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Information technology — Process assessment —

Part 7: Assessment of organizational maturity

Technologies de l'information — Évaluation des procédés —

Partie 7: Évaluation de maturité d'organisation

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Foreword

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

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

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

In exceptional circumstances, the joint technical committee may propose the publication of a Technical Report of one of the following types:

— type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;

— type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;

— type 3, when the joint technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

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

ISO/IEC TR 15504-7, which is a Technical Report type 2, was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*.

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

— *Part 1: Concepts and vocabulary*

— *Part 2: Performing an assessment*

— *Part 3: Guidance on performing an assessment*

— *Part 4: Guidance on use for process improvement and process capability determination*

— *Part 5: An exemplar Process Assessment Model*

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

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

Introduction

This part of ISO/IEC 15504 defines the conditions for an assessment of organizational maturity; it defines a framework for determining organizational maturity, based upon profiles of process capability derived from process assessment, and defines the conditions under which such assessments are valid. Other parts of this International Standard define and provide guidance on the assessment of process capability.

ISO/IEC 15504-2 sets out the minimum requirements for performing a process assessment that ensure consistency and repeatability of the ratings. The requirements help to ensure that the assessment output is self-consistent and provides evidence to substantiate the ratings and to verify compliance with the requirements.

This part of ISO/IEC 15504 identifies a measurement framework for the assessment of organizational maturity and the requirements for:

a) constructing Organizational Maturity Models;

b) performing an assessment of organizational maturity;

c) verifying conformity of organizational maturity assessments.

The scope of reference for an assessment of organizational maturity is determined by the Organizational Maturity Model employed for the assessment.

As defined in this part of ISO/IEC 15504, organizational maturity is an expression of the extent to which an organization consistently implements processes within a defined scope that contributes to the achievement of its business goals (current or projected). An Organizational Maturity Model is based upon one or more specified Process Assessment Model(s), and addresses the domains and contexts for use of the Process Reference Model(s) from which the Process Assessment Model(s) are derived.

The assessment of organizational maturity is undertaken through the performance of process assessment as specified in ISO/IEC 15504-2. Specific conditions are defined in this part of ISO/IEC 15504 relating to the process scope of the organizational maturity assessment, the organizational scope of the assessment (which has to be specified as representing the elements characterised by the organizational maturity rating), and the data collection strategy (which needs to ensure that the results of the assessment are representative of the organizational scope). On completion of the assessment, the set of process profiles established for the organization determine the rating of the level of organizational maturity based on the framework defined in this part of ISO/IEC 15504, as specified in the relevant Organizational Maturity Model.

This part of ISO/IEC 15504 also contains guidance on implementing the requirements for constructing an Organizational Maturity Model; on performing assessments of organizational maturity; and on the application of organizational maturity ratings for process improvement and capability determination.

This part of ISO/IEC 15504 is published as a Technical Report Type 2, to enable experience in the use of the approach to assessment of organizational maturity to be gained. In future revisions of this International Standard, it is likely that the content of this part will be distributed across the complete document set.

Information technology — Process assessment —

Part 7:
Assessment of organizational maturity

1 Scope

This part of ISO/IEC 15504 addresses the expression of the results of assessment of processes in terms of the overall maturity of an organizational unit, and the application of the results of assessment of organizational maturity for process improvement and capability determination. It defines the conditions under which the results of conformant assessments of process capability determine the expressions of organizational maturity, ensuring that the results are objective, impartial, consistent, repeatable, comparable and representative of the assessed organizational units.

This part of ISO/IEC 15504 provides a structured approach for the assessment of organizational maturity for the following purposes:

— by or on behalf of an organization with the objective of understanding the status of its organizational maturity for process improvement;

— by or on behalf of an organization with the objective of determining the suitability of its organizational maturity for a particular requirement or class of requirements;

— by or on behalf of one organization with the objective of determining the suitability of another organization's processes for a particular contract or class of contracts.

2 Normative references

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

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

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

3 Terms and definitions

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

3.1
Organizational Maturity Model
model, derived from one or more specified Process Assessment Model(s), that identifies the process sets associated with each of the levels in the scale of organizational maturity

3.2
organizational maturity
extent to which an organization consistently implements processes within a defined scope that contributes to the achievement of its business goals (current or projected)

NOTE The defined scope is that of the specified Organizational Maturity Model.

3.3
(organizational) maturity level
point on the ordinal scale of organizational maturity that characterises the maturity of the organization in the scope of the organizational maturity model used; each level builds on the maturity of the level below

NOTE The organizational maturity level is determined from the organization's set of Process Profiles.

3.4
basic process set
set of processes that ensure the achievement of maturity level 1

NOTE A basic process set will include a minimum set of processes, together with additional and optional processes determined by the organizational context for the assessment.

3.5
extended process set
set of processes specific to a maturity level higher than maturity level 1 that ensures the achievement of the relevant process attributes

NOTE An extended process set will include a minimum set of processes, together with additional and optional processes determined by the organizational context for the assessment.

3.6
process instance
single specific and identifiable implementation of a process

3.7
assessment body
body that performs an assessment

NOTE 1 A body may be an organization, or part of an organization.

NOTE 2 Adapted from ISO/IEC 17020:1998.

4 A measurement framework for organizational maturity

4.1 Introduction

This clause of ISO/IEC 15504-7 defines a measurement framework for the assessment of organizational maturity. Organizational maturity is defined on a six point ordinal scale that enables maturity to be assessed from the bottom of the scale, Level 0 Organization - the Immature Organization, through to the top end of the scale, Level 5 Organization - the Innovating Organization. The scale represents the extent to which the organization has explicitly and consistently performed, managed and established its processes with predicable performance and demonstrated the ability to change and adapt the performance of the processes fundamental to achieving the organization’s business goals.

The scale for organizational maturity retains the semantic intent of the process capability levels that are defined in ISO/IEC 15504-2. The scale for process capability characterises the ability of a process to meet current or projected business goals; the scale of organizational maturity characterises the extent to which an organization consistently implements sets of processes within a defined scope that contribute to the achievement of its business goals. Thus, the two scales, while consistent, characterise different attributes of separate entities – the process and the organization. The measurement framework provides a schema for use in characterising the maturity of an organization with respect to specified Process Assessment Model(s).

Within this measurement framework, each level of organizational maturity is characterised by the demonstration of achievement of specified levels of process capability in process sets drawn from the specified Process Assessment Model(s).

Processes can be categorized into 5 process sets based on their contributions to the business goals of the organization. The set of fundamental processes that support the business is called the basic process set. Each organizational maturity level beyond level 1 maturity is characterized by the implementation, at an appropriate level of process capability, of a further set of processes that drive the achievement of the capabilities relevant to each maturity level. These are called extended process sets.

4.2 A scale for organizational maturity

Organizational maturity is expressed on a scale from maturity level 0 through maturity level 5 as follows.

4.2.1 Level 0 Organization – Immature

The organization does not demonstrate effective implementation of its processes that are fundamental to support the organization's business.

At least one process in the basic process set is assessed at capability level 0.

4.2.2 Level 1 Organization – Basic

The organization demonstrates achievement of the purpose of the processes that are fundamental to support the organization's business.

As a result of achieving this level of maturity, the organization:

a) implements the processes required to support the organization's business;

b) performs sets of activities and tasks that achieve the purposes of these processes.

All processes in the basic process set are assessed at capability level 1 or higher.

4.2.3 Level 2 Organization – Managed

The organization demonstrates management of the processes that are fundamental to support the organization's business.

As a result of achieving this level of maturity, the organization:

a) establishes plans for the performance of the processes that are fundamental to support the organization's business;

b) acts to ensure effective communication regarding the performance of the processes, through clear assignment of responsibilities and authorities to involved parties;

c) allocates adequate resources and information to ensure implementation of the plans;

d) monitors performance of the processes against plans in the individual instances;

e) takes action to address deviation from planned performance of the process;

f) identifies requirements for the management of work products developed by the processes;

g) takes action through appropriate reviews and control mechanisms to ensure that the requirements for work product management are satisfied.

All processes in the basic process set are assessed at capability level 2 or higher.

The extended process set for maturity level 2 incorporates additional processes that ensure management of process performance and work product integrity. The processes in the extended process set are assessed at capability level 2 or higher.

4.2.4 Level 3 Organization – Established

The organization demonstrates effective definition and deployment of the processes that are fundamental to support the organization's business.

As a result of achieving this level of maturity, the organization:

a) establishes standard process descriptions covering all of the basic and extended sets of processes employed on a routine basis in the organization;

b) ensures that individual implementations of the processes are performed as defined processes with appropriately tailored standard processes;

c) collects and analyses data and information from the performance of the defined processes and stores this data for use across the organization;

d) uses the collected data and information to improve both the standard and defined processes.

All processes in the basic process set are assessed at capability level 3 or higher.

The extended process set for maturity level 3 incorporates additional processes that ensure that processes are established and deployed using a defined process that is capable of achieving its process outcomes. The processes in the extended process set are assessed at capability level 3 or higher.

4.2.5 Level 4 Organization – Predictable

The organization demonstrates a quantitative understanding of relevant processes that are fundamental to support the organization's business goals, in order to establish consistent and predictable performance.

As a result of achieving this level of maturity, the organization:

a) establishes quantitative objectives for process performance, based upon business goals;

b) selects processes for process performance analyses, covering at a minimum the basic process set, on the basis of their relevance and significance to the achievement of business goals;

c) employs effective measurement to collect, store and analyse data on the performance of the selected processes;

d) identifies special causes of variation in the performance of the selected processes and takes appropriate corrective and preventive action to address them;

e) establishes stable, capable and predictable performance of the selected processes within defined control limits.

At least one of the processes in the basic process set, selected on the basis of their relevance and significance to support the organization's business goals, is assessed at capability level 4 or higher.

The extended process set for maturity level 4 incorporates an additional process that supports the achievement of a quantitative understanding of the performance of relevant processes in the overall process profile of the organization. The processes in the extended process set are assessed at capability level 3 or higher; one or more of the processes in the extended process set may be assessed at capability level 4 or higher.

4.2.6 Level 5 Organization – Innovating

The organization demonstrates the ability to change and adapt the performance of the processes that are fundamental to support the organization's business goals in a systematically planned and predictable manner.

As a result of achieving this level of maturity, the organization:

a) identifies common causes of variation in process performance, based on results of process performance analysis, and identifies candidate improvements to address these, in the light of the business goals;

b) identifies innovations with the potential to improve process performance and business success;

c) identifies opportunities for piloting potential innovative and incremental improvements with control of associated risk;

d) collects and analyses data from the pilot implementations, and uses the results of analysis to select improvements for organizational deployment based on their impact on process performance and business success;

e) deploys the improvements, monitors performance of the improved processes and compares the results of improvement to expected values.

At least one of the processes in the basic process set, selected on the basis of their relevance and significance to support the organization's business goals, is assessed at capability level 5.

The extended process set for maturity level 5 incorporates an additional process that supports the continuous and predictable improvement of process performance. The processes in the extended process set are assessed at capability level 3 or higher; one or more of the processes in the extended process set may be assessed at capability level 5.

4.3 Architecture of an Organizational Maturity Model

4.3.1 Relationship between assessment of process capability and determination of organizational maturity

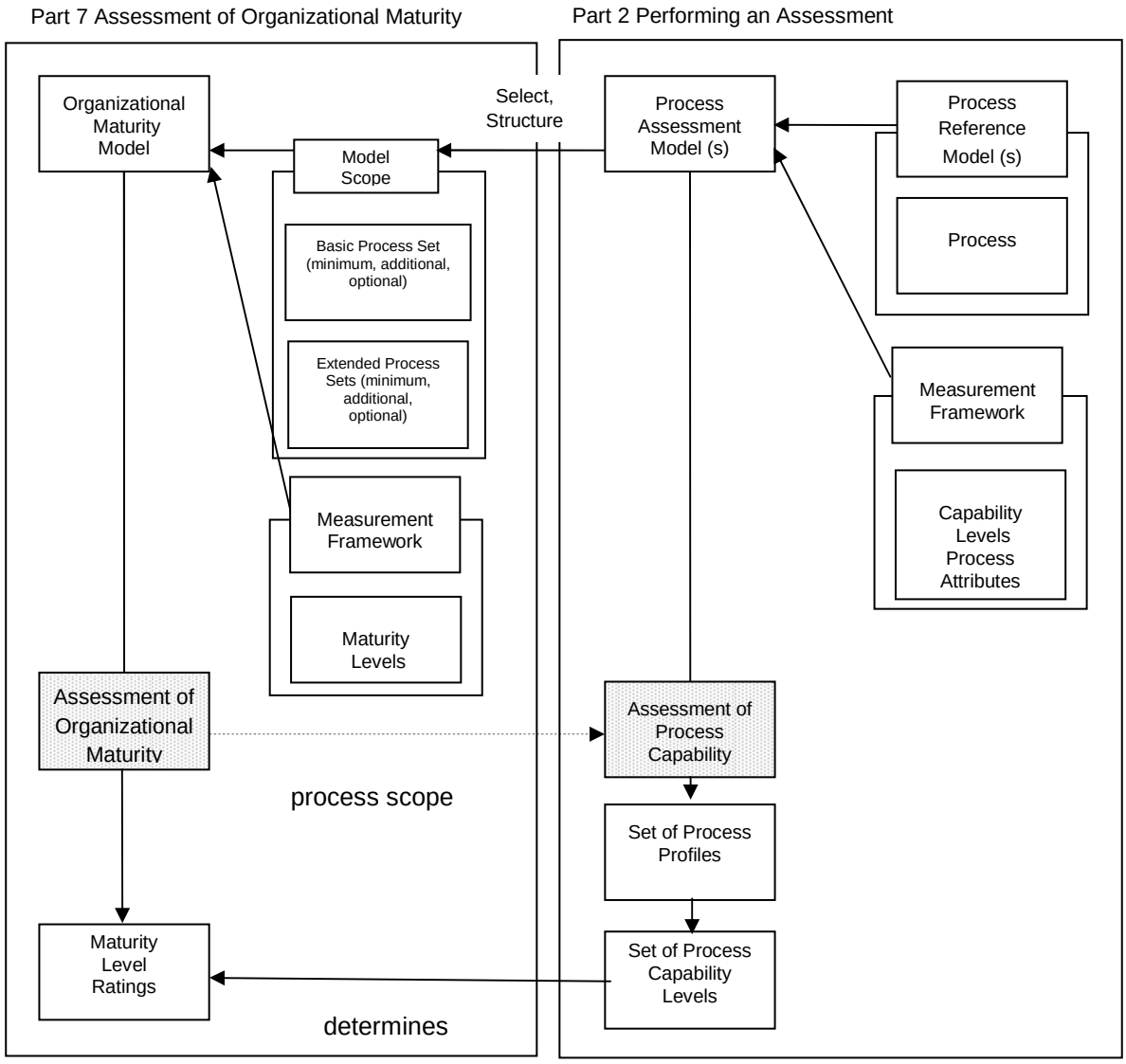

Figure 1 — Relationship between assessment of process capability and derivation of organization maturity

Figure 1 shows the relationship between the Organizational Maturity Model and the specified Process Assessment Model(s) when an assessment of organizational maturity is conducted. The key elements are the defined components of the relevant Process Reference Model(s) and the measurement frameworks, shown in the Figure as nested boxes. These components are used to construct models supporting the assessment of process capability and organizational maturity. The definition of the Organizational Maturity Model scope and the selection of the basic and extended process sets are made in the context of the Organizational Maturity Model. Once the assessment has been planned employing an Organizational Maturity Model based upon one or more conformant Process Assessment Model(s), an assessment of process capability is performed using the specified Process Assessment Model(s) to obtain the set of process profiles. The process capability levels, derived from the process profiles, determine the organizational maturity level rating according to the rules in clause 4.4.

4.3.2 Rules for deriving maturity levels from capability levels

A rating of organizational maturity shall be derived from a set of process profiles in the following manner:

a) An assessment of process capability, compliant to the requirements of ISO/IEC 15504-2 and meeting the requirements of Clause 5 of this part of ISO/IEC 15504 shall be conducted.

b) The process scope of the assessment shall embrace at minimum all of the processes in the Basic and extended process sets defined in the selected Organizational Maturity Model for the maturity level to be assessed.

c) All process attributes up to and including the highest relevant capability level shall be rated for all processes in the scope of the assessment.

d) Process capability level ratings shall be derived for all processes in the scope of the assessment according to Clause 5.8 of ISO/IEC 15504-2.

e) The maturity level achieved by an organization shall be determined from the set of process capability level ratings according to the following rules:

    1) To achieve maturity level 1, all processes assigned to maturity level 1 shall achieve process capability level 1 or higher.

    2) To achieve maturity level 2, all processes assigned to maturity level 1 and 2 shall achieve process capability level 2 or higher.

    3) To achieve maturity level 3, all processes assigned to maturity levels 1, 2 and 3 shall achieve process capability level 3 or higher.

    4) To achieve maturity level 4, all processes assigned to maturity levels 1, 2, 3, and 4 shall achieve process capability level 3 or higher. One or more of the processes in the basic process set shall achieve process capability level 4 or higher.

    5) To achieve maturity level 5, all processes shall achieve process capability level 3 or higher. One or more of the processes in the basic process set shall achieve process capability level 5.

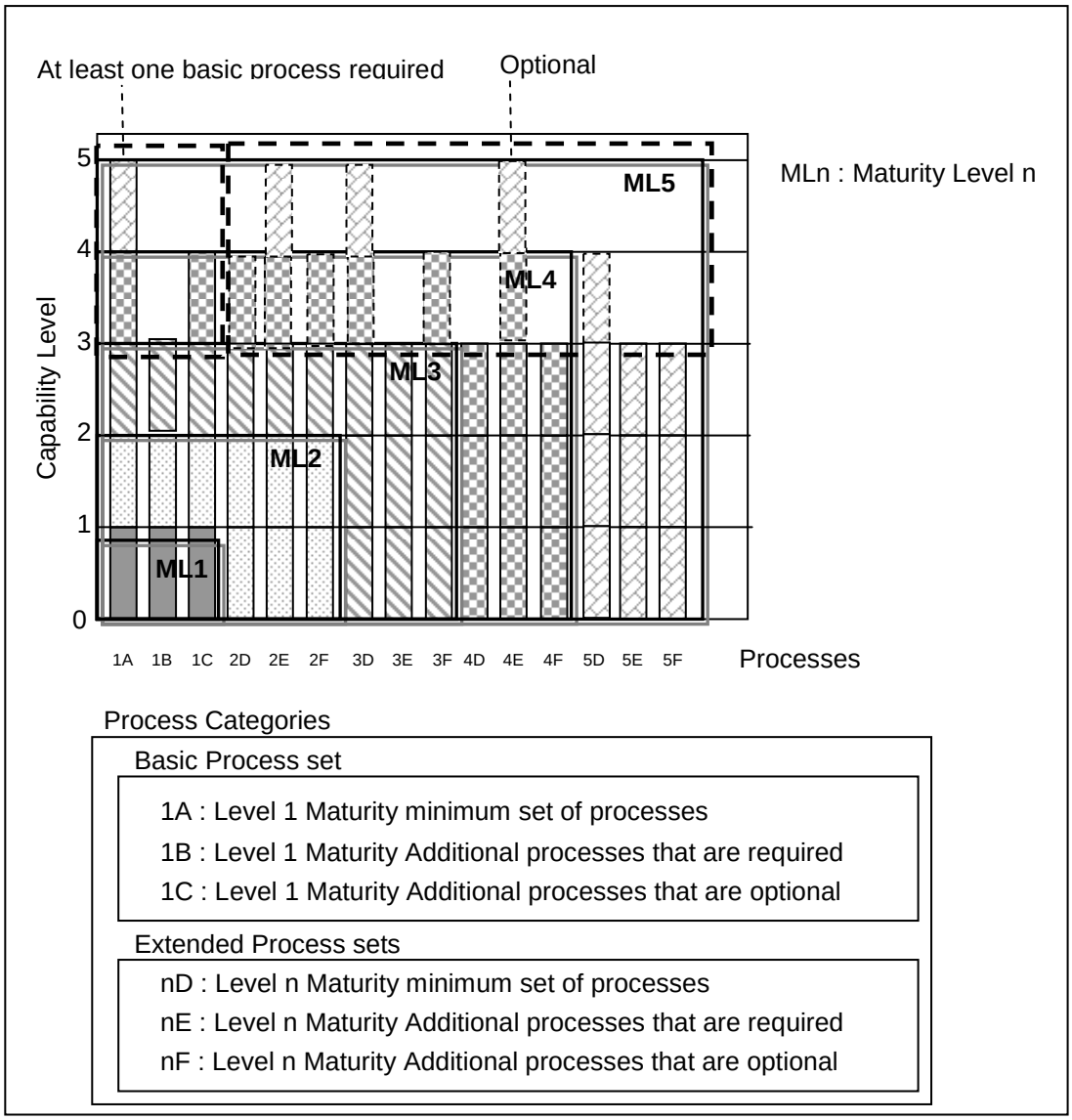

Figure 2 — Rules for deriving maturity levels from capability levels

Figure 2 shows the rules for deriving maturity levels from capability levels. The figure illustrates the relationship between capability levels and processes, overlaid with the boundaries that characterize maturity levels. The different process sets (basic and extended) are indicated in the process dimension of the graph. The nomenclature (or identifiers) of the processes correspond to the identifiers in the Process Categories, just below the figure. For full details, refer to Clauses 4.4.2 and 4.4.3.

4.4 Requirements for an Organizational Maturity Model

4.4.1 Model characteristics

An Organizational Maturity Model relates to one or more specified related domains of application. The domain of application of the Organizational Maturity Model shall be specified clearly and unambiguously.

The Organizational Maturity Model shall document the community of interest of the Organizational Maturity Model and the actions taken to achieve consensus within that community of interest:

— the relevant community of interest shall be characterized or specified;

— the extent of achievement of consensus shall be documented;

— if no actions are taken to achieve consensus, a statement to this effect shall be documented.

An Organizational Maturity Model shall be based upon one or more specified Process Assessment Model(s). The Organizational Maturity Model shall specify the elements, drawn from the specified Process Assessment Model(s) that constitute the elements of the Organizational Maturity Model, and the relationships between these elements and the organizational maturity levels specified in Clause 4.1.

NOTE "Elements" is used in the same context as in Clause 6.3.4 of ISO/IEC 15504-2.

An Organizational Maturity Model shall specify a continuous subset of maturity levels defined in the measurement framework for the assessment of organizational maturity, starting with maturity level 1 (through the basic process set), for each of the maturity levels within its scope.

NOTE Annex A contains an exemplar Organizational Maturity Model, based upon ISO/IEC 15504-5 as the specified Process Assessment Model.

4.4.2 Basic process set

An Organizational Maturity Model shall include a set of elements from the Process Assessment Model(s) constituting the basic process set for the model. The basic process set shall include:

— A minimum set of elements that define Level 1 maturity for all assessments based on the model;

— Additional elements that are required for assessments in particular domains or scope of application; and

— Additional elements that are optional depending on the particular circumstances of the organization.

The Organizational Maturity Model shall include justification for the inclusion of the additional processes in the basic process set, and an indication of how the use of additional processes is to be reflected in the published assessment record. The Organizational Maturity Model shall define, through reference to the established mapping of the Process Assessment Model(s), the processes from relevant Process Reference Model(s) that constitute the basic process set.

4.4.3 Extended process sets

An Organizational Maturity Model shall include sets of elements constituting the extended process sets for each maturity level addressed by the model. The extended process sets shall include:

— A minimum set of elements that define the specified level of Maturity for all assessments based on the model;

— Additional elements that are required for assessments with particular scope of application; and

— Additional elements that are optional depending on the particular circumstances of the organization.

The Organizational Maturity Model shall include justification for the inclusion of the additional processes in the extended process set, and an indication of how the use of additional processes is to be reflected in the published assessment record. The Organizational Maturity Model shall define, through reference to the established mapping of the Process Assessment Model(s), the processes from relevant Process Reference Model(s) that constitute each extended process set.

4.5 Interpreting the requirements for an Organizational Maturity Model

This guidance assumes that the elements of the Process Assessment Model(s) are strongly related to the corresponding elements of the Process Reference Model(s); if this is not the case, the situation may be more complex.

The scope of application of an Organizational Maturity Model is dependent on the existence of one or more Process Assessment Model(s) that include candidate basic and extended processes appropriate to the target businesses and organizations. When considering the establishment of an Organizational Maturity Model, the target businesses and processes of interest should be identified, and the candidate Process Assessment Model(s) determined. If appropriate Process Assessment Model(s) (and Process Reference Model(s)) are not available, these need to be constructed or adapted from those identified, prior to completing the Organizational Maturity Model.

The declaration of scope for an Organizational Maturity Model may take the form of a description of the domain of application and the specific aspects of that domain that are addressed. For example, an Organizational Maturity Model might be developed for use in the software industry and might address, in general, software life cycle processes defined in ISO/IEC 12207:1995/Amd.1:2002; Amd.2:2004. In addition the Organizational Maturity Model may identify sub-domains of application by excluding or including the applicability of some processes. For example, software development organizations may also be concerned with some aspects of systems development.

The scope declaration should include the identification of the specified Process Assessment Model(s) and an itemization of the processes comprising the Organizational Maturity Model. The processes covered by the Organizational Maturity Model will be grouped according to the maturity level to which they belong.

In order to support the concept of sub-domain tailoring, the process sets comprising the maturity levels 1, 2 and 3 may be additionally partitioned between mandatory processes, (i.e. the minimum subset applicable to all sub-domains) and additional processes applicable for specific sub-domains. For example, in the exemplar Organizational Maturity Model provided in Annex A, the basic set of processes at level 1 includes the software development processes in the minimum process set. Additional processes, applicable in specific contexts, may include processes related to system development, installation and maintenance.

Accompanying the declaration of scope as described above would be descriptions of each of the processes encompassed by the Organizational Maturity Model; these process descriptions provide the additional detail required to ensure their usability in the framework established by this international standard. These descriptions will be drawn and may be referenced from the specified Process Assessment Model(s) used to build the Organizational Maturity Model. In the simplest case of an Organizational Maturity Model based on only one specified Process Assessment Model, the Organizational Maturity Model definition could be an addendum to the specified Process Assessment Model.

NOTE ISO/IEC 15504-2, 6.3, provides specific requirements on the content and structuring of Process Assessment Models.

Since there are typically multiple ways of partitioning processes for a particular mode of application, the Organizational Maturity Model should also provide a declaration of its intended usage.

To help ensure correct understanding of the intended usage of the Organizational Maturity Model, a description should be provided of how its basic process set is fundamental to achieving the specific business goal for the intended use. This description should relate specific processes to aspects of the business domains within which the processes would operate.

One indicator of the acceptability and usefulness of a specific selection and partitioning of processes will be the extent to which the stakeholders in a community of interest have participated in the definition of the Organizational Maturity Model. Since most communities of interest will only be able to actively use a relatively small number of Organizational Maturity Models (for a given domain), it is in everyone's best interest to know in advance the steps that have been taken by the provider of an Organizational Maturity Model to gain consensus.

International Standards progress through defined stages prior to achieving the status of international standard. These stages provide inherent assurance of a significant degree of international consensus. Similarly, the provider of an Organizational Maturity Model will explicitly document the measures taken to ensure consensus within the communities of interest for the Organizational Maturity Model.

Anticipating that there may be special situations where community consensus is not important to the creation of an Organizational Maturity Model, the requirements in clause 4.4.1, provide that if no measures are taken to achieve consensus then a statement to this effect is adequate to meet the requirements of this clause.

4.6 Guidance on selecting an Organizational Maturity Model

The Organizational Maturity Model may be selected by the competent assessor, or may be stipulated by the sponsor of the assessment (in which case, this should be documented as a constraint). Irrespective of which party makes the final decision, there are factors to consider that will help ensure that the selection of an Organizational Maturity Model is appropriate for use. The overriding objective in selecting an Organizational Maturity Model is its suitability for the context of the assessment. Some principal factors affecting the selection of a model are:

- the planned scope of the assessment;
- the business goals of the organization being assessed;
- the industry sector of the organization being assessed;
- the application domain that is the focus of the assessment;
- business opportunities that may demand the use of a particular Organizational Maturity Model as a condition of contract performance;
- specific requirements for strong comparability with other assessments or organizations.

Where Organizational Maturity Models exist that have been specifically developed for use in particular industry sectors - e.g., telecommunications, defence, automotive, aerospace - or for particular application domains - e.g. high security systems, safety critical systems, real time embedded software - then, when applicable, these should be considered.

When an organization wishes to conduct an assessment in an area that is not representative of its normal domain, it should take care that the Organizational Maturity Model chosen is suitable. For example, an aerospace organization that wishes to assess the processes responsible for maintenance of its internal management systems might find that an industry specific Organization Maturity Model is not the most suitable for the task.

The maturity of an organization unit depends on the scope assessed. One organizational unit could have different maturity levels for different scopes of assessment. For example, if an organizational unit manages both software development and computer operations, the organizational unit could have two different maturity levels - one for software development, one for computer operations.

Assessors should ensure that the organization’s business goals are translated into appropriate process goals and the assessors should have a rationale for the Organisational Maturity Model selection in advance of the assessment. An important selection factor over which an individual organization may have relatively little influence is the extent to which a market segment has a de facto assessment approach already established. If this is the case then an individual organization will likely find this to be the most influential selection factor. This does not preclude an organization from using additional assessment approaches but most will find the additional cost and effort to be prohibitive.

Some business opportunities may demand the use of a particular Organizational Maturity Model as a condition of bidding and/or as a condition of contract performance.

5 Assessing organizational maturity

5.1 Introduction

Organizational maturity can be assessed using a process assessment conformant to the requirements of ISO/IEC 15504-2 and employing an Organizational Maturity Model based upon conformant Process Assessment Model(s). This International Standard defines additional requirements intended to ensure that the approach followed provides adequate and representative coverage of the organizational scope addressed in the assessment.

Three Classes of assessment are identified, resulting in different level of confidence in the ratings of organizational maturity level. Specific requirements relating to each Class are contained in this Clause.

The Classes of assessment are defined below.

5.1.1 Class 1 assessment

The purpose of a Class 1 assessment is:

— to provide a level of confidence in the results of the Assessment such that the results are well suited for comparisons across different organizations;

— to enable assessment conclusions to be drawn as to the relative strengths and weaknesses of the organizations compared;

— to provide a basis for process improvement, external benchmarking and capability determination.

For a Class 1 assessment, this part of ISO/IEC 15504 contains additional requirements relating to the collection and validation of data, the rating of process attributes, and the recording of the level of independence of the assessment team.

5.1.2 Class 2 assessment

The purpose of a Class 2 Assessment is:

— to provide a level of confidence in the assessment results that may indicate the overall level of performance of the key processes in the organization unit, which are suitable for comparisons of maturity across an organizational or product line scope;

— to enable assessment conclusions to be drawn about the opportunities for improvement and levels of process-related risk;

— to provide a basis for an initial assessment at the commencement of an improvement program.

For a Class 2 assessment, this part of ISO/IEC 15504 contains additional requirements relating to the collection and validation of data, the rating of process attributes, and the recording of the level of independence of the assessment team.

5.1.3 Class 3 assessment

The purpose of a Class 3 Assessment is:

— to generate results that may indicate critical opportunities for improvement and key areas of process-related risk;

— to be suitable for monitoring the ongoing progress of an improvement program, or to identify key issues for a later Class 1 or Class 2 assessment.

— to provide a general indication of organizational maturity of the organization unit;

A Class 3 assessment meets the general requirements defined in ISO/IEC 15504-2, without any specific additional requirements. Use of a Class 3 Assessment to provide a firm rating of organizational maturity is not recommended.

5.2 The assessment process

5.2.1 General

An assessment of organizational maturity shall be conducted according to a documented process that is capable of meeting the assessment purpose. The documented assessment process shall contain at minimum the following activities.

5.2.2 Planning

A plan for the assessment shall be developed and documented, as specified in ISO/IEC 15504-2, Clause 4.2.2(a).

5.2.3 Data collection

5.2.3.1 General requirements: Objective evidence required for evaluating the processes within the scope of the assessment shall be collected in a systematic manner, applying the requirements listed in ISO/IEC 15504-2, Clause 4.2.2(b).

5.2.3.2 Specific requirements – Class 1 and Class 2 assessments: For a Class 1 assessment, a minimum of four process instances shall be identified for each process within the scope of the assessment. For a Class 2 assessment, a minimum of two process instances shall be identified for each process within the scope of the assessment. If there is fewer than the required number of process instances available in the organization, all process instances shall be selected.

Note that for Class 3 assessments there is no minimum of process instances stated.

In the collection of data from the identified process instances, the following criteria shall be satisfied:

a) For each process attribute of each Process in the scope of the assessment, across the set of process instances, objective evidence drawn both from evaluation of work products and from testimony of performers of the process shall be collected.

b) For each process instance, objective evidence drawn both from evaluation of work products and from testimony of performers of the process shall be collected for each Process within the scope of the assessment.

These requirements are illustrated in Table 1, which shows that all process attributes of all process instances shall be assessed, and the assessment of each process instance (columns) shall include both work product evaluations and testimony, and that the assessment of each process attribute (rows) shall include both work product evaluations and testimony.

Table 1 — Requirements for data collection for an example assessment of four process instances and process attributes up to capability level 3

Process Attribute	Process Instance 1	Process Instance 2	Process Instance 3	Process Instance 4	
PA 1.1	Work product	Testimony	Work product	Testimony	For each process attribute there shall be both work product evaluation and testimony (5.2.3.2.a).
PA 2.1	Testimony	Work product & Testimony	Work product	Testimony	
PA 2.2	Work product	Testimony	Testimony	Testimony	
PA 3.1	Work product	Work product	Testimony	Testimony	
PA 3.2	Work product	Work product	Work product & Testimony	Work product	
	Each process instance shall include both work product evaluation and testimony (5.2.3.2 b)				

Note that for any specific process attribute for a specific process instance data may be gathered through both work product evaluation and testimony.

5.2.4 Data validation

The Data Validation approach for the assessment shall ensure that the requirements of ISO/IEC 15504-2 are met in respect of every process instance identified in the Assessment Scope, and that the coverage requirements in Clause 5.2.3 of this Part of ISO/IEC 15504 are satisfied.

5.2.5 Process attribute and maturity level rating

5.2.5.1 General requirements: The approach to process attribute rating for the assessment shall ensure that the requirements of ISO/IEC 15504-2 are met in respect of each Process and process attribute within the scope of the assessment, and that an organization maturity level rating is determined.

5.2.5.2 Specific requirements – Class 1 assessments: For a Class 1 assessment, the approach to process attribute rating shall satisfy the following conditions:

a) The achievement of each outcome of every process within the scope of the assessment shall be characterised for each process instance, based on validated data;

b) The extent of achievement of each attribute achievement for every process attribute within the scope of the Assessment shall be characterised for each process instance, based on validated data;

c) Where a process outcome or attribute achievement cannot be characterised as Fully Achieved for any process instance, the issue resulting in the lack of achievement shall be documented as a gap in performance.

d) Prior to rating the overall achievement of the process attribute, the assessment team shall make a judgement whether the set of performance gaps identified for the process instances examined represent an overall weakness in performance, and what the extent of the weakness is. The individual gaps in performance, and any resulting weakness statements, shall be documented and retained in the Assessment Record.

e) The extent of achievement of each process attribute within the scope of the assessment shall be rated, using the approach defined in ISO/IEC 15504-2. In order for a process attribute to be rated as Fully Achieved or Largely Achieved, there shall be two sources of objective evidence available from each selected process instance.

f) Following the completion of rating of all of the processes within the Assessment Scope, the assessment team will review the Process Profiles and determine the maturity level rating, based on the requirements of the selected Organizational Maturity Model.

5.2.5.3 Specific requirements – Class 2 assessments: For a Class 2 assessment, the approach to process attribute rating shall satisfy the following conditions:

a) The extent of achievement of each process attribute within the scope of the Assessment shall be rated, using the approach defined in ISO/IEC 15504-2. In order for a process attribute to be rated as Fully Achieved or Largely Achieved, there shall be two sources of objective evidence available from each selected process instance.

b) Where a process attribute cannot be rated as Fully Achieved, the issue resulting in the lack of achievement shall be documented as a weakness and retained in the Assessment Record.

c) Following the completion of rating of all of the Processes within the Assessment Scope, the assessment team will review the Process Profiles and determine the maturity level rating, based on the requirements of the selected Organizational Maturity Model.

5.2.6 Reporting

5.2.6.1 General requirements: The assessment results, including at minimum the outputs specified in Clause 5.5, shall be documented and reported to the assessment sponsor or to their delegated representative. The results shall include the recorded organizational maturity level rating, the identity of the Organization Maturity Model used, and the Class of the assessment.

5.2.6.2 Specific requirements – Class 1 & 2 assessments: In addition to the elements specified above, the weaknesses established during process attribute rating shall be documented and reported to the assessment sponsor.

5.3 Roles and responsibilities

The sponsor of the assessment, the competent assessor and the assessor(s) shall have the oles and responsibilities as defined in ISO/IEC 15504-2, Clause 4.3.. In addition to these requirements, for the assessment of organizational maturity, the following minimum sizes of the assessment team shall apply:

a) For a Class 1 assessment, at least two members, including the Competent Assessor. The Competent Assessor shall be independent of the organization unit being assessed.

b) For a Class 2 assessment, at least two members, including the Competent Assessor.

c) For a Class 3 assessment, at least one member, who shall be a Competent Assessor.

NOTE 1: For Class 1 assessment a team size greater than two may be required to address workload for data collection and validation.

NOTE 2: For a Class 2 assessment the Competent Assessor should be independent of the organization unit being assessed.

5.4 Defining the initial assessment input

5.4.1 General requirements

The assessment input shall be defined prior to the data collection phase of an assessment and approved by the sponsor of the assessment or the sponsor's delegated authority. In addition to the content specified in ISO/IEC 15504-2 Clause 4.4, the assessment input shall include the following elements.

5.4.2 Assessment purpose

The assessment purpose shall include the assessment of organizational maturity as a fundamental element, and shall include justification for seeking the rating of organizational maturity level.

5.4.3 Assessment scope

In defining the scope of the assessment, the following issues shall be specifically addressed:

a) The set of processes, and the relevant capability levels, to be included in the assessment scope shall be specified, based upon the selected Organizational Maturity Model to be used, and the maturity level(s) within the assessment scope.

b) Assessment of organizational maturity shall be performed against a defined and declared organization scope. The scope may include:

   — One or more site locations;

   — One or more geographic units;

   — One or more product lines ;

   — One or more application domains;

   — One or more business units;

   — One or more companies;

   — An entire organization.

c) The identification and justification for selection of the process instances to be examined shall be defined for each of the Processes within the Scope of the Assessment.

d) The set of process instances shall be representative of the defined organisation scope.

Organizations that do not perform the minimum set of processes in the basic process set specified in an Organizational Maturity Model shall not be assessed for organizational maturity based upon that model.

5.4.4 Class of assessment

Explicit identification of the Class of the Assessment and an explanation of the reason for selection of the Class of Assessment shall be recorded.

5.4.5 Organizational Maturity Model

The Organizational Maturity Model to be employed for the assessment shall be recorded together with the identification of the specified Process Assessment Model(s) on which it is based, and the highest level of organizational maturity to be investigated.

5.4.6 Roles and responsibilities

In identifying and specifying the roles and responsibilities of the Competent Assessor and the other assessor(s) involved in the Assessment, the independence of the Body and the assessment team performing the assessment shall be explicitly identified.

5.5 Recording the assessment output

5.5.1 General requirements

In addition to the elements specified in ISO/IEC 15504-2, the Assessment Output shall include:

a) the additional items recorded in the Assessment Input; and

b) the recorded maturity level rating.

5.5.2 Specific requirements – Class 1 and Class 2 assessments

The Assessment Output shall include the documented performance gaps and weaknesses found during process attribute rating (refer to Clauses 5.2.5.2 and 5.2.5.3).

5.6 Guidance on the assessment of organizational maturity

5.6.1 Assessment scope

Generally, the part of the organization which will be the subject of an assessment will be a subset of the organization hosting the assessment (see clause 5.6.1.2 for a discussion for consideration of distributed or virtual organizations). The purpose of this clause is to identify some of the factors which determine the organizational unit – that is, the part of the organization of which the assessment results – in particular, the maturity level – are representative.

5.6.1.1 Defining the organizational unit

In addition to all of the typical considerations for defining the organizational unit undergoing an assessment conformant to ISO/IEC 15504, there are additional considerations when planning an assessment which will result in a maturity level rating. Some of these are addressed in Clause 5.6.2 and have to do with identifying a representative sample and satisfying minimum requirements for coverage.

The organizational unit should have deployed all of the processes within the scope of the assessment. If all the processes are not deployed in the organizational unit, then the scope of the assessment or the selection of organizational unit should be reconsidered.

5.6.1.2 Distributed or virtual organizations

The sponsor of an assessment may have an interest in understanding organizational maturity when the organization of interest is either geographically dispersed or is a virtual organization consisting of one or more legal entities which are collaborating.

While these scenarios present logistical challenges which need to be addressed, they do not constitute exceptions to the framework for assessment established by ISO/IEC 15504. Part of the key to understanding whether a distributed or virtual organization is suitable for assessment is the extent to which the composite entity satisfies the basic definition of an organizational unit (contained in ISO/IEC 15504-1). The two critical aspects are as follows: does the composite entity (1) have a coherent process context and (2) operate within a coherent set of business goals.

5.6.2 Assessment sample

For the assessment of organizational maturity a representative sample of process instances shall be selected, which shall cover all the processes specified in the minimum sets for the selected maturity levels in the Organizational Maturity Model.

For an assessment that results in an organizational maturity level rating the minimum sample sizes specified in Clause 5.2.3 shall be satisfied. The representative sample of process instances will be based on a number of factors that include:

— management processes;

— the lifecycle or lifecycles in use within the organization;

— business risks;

— representative life cycles;

— product line coverage;

— site coverage;

— size of operations, projects, programmes or product lines;

— safety, security, or regulatory factors;

— geographic areas;

— value to the business;

— constraints on availability;

— use of internal and/or external suppliers.

The sample size, type and amount of objective evidence should be sufficient to match the scope of the assessment.

Based on the individual process capability rating of selected process instances, a single organizational maturity rating shall be established according to defined rules.

6 Guidance in the use of organizational maturity assessment results

6.1 Introduction

An Organizational Maturity Model provides a general framework for an organization to achieve progressive improvements in their organizational maturity. A maturity level is a well-defined evolutionary plateau toward achieving a mature organization.

Organizational maturity levels can be used to

— Guide organizational level improvements;

— Demonstrate a level of organizational maturity to current and potential customers;

— Benchmark or compare internally or externally as a basis for competitive analysis.

Process improvement efforts should be focused on the needs of the organization in the context of its business environment. One way to prioritise improvements is to identify gaps and risks in the process capability profiles and implement individual improvements in the short term, whilst at the same time establishing overall longer term improvement goals to achieve a target organizational maturity level.

Achieving a maturity level provides a way for an organization to benchmark or compare itself with other organizations and can provide a visual way to project market recognition for an organization's overall improvement efforts.

6.2 Validity and comparability of results

There are a number of factors to be considered when using the results of maturity level assessments. A list of general factors affecting the comparability of assessment results is highlighted in ISO/IEC 15504 Part 4 Clause 7.3. This clause provides additional guidance on the validity and comparability of results in the context of assessments of organizational maturity.

Results are only valid to compare if the same Organizational Maturity Model has been selected for the basis of the maturity level assessment. The Organizational Maturity Model selected will have associated with it specified Process Assessment Model(s) and Process Reference Model(s).

Factors to be additionally considered include:

— The class of the assessment

— The scope of the assessment

— The independence of the Assessment Body and assessment team

— The qualification of assessors

— The information available to qualify the assessment result.

6.2.1 Class of assessment

The Class of assessment will determine a level of rigour for which an assessment is to be performed. Comparisons of organizational maturity level should only be made for the same class of assessment. .

6.2.2 Scope of assessment

The scope of an assessment may include a strategic business unit or line of business, or the entire organization. Major aspects that affect the scope of an assessment are the specified Process Assessment Model(s), the entity (projects, process instances included, etc.), and life cycle processes to be assessed. These have a significant impact on the duration and resources required for the assessment and the approach taken.

When lifecycle processes are included within the scope of assessment, adequate coverage of the representative lifecycles used within the organization shall be included in the representative sample. The representative sample should be based on a number of factors that are defined in Clause 5.6.2.

The application domain of the organization being assessed should be recorded in the assessment report and disclosure statement. Comparisons or benchmarking of assessment results should consider the similarity of organization domains.

6.2.3 Independence of the assessment body and assessment team

An important factor when using the results of an organizational maturity level assessment is the level of independence of the body and the assessment team performing the assessment.

Table 2 sets out a typology that can be used to categorize the independence of different types of bodies and the make-up of the assessment team performing an assessment.

A body performing the assessment may be an organization or party of an organization, and may or may not be independent of the organization being assessed. An assessment team may comprise one or more assessors, one of whom will be the competent assessor. The assessment team may or may not be independent of the organization being assessed. The assessment team will be represented by the body performing the assessment.

Type A might be an organization providing fully independent 3rd party services (as a basis for certification).

Type B might be an organization providing 2nd or 3rd party services where the assessment team is led by a competent assessor from the independent organization and where the other assessment team members may be from the organization being assessed. Such an approach may be used in a verification based approach where data is collected by internal team members.

Type C might be an internal but independent process group or quality assurance group within the organization being assessed but where there is a separate reporting line. This approach may be used in a large organization that has a separate functional group responsible for performing assessments.

Type D might be an internal consultant or an external consulting organization that is assisting an organization in implementing process improvement which then assesses their capabilities. Many small organizations may follow such an approach where there is no customer pressure for an independent assessment to be performed.

Table 2 — Classification of independence of bodies and personnel performing assessment

<table>
<tr><th></th><th>Type A</th><th>Type B</th><th>Type C</th><th>Type D</th></tr>
<tr><td>Body performing the assessment</td><td colspan="2">The body performing the assessment is independent of the organization being assessed</td><td>The body performing the assessment is part of the organization being assessed</td><td>The body performing assessment may or may NOT be independent of the organization being assessed</td></tr>
<tr><td>Competent assessor</td><td rowspan="2">Independent of the organization being assessed</td><td>Independent of the organization being assessed</td><td rowspan="2">Adequate separation of responsibilities from personnel in other functions</td><td rowspan="2">Need NOT be independent of the organization being assessed</td></tr>
<tr><td>Assessors (other than competent assessor)</td><td>May be from the organization being assessed provided clear separation of the responsibilities of the assessors from personnel in other functions</td></tr>
</table>

There is no requirement that any particular Class of assessment should be performed by any type of body except that for a Class 1 assessment the competent assessor is to be independent of the organization being assessed (refer Clause 5.3). It is recommended also that the Competent Assessor be independent for a Class 2 assessment.

Information about the degree of independence of the Assessment Body and assessment team should be available to substantiate any claim.

6.2.4 Assessor qualification

Assessors should have the appropriate qualifications, training, experience, satisfactory knowledge of the requirements for performing an assessment and the ability to make professional judgement.

Assessors should be registered with a personnel competency recognition scheme. Any scheme should recognise domain experience and qualify against relevant methods/models. Schemes should address the competencies identified in ISO/IEC 15504-3, and should be accredited against ISO/IEC 17024 (Conformity assessment - General requirements for bodies operating certification of persons).

For the assessment of higher maturity levels (organizational maturity levels 4 and 5) an assessor may need additional knowledge, skills and experience in measurement approaches in addition to the knowledge, skills and experience needed to assess to organizational maturity levels 1 – 3.

6.2.5 Information available to qualify the assessment result

When considering any assessment result it is important to have access to qualified information regarding the assessment result as a documented output of the assessment (typically contained in an assessment report and/or an assessment disclosure statement).

The information that should be available to properly characterize and qualify the assessment results includes

— The date and duration of assessment;

— The location where the assessment was performed;

— Identification of the organization assessed;

— The Class of assessment performed;

— Identification and type of the assessment body performing the assessment;

— Identification of the assessors performing the assessment;

— The independence of the assessment body and assessment team in relation to the organization being assessed;

— Identification of the international standard, specified Process Assessment Model(s) and Organizational Maturity Model against which the assessment has taken place;

— The scope of the assessment in terms of business scope and processes assessed;

— Any exclusions and/or inclusions from/to the scope of assessment;

— A description of process measures collected (for maturity level 4 or 5);

— The set of process profiles and/or organizational process profiles resulting from the assessment;

— The achieved organizational maturity level;

— Signature of the competent assessor on the assessment report and/or disclosure statement.

7 Mechanisms for verification of conformity

7.1 Introduction

Several mechanisms can be used to verify that the requirements of this part of ISO/IEC 15504 have been fulfilled.

There are two types of conformity to the requirements of this part of ISO/IEC 15504:

— conformity of organizational maturity models;

— conformity of assessments of organizational maturity.

Conformity to the requirements of this part of ISO/IEC 15504 may be verified by:

— self-declaration (first party);

— a second party;

— a third party.

7.2 Verifying conformity of Organizational Maturity Models

Since an Organizational Maturity Model may be material produced by a community of interest, or a relevant International or National Standard, or Publicly Available Specification, verification of the extent to which such models meet the requirements of this International Standard may be through either demonstration of conformity or demonstration of compliance.

The party performing verification of conformity shall obtain objective evidence that the Organizational Maturity Model fulfils the requirements set forth in Clause 4 of this part of ISO/IEC 15504. Objective evidence of conformity shall be retained.

NOTE Conformity is fulfilment by a product, process or service of specified requirements. Compliance is adherence to those requirements contained in International Standards and Technical Reports which specify requirements to be fulfilled by other International Standards, Technical Reports or International Standardized Profiles (ISPs) (e.g. reference models and methodologies).

7.3 Verifying conformity of assessments of organizational maturity

The party performing verification shall ensure that the assessment has conformed with the requirements stated in Clause 5 of this part of ISO/IEC 15504. Objective evidence of conformity shall be retained.

Annex A
(informative)

An exemplar Organizational Maturity Model

A.1 Introduction

This Annex defines the content of an exemplar Organizational Maturity Model, based upon ISO/IEC 12207 as a Process Reference Model and ISO/IEC 15504-5 as a Process Assessment Model. This exemplar Organizational Maturity Model is designed for organizations in the software industry.

A.2 Content of the exemplar Organizational Maturity Model

The basic content of the Exemplar Organizational Maturity Model is set out in Table A.1; the processes listed are identified through their acronyms from ISO/IEC 15504-5. Two additional processes (QNT.1 and QNT.2) are required to support maturity levels 4 and 5; these are specified in Annex B and Annex C.

Table A.1 - Exemplar Organizational Maturity Model

	ML	List of Processes	Minimum Set	Additional processes	
				ID	Conditions (Required or Optional)
Basic Process Set	**1**	ENG.1 Requirements elicitation ENG.2 System requirements analysis ENG.3 System architectural design ENG.4 Software requirements analysis ENG.5 Software design ENG.6 Software construction ENG.7 Software integration ENG.8 Software testing ENG.9 System integration ENG.10 System testing ENG.11 Software installation ENG.12 Software and system maintenance SPL.2 Product Release	ENG.1 ENG.4 ENG.5 ENG.6 ENG.7 ENG.8 SPL.2	ENG.2 ENG.3 ENG.9 ENG.10	Required where development covers system issues and not exclusively software issues.
				ENG.11	Required where the Organization Unit is responsible for installing the software product in the customer environment.
				ENG.12	Required where the Organization Unit is responsible for ongoing maintenance and evolution of the software and/or system.
Extended Process Sets	**2**	SUP.1 Quality Assurance SUP.2 Verification SUP.3 Validation SUP.4 Joint Review SUP.7 Documentation SUP.8 Configuration Management SUP.9 Problem Resolution Management SUP.10 Change Request Management MAN.3 Project Management MAN.5 Risk Management ACQ.3 Contract Agreement ACQ.4 Supplier Monitoring ACQ.5 Customer Acceptance SPL.3 Product Acceptance Support	SUP.1 SUP.2 SUP.7 SUP.8 SUP.9 SUP.10 MAN.3 MAN.5	ACQ.3 ACQ.4 ACQ.5	Required where external or internal suppliers of product components, services or infrastructure are involved in the development projects.
				SUP.3	Required where confirmation of fitness for use of the work products is the responsibility of the Organization Unit.
				SUP.4	Optional where the work in the Organization Unit involves agreements with stakeholders.
				SPL.3	Optional where the work in the Organization Unit involves product acceptance support.
	3	RIN.1 Human Resource Management RIN.2 Training RIN.3 Knowledge Management RIN.4 Infrastructure PIM.1 Process Establishment PIM.2 Process Assessment PIM.3 Process Improvement MAN.2 Organization Management MAN.4 Quality Management MAN.6 Measurement SUP.5 Audit REU.1 Asset Management REU.2 Reuse Program Management REU.3 Domain Engineering	RIN.1 RIN.2 RIN.3 RIN.4 PIM.1 PIM.2 PIM.3 MAN.2 MAN.4 MAN.6 SUP.5	REU.1 REU.2 REU.3	Optional if the Organization Unit has a structured reuse program in force - the three processes are mutually reinforcing.
	4	QNT.1 Quantitative Performance Management			
	5	QNT.2 Quantitative Process Improvement			

A.3 Conformity of the exemplar Organizational Maturity Model

A.3.1 Introduction

This Annex of ISO/IEC 15504-7 describes an Organizational Maturity Model that meets the requirements for conformance defined in Clause 4.4. The Organizational Maturity Model can be used in the performance of assessments that meet the requirements of ISO/IEC 15504. It may also be used as an example for an Organizational Maturity Model developer.

This clause serves as the statement of conformance of the Organizational Maturity Model to the requirements defined in Clause 4.4. For ease of reference, the requirements from Clause 4.4 are embedded verbatim in the text of this clause. They should not be construed as normative elements of this Annex.

Since this Organizational Maturity Model has been explicitly constructed to be an elaboration of the Process Assessment Model defined in ISO/IEC 15504-5, the conformance claim is relatively simple. For other models, particularly ones with a different architecture, the demonstration of conformance may be more difficult.

A.3.2 Requirements for Organizational Maturity Models (from Clause 4.4)

A.3.2.1 Model characteristics

An Organizational Maturity Model relates to a specified domain of application or set of related domains of application. The domain of application of the Organizational Maturity Model shall be specified clearly and unambiguously.

The Organizational Maturity Model shall document the community of interest of the Organizational Maturity Model and the actions taken to achieve consensus within that community of interest:

The Exemplar Organizational Maturity Model is designed for the specific domain of the software industry; as a part of an International Standard, the standardisation process includes approaches designed to achieve consensus within the community of interest.

An Organizational Maturity Model shall be based upon one or more specified Process Assessment Model(s). The Organizational Maturity Model shall specify the elements, drawn from the specified Process Assessment Model(s) that constitute the elements of the Organizational Maturity Model, and the relationships between these elements and the organizational maturity levels specified in Clause 4.1.

An Organizational Maturity Model shall specify a continuous subset of maturity levels defined in the measurement framework for the assessment of organizational maturity, starting with maturity level 1 (through the basic process set), for each of the maturity levels within its scope.

The Exemplar Organizational Maturity Model is based upon ISO/IEC 15504-5 – An Exemplar Process Assessment Model. Conformance of the Process Assessment Model is demonstrated in Annex A of ISO/IEC 15504-5.

The Exemplar Organizational Maturity Model contains 41 of the 48 Processes contained in ISO/IEC 15504-5, together with two additional processes (QNT.1 and QNT.2) specified in Annexes B and C. These are assigned to basic and extended process sets as defined in Clause A.2 above.

The exemplar Organizational Maturity Model addresses all of the maturity levels defined in the measurement framework.

A.3.2.2 Basic process set

An Organizational Maturity Model shall include a set of elements from the Process Assessment Model(s) constituting the basic process set for the model. The basic process set shall include:

— *A minimum set of elements that define Level 1 maturity for all assessments based on the model;*

— *Additional elements that are required for assessments in particular domains or scope of application; and*

— *Additional elements that are optional depending on the particular circumstances of the organization.*

The model shall include specifications of the particular circumstances for inclusion of the additional processes in the basic process set, and an indication of how the use of additional processes is to be reflected in the published assessment record. The model shall define, through reference to the established mapping of the Process Assessment Model(s), the processes from relevant Process Reference Model(s) that constitute the basic process set.

The processes drawn from ISO/IEC 15504-5 that constitute the basic process set are listed in Table 1, along with their status and the conditions under which they are to be applied.

A.3.2.3 Extended process sets

An Organizational Maturity Model shall include sets of elements constituting the extended process sets for each maturity level addressed by the model. The extended process sets shall include:

— *A minimum set of elements that define the specified level of Maturity for all assessments based on the model;*

— *Additional elements that are required for assessments with particular scope of application; and*

— *Additional elements that are optional depending on the particular circumstances of the organization.*

The model shall include specifications of the particular circumstances for inclusion of the additional processes in the extended process set, and an indication of how the use of additional processes is to be reflected in the published assessment record. The model shall define, through reference to the established mapping of the Process Assessment Model(s), the processes from relevant Process Reference Model(s) that constitute each extended process set.

The processes drawn from ISO/IEC 15504-5 that constitute the extended process sets for maturity levels 2 - 5 are listed in Table 1, along with their status and the conditions under which they are to be applied.

Annex B
(informative)

Extensions to Process Reference Model

B.1 Introduction

This Annex defines the two additional processes to the Process Reference Model in ISO/IEC 12207 that are required to support maturity levels 4 and 5 of the Organizational Maturity Model defined in Annex A.

B.2 Quantitative Performance Management process

B.2.1 Purpose

The purpose of the Quantitative Performance Management process is to establish and maintain a quantitative understanding of the performance of the organization's processes through measurement and the use of appropriate quantitative techniques to ensure that performance of the organization's implemented processes support the achievement of the organization's relevant business goals.

B.2.2 Outcomes

As a result of successful implementation of the Quantitative Performance Management process:

1) Processes or process elements are selected for quantitative management on the basis of their relevance and significance to the achievement of business goals;

2) Measures and analytical techniques to be used in quantitatively managing the processes or process elements are established and maintained;

3) Process performance data is collected and analyzed using appropriate statistical or other quantitative techniques to establish an understanding of the variation of the selected processes or process elements;

4) Special causes of variation (assignable causes) in process performance are identified;

5) Corrective and preventive actions are implemented to address the special and other causes of variation; and

6) Performance of the selected processes or process elements is monitored and controlled to establish stable, capable and predictable processes within control limits.

B.3 Quantitative Process Improvement process

B.3.1 Purpose

The purpose of the Quantitative Process Improvement process is to improve the performance of selected processes that are fundamental to achieve an organization's business goals in a systematically planned and predictable manner, based on quantitative analysis of the impact of the proposed changes.

B.3.2 Outcomes

As a result of successful implementation of the Quantitative Process Improvement process:

1) New processes, new technologies and new process concepts are examined to identify improvement opportunities on the basis of their relevance and significance to the achievement of key business goals;

2) Results of data analysis are used to identify common causes of variation in process performance and opportunities for best practice and innovation;

3) Each improvement opportunity is analysed and selected based on its relevance and significance to the achievement of business goals;

4) Process improvements are piloted to select those for implementation across the organization; and

5) Process improvements are implemented and the effects of implementation are quantitatively measured on the basis of actual performance against the defined process improvement objectives.

Annex C
(informative)

Extensions to Process Assessment Model

C.1 Introduction

This Annex describes the two additional processes to the Process Assessment Model in ISO/IEC 15504-5 that are required to support maturity levels 4 and 5 of the Organizational Maturity Model defined in Annex A.

C.2 The Quantitative Management Process Group (QNT)

C.2.1 QNT.1 Quantitative Performance Management

Process ID	QNT.1
Process Name	Quantitative Performance Management
Process Purpose	The purpose of the Quantitative Performance Management process is to establish and maintain a quantitative understanding of the performance of the organization's processes through measurement and the use of appropriate quantitative techniques to ensure that performance of the organization's implemented processes support the achievement of the organization's relevant business goals.
Process Outcomes	As a result of successful implementation of the Quantitative Process Management Process: 1) Processes or process elements are selected for quantitative management on the basis of their relevance and significance to the achievement of business goals; 2) Measures and analytical techniques to be used in quantitatively managing the processes or process elements are established and maintained; 3) Process performance data is collected and analyzed using appropriate statistical or other quantitative techniques to establish an understanding of the variation of the selected processes or process elements; 4) Special causes of variation (assignable causes) in process performance are identified; 5) Corrective and preventive actions are implemented to address the special and other causes of variation to the business quality and performance objectives; and 6) Performance of the selected processes or process elements is monitored and controlled to establish stable, capable and predictable processes within control limits.
Base Practices	QNT.1.BP1 Determine the business goals to be addressed by quantitative management. [Outcome: 1] Select the relevant business goals from the organization's business goals to be addressed by quantitative measurement. QNT.1.BP2 Select the processes or process elements to be addressed by quantitative management based on the relevant business goals. [Outcome: 1] Select the processes or process elements from the organization's set of standard processes that are to be included in the organization's quantitative measurement.

	QNT.1.BP3 Establish the organization's set of appropriate quantitative techniques. [Outcome: 2] Establish the organization's set of statistical or other quantitative techniques to manage the organization's set of processes. QNT.1.BP4 Collect and analyze the measurement data. [Outcome: 3] Analyze the measurement data using the organization's set of statistical or quantitative techniques to establish an understanding of the variation of the selected processes or process elements. QNT.1.BP5 Establish the control limits of process performance. [Outcome: 4, 6] Establish and maintain the control limits of process performance for the process or process elements based on historical data. QNT.1.BP6 Identify and analyze special causes of variation. [Outcome: 4] Identify and analyze special causes of variation to determine the root cause. QNT.1.BP7 Determine the corrective and preventative actions. [Outcome: 5] Determine corrective and preventative actions (as needed) to be taken to address the special and other causes of variation to prevent re-occurrence. QNT.1.BP8 Implement the corrective and preventative actions. [Outcome: 5] Implement the corrective and preventative actions (as needed) to address variances outside control and performance limits. QNT.1.BP9 Monitor the performance of the selected processes or process elements. [Outcome: 6] Monitor the performance of the selected processes or process elements to establish stable, capable and predictable processes within control and performance limits. NOTE An organization may establish process performance models based on organizational process performance baselines to establish predictable processes.

Work Products	
Inputs	Outputs
03-04 Customer satisfaction data [Outcome: 3]	
03-06 Process performance data [Outcome: 3]	03-06 Process performance data [Outcome: 3]
05-02 Business goal [Outcome: 1]	
05-07 Process performance goal [Outcome: 4, 6]	
07-01 Customer satisfaction survey [Outcome: 3]	07-01 Customer satisfaction survey [Outcome: 3]
07-04 Process measure [Outcome: 2, 6]	07-04 Process measure [Outcome: 2, 6]
07-05 Project measure [Outcome: 2]	
07-06 Quality measure [Outcome: 2]	
07-09 Quantitative analysis technique [Outcome: 2, 3]	
	07-10 Process performance model [Outcome: 2, 3, 6]
08-13 Quality plan [Outcome: 1]	
09-02 Quality policy [Outcome: 1]	
10-06 Process control limit [Outcome: 3, 4, 6]	10-06 Process control limit [Outcome: 3, 4, 6]
14-02 Corrective action register [Outcome: 5]	14-02 Corrective action register [Outcome: 5]
14-12 Preventive action register [Outcome: 5]	14-12 Preventive action register [Outcome: 5]
15-01 Analysis report [Outcome: 4]	15-01 Analysis report [Outcome: 3]
15-18 Process performance report [Outcome: 6]	15-18 Process performance report [Outcome: 6]
15-08 Risk analysis report [Outcome: 1, 4]	15-08 Risk analysis report [Outcome: 6]
16-06 Process repository [Outcome: 1, 6]	16-06 Process repository [Outcome: 1, 6]
16-07 Measurement repository [Outcome: 3]	16-07 Measurement repository [Outcome: 3]
19-13 Decision-making strategy [Outcome: 1] (work products 3.14 in Part 6)	
19- 14 Selection criteria [Outcome: 1]	
	19- 15 List of selected processes and/or process elements [Outcome: 1]

C.2.2 QNT.2 Quantitative Process Improvement

Process ID	QNT.2
Process Name	Quantitative Process Improvement
Process Purpose	The purpose of the Quantitative Process Improvement process is to improve the performance of selected processes that are fundamental to achieve an organization's business goals in a systematically planned and predictable manner, based on quantitative analysis of the impact of the proposed changes.
Process Outcomes	As a result of successful implementation of the Quantitative Process Improvement Process: 1) New processes, new technologies and new process concepts are examined to identify improvement opportunities on the basis of their relevance and significance to the achievement of key business goals; 2) Results of data analysis are used to identify common causes of variation in process performance and opportunities for best practice and innovation; 3) Each improvement opportunity is analyzed and selected based on their relevance and significance to the achievement of business goals; 4) Process improvements are piloted to select those for implementation across the organization; and 5) Process improvements are deployed and the effects of implementation are quantitatively analyzed on the basis of actual performance against the defined process improvement objectives.
Base Practices	QNT.2.BP1 Identify improvement opportunities. [Outcome: 1] Identify potential improvement opportunities for processes, arising from new technologies and process concepts. QNT.2.BP2 Identify common causes of variation. [Outcome: 2] Analyze process performance and other data using of statistical or quantitative techniques to identify common causes of variation. QNT.2.BP3 Identify opportunities for best practice and innovation. [Outcome: 2] Analyze process performance and other data to identify opportunities for best practice and innovation. QNT.2.BP4 Select the improvement opportunities. [Outcome: 3] Select the improvement opportunities based on their relevance and significance to the achievement of business goals. QNT.2.BP5 Establish process improvement objectives for improvement opportunities. [Outcome: 3] Analyze the costs, benefits, and risks of the improvement opportunities and the contribution towards meeting the organization's process performance objectives. QNT.2.BP6 Establish quantitative measures for the improvement opportunities. [Outcome: 3, 5] Establish quantitative measures for improvement opportunities with respect to the process improvement objectives. QNT.2.BP7 Plan the pilot improvements. [Outcome: 4] Select and plan the pilot improvements including criteria to be used for evaluating results in order to gain early feedback on the potential benefits. QNT.2.BP8 Review the results of pilot improvements. [Outcome: 3, 4] Review the results of pilots to determine whether to proceed with organization wide deployment. QNT.2.BP9 Select improvements to be deployed. [Outcome: 5] Prioritize and select candidate improvements for deployment based on priorities and available resources. QNT.2.BP10 Monitor the deployment of the improvements. [Outcome: 5] Plan and monitor the deployment of the improvements according to the deployment plan. QNT.2.BP11 Measure progress towards achieving process improvement objectives. [Outcome: 5] Quantitatively measure the progress towards achieving the defined process improvement objectives on the basis of actual performance. QNT.2.BP12 Take corrective actions when process improvement objectives are not achieved. [Outcome: 5] Take corrective actions when process improvements fail to meet the defined process improvement objectives.

Work Products	
Inputs	Outputs
03-03 Benchmarking data [Outcome: 1]	
03-06 Process performance data [Outcome: 2]	03-06 Process performance data [Outcome: 5]
05-02 Business goal [Outcome: 1]	
	07-04 Process measure [Outcome: 4, 5]
05-07 Process performance goal [Outcome: 2]	
	06-04 Training material [Outcome: 5]
07-09 Quantitative analysis technique [Outcome: 2, 3]	
07-10 Process performance model [Outcome: 3, 4]	07-10 Process performance model [Outcome: 3, 4]
08-13 Quality plan [Outcome: 4, 5]	08-13 Quality plan [Outcome: 4, 5]
08-29 Improvement plan [Outcome: 4, 5]	08-29 Improvement plan [Outcome: 4, 5]
09-02 Quality policy [Outcome: 1]	
10- 05 New process concept [Outcome: 1]	
14-02 Corrective action register [Outcome: 4, 5]	14-02 Corrective action register [Outcome: 4, 5]
14-12 Preventive action register [Outcome: 3]	14-12 Preventive action register [Outcome: 3]
15-01 Analysis report [Outcome: 2, 3, 5]	15-01 Analysis report [Outcome: 2, 3, 4, 5]
15-04 Market analysis report [Outcome: 1]	
15-05 Evaluation report [Outcome: 4, 5]	15-05 Evaluation report [Outcome: 4, 5]
15-14 Customer satisfaction report [Outcome: 1]	
15-16 Improvement opportunity [Outcome: 1, 2, 3]	15-16 Improvement opportunity [Outcome: 1, 2, 3]
	15-25 Pilot evaluation report [Outcome: 4]
16-01 Assessment results repository [Outcome: 1,2]	
16-06 Process repository [Outcome: 1]	16-06 Process repository [Outcome: 5]
16-07 Measurement repository [Outcome: 2, Purpose]	
19-02 Process strategy [Outcome: 1]	19-02 Process strategy [Outcome: 3]
19-13 Decision-making strategy [Outcome: 3, 4]	
19-14 Selection criteria [Outcome: 3, 4]	
	19-16 Selected improvement opportunity [Outcome: 3, 4]

C.2.3 Description of additional specific work products

The work products described below are those which are not described in ISO/IEC 15504-5 and required by the processes related to maturity levels 4 and 5 of the Organizational Maturity Model defined in Annex A.

ID	Name	Characteristics
05-07	Process performance goal	– Process performance goals aligned with business goals and context-specific other relevant goals like: – – Project / process effectiveness – – Baselines for process performance and product quality
07-09	Quantitative analysis technique	– Guidelines to determine which issues or problems are subject to a quantitative analysis – Measures and historical data required in quantitative analysis technique – Appropriate analysis technique considering the measures as well as the purpose – Assumptions of selected technique – Contribution to measurement repository
07-10	Process performance model	– Purpose of analysis – Measures related to the purpose of analysis – Operational definition of the measures – An model appropriate to the process context – Model Calibration – Assumptions and limitations of the model – Baseline update – Distribution to relevant stakeholders – Contribution to measurement repository
10-05	New process concept	– Potential improvement: – – advances in related hardware products – – new techniques, methodologies, processes, or lifecycle models – – new quality-improvement techniques – – new process development and deployment support tools – Expected benefits, costs, and risks
10-06	Process control limit	– Guideline to determine which issues of process or product are subject to process control – Characteristics of process or products subject to control chart – Selection of an appropriate control chart – Initial control limit – Control chart monitored – Special causes identified and its sources – Validated result after remedial activities of special causes – Control limits re-established – Distribution to relevant stakeholders
14-12	Preventive action register	– Identification of the potential problem(s) or issue(s) – Ownership for completion of defined action – Solution (series of actions to fix problem) – Open date and target closure date – Status indicator – Follow-up audit actions

15-25	Pilot evaluation report	– Purpose of evaluation – Rationale for the pilot – Requirements used for the evaluation – Method (technique) used for evaluation – Context and scope information required: – – date of evaluation – – parties involved – – context details – – evaluation instrument (check-list, tool) used – Result recorded: – – data – – Required corrective and preventive actions – – improvement opportunities, as appropriate – – assumptions and limitations
16-07	Measurement repository	– Guidelines for entering repository – Classification of measures, data and relevant documents – Control mechanism of items in measurement repository – Search mechanism to find appropriate information – Ability to identify where the information in repository has been used
19-13	Decision-making strategy	– Guideline to determine which issues belong to decision-making – Options and approach for satisfying decision needs: – – decision categories – – prioritization scheme – – decision-making parties
19-14	Selection criteria	– Evaluation purpose – Selected evaluation criteria against which the strategic options are evaluated. Types of criteria to consider include the following: – – technology limitations – – environmental impact – – risks – – total ownership and lifecycle costs – Operational definition of the selected criteria – Aggregation method of candidate alternatives – Distribution to relevant stakeholders
19-15	List of selected processes and/or process elements	– Candidate list of processes to be or have potential to be quantitatively managed – List of selected processes – Potential impacts to process improvement – Sensitivity analysis – Rationale for selection
19-16	Selected improvement opportunity	– Selected list of process improvement opportunities – Rationale for selection – Potential impacts of the improvement in the achievement of key business goals – Risks in deployment of the selected improvements – Distribution to relevant stakeholders

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