

c) Registration of configuration items.

This activity consists of the following tasks:

- 1) CIs shall be uniquely identified and recorded in a CMDB.
- 2) The CMDB shall be managed to ensure its reliability and accuracy, including control of update access.
- 3) There shall be a documented procedure for recording, controlling and tracking versions of CIs. The degree of control shall maintain the integrity of services and service components taking into consideration the service requirements and the risks associated with the CIs.
- 4) The service provider shall audit the records stored in the CMDB, at planned intervals. Where deficiencies are found, the service provider shall take necessary actions and report on the actions taken.
- 5) Changes to CIs shall be traceable and auditable to ensure integrity of the CIs and the data in the CMDB.
- 6) Master copies of CIs recorded in the CMDB shall be stored in secure physical or electronic libraries referenced by the configuration records.

[ISO/IEC 20000-1:2011, 9.1.]

NOTE 1 CIs containing information on services (i.e. service items) are recorded in a CMDB as well. This (part of the) CMDB is in practice often referred to as a Service Delivery Database (SDDB). This SDDB contains an overview of documented agreements such as contracts, SLA's, service definitions etc. and their status. It contains information about where those documents are stored. It is an internal registration. It is not to be confused with the service catalogue. The service catalogue is external: it contains an overview over the services that may be delivered.

NOTE 2 A service item is the part of the set of services delivered to a customer, for which one or more service levels apply. Examples of service items are opening hours, availability, reaction time, repair time. A service item is not to be confused with a service component. Examples of service components are impact analysis report, release, and hotfix.

- 7) A configuration baseline of the affected CI's shall be taken before transferral of a release to a customer.

d) Reporting on configuration items.

This activity consists of the following tasks:

- 1) The progress of the Configuration Management activities shall be monitored.
- 2) Management records and status reports that show the status and history of controlled configuration items shall be prepared.
- 3) Information about versions of the configuration items and their use shall be provided, both on demand and on a regular basis.

e) Process control and reporting.

This activity consists of the following tasks:

- 1) The Configuration Management Process shall be implemented, controlled, monitored, evaluated and improved.
- 2) Quality reports about the Configuration Management Process shall be provided.

5.1.3 Application Operation Management

5.1.3.1 Purpose

The purpose of the Application Operation Management Process is to manage that the applications or components display the correct and agreed-upon behaviour in operational situations and that the services of the application management organization are delivered as agreed.

NOTE 1 In this International Standard the availability and capacity management processes are not described separately. The Application Operation Management Process covers both availability and capacity issues. The reasons are:

- Availability, capacity (and reliability) features have mutual relationships: a lack of computer capacity may lead to availability problems and vice versa.
- Availability problems and capacity problems are handled and managed in a similar way and the activities and contacts between the application management organization and the IT infrastructure management teams are similar on these types of problem.
- By combining the similar aspects in one process the implementation and execution of this process is more efficient.

NOTE 2 Capacity management comprises the monitoring and allocation of the correct resources at the right time with the correct capacity to the services that concern the application support, use and production of the software system. The purpose of capacity management is to realize and maintain a cost-effective use of capacity at present and in relation to the future needs of the organization.

NOTE 3 Capacity of human resources is outside the scope of this process. It is part of the Planning and Control Process.

NOTE 4 Capacity of financial resources is outside the scope of this process. Financial resources are addressed in the Financial Management Process.

5.1.3.2 Outcomes

As a result of the successful implementation of the Application Operation Management Process:

- a) Reliability requirements are identified.
- b) Availability requirements are identified.
- c) Current and future capacity and performance requirements are identified and agreed.

NOTE Reliability and availability are non-functional requirements and they are also input for software design and software construction & integration and also for software testing. Also see for instance [section 5.2.1.3, c\) 1\)](#) where capacity and availability are mentioned in relation to estimating the impact of proposed changes.

- d) An operations plan is developed, which includes:
 - detailed reliability, availability and capacity demands and their feasibility;
 - operations administrations: reliability, availability and capacity measurement results;
 - demands and restrictions regarding the operation in the context of the IT infrastructure management and customer organizations;
 - demands and restrictions regarding the operation in the context of the maintenance and renewal processes.
- e) A processing planning is developed which includes:
 - regular application production planning;
 - incidental production runs.

- f) Service availability is tested against the service availability requirements to validate the plan.
- g) Service availability is monitored.
- h) Underlying causes of unplanned service non-availability are identified and analyzed.
- i) Corrective actions are taken to address identified underlying causes.
- j) Changes to service availability requirements are reflected in the service availability plan.
- k) Capacity is provided to meet current capacity and performance requirements;
- l) Capacity usage is monitored, analyzed and performance is tuned.
- m) Capacity is prepared to meet future capacity and performance needs.
- n) Changes to capacity and performance are reflected in the capacity plan.
- o) Reports on operations are produced on a regular basis:
 - progress- and planning reports;
 - availability- and reliability reports.

5.1.3.3 Activities and tasks

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Application Operation Management Process.

a) Operation planning: development of an operations plan.

This activity consists of the following tasks:

1) The service provider shall identify and agree capacity and performance requirements with the customer and interested parties.	[ISO/IEC 20000-1:2011, 6.5.]
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2) The service provider shall identify and agree with the customer and interested parties service availability requirements.	[ISO/IEC 20000-1:2011, 6.3.1]
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3) The general demands for reliability shall identified and agreed with the customer and interested parties.

4) The regular production runs shall be described.

5) The effects of changes of software, hardware or services on availability, reliability and capacity shall be predicted.

6) An operations plan shall be created, implemented, maintained and reassessed on a regular basis. The plan shall include at least:

- | |
|---|
| <ul style="list-style-type: none"> — current and forecast demand for services; — expected impact of agreed requirements for availability, service continuity and service levels; — time-scales, thresholds and costs for upgrades to service capacity; — potential impact of statutory, regulatory, contractual or organizational changes; — potential impact of new technologies and new techniques; — procedures to enable predictive analysis, or reference to them. |
|---|

[ISO/IEC 20000-1:2011, 6.5.]

— availability requirements and targets

[ISO/IEC 20000-1:2011, 6.3.2]

— reliability requirements and targets.

b) **Operation realization: determination of the specifications and measures necessary to meet the demands.**

This activity consists of the following tasks:

- 1) The demands regarding the necessary infrastructure and the necessary functionality to be obtained externally (components) shall be defined.
- 2) The demands to be placed upon subcontractors shall be defined.
- 3) The possible service moments or service windows for the IT infrastructure management organizations for housekeeping or implementing new releases shall be identified.

c) **Monitoring of the effectiveness of measures and processing of results.**

This activity consists of the following tasks:

1) Availability of services shall be monitored, the results recorded and compared with agreed targets. Unplanned non-availability shall be investigated and necessary actions taken.

[ISO/IEC 20000-1:2011, 6.3.3]

2) Reliability, manageability and efficiency of production runs and services shall be measured by: determining whether production runs have been executed completed as expected, on time and without errors and whether applications are online.

NOTE The application management organization does not run the application software in the production environment. Data on production runs and problems with production runs, performance problems etc. shall be requested from the parties that run the software.

3) Availability plans shall be tested against the availability requirements.

[ISO/IEC 20000-1:2011, 6.3.3]

4) If necessary, the Use Support Process shall be informed concerning any problems and measures.

d) **Capacity management.**

This activity consists of the following tasks:

1) The IT infrastructure organizations shall be informed about resource demands.

2) The service provider shall monitor capacity usage, analyze capacity data and tune performance.

[ISO/IEC 20000-1:2011, 6.5.]

NOTE The application management organization does not run the application software in the production environment nor do they monitor capacity usage in the production environment. Data on capacity usage shall be requested from the parties that run the software.

3) Improvements shall be undertaken or actions shall be suggested to IT infrastructure management if needed.

NOTE Improvement actions can be:

- tuning means, resources, runs and/or software;
- de-normalization;
- access optimization.

e) IT services control and reporting.

This activity consists of the following tasks:

- 1) Schedules, progress, time spent, etc. shall be monitored.
- 2) (Changes in) Capacity, usage, performance, workload, availability and reliability against targets, detected nonconformities and trends shall be reported.

f) Process reporting and control.

This activity consists of the following tasks:

- 1) The Application Operation Management Process shall be implemented, controlled, monitored, evaluated and improved;
- 2) Quality reports about the Application Operation Management Process shall be provided.

5.1.4 Continuity Management

5.1.4.1 Purpose

The purpose of the Continuity Management Process is to manage the continuity of the business process using the application(s) by ensuring the continuity of the application(s) or components in the long term and during exceptional circumstances.

NOTE Security is one of the topics of the Continuity Management Process because the continuity and vulnerability of the information systems are also addressed in this process. Security is also an important part of the functionality of the application, so it is dealt with within the specifications of the application and defined in the Software Design Process and within the service levels and therefore specified in the Agreement Management and Supplier Management Processes.

5.1.4.2 Outcomes

As a result of the successful implementation of the Continuity Management Process:

- a) Service continuity requirements are identified.
- b) A service continuity plan is developed using the service continuity requirements.
- c) Continuity measures are taken and the results of the measures are recorded and presented.
- d) Service continuity is tested against the service continuity requirements to validate the plan.
- e) Reports on continuity aspects are produced on a regular basis.
- f) Changes to service continuity requirements are reflected in the service continuity plan.

NOTE ISO/IEC 20000 addresses service availability and service continuity in one process. In this International Standard the topic of service availability is addressed in the Application Operation Management Process.

5.1.4.3 Activities and tasks

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Continuity Management Process.

a) **Continuity planning: setup of a continuity plan based on dependency and vulnerability analyses.**

This activity consists of the following tasks:

1) Provided products and services shall be identified.

2) The service provider shall assess and document the risks to service continuity;
[ISO/IEC 20000-1:2011, 6.3.1]

NOTE 1 Risks may be assessed in a dependency analysis and vulnerability study.

NOTE 2 Risks may concern internal and external threats, they may concern misuse of resources (the system or its infrastructure) and they may concern the resources themselves. An example of continuity of resources is the future proof nature of the development tools and platform.

3) The service provider shall identify and agree with the customer and interested parties service continuity requirements. The agreed requirements shall take into consideration applicable business plans, service requirements, SLAs and risks;
[ISO/IEC 20000-1:2011, 6.3.1]

NOTE The management of the application management organization is an important interested party.

4) Risks shall be analyzed and the significance and dependency levels of risks shall be determined.

5) The required requirements levels shall be determined.

6) The service provider shall create, implement and maintain a service continuity plan(s).
[ISO/IEC 20000-1:2011, 6.3.2]

7) The service continuity plan(s) shall include at least:
— procedures to be implemented in the event of a major loss of service, or reference to them;
— availability targets when the plan is invoked;
— recovery requirements;
— approach for the return to normal working conditions.
8) The service continuity plan(s), contact lists and the CMDB shall be accessible when access to normal service locations is prevented.
[ISO/IEC 20000-1:2011, 6.3.2]

NOTE Also the software version management system, in which the software sources, documentation, data structures, scripts etc. are stored, shall be accessible.

b) **Continuity realization: the implementation of measures.**

This activity consists of the following tasks:

1) Measures for controlling the continuity shall be implemented.

2) The measures to manage the continuity should be carried out on a continual basis.

c) **Continuity monitoring.**

This activity consists of the following tasks:

- 1) Service continuity plans shall be tested against the service continuity requirements;

[ISO/IEC 20000-1:2011, 6.3.2]

- 2) The security shall be tested.
- 3) The backup, rollback and fallback procedures shall be tested.

4) The results of the tests shall be recorded. Reviews shall be conducted after each test and after the service continuity plan has been invoked. Where deficiencies are found, the service provider shall take necessary actions and report on the actions taken;

[ISO/IEC 20000-1:2011, 6.3.2]

- 5) The status of organizational measures shall be monitored.
- 6) The status of the technical infrastructure shall be monitored.

d) **Continuity control and reporting: management and monitoring of the Continuity Management activities.**

This activity consists of the following tasks:

- 1) The (progress of the) Continuity Management activities shall be controlled, monitored and evaluated;
- 2) Continuity reports shall be drafted;
- 3) Control aspects shall be reported.

e) **Process reporting and control.**

This activity consists of the following tasks:

- 1) The Continuity Management Process shall be implemented, controlled, monitored, evaluated and improved;
- 2) Quality reports about the Continuity Management Process shall be provided.

5.2 Application Maintenance and Renewal Processes

NOTE There are five Maintenance and Renewal processes: Impact Analysis, Software Design, Software Construction and Integration, Software Testing and Preparation of Transfer to Production. However these processes are described here in a logical order, they do not necessarily have to start sequentially. For instance: activities regarding Testing and Preparation of Transfer to production can start as soon as the assignment is given or when the impact analysis or designs are approved. Very often the sequence of these processes is determined by the development method.

5.2.1 Impact Analysis

5.2.1.1 Purpose

The purpose of the Impact Analysis Process is to:

- determine possible solution directions (alternatives) for the realization of proposed changes;
- determine the best overall solution direction;
- determine the consequences of one or more solution directions in terms of activities, required efforts, the possible impact on future use and operation and the impact on the environment.

5.2.1.2 Outcomes

As a result of successful implementation of the Impact Analysis Process:

- a) the impact of changes to the existing system on organization, operations or interfaces are identified
[ISO/IEC 12207:2008, 6.4.10.2.]
- b) The impact of proposed application changes are outlined in an impact analysis report, which gives insight into:
 - the purpose of the change (description);
 - assumptions regarding the impact analysis, including threat scenarios and vulnerability analysis;
 - alternative solution directions (or selection of alternatives);
 - proposed solution direction;
 - the affected objects (change set);
 - consequences for the application objects and activities to be executed for each object;
 - estimation of required human capacity: type of knowledge and experience and amount of time needed;
 - possible risks and measures;
 - consequences for user environment and the operation environment (short and long-term);
 - consequences for the application management organization;
 - proposed adjustments to releases, if any.
- c) The affected objects are listed and of each affected object it is known whether or not it is also affected by other changes.
- d) Reports on the Impact Analysis activities are produced on a regular basis:
 - planning and progress;
 - evaluations of impact analyses and the Impact Analysis activities.

5.2.1.3 Activities and tasks

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Impact Analysis Process.

- a) **Determination of the outline of the changes.**
 - 1) The (bundles of) request(s) for change shall be described.

The maintainer shall analyze the modification request for its impact on the organization, the existing system, and the interfacing systems for the following:

- Type; for example, corrective, improvement, preventive, or adaptive to new environment;
- Scope; for example, size of modification, cost involved, time to modify;
- Criticality; for example, impact on performance, safety, or security.

[ISO/IEC 12207:2008, 6.4.10.3.2.]

NOTE 1 Impact analysis and modification analysis are considered to be synonyms.

NOTE 2 Modification requests and requests for change are considered to be synonyms.

b) Assessment of the scope of the changes.

This activity consists of the following tasks:

- 1) Based upon the analysis, the maintainer shall develop options for implementing the modification.
- [ISO/IEC 12207:2008, 6.4.10.3.2.]

2) The configuration items that are affected by the proposed alternatives (architecture, design and other documentation, software units, versions, interfaces) shall be identified.

3) The required changes to these items shall be estimated.

4) Pros and cons of the alternatives shall be described.

5) The interdependence of various proposed changes shall be identified.

6) The impact of the proposed changes on other releases shall be identified.

7) Handling and testing the proposed changes shall be prepared.

c) Estimation of the consequences.

This activity consists of the following tasks:

1) The impact of the proposed changes on the application objects shall be estimated

2) The impact of the proposed changes on the operating environment, the user environment and on agreements (required capacity, availability, etc.) shall be estimated.

3) The effects for the long term (for quality attributes as described in ISO 25010) shall be estimated.

4) Risks caused by the changes and possible measures that can be taken to minimize those risks shall be identified.

5) The workload of the activities that are needed for the changes and assess the associated time aspects shall be estimated.

d) Verification and feedback.

This activity consists of the following tasks:

- 1) The maintainer shall document the modification request, the analysis results, and implementation options.
- 2) The maintainer shall obtain approval for the selected modification option as specified in the contract.
- [ISO/IEC 12207:2008, 6.4.10.3.2.]

3) The results shall be verified with the IT infrastructure management organizations.

4) Feedback shall be provided to the Application Change Management Process.

e) Impact analysis control and reporting.

This activity consists of the following tasks:

1) The impact analysis activities shall be planned.

- 2) The progress of the impact analysis activities shall be monitored and progress reports shall be produced.

f) **Process control and reporting.**

This activity consists of the following tasks:

- 1) The Impact Analysis Process shall be implemented, controlled, monitored, evaluated and improved.
- 2) Quality reports about the Impact Analysis Process shall be provided.

5.2.2 Software Design

5.2.2.1 Purpose

The purpose of the Software Design Process is to make a description of the desired functionality of the information system in such a way that it can be easily realized and tested.

5.2.2.2 Outcomes

As a result of successful implementation of the Software Design Process:

- a) a software architectural design is developed and baselined that describes the software items that will implement the software requirements;
 - b) internal and external interfaces of each software item are defined; and
 - c) consistency and traceability are established between software requirements and software design.
- [ISO/IEC 12207:2008, 7.1.3.2]

- d) a detailed design of each software component, describing the software units to be built, is developed;
 - e) external interfaces of each software unit are defined; and
 - f) consistency and traceability are established between the detailed design and the requirements and architectural design.
- [ISO/IEC 12207:2008, 7.1.4.2]

NOTE 1 The Software Design Process may concern developing new designs, but very often existing design may have to be adjusted or renewed.

NOTE 2 The result of this process is a (modified) functional or logical information system design (for the affected application objects). The technical design is developed or adjusted in the Software Construction and Integration Process.

- g) A (modified) functional test design is produced.

NOTE The design documentation consists of:

- a description of the functions of the (changed) application, the data flows between them and the data model;
- a description of the way in which testing shall be carried out (test specifications, test cases).

- h) Reports that give insight into the planning and the progress of the design activities and describe evaluations and possible problems are produced on a regular basis.

5.2.2.3 Activities and tasks

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Software Design Process.

a) Elaboration of the request.

This activity consists of the following tasks:

- 1) The specified Request for Change shall be analyzed and the consequences for the top-level and detailed system designs shall be considered, including the external interfaces.
- 2) The preconditions shall be determined and analyzed.
- 3) The results of this analysis should be documented.
- 4) The request for change shall be translated into (changed) information (data) requirements.
- 5) The parts of the system that need to be changed shall be recorded.

b) Determination of alternatives.

This activity consists of the following tasks:

- 1) The alternatives for changing the system shall be determined in order to meet the requested specifications.
- 2) The advantages and disadvantages of each alternative shall be determined, considering the preconditions.
- 3) All possible alternatives for modification shall be documented.
- 4) The preferred alternative shall be selected.
- 5) Approval for the preferred alternative should be obtained.

c) Elaboration of the preferred alternative.

This activity consists of the following tasks:

- 1) The implementer shall transform the requirements for the software item into an architecture that describes its top-level structure and identifies the software components. It shall be ensured that all the requirements for the software item are allocated to its software components and further refined to facilitate detailed design. The architecture of the software item shall be documented.
NOTE The software architectural design also provides a basis for verifying the software items, integration of software items with each other, and integration of software items with the rest of the system items.
- 2) The implementer shall develop and document a top-level design for the interfaces external to the software item and between the software components of the software item.
- 3) The implementer shall develop and document a top-level design for the database.
- 4) The implementer should develop and document preliminary versions of user documentation.
- 5) The implementer shall define and document preliminary test requirements and the schedule for Software Integration.

6) The implementer shall evaluate the architecture of the software item and the interface and data-base designs considering the criteria listed below. The results of the evaluations shall be documented.

- Traceability to the requirements of the software item.
- External consistency with the requirements of the software item.
- Internal consistency between the software components.
- Appropriateness of design methods and standards used.
- Feasibility of detailed design.
- Feasibility of operation and maintenance.

[ISO/IEC 12207:2008, 7.1.3.3.1]

NOTE 1 Software design activities are generally prescribed by the selected development method and methodology. The software design activities and tasks listed in this International Standard occur in almost all development methods, although often in other wordings or terminology.

NOTE 2 In the case of maintenance the designer shall preferably work bottom up instead of top down: first adjust the detailed design and then, if necessary the architectural design.

NOTE 3 This process is often used to identify the software critical functions and interfaces and to apply appropriate controls (e.g., security) to reduce vulnerabilities or unintended consequences. This applies to the software integration and testing.

NOTE 4 In some cases the user documentation will be made and/or maintained by the customer organization.

7) The implementer shall conduct review(s) of the top-level design regarding the degree to which:

- design-standards are followed;
- business requirements are met.

8) The implementer shall develop a detailed design for each software component of the software item. The software components shall be refined into lower levels containing software units that can be coded, compiled, and tested. It shall be ensured that all the software requirements are allocated from the software components to software units. The detailed design shall be documented.

9) The implementer shall develop and document a detailed design for the interfaces external to the software item, between the software components, and between the software units. The detailed design of the interfaces shall permit coding without the need for further information.

10) The implementer shall develop and document a detailed design for the database.

11) The implementer shall update user documentation as necessary.

12) The implementer shall define and document test requirements and the schedule for testing software units. The test requirements should include stressing the software unit at the limits of its requirements.

13) The implementer shall update the test requirements and the schedule for Software Integration.

14) The implementer shall evaluate the software detailed design and test requirements considering the criteria listed below. The results of the evaluations shall be documented.

- Traceability to the requirements of the software item;
- External consistency with architectural design;
- Internal consistency between software components and software units;
- Appropriateness of design methods and standards used;
- Feasibility of testing;
- Feasibility of operation and maintenance.

15) The implementer shall conduct review(s) of the detailed designs regarding the degree to which:

- design-standards are followed;
- business requirements are met.

d) **Validation.**

This activity consists of the following tasks:

- 1) The internal or external customer should review the design.
- 2) An approval should be obtained from the customer.

e) **Control and reporting on design activities.**

This activity consists of the following tasks:

- 1) The software design activities shall be planned.
- 2) The progress of the software design activities shall be planned and progress reports shall be produced.

f) **Process control and reporting.**

This activity consists of the following tasks:

- 1) The Software Design Process is implemented, controlled, monitored, evaluated and improved.
- 2) Quality reports about the Software Design Process are provided.

5.2.3 Software Construction and Integration

5.2.3.1 Purpose

The purpose of the Software Construction and Integration Process is to produce 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.

5.2.3.2 Outcomes

As a result of the successful implementation of the Software Construction and integration Process:

a) Technical documentation is created or modified:

- technical designs: description of the technical solution and the motives for choosing that solution;
- technical data model;
- technical description of the software;
- technical test design;
- production documentation: instructions for installation and operation, including any applicable preconditions.

- b) verification criteria are defined for all software units against their requirements;
- c) software units defined by the design are produced;
- d) consistency and traceability are established between software units and requirements and design; and
- e) verification of the software units against the requirements and the design is accomplished.

[ISO/IEC 12207:2008, 7.1.5.2]

NOTE The Software Construction and Integration Process covers both the construction of new software including data structures and documentation, and the modification of existing software components. So a result may be a newly constructed software unit or a modified software unit.

- f) an integration strategy is developed for software units consistent with the software design and the prioritized software requirements;
- g) verification criteria for software items are developed that ensure compliance with the software requirements allocated to the items;
- h) software items are verified using the defined criteria;
- i) software items defined by the integration strategy are produced;
- j) results of integration testing are recorded;
- k) consistency and traceability are established between software design and software items; and
- l) a regression strategy is developed and applied for re-verifying software items when a change in software units (including associated requirements, design and code) occurs.

[ISO/IEC 12207:2008, 7.1.6.2.]

m) Reports and evaluations on the progress and outcomes of the Software Construction and Integration Process activities are produced on a regular basis.

5.2.3.3 Activities and tasks

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Software Construction and Integration Process.

a) **Determination of the technical impact of the desired changes.**

This activity consists of the following tasks:

- 1) The current system and the desired changes shall be examined.
- 2) The affected application objects in detail shall be identified.

NOTE Documentation is also deemed to be an application object.

- 3) The desired changes in the application objects shall be documented.

b) **Design of the technical solution.**

This activity consists of the following tasks:

- 1) The overall technical solution direction shall be determined.
- 2) The desired setup shall be determined.
- 3) The detailed technical changes shall be determined.
- 4) The technical solution shall be documented.

c) **Software construction or modification.**

For each software item (or configuration item, if identified) this activity consists of the following tasks:

- 1) The implementer shall develop and document the following:
 - Each software unit and database.
 - Test procedures and data for testing each software unit and database.
- 2) The implementer shall test each software unit and database ensuring that it satisfies its requirements. The test results shall be documented.
- 3) The implementer shall update the user documentation as necessary.
- 4) The implementer shall update the test requirements and the schedule for Software Integration.
- 5) The implementer shall evaluate software code and test results considering the criteria listed below. The results of the evaluations shall be documented.
 - a) Traceability to the requirements and design of the software item.
 - b) External consistency with the requirements and design of the software item.
 - c) Internal consistency between unit requirements.
 - d) Test coverage of units.
 - e) Appropriateness of coding methods and standards used.
 - f) Feasibility of software integration and testing.
 - g) Feasibility of operation and maintenance

[ISO/IEC 12207:2008, 7.1.5.3.1]

NOTE 1 The Software Construction and Integration Process covers both the construction of new application objects including data structures and documentation, and the modification of existing application objects.

NOTE 2 In some cases the user documentation will be made and/or maintained by the customer organization.

6) Test results shall be processed.

d) Software integration.

For each software item (or configuration item, if identified) this activity consists of the following tasks:

1) The implementer shall develop an integration plan to integrate the software units and software components into the software item. The plan shall include test requirements, procedures, data, responsibilities, and schedule. The plan shall be documented.

2) The implementer shall integrate the software units and software components and test as the aggregates are developed in accordance with the integration plan. It shall be ensured that each aggregate satisfies the requirements of the software item and that the software item is integrated at the conclusion of the integration activity. The integration and test results shall be documented.

NOTE A regression strategy should be developed to be applied for re-verifying the software items when a change is made to software units (including associated requirements, design and code).

3) The implementer shall update the user documentation as necessary.

4) The implementer shall develop and document for each qualification requirement of the software item a set of tests, test cases (inputs, outputs, test criteria), and test procedures for conducting Software Qualification Testing. The developer shall ensure that the integrated software item is ready for Software Qualification Testing.

5) The implementer shall evaluate the integration plan, design, code, tests, test results, and user documentation considering the criteria listed below. The results of the evaluations shall be documented.

- a) Traceability to the system requirements.
- b) External consistency with the system requirements.
- c) Internal consistency.
- d) Test coverage of the requirements of the software item.
- e) Appropriateness of test standards and methods used.
- f) Conformance to expected results.
- g) Feasibility of software qualification testing.
- h) Feasibility of operation and maintenance.

NOTE Evaluation criteria should include consistency and traceability between the software design and the software items.

6) The implementer shall conduct review(s)

[ISO/IEC 12207:2008, 7.1.6.3.1]

f) Software Construction and Integration reporting.

This activity consists of the following tasks:

- 1) The Software Construction and Integration Process activities shall be planned.
- 2) The progress of the Software Construction and Integration Process activities shall be monitored and progress reports shall be produced.

g) Process reporting and control.

This activity consists of the following tasks:

- 1) The Software Construction and Integration Process shall be implemented, controlled, monitored, evaluated and improved.

- 2) Quality reports about the Software Construction and Integration Process shall be provided.

5.2.4 Software Testing

5.2.4.1 Purpose

The purpose of the Software Testing Process is to confirm that the integrated software product meets its defined requirements and to see to it that the implementation of each software requirement is tested for compliance, that the applications show the correct behaviour and that the software is ready for delivery.

5.2.4.2 Outcomes

As a result of successful implementation of the Software Testing Process:

- a) Functional and technical software tests are carried out.

b) Criteria for the integrated software is developed that demonstrates compliance with the software requirements;

[ISO/IEC 12207:2008, 7.1.7.1]

- c) Integrated software is verified using the defined criteria and test coverage level.

d) test results are recorded; and

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

NOTE A regression strategy should be developed, to be applied for re-testing the integrated software when a change is made to software items.

[ISO/IEC 12207:2008, 7.1.7.1]

- f) Test products are made, registered and stored:

- test strategy;
- test plans;
- test cases, test scripts and test sets;
- test environments, test user-id's, test tools;
- recorded test results (outcomes, statuses, repair assignments);
- test reports.

- g) Test results are decided upon and handled accordingly.

- h) Tests are evaluated.

- i) Progress and evaluation reports on the test activities are produced on a regular basis.

5.2.4.3 Activities and tasks

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Software Testing Process.

- a) **Preparation of the test activities.**

This activity consists of the following tasks:

- 1) If necessary a test strategy shall be produced or adjust the existing test strategy.

- 2) An overall test plan shall be produced.
- 3) The necessary resources shall be estimated and tasks shall be assigned.
- 4) Test environments, test tooling and test user id's shall be prepared and /or installed.
- 5) Test cases shall be created for the functional and the technical software test.

NOTE A test case is a single specified test aimed at a specific test purpose: a succession of related actions and checks, whose order of execution is indicated. A test case is described in a test case specification: a document specifying inputs, predicted results, and a set of execution conditions for a test item aimed at a specific test purpose and related to a particular test unit. (Adapted from ISO/IEC/IEEE 24765:2010). The description of the way in which a test case will be tested is called a test script.

- 6) Test data shall be created or test sets shall be adjusted.

b) Technical software testing.

This activity consists of the following tasks:

- 1) Technical software testing shall be conducted in accordance with the requirements

NOTE The technical software test is a type of test that investigates whether what has been realized fully meets the technical specifications. The test also investigates whether what has been changed works within the whole system, whether the whole system after realization can still be maintained and whether the whole system meets the quality criteria that have been agreed from an application management point of view. *Synonym:* technical integration test.

- 2) Test results shall be examined.
- 3) The impact of test defects shall be determined.
- 4) Solution directions shall be determined.
- 5) Test defects shall be resolved, retested and documented.

c) Functional software testing.

For each software item (or configuration item, if identified) this activity consists of the following tasks:

- 1) The implementer shall conduct qualification testing in accordance with the qualification requirements for the software item. It shall be ensured that the implementation of each software requirement is tested for compliance. The qualification testing results shall be documented.
- 2) The implementer shall evaluate the design, code, tests, test results, and user documentation considering the criteria listed below. The results of the evaluations shall be documented.
 - Test coverage of the requirements of the software item.
 - Conformance to expected results.
 - Feasibility of system integration and testing, if conducted.
 - Feasibility of operation and maintenance.

[ISO/IEC 12207:2008, 7.1.7.3.1]

NOTE A functional software test determines whether the changes in the application have been made correctly (in accordance with the software architectural and detail design). In this International Standard the scope is the application software: the functionality and the behaviour of the software on the infrastructure. Testing the new or adjusted infrastructure is not in scope, nor testing the adjustments in the user organisation. *Synonyms:* functional integration test, software qualification test, logical system and integration test.

- 3) Test results shall be examined.
- 4) The impact of test defects shall be determined.

- 5) The solution direction shall be determined.
- 6) Test defects shall be resolved, retested and documented.

d) Support of the production test(s).

This activity consists of the following tasks:

- 1) Support during performing of production tests shall be given if requested.
- 2) Support shall be given for determination of the impact of test defects.
- 3) Support shall be given for determination of solution direction.
- 4) Test defects shall be resolved, retested and documented.

NOTE A production test is a test under the responsibility of the IT infrastructure management organization in which it is determined whether the new or changed application objects can be installed and run on the infrastructure and will behave correctly (in accordance with the SLA). Synonyms: production acceptance test, exploitation acceptance test.

e) Software testing control and reporting.

This activity consists of the following tasks:

- 1) The progress of the test activities shall be monitored and progress reports shall be made.
- 2) Test evaluation reports shall be produced.

f) Process control and reporting.

This activity consists of the following tasks:

- 1) The Software Testing Process shall be implemented, controlled, monitored, evaluated and improved.
- 2) Quality reports about the Software Testing Process shall be provided.

NOTE More detailed information on the subject of testing can be found in IEEE Std 1012 (Verification and Validation) and ISO/IEC/IEEE 29119 (SW Testing).

5.2.5 Preparation of Transfer to Production

5.2.5.1 Purpose

The purpose of the Preparation of Transfer to Production Process is to complete the application maintenance and renewal activities and to fulfil the necessary preconditions for an error-free transfer of the new version of the application to production.

5.2.5.2 Outcomes

As a result of the successful implementation of the Preparation of Transfer to Production Process:

- | |
|---|
| a) acquirer acceptance tests and reviews are supported. |
|---|

[ISO/IEC 12207:2008, 6.4.8.2]

- b) Test defects that occurred during acceptance tests are handled.
- c) The documents modified or produced in the Application Maintenance and Renewal Processes are registered and archived.

- d) an operation strategy is defined;
- e) conditions for correct operation of the software in its intended environment are identified and evaluated.

[ISO/IEC 12207:2008, 6.4.9.2]

- f) Transfer to the stage in which a version of an application actually is in use and in production is prepared.
- g) Progress and evaluation reports on the implementation activities are produced on a regular basis.

5.2.5.3 Activities and tasks

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Preparation of Transfer to Production Process.

a) **Software acceptance support.**

This activity consists of the following tasks:

1) The developer shall support the acquirer's acceptance review and testing of the software product. Acceptance review and testing shall consider the results of the Software Review (subclause 7.2.6), Software Audit (subclause 7.2.7), Software Qualification Testing, and System Qualification Testing (if performed) processes. The results of the acceptance review and testing shall be documented.

NOTE This includes documentation and communication of problems detected during acceptance testing to those responsible for resolution.

2) The developer shall complete and deliver the software product as specified in the contract.

NOTE The contract may require the developer to put the product into operation in the customer's environment.

3) The developer shall provide initial and continuing training and support to the acquirer as specified in the contract.

NOTE Initial support includes identifying and communicating problems detected during acceptance to those responsible for resolution.

[ISO/IEC 12207:2008, 6.4.8.3.1]

NOTE 1 The preparation and execution of the acceptance test shall only be supported on request of the customer. Activities may include: developing a test plan, preparing the test environment, defining test data, answering questions, analyzing test results etc.

NOTE 2 Transfer of the executables of the applications to the IT-infrastructure organization(s) is part of the Software Control and Distribution Process. The IT-infrastructure organization will then install the executables in the production environment (deployment).

NOTE 3 Support of the acquirer may include preparation of the introduction into the user organization.

NOTE 4 Not only acceptance by the acquirer shall be prepared but also acceptance by other involved parties, such as infrastructure management organizations and any application support and application maintenance teams that have to work with the modified application.

4) Test defects found in acceptance tests shall be handled.

NOTE In this process the test defects are accepted and, if necessary, discussed with the tester. The repair action takes place within the Software Construction and Integration Process.

b) **Support of the application operation process of IT-infrastructure management.**

NOTE 1 ISO/IEC 12207 describes the Software Operation process and its activities and tasks. The application management organization may support these activities by preparing draft operations plans and instructions and by supporting installation activities etc. . . .

This activity consists of the following tasks:

- 1) The preparation of the production environment shall be supported, if necessary: installation, necessary conversions, batch scheduling etc.
- 2) A formal production assignment shall be prepared, if necessary.

NOTE When the application management team and the infrastructure management team are part of the same organization the application management team may assist the IT infrastructure management team and the customer organization by preparing and issuing a formal production assignment.

c) Preparation of the finalization of the release.

This activity consists of the following tasks:

- 1) All documents produced or adjusted during the implementation activities shall be archived.
- 2) Discharge of the implementation activities shall be initiated.

NOTE It concerns all parties (acquirer, infrastructure management team, application support, etc.) that will work with the new version of the application

- 3) The implementation activities shall be evaluated.

d) Completion of the assignment.

This activity consists of the following tasks:

- 1) Assignment discharge shall be organized.
- 2) A production assignment shall be issued (if needed) and the Software Control and Distribution Process shall be reported on the status.
- 3) The Application Change Management Process shall be informed on the status.

e) Preparation of Transfer to Production control and reporting.

This activity consists of the following tasks:

- 1) The working method shall be decided on with all parties involved.
- 2) The necessary capacity shall be estimated for all parties.

NOTE In this process different parties may be involved: the customer organizations that perform acceptance tests and the infrastructure management organizations that will install and deploy the release. So the working method and necessary capacity have to be tuned with all those parties involved.

- 3) Monitor the progress of the Preparation of Transfer to Production activities and make progress reports for all parties involved.

f) Process control and reporting.

This activity consists of the following tasks:

- 1) The Preparation of Transfer to Production Process shall be implemented, controlled, monitored, evaluated and improves.
- 2) Quality reports about the Preparation of Transfer to Production Process shall be provided.

5.3 Connecting Processes

NOTE See Annex [A.2](#) for an explanation of the term “connecting processes”.

5.3.1 Application Change Management

5.3.1.1 Purpose

The purpose of the Application Change Management Process is to control changes in the functionality of applications by prioritizing requests for change and arranging the decisions about them in a standardized way.

NOTE See Annex A.2 for an explanatory text concerning the Application Change Management process

5.3.1.2 Outcomes

As a result of the successful implementation of this process:

- a) Requests for change are recorded and classified.
- b) Requests for change are assessed using defined criteria.
- c) Requests for change are approved before changes are developed.
- d) An implementation schedule of changes and releases is established.
- e) An implementation schedule of changes and releases is communicated to interested parties.

NOTE In this International Standard a release is a particular version of the application a set of grouped change requests, established in the Application Change Management Process that are designed, realized, tested and deployed as a cohesive whole

- f) If possible and necessary requests for change are combined to form a release.
- g) Progress of individual changes and releases is monitored.
- h) Progress of changes and releases is reported on a regular basis.
- i) Changes and releases are evaluated.

5.3.1.3 Activities and tasks

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Application Change Management Process.

a) Registration of the requests for change.

This activity consists of the following tasks:

- | |
|---|
| <ul style="list-style-type: none">1) There shall be a documented procedure to record, classify, assess and approve requests for change2) The service provider shall document and agree with the customer the definition of an emergency change.3) There shall be a documented procedure for managing emergency changes. |
|---|

[ISO/IEC 20000-1:2011, 9.2]

- 4) All changes to an application or application object shall be raised using a request for change.

- | |
|---|
| <ul style="list-style-type: none">5) Requests for change shall have a defined scope.6) All requests for change shall be recorded and classified. |
|---|

[ISO/IEC 20000-1:2011, 9.2]

7) Requests for change shall be assessed using agreed criteria.

NOTE Characteristics of the requests for change that shall be recorded are

- goal;
- origin;
- scope;
- priority;
- cause and rationale;
- expected impact;
- status;
- description.

b) Scheduling of the release.

This activity consists of the following tasks:

- 1) Preconditions regarding releases shall be determined.
- 2) Requests for change may be clustered into releases taking into account the demands and assumptions.
- 3) It shall be monitored that decision-making takes place on the way the request for change will be handled.

NOTE A request for change can lead to a(n) (individual) change, if it is not allocated to a release, or a release or it can be rejected.

- 4) The development and testing of the change / release shall be scheduled and initiated.
- 5) It shall be monitored that the requests for change are approved before changes are developed.
- 6) The schedule shall be communicated to interested parties.

c) Monitoring and adjusting changes and releases.

This activity consists of the following tasks:

- 1) The progress of the change or release including the interaction between changes and releases shall be monitored.
- 2) It shall be validated whether the demands are met.
- 3) The content of the release shall be adjusted, if necessary.
- 4) The statuses of the requests for change shall be monitored and be kept up-to-date.

d) Application change control and reporting.

This activity consists of the following tasks:

- 1) Information regarding requests for change, changes and releases shall be provided to interested parties.

2) The service provider shall review changes and releases for effectiveness and take actions agreed with interested parties.

[ISO/IEC 20000-1:2011, 9.2]

3) Requests for change shall be analyzed at planned intervals to detect trends. The results and conclusions drawn from the analysis shall be recorded and reviewed to identify opportunities for improvement.

[ISO/IEC 20000-1:2011, 9.2]

e) Process control and reporting.

This activity consists of the following tasks:

1) A change management policy shall be established that defines criteria to determine changes with potential to have a major impact on services or the customer.

[ISO/IEC 20000-1:2011, 9.2]

2) The Application Change Management Process shall be implemented, controlled, monitored, evaluated and improved.

3) Quality reports about the Application Change Management Process that describe the performance of the process shall be produced.

5.3.2 Software Control and Distribution

5.3.2.1 Purpose

The purpose of Software Control and Distribution is to store application objects, transfer the correct (version of) application objects to the right environment or process at the right time and inform stakeholders about status and location of application objects.

NOTE 1 Objects to be considered here include applications and modules, data structures, designs, test sets, compilation scripts, etc.

NOTE 2 Within Software Control and Distribution three types of object sets are being handled: the change set, the change package and final transfer set. Their interrelationship is shown in [figure 5](#).

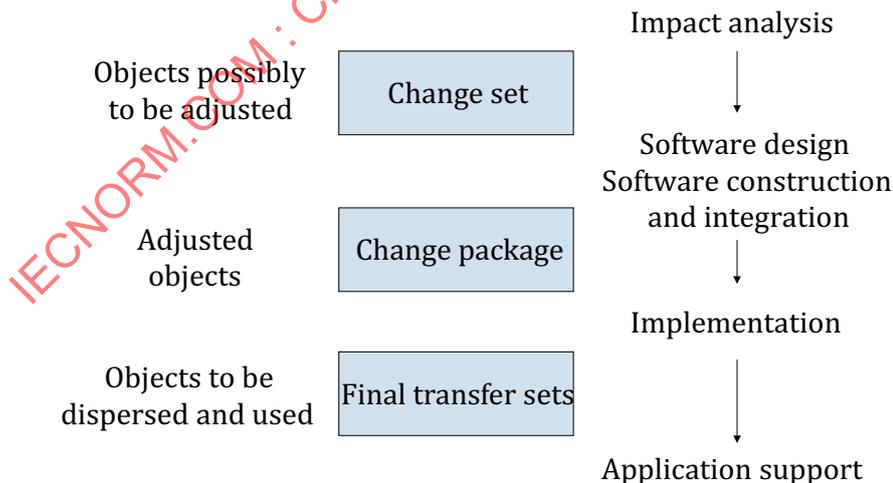


Figure 5 — Objects within Software Control and Distribution

NOTE 3 There are three types of activities: storing objects, transferring objects and keeping track of the status of the objects (and informing stakeholders on the status and position). The activity of keeping track of the status and informing stakeholders can be considered as configuration management of the maintenance situation, where the configuration management of the operational software is described in the Configuration Management Process in 5.1.2. For this type of activities the Configuration Management process in 5.1.2. can be used.

5.3.2.2 Outcomes

As a result of successful implementation of the Software Control and Distribution Process:

- a) Application objects are stored, combined to form change sets, change packages and final transfer sets and transferred from object libraries to development, test and production environments and/or libraries.
- b) Status of and information about the objects (versions and history, relations and interferences between releases) are registered and made available to stakeholders and application management processes.
- c) Progress reports and evaluation on the Software Control and Distribution activities are produced on a regular basis.

5.3.2.3 Activities and tasks

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Software Control and Distribution Process.

a) Registration of application objects.

This activity consists of the following tasks:

- 1) The application objects and their status shall be registered.
- 2) The change sets, change packages and final transfer sets shall be registered.

b) Storage and issuing of application objects.

This activity consists of the following tasks:

- 1) The storage of the relevant versions of the application objects shall be controlled.
- 2) Timely and correct transfer of the application objects between the different environments in the application maintenance processes shall be controlled.
- 3) Documentation objects shall be provided to other application management processes and to other stakeholders.

c) Provision of information on the application objects.

This activity consists of the following tasks:

- 1) The service provider shall conduct analysis and determine which documentation, software units, and versions thereof need to be modified as a result of a request for change. These shall be documented.

[ISO/IEC 12207:2008, 6.4.10.3.3.1]

NOTE The objects that need to be modified form the change set.

- 2) Possible overlaps in change sets shall be identified.

3) Information about application objects and their status shall be provided to stakeholders and processes.

4) Management records and status reports that show the status and history of controlled software items, including baselines shall be prepared.

[ISO/IEC 12207:2008, 7.2.2.3.4.1]

5) The change packages shall be defined.

d) **Transfer to the production environments.**

This activity consists of the following tasks:

- 1) Possible final transfer sets shall be defined.
- 2) Approval for transfer to production shall be initiated.
- 3) The final transfer sets shall be transferred to the customers.
- 4) Current information about new or changed application objects shall be provided to the Configuration Management Process.

e) **Process reporting and control.**

This activity consists of the following tasks:

- 1) A Software Control and Distribution policy shall be defined.
- 2) The Software Control and Distribution Process shall be implemented, controlled, monitored, evaluated and improved.

NOTE Criteria for evaluation include whether the Software Control and Distribution process is secure and whether the process is updated when necessary

- 3) Quality reports about the Software Control and Distribution Process shall be provided to the stakeholders and other application management processes.

5.4 Management Processes

5.4.1 Agreement Management

5.4.1.1 Purpose

The purpose of the Agreement Management Process is to manage that the services delivered by the application management organization meet or surpass the requirements agreed with the customer.

5.4.1.2 Outcomes

As a result of successful implementation of the Agreement Management Process:

- a) Services and dependencies are identified.
- b) Service level targets and workload characteristics for services are defined in service level agreements.
- c) The application management organization has an agreed-upon framework of documented agreements and underlying agreements with the customer organizations, including Service Level Agreements.

NOTE This framework includes:

- contracts;
- underlying documents describing the services, products, solutions and approaches in more detail;

- acceptance criteria;
- financial agreements;
- security responsibilities and risk acceptance

- d) Services are monitored against service level agreements.
- e) Service level performance against service level targets is communicated to interested parties.

NOTE These products will not always necessarily be created in the Agreement Management Process (e.g. acceptance criteria, specifications or design), but they will generally form part of the complete set of agreements which make up a contract or internal agreement.

- f) Changes to service requirements are reflected in the service level agreements.
- g) Agreements are evaluated on a regular basis.

5.4.1.3 Activities and tasks

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Agreement Management Process.

a) Drawing up agreements.

This activity consists of the following tasks:

- 1) The interrelations between the application management organization, its customers and other suppliers shall be defined.
- 2) Responsibilities and accountabilities involved shall be defined of all parties.

- 3) The service provider shall agree the services to be delivered with the customer.
- 4) The service provider shall agree a catalogue of services with the customer. The catalogue of services shall include the dependencies between services and service components.
- 5) For each service delivered, one or more SLAs shall be agreed with the customer. When creating SLAs, the service provider shall take into consideration the service requirements. SLAs shall include agreed service targets, workload characteristics and exceptions.

[ISO/IEC 20000-1:2011, 6.1]

- 6) The pricing model and rates shall be determined.
- 7) Responsibilities, services, products and rates shall be negotiated and adjusted.
- 8) The agreements shall be agreed with the customers.
- 9) The agreements shall be documented.
- 10) A communication, reporting and escalation mechanism shall be established.

b) Monitoring of agreements, reporting and taking measures.

This activity consists of the following tasks:

- 1) The service provider shall review services and SLAs with the customer at planned intervals.
- 2) The service provider shall monitor trends and performance against service targets at planned intervals. Results shall be recorded and reviewed to identify the causes of nonconformities and opportunities for improvement.

[ISO/IEC 20000-1:2011, 6.1]

- 3) The description of each service report, including its identity, purpose, audience, frequency and details of the data source(s), shall be documented and agreed by the service provider and interested parties.
- 4) Service reports shall be produced for services using information from the delivery of services and the SMS activities, including the service management processes. Service reporting shall include at least:
 - i) performance against service targets;
 - ii) relevant information about significant events including at least major incidents, deployment of new or changed services and the service continuity plan being invoked;
 - iii) workload characteristics including volumes and periodic changes in workload;
 - iv) detected nonconformities against the requirements in this part of ISO/IEC 20000, the SMS requirements or the service requirements and their identified causes;
 - v) trend information;
 - vi) customer satisfaction measurements, service complaints and results of the analysis of satisfaction
 - vii) measurements and complaints.
- 5) The service provider shall make decisions and take actions based on the findings in service reports. The agreed actions shall be communicated to interested parties.

[ISO/IEC 20000-1:2011, 6.2]

- 6) The results of these actions shall be monitored.
 - 7) Opportunities for improvement shall be identified.
- c) Evaluation and adjustment of agreements.
- This activity consists of the following tasks:

- 1) The service provider shall review the performance of the services at planned intervals, with the customer.

[ISO/IEC 20000-1:2011, 7.1]

- 2) The satisfaction of all involved parties on the content and the observance of the agreements shall be evaluated.
- 3) The agreements shall be evaluated and it shall be monitored whether the agreements are appropriate and draw up proposals for improvements if necessary. Evaluation subjects are:
 - set-up of the agreement;
 - services and products;
 - service levels;
 - pricing models and rates.
- 4) Proposals for future cooperation shall be made.

5) Changes to the documented service requirements, catalogue of services, SLA's and other documented agreements shall be controlled. The catalogue of services shall be maintained following changes to services and SLA's to ensure that they are aligned.

[adjusted from ISO/IEC 20000:2011, 6.1]

d) **Process control and reporting.**

This activity consists of the following tasks:

- 1) The Agreement Management Process shall be implemented, controlled, monitored, evaluated and improved.
- 2) Quality reports about the Agreement Management Process shall be provided.

5.4.2 Planning and Control

5.4.2.1 Purpose

The purpose of the Planning and Control Process is to manage that the services are provided on the agreed delivery date by deploying the right personnel in the appropriate capacity at the right time.

NOTE Activities within the field of application management may take place in a project. This process does not only cover the planning and control of projects but also the planning and control of all day-to-day application management activities and combined work packages.

5.4.2.2 Outcomes

As a result of successful implementation of the Planning and Control Process:

- a) the scope of the work for the project is defined;
- b) the feasibility of achieving the goals of the project with available resources and constraints are evaluated;
- c) the tasks and resources necessary to complete the work are sized and estimated;
- d) interfaces between elements in the project, and with other project and organizational units, are identified;
- e) plans for the execution of the project are developed; and
- f) plans for the execution of the project are activated.

[ISO/IEC 12207:2008, 6.3.1.2]

NOTE In ISO/IEC 12207:2008, 6.3.1 the subject of the process is Project Planning.

The activities in this Planning & Control Process can take place in projects but also as separate line activities, in releases etc. The term 'project plan' is, within this context, synonymous with 'release plan'.

- g) Annual or rolling quarterly plans are available.

NOTE In the project plan and annual and/or rolling quarterly plans there should be estimates of:

- expected workload or activities to be executed;
- required human resource capacity (type and amount);
- expected starting times, due dates and timelines;
- estimates for needed capacity and provisional schedules for application support and application maintenance and renewal activities, for management activities, etc.;
- estimates for required capacity for quality improvement activities;

— in case of rolling plans: changes in the plans compared to previous versions.

- h) Progress of the project is monitored and reported;
- i) Interfaces between elements in the project, and with other project and organizational units, are monitored;
- j) Actions to correct deviations from the plan and to prevent recurrence of problems identified in the project are taken when project targets are not achieved; and
- k) Project objectives are achieved and recorded.

[ISO/IEC 12207:2008, 6.3.2.2]

- l) The application management organization has metrics, such as productivity figures and empirical data on previous work.

5.4.2.3 Activities and tasks

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Planning and Control Process.

a) Planning of application management activities.

This activity consists of the following tasks:

The project shall implement the following activities and tasks in accordance with applicable organization policies and procedures with respect to the Planning Process.

Project initiation. This activity consists of the following tasks:

- 1) The manager shall establish the requirements of the project to be undertaken.

NOTE Establishing the requirements includes identifying the project's objectives, motivations and boundaries.

- 2) Once the project requirements are established, the manager shall establish the feasibility of the project by checking that the resources (personnel, materials, technology, and environment) required to execute and manage the project are available, adequate, and appropriate and that the timescales to completion are achievable.

- 3) As necessary, and by agreement of all parties concerned, the requirements of the project may be modified at this point to achieve the completion criteria.

[ISO/IEC 12207:2008, 6.3.1.3.1]

- 4) The application management organization shall have continuous insight into available, allocated, committed and available human resources capacity.
- 5) The expected human capacity required for application management activities shall be estimated:
 - application support activities;
 - small every day maintenance activities;
 - larger maintenance and renewal activities;
 - management and strategic activities.
- 6) These requirements shall be detailed to provide estimates by activity, release or project, detailed by type of human capacity, amount and period.
- 7) In case of staff augmentation the human capacity required from suppliers (including subcontractors) shall be estimated, detailed by type of expertise, amount and period.

- 8) The requested or agreed timelines provided by customers and suppliers shall be identified.
- 9) The available, required and, where applicable, available human capacity for both the application management organization as well as subcontractors shall be identified.
- 10) Risks (probability, effects) and appropriate mitigation measures and the effect on human capacity required shall be identified and quantified.

Project planning. This activity consists of the following tasks:

11) The manager shall prepare the plans for execution of the project. The plans associated with the execution of the project shall contain descriptions of the associated activities and tasks and identification of the software products that will be provided. These plans shall include, but are not limited to, the following:

- Schedules for the timely completion of tasks.
- Estimation of effort.
- Adequate resources needed to execute the tasks.
- Allocation of tasks.
- Assignment of responsibilities.
- Quantification of risks associated with the tasks or the process itself.
- Quality assurance measures to be employed throughout the project.
- Costs associated with the process execution.
- Provision of environment and infrastructure.
- Definition and maintenance of a life cycle model that is comprised of stages using the defined life cycle models for projects of the organization.

NOTE Organizational models for project use would be provided through the Life Cycle Model Management Process.

Project activation. This activity consists of the following tasks:

- 12) The manager shall obtain authorization for the project.
- 13) The manager shall submit requests for necessary resources to perform the project.
- 14) The manager shall initiate the implementation of the project plan/s to satisfy the objectives and criteria set, exercising control over the project

[ISO/IEC 12207:2008, 6.3.1.3.2]

- b) **Monitoring, control and reporting of application management activities.**

Project monitoring. This activity consists of the following task:

1) The manager shall monitor the overall execution of the project, providing both internal reporting of the project progress and external reporting to the acquirer as defined in the contract.

NOTE The manager ensures that internal project element interfaces, as well as interfaces with other relevant projects and organizational units, are monitored during this activity.

Project control. This activity consists of the following tasks:

2) The manager shall investigate, analyze, and resolve the problems discovered during the execution of the project. The resolution of problems may result in changes to plans. It is the manager's responsibility to ensure the impact of any changes is determined, controlled, and monitored. Problems and their resolution shall be documented.

3) The manager shall report, at agreed points, the progress of the project, declaring adherence to the plans and resolving instances of the lack of progress. These include internal and external reporting as required by the organizational procedures and the contract.

Project assessment. This activity consists of the following tasks:

4) The manager shall ensure that the software products and plans are evaluated for satisfaction of requirements.

5) The manager shall assess the evaluation results of the software products, activities, and tasks completed during the execution of the project for achievement of the objectives and completion of the plans.

NOTE The manager uses assessment results to take steps to prevent future recurrence of problems identified on the project.

Project closure. This activity consists of the following tasks:

6) When all software products, activities, and tasks are completed, the manager shall determine whether the project is complete, taking into account the criteria as specified in the contract or as part of organization's procedure.

7) These results and records shall be archived in a suitable environment as specified in the contract.

[ISO/IEC 12207:2008, 6.3.2.3]

c) **Evaluation of planning and control.**

This activity consists of the following tasks:

1) The overall results of the activities of the application management organization and the suppliers shall be evaluated.

2) The lessons learned, e.g. by updating risk analysis checklists, metrics etc. shall be identified, documented and communicated.

3) Any problems in planning and controlling the application management activities shall be identified and proposals for improvement shall be produced.

d) **Process control and reporting.**

This activity consists of the following tasks:

1) The Planning and Control Process shall be implemented, controlled, monitored, evaluated and improved.

2) Quality reports about the Planning and Control Process shall be provided.

5.4.3 Quality Management

5.4.3.1 Purpose

The purpose of the Quality Management Process is to manage that the products, processes, resources and structure of the application management organization comply with the requirements of the organization, the customers and relevant regulations.

5.4.3.2 Outcomes

As a result of successful implementation of the Quality Management Process:

- | | |
|--|-------------------------------|
| a) strategy for conducting quality assurance is developed; | [ISO/IEC 12207:2008, 7.2.3.2] |
|--|-------------------------------|
- b) Quality assurance criteria are defined
- | | |
|---|-------------------------------|
| c) evidence of software quality assurance is produced and maintained; | [ISO/IEC 12207:2008, 7.2.3.2] |
| d) problems and/or non-conformance with requirements are identified and recorded; and | |
| e) adherence of products, processes and activities to the applicable standards, procedures and requirements are verified. | |
- f) The application management organization has insight into the required and actual internal and acquired quality.
- | | |
|---|-------------------------------|
| g) organization quality management policies and procedures are defined; | [ISO/IEC 12207:2008, 6.2.5.2] |
| h) organization quality objectives are defined; | |
| i) accountability and authority for quality management are defined. | |
- j) The requirements (agreements) from the other Management Processes are handled, for instance in the field of customer agreements, quality demands, cost demands. Feedback to the Management Processes on the feasibility of the requirements should be provided.
- k) Demands placed on the other Management Processes are defined and communicated. Feedback is also provided regarding the feasibility of this.
- l) A process is in place for identifying, registering and handling problems (shortcomings in the quality system).
- | | |
|--|-------------------------------|
| m) Appropriate action is taken when quality objectives are not achieved. | [ISO/IEC 12207:2008, 6.2.5.2] |
|--|-------------------------------|
- n) Reports on the quality of the application management activities are produced on a regular basis.

5.4.3.3 Activities and tasks

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Quality Management Process.

a) Quality planning.

This activity consists of the following tasks:

1) The organization shall establish quality management policies, standards and procedures.

NOTE 1 A process model for quality management system can be found in ISO 9001:2000. For organizations wishing to move beyond ISO 9001:2000, in pursuit of continual improvement of performance, guidance is provided in ISO 9004:2000.

NOTE 2 Guidance for application of ISO 9001:2000 to software can be found in ISO/IEC 90003:2004. The organization shall establish organization quality management goals and objectives based on business strategy for customer satisfaction.

2) The organization shall establish organization quality management goals and objectives based on business strategy for customer satisfaction.

[ISO/IEC 12207:2008, 6.2.5.3.1].

3) A plan for conducting the quality assurance process activities and tasks shall be developed, documented, implemented, and maintained for the life of the contract.

[ISO/IEC 12207:2008, 7.2.3.3.1.3]

4) The current quality levels shall be estimated.

5) Known limitations regarding quality levels to be met shall be inventoried.

6) The ability of the organization and the suppliers to deliver the current and required services shall be estimated.

7) The organization shall define responsibilities and authority for implementation of quality management.

[ISO/IEC 12207:2008, 6.2.5.3.1.3]

8) A training plan, addressing implementation schedules, resource requirements, and training needs, should be developed and documented.

[ISO/IEC 12207:2008, 6.2.4.3.2.1]

9) Improvements in the quality system shall be initiated.

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

11) The training plan shall be implemented to provide training to personnel. Training records should be maintained.

[ISO/IEC 12207:2008, 6.2.4.3.2]

12) Agreements about quality requirements with suppliers shall be made.

13) It shall be assured that applicable prime-contract requirements are passed down to the subcontractor, and that the subcontractor's software products satisfy prime-contract requirements.

[ISO/IEC 12207:2008, 7.2.3.3.3.3]

14) Scheduled and on-going quality assurance activities and tasks shall be executed. When problems or non-conformances with contract requirements are detected, they shall be documented and serve as input to the Problem Resolution Process (subclause 7.2.8). Records of these activities and tasks, their execution, problems, and problem resolutions shall be prepared and maintained.

[ISO/IEC 12207:2008, 7.2.3.3.1.4]

NOTE In this International Standard the Problem Resolution activities are part of the Quality Management Process (5.4.3.3 b.2).

15) The organization shall implement preventive actions [ISO/IEC 9001:2008, 8.5.3]

b) Quality monitoring, improvement and reporting.

This activity consists of the following tasks:

1) The organization shall conduct periodic reviews of project quality plans.
[ISO/IEC 12207:2008, 6.2.5.3.1.3]

2) There shall be a documented procedure to identify problems and minimize or avoid the impact of incidents and problems. The procedure for problems shall define:

- identification;
- recording;
- allocation of priority;
- classification;
- updating of records;
- escalation;
- resolution;
- closure.

3) Problems shall be managed according to the procedure.
[ISO/IEC 20000-1:2011, 8.2]

4) It shall be assured that software products and related documentation comply with the contract and adhere to the plans.

5) In preparation for the delivery of the software products, it shall be assured that they have fully satisfied their contractual requirements and are acceptable to the acquirer.

6) It shall be assured that those software life cycle processes (supply, development, operation, maintenance, and support processes including quality assurance) employed for the project comply with the contract and adhere to the plans.

7) It shall be assured that the internal software engineering practices, development environment, test environment, and libraries comply with the contract.
[ISO/IEC 12207:2008, 7.2.3.3.2.3]

8) The organization shall implement corrective actions and communicate results through the organization.
[ISO/IEC 12207:2008, 6.2.5.3.2.2]

9) It shall be assured that the acquirer and other parties are provided the required support and cooperation in accordance with the contract, negotiations, and plans.

10) It should be assured that software product and process measurements are in accordance with established standards and procedures.

11) It shall be assured that the staff assigned has the skill and knowledge needed to meet the requirements of the project and receive any necessary training.
[ISO/IEC 12207:2008, 7.2.3.3.3]

12) The organization shall take corrective actions when quality management goals are not achieved.
[ISO/IEC 12207:2008, 6.2.5.3.2.1]

13) The quality of the application management activities shall be reported.

14) Additional quality management activities may be assured in accordance with the clauses of ISO 9001.

[ISO/IEC 12207:2008, 7.2.3.3.4.1]

c) Quality evaluation.

This activity consists of the following tasks:

- 1) Releases shall be evaluated.
- 2) The results of the improvement activities based on executed assessments, reviews and tests shall be evaluated.

- 3) Define objective criteria that can be used to evaluate staff performance.
- 4) Evaluate the performance of the staff in respect of their contributions to the goals of the organization or project.
- 5) Ensure that feedback is provided to the staff on the results of any evaluations performed.
- 6) Maintain adequate records of staff performance including information on skills, training completed, and performance evaluations.
- 7) Empower teams to perform their role by ensuring the teams have:
 - i) An understanding of their role on the project.
 - ii) A shared vision or sense of common interests on the success of the project.
 - iii) Appropriate mechanisms or facilities for communication and interactions among teams.
 - iv) Support from appropriate management to accomplish project requirements.

[ISO/IEC 12207:2008, 6.2.4.3.3]

8) The general quality of products and processes shall be evaluated.

9) The problems that have been dealt with shall be evaluated.

d) Process control and reporting:

This activity consists of the following tasks:

- 1) The Quality Management Process shall be implemented, controlled, monitored, evaluated and improved.
- 2) Quality reports about the Quality Management Process shall be provided.

5.4.4 Financial Management

5.4.4.1 Purpose

The purpose of the Financial Management Process is to manage that the costs of the application management organization are in balance with the benefits and the products and services are competitively priced.

5.4.4.2 Outcomes

As a result of successful implementation of the Financial Management Process:

- a) The application management organization has defined a cost allocation and a cost charging structure.

- b) Costs of service provision are estimated.
- c) Budgets are produced using cost estimates.
- d) The application management organization has drawn up a financial plan.

This plan provides insight into:

- costs;
- benefits;
- developments;
- long-term expectations.

NOTE Cost benefit analysis should encompass criticality analysis.

- e) Financial reviews take place on a regular basis.

The review reports provide insight into:

- financial results;
- results of financial evaluations;
- change proposals for the financial process;
- any problems encountered.

- f) deviations from the budget and costs are controlled;
- g) deviations from the budget are resolved;
- h) deviations from the budget and costs are communicated to interested parties.

5.4.4.3 Activities and tasks

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Financial Management Process.

- a) **Financial planning.**

This activity consists of the following tasks:

- 1) A cost structure shall be created or adjusted.

NOTE The cost structure concerns the determination of which internally costs and which cost made by deliverers are included or not and to which degree.

- 2) A cost charging structure shall be created or adjusted.

NOTE The charging structure concerns the determination of which costs will be charged to customers and how, in which form, they will be charged.

- 3) There shall be policies and documented procedures for:
- a) budgeting and accounting for service components including at least
 - 1) assets — including licenses — used to provide the services,
 - 2) shared resources,
 - 3) overheads,
 - 4) capital and operating expenses,
 - 5) externally supplied services,
 - 6) personnel,
 - 7) facilities
 - b) apportioning indirect costs and allocating direct costs to services, to provide an overall cost for each service;
 - c) effective financial control and approval.

[ISO/IEC 20000-1:2011, 6.4]

- 4) The costs of the required activities of the application management organization shall be predicted. A distinction is made between costs for:
- support;
 - maintenance and renewal;
 - management;
 - strategic activities.
- 5) Financial risk and appropriate mitigation measures shall be identified and quantified.
- 6) The costs that will be made by suppliers or subcontractors shall be predicted.
- 7) The service provider shall predict the expected benefits of the products and services.
- 8) The market conformity of the pricing and of the expected benefits shall be estimated.
- b) **Financial monitoring and reporting.**

This activity consists of the following tasks:

- 1) The service provider shall monitor and report costs against the budget, review the financial forecasts and manage costs.

[ISO/IEC 20000-1:2011, 6.4]

NOTE This monitoring shall include cost of the subcontractors and suppliers.

- 2) The cost charging and the revenues shall be monitored.
 - 3) In case of deviation of the financial planning, measures shall be identified and initiated.
 - 4) Financial information shall be provided to all the application management processes.
 - 5) Reports on the financial results of the application management activities shall be provided.
- c) **Financial evaluation.**

This activity consists of the following tasks:

- 1) The costs incurred and the benefits realized shall be evaluated.

2) The appropriateness of the cost and cost charging structures used shall be evaluated.

d) **Process control and reporting.**

This activity consists of the following tasks:

- 1) The Financial Management Process shall be implemented, controlled, monitored, evaluated and improved.
- 2) Quality reports about the Financial Management Process shall be provided.

5.4.5 Supplier Management

5.4.5.1 Purpose

The purpose of the Supplier Management Process is to manage that supplier services are integrated into service delivery to meet the agreed requirements.

NOTE 1 The application management organization may have internal or external suppliers. A supplier can be another application management organization, but also IT infrastructure management organizations or consultants. This International Standard makes no distinction between internal or external customers. Similarly, no distinction is made between internal or external suppliers.

NOTE 2 Suppliers are managed on two levels:

- strategic: Supplier and Sourcing Definition;
- tactical: Supplier Management (this process).

NOTE 3 Within this International Standard two types of contracts or documented agreements are recognized: agreements between the application management organization and its customers, and agreements between the application management organization and its suppliers. The first type is the object of Agreements Management (application management is the supplier) and the second type is the object of Supplier Management (application management is the customer).

NOTE 4 Security is an increasing concern in systems and software engineering. See ISO/IEC 27036, Security techniques - Information security for supplier relationships, for requirements and guidance for suppliers and acquirers on how to secure information in supplier relationships. Specific aspects of information security supplier relationships are addressed in Parts 3 and Part 4.

5.4.5.2 Outcomes

As a result of successful implementation of the Supplier Management Process:

- a) relationships between the service provider and suppliers are managed.
- b) Services to be provided are negotiated with each supplier.
- c) Roles and relationships between suppliers are determined.
- d) The capability of subcontracted suppliers to meet obligations is confirmed.
- e) The application management organization has agreed-upon framework agreements, contracts and underlying agreements with suppliers:
 - description of the services and products to be ordered;
 - underlying documents describe the services, solution and approaches in more detail.

NOTE Service level agreements are considered to be part of a contract or to be a specific type of contract. So service level management is part of Supplier Management.

- f) Information regarding suppliers' capacity, capabilities and services, including any technology they use, and developments in the supplier market is documented.
- g) Supplier obligations to meet service requirements are monitored.
- h) Supplier performance against agreed criteria is monitored.

NOTE In this International Standard this monitoring also includes the non-rational aspects, such as experience, respect, reasonableness.

- i) Reports on the performance of the suppliers and the supplier management activities are produced on a regular basis.

5.4.5.3 Activities and tasks

The service provider may use suppliers to implement and operate some parts of the service management processes. An example of supply chain relationships is illustrated in [Figure 3](#).

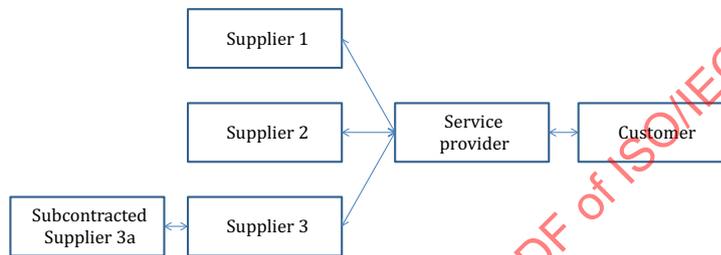


Figure 3 — Example of supply chain relationships

[ISO/IEC 20000-1:2011, 7.2]

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Supplier Management Process.

a) **Supplier planning (drawing up of contracts with suppliers).**

This activity consists of the following tasks:

- 1) The actual need, demand and volume shall be determined.
- 2) Supplier(s) shall be selected.
- 3) Supply and demand shall be matched.
- 4) An engagement model and a contract model shall be drafted.
- 5) The desired parameters for managing and invoicing the supplier shall be designed.
- 6) The services and products to be provided by the supplier shall be defined.

7) The service provider shall agree with the supplier service levels to support and align with the SLAs between the service provider and the customer.

[ISO/IEC 20000-1:2011, 7.2]

8) Prices and sharing of costs shall be defined and agreed with the suppliers.

9) The service provider shall ensure that roles of, and relationships between, lead and sub-contracted suppliers are documented. The service provider shall verify that lead suppliers are managing their sub-contracted suppliers to fulfil contractual obligations.

10) The service provider and the supplier shall agree a documented contract.

The contract shall contain or include a reference to:

- scope of the services to be delivered by the supplier;
- dependencies between services, processes and the parties;
- requirements to be fulfilled by the supplier;
- service targets;
- interfaces between service management processes operated by the supplier and other

parties;

- integration of the supplier's activities within the SMS;
- workload characteristics;
- contract exceptions and how these will be handled;
- authorities and responsibilities of the service provider and the supplier;
- reporting and communication to be provided by the supplier;
- basis for charging;
- activities and responsibilities for the expected or early termination of the contract and the transfer of services to a different party.

11) For each supplier, the service provider shall have a designated individual who is responsible for managing the relationship, the contract and performance of the supplier.

[ISO/IEC 20000-1:2011, 7.2]

b) Supplier monitoring and reporting.

This activity consists of the following tasks:

1) The service provider shall monitor the performance of the supplier at planned intervals. The performance shall be measured against service targets and other contractual obligations. Results shall be recorded and reviewed to identify the causes of nonconformities and opportunities for improvement. The review shall also ensure that the contract reflects current requirements.

[ISO/IEC 20000-1:2011, 7.2]

2) Measures to resolve any shortcomings shall be taken.

3) The results of these measures shall be monitored.

4) There shall be a documented procedure to manage contractual disputes between the service provider and the supplier.

[ISO/IEC 20000-1:2011, 7.2]

5) There shall be a report on the supplier management activities.

c) Supplier evaluation.

This activity consists of the following tasks:

1) The observance of the agreements shall be evaluated.

- 2) The contract(s) shall be evaluated and adjusted if necessary. Evaluation subjects are:
 - set-up of the contract;
 - management and invoicing model used;
 - services and products;
 - service levels.
- 3) The service provider shall make proposals for the future cooperation.

d) **Process control and reporting.**

This activity consists of the following tasks:

- 1) The Supplier Management Process shall be implemented, controlled, monitored, evaluated and improved.
- 2) Quality reports about the Supplier Management Process shall be provided.

5.5 Application Strategy Processes

5.5.1 Analysis of Developments in IT

5.5.1.1 Purpose

The purpose of the Analysis of Developments I IT Process is exploring technological developments in the field of development tools, functionalities, service management tools, application platforms and IT infrastructure, determining the impact on the application portfolio and advising on strategic choices regarding applications and application portfolio.

5.5.1.2 Outcomes

As a result of a successful implementation of the Analysis of Developments in IT Process:

- a) The application management organization has insight into the current status of the used technology and functionalities.
- b) The application management organization has insight into opportunities and threats in the field of technology and standard functionalities.
- c) The application management organization has insight into the impact of technological changes and possibilities on the existing applications.
- d) The application management organization has a technology strategy covering possible and preferred scenarios for implementation or renewal of technologies.

5.5.1.3 Activities and tasks

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Analysis of Developments in IT Process.

a) **Inventory of technological developments.**

This activity consists of the following tasks:

- 1) The used tools and infrastructure and externally obtained functionality (components) shall be identified and their status shall be determined.

- 2) The necessity for upgrading or replacement of tools, infrastructure and obtained functionality shall be identified.
- 3) New technologies or solutions shall be identified.
- 4) Opportunities to reduce threats regarding application and regarding means such as tools and infrastructure and opportunities to improve services shall be determined.
- 5) The affected applications shall be determined.
- 6) Possible scenarios for implementing technological developments regarding application and interfaces shall be developed and activities, risks, costs shall be estimate and results shall be predicted.

b) Technology strategy definition.

This activity consists of the following tasks:

- 1) An overall policy or desired approach for current or future technology (tools and infrastructure) and functionality shall be identified.
- 2) The impact on the existing application or application portfolio shall be identified.

NOTE The exact (factual) impact is determined in the Application Life Cycle Management Process. In the Analysis of Developments in IT Process only the rough generic impact is determined, such as the rough impact on the application itself or on related developments and rough scenarios or alternatives for renewal.

c) Process reporting and control.

This activity consists of the following tasks:

- 1) The Analysis of Developments in IT Process shall be implemented, controlled, monitored, evaluated and improved.
- 2) Quality reports about the Analysis of Developments in IT Process shall be provided.

5.5.2 Customer Organizations Analysis

5.5.2.1 Purpose

The purpose of the Customer Organizations Analysis Process is to proactively monitor the impact of developments in the customer organization(s) on an application and the application portfolio and determine which constraints the existing applications will have for these developments.

5.5.2.2 Outcomes

As a result of the successful implementation of Customer Organizations Analysis Process:

- a) The application management organization has insight into developments in the customer organizations.
- b) The application management organization has insight into the impact of developments in the customer organizations on the applications within its portfolio.
- c) The application management organization has insight into the obstacles that the current applications may form for developments in the customer organizations.

5.5.2.3 Activities and tasks

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Customer Organizations Analysis Process.

a) **Production of an inventory of organizational developments.**

This activity consists of the following tasks:

- 1) Changes in the customer organizations policies shall be identified.
- 2) The changes in the business processes of the customers shall be identified.
- 3) The changes in the infrastructure of the customers (machines, buildings, IT) shall be identified.
- 4) The organizational changes within the customer organizations shall be identified.
- 5) Changes regarding the IT-control of the customers shall be identified.

b) **Determination of the impact.**

This activity consists of the following tasks:

- 1) Existing applications that have been or will be affected by the developments shall be identified.
- 2) Possible obstacles imposed by the existing information systems on the developments shall be identified.
- 3) The implications of the customer organizational developments for existing and potential new / renewed applications shall be identified.

NOTE The exact (factual) impact is determined in the Application Life Cycle Management Process. In the Customer Organization Analysis Process only the rough generic impact is determined, such as the rough impact on the application itself or on related developments, and rough scenarios or alternatives for renewal.

c) **Process reporting and control.**

This activity consists of the following tasks:

- 1) The Customer Organizations Analysis Process shall be implemented, controlled, monitored, evaluated and improved.
- 2) Quality reports about the Customer Organizations Analysis Process shall be provided.

5.5.3 Customer Environment Analysis

5.5.3.1 Purpose

The purpose of the Customer Environment Analysis Process is to proactively monitor developments in the information chains that the customer organizations are part of and to determine the impact of those developments on an application and the application portfolio. The Process will also define which obstacles the existing applications may form for these developments.

5.5.3.2 Outcomes

As a result of the successful implementation of the Customer Environment Analysis Process:

- a) The application management organization has insight into developments in chain processes of their customers:
 - developments in the processes between parties in the chain;

- developments in communication standards, technology standards and exchange standards that are used by the customers;
 - mutual or market wide needs, opportunities and constraints.
- b) The application management organization has insight into the impact of the developments in the customer organizations chains on the applications within its portfolio.

5.5.3.3 Activities and tasks

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Customer Environment Analysis Process.

a) **Production of an inventory of developments in the organization chains.**

This activity consists of the following tasks:

- 1) Relevant developments in the overall business processes concerning the customer chains shall be identified.
- 2) Developments in any standards used or databases shared with other organizations in the customer chains shall be identified.
- 3) Recognized needs regarding more cooperation or information exchange in the chains shall be identified.
- 4) The opportunities and possibilities for further alignment of information processes shall be identified.

b) **Determination of the impact.**

This activity consists of the following tasks:

- 1) Necessary or possible changes in the commonly used IT communication infrastructure shall be identified.
- 2) An overall policy or desired direction regarding the chain processes based on the inventories shall be indicated.
- 3) Potentially interesting opportunities for chain processes based on the existing infrastructure and applications shall be indicated.
- 4) The implications of the chain developments for existing and potential new /renewed applications shall be identified.

NOTE The exact (factual) impact is determined in the Application Life Cycle Management Process. In the Customer Environment Analysis Process only the rough generic impact is determined, such as the rough impact on the application itself or on related developments, and rough scenarios or alternatives for renewal.

c) **Process reporting and control.**

This activity consists of the following tasks:

- 1) The Customer Environment Analysis Process shall be implemented, controlled, monitored, evaluated and improved.
- 2) Quality reports about the Customer Environment Analysis Process shall be provided.

5.5.4 Application Life Cycle Management

5.5.4.1 Purpose

The purpose of the Application Life Cycle Management Process is to determine the future strategy for an application, so that the application can optimally support the business processes in the future.

5.5.4.2 Outcomes

As a result of the successful implementation of the Application Life Cycle Management Process:

- a) The application management organization has a strategy for each application within the portfolio, containing:
 - current functional, technical and operational quality of the application;
 - relevant developments in technology and (future) use;
 - possible strategies for the future and scenarios to get there, including blueprints and financial estimates;
 - a preferred scenario.

5.5.4.3 Activities and tasks

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Application Life Cycle Management Process.

- a) **Determination of the status of the current situation.**

This activity consists of the following tasks:

- 1) The technical quality of the application shall be examined:
 - the current and estimate the future expected stability, maintainability, flexibility.
- 2) The functional quality shall be determined:
 - the degree to which the application supports the business process, legislation and regulations (now and in the future);
 - the extent to which users are satisfied with the application.
- 3) The operational quality shall be determined:
 - the current and future continuity, manageability, efficiency, reliability.

- b) **Determination of the impact of the business strategy on the application.**

This activity consists of the following tasks:

- 1) The impact of developments and changes in the business processes, business policy and the environment of the application shall be determined.
- 2) The impact of the changes in the organization, users, information provisioning processes and other applications shall be determined.
- 3) The commitment and willingness of the application owner to make investments and change shall be determined.

- c) **Determination of the technical possibilities for upgrading and threats regarding the application.**

This activity consists of the following tasks:

- 1) Potentially interesting or necessary technology shall be determined.
- 2) The developments of existing technology shall be determined.
- 3) The developments in the strategies of the existing suppliers: technology, market ambitions, products and services shall be determined.
- 4) The possibilities to apply the explored new or changed technologies and the value they may or will have for the application shall be determined.
- 5) The effects of the developments of suppliers: opportunities and threats shall be determined.

d) **Determination of a strategy and scenarios for the future.**

This activity consists of the following tasks

- 1) Possible strategies: scenarios and blueprints for the future of the application shall be defined.
- 2) Possible scenarios for every strategy shall be defined.
- 3) The investments needed, benefits, advantages, disadvantages and the extent to which the requirements are met for every option and scenario shall be determined.
- 4) The preferred action and scenario shall be advised or chosen if this responsibility has been delegated to application management.

e) **Process reporting and control.**

This activity consists of the following tasks:

- 1) The Application Life Cycle Management Process shall be implemented, controlled, monitored, evaluated and improved.
- 2) Quality reports about the Application Life Cycle Management Process shall be provided.

5.5.5 Application Portfolio Management

5.5.5.1 Purpose

The purpose of the Application Portfolio Management Process is to align and coordinate the various components in the application landscape and balance, prioritize and coordinate changes and investments in the application portfolio by:

- Examining whether individual planned investments fit into the broad perspective of the application portfolio.
- Determining if all the projects and programs are feasible for the customer organization(s) and/or for the application management organization.

NOTE The scope of this process and underlying activities and tasks may be the entire portfolio or a specific part of the portfolio, e.g. all the applications of one customer organisation or market.

5.5.5.2 Outcomes

As a result of the successful implementation of the Application Portfolio Management Process:

- a) The application management organization has an overview of the application portfolio giving insight in:
 - the various applications with descriptions of these applications;
 - cohesion between the applications;
 - indications of current quality and of investments needed, including priority;

- relevant developments, such as policy-changes, opportunities and threats, affecting the applications, and their impact, their importance and their time-aspects.
- b) The application management organization has an application portfolio policy containing:
- proposed (changes in the) cohesion of the application portfolio;
 - use of current and future standards and technology.
 - strategic change portfolio.

5.5.5.3 Activities and tasks

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Application Portfolio Management Process.

NOTE The structure of the activities of Application Portfolio Management is similar to that of the Application Life Cycle Management Process. However, the content, depth, scope, and process differ.

a) **Determination of the status of the current situation.**

This activity consists of the following tasks:

- 1) The current portfolio shall be identified or updated: existing applications, size, and use of tools, relations between them, replacement or investment value, technical debt).
- 2) The current quality of the entire application portfolio shall be determined: strengths/weaknesses, functional quality, technical quality, operational quality and existing (generic) bottlenecks.

b) **Determination of the impact of policy.**

This activity consists of the following tasks:

- 1) An overview shall be made of the developments in the customer organization and its environment and of the desired changes of the applications.
- 2) The impact of these developments and desired changes, their mutual impact and the overall impact shall be determined.
- 3) The total change capacity of the organization, the users and the IT shall be assessed.

c) **Production of an inventory of IT possibilities.**

This activity consists of the following tasks:

- 1) Opportunities, required or mandatory changes and developments in the field of technology and their applicability shall be determined.
- 2) Cohesion of the various technological developments which were determined at application level shall be determined.

d) **Definition of the application portfolio strategy.**

This activity consists of the following tasks:

- 1) The total impact of (bottlenecks on) current status, policy developments and technological developments shall be determined.
- 2) Basic sketches and scenarios and (modifications in) overall-architectures shall be created.
- 3) Decision-making and deliberation shall be coordinated.

- 4) Future actions shall be defined, such as projects, programs or releases.
- e) **Process reporting and control.**
This activity consists of the following tasks:
 - 1) The Application Portfolio Management Process shall be implemented, controlled, monitored, evaluated and improved.
 - 2) Quality reports about the Application Portfolio Management Process shall be provided.

5.6 Application Management Organization Strategy Processes

5.6.1 Account and Market Definition

5.6.1.1 Purpose

The purpose of the Account and Market Definition Process is to optimize the position of the application management organization in current or new markets.

5.6.1.2 Outcomes

As a result of the successful implementation of the Account and Market Definition Process:

- a) The application management organization has insight into its existing and desired product market combinations.
- b) The application management organization has insight into its account and market:
 - existing services to customers;
 - relationships with customers and image of the organization;
 - developments in the market, opportunities and threats;
 - possibilities in the field of strategic coalitions.
- c) The application management organization has an account strategy addressing:
 - desired relationship with customers and desired image;
 - desired position, place and role in the market;
 - strategy to achieve these, translated into actions, including strategy regarding other market parties.

5.6.1.3 Activities and tasks

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Account and Market Definition Process.

- a) **Production of an inventory of the current position with regard to customers, market and other suppliers.**

This activity consists of the following tasks:

- 1) An inventory of the current customer, delivered services and products and the image of the organization and its products shall be made.
- 2) An account inventory, including a list of stakeholders and the customers' decision-makers shall be made.

- 3) An inventory of competitors in the current market, their services and products (content, quantities) and their position, ambitions and possibilities shall be made.

b) **Definition of account and market opportunities.**

This activity consists of the following tasks:

- 1) An inventory of possibilities to improve revenue, relationships, image, and increase market share shall be made.
- 2) The need for action and urgency shall be determined.
- 3) The scenarios, impact on the organization and any necessary investments shall be determined.

c) **Definition of account and market.**

This activity consists of the following tasks:

- 1) The required product-market combinations shall be defined.
- 2) The required activities and measures toward suppliers, partnerships, quality system, tooling, etc. shall be defined.

d) **Definition of the account and market strategy.**

This activity consists of the following tasks:

- 1) A detailed strategy and approach shall be described.
- 2) A financial and capacity plan shall be developed.
- 3) The subsequent steps to be made shall be described.
- 4) The activities and measures shall be initiated.

e) **Process reporting and control.**

This activity consists of the following tasks:

- 1) The Account and Market Definition Process shall be implemented, controlled, monitored, evaluated and improved.
- 2) Quality reports about the Account and Market Definition Process shall be provided.

5.6.2 Capabilities Definition

5.6.2.1 Purpose

The purpose of the Capabilities Definition Process is to give insight into the necessary skills and expertise of the application management organization in the near future.

5.6.2.2 Outcomes

As a result of the successful implementation of the Capabilities Definition Process:

- a) The application management organization has insight into its current and required capabilities:
 - existing skills and expertise and shortcomings thereof;
 - changes in the qualitative and quantitative needs of skills and expertise;
 - the possibilities and alternatives to develop skills and expertise (the core competencies);

- the impact on market and provided services.
- b) The application management organization has a capabilities strategy:
- a description of the future capabilities (blue print);
 - a detailed activity plan;
 - an investment plan.

5.6.2.3 Activities and tasks

The organization shall implement the following activities in accordance with applicable organization policies and procedures with respect to the Capabilities Definition Process.

a) **Description of the current capabilities.**

This activity consists of the following tasks:

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.

[ISO/IEC 12207:2008, 6.2.4.3.1.1]

b) **Definition of expected changes in the need of capabilities.**

This activity consists of the following tasks:

- 1) The influence of adjustment of the current services (improvement, expansion, change) on the needed capabilities shall be determined.

2) The types and levels of training and knowledge needed to satisfy organization and project requirements shall be determined.

[ISO/IEC 12207:2008, 6.2.4.3.1.2]

- 3) The need for actions with regard to education, hiring, replacement etc. and the total impact shall be identified.

c) **Identification of modifications and actions required to satisfy need of capabilities.**

- 1) The required modifications in capabilities based on the identified needs shall be identified.
- 2) Required actions regarding the quality system, technology and contracts with suppliers shall be identified.

d) **Definition of the capabilities strategy.**

This activity consists of the following tasks:

- 1) A detailed strategy and approach shall be described.
- 2) A financial and capacity plan shall be developed.
- 3) The subsequent steps to be made shall be described.
- 4) The activities and measures shall be initiated.

e) **Process reporting and control.**

This activity consists of the following tasks: