
**Information technology — Software process
assessment —**

Part 7:
Guide for use in process improvement

*Technologies de l'information — Évaluation des procédés du logiciel —
Partie 7: Guide pour l'utilisation dans l'amélioration de procédé*
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Contents

1 Scope 1

2 Normative reference 1

3 Terms and definitions..... 2

4 Overview of process improvement 2

4.1 Drivers 2

4.2 Process improvement basics 2

4.3 General principles..... 2

4.4 Process improvement context..... 3

5 Guidelines for software process improvement..... 4

5.1 Examine the organization's needs and business goals..... 5

5.2 Initiate process improvement 6

5.3 Prepare for and conduct a process assessment 6

5.3.1 Prepare assessment input 6

5.3.2 Conduct a process assessment 8

5.4 Analyse assessment output and derive action plan 8

5.4.1 Identify and prioritize improvement areas..... 9

5.4.2 Define specific improvement goals and set targets 11

5.4.3 Derive action plan 11

5.5 Implement improvements 12

5.5.1 Operational approach to implementation..... 12

5.5.2 Detailed implementation planning 12

5.5.3 Implementing improvement actions 13

5.5.4 Monitoring the process improvement project..... 13

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5.6	Confirm improvements.....	14
5.6.1	Improvement targets	14
5.6.2	Organizational culture.....	14
5.6.3	Re-evaluate risks	14
5.6.4	Re-evaluate cost-benefit	14
5.7	Sustain improvement gains	14
5.8	Monitor performance	15
5.8.1	Monitoring performance of the software process	15
5.8.2	Reviewing the process improvement programme	15
6	Cultural issues	16
6.1	Management responsibility and leadership	16
6.2	Values, attitudes and behaviour	16
6.3	Process improvement goals and motivation	17
6.4	Communication and teamwork	17
6.5	Recognition	17
6.6	Education and training	17
7	Management	18
7.1	Organizing for process improvement.....	18
7.1.1	Senior management.....	18
7.1.2	Process improvement programme management	19
7.1.3	Process improvement project management	19
7.1.4	Responsibilities of the process owners	20
7.1.5	Role of the organizational unit	20
7.2	Planning for process improvement.....	20
7.2.1	Business plan.....	21
7.2.2	Process improvement programme plan	21
7.2.3	Process improvement project plan	22
7.3	Measuring process improvement.....	22
7.3.1	Process attribute and capability level ratings.....	22
7.3.2	Effectiveness measures	23

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ISO/IEC TR 15504-7:1998
<https://standards.iteh.ai/catalog/standards/sist/662f564e-0494-4dee-8049-e834b7a2f110/iso-iec-tr-15504-7-1998>

7.3.3	How to use process attribute ratings and effectiveness measures	23
7.3.4	Framework for measuring processes	23
7.4	Reviewing process improvement activities	25
Annex A (informative)	Application of the process measurement framework	27
Annex B (informative)	Application of the improvement methodology	28
Annex C (informative)	Mapping to ISO 9004-4.....	35
Bibliography	36

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[ISO/IEC TR 15504-7:1998](https://standards.iteh.ai/catalog/standards/sist/662f564e-0494-4dec-8049-e834b7a2f110/iso-iec-tr-15504-7-1998)

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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 main task of technical committees is to prepare International Standards, but in exceptional circumstances a 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 a 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.

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

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

- *Part 1: Concepts and introductory guide*
- *Part 2: A reference model for processes and process capability*
- *Part 3: Performing an assessment*
- *Part 4: Guide to performing assessments*
- *Part 5: An assessment model and indicator guidance*
- *Part 6: Guide to competency of assessors*
- *Part 7: Guide for use in process improvement*
- *Part 8: Guide for use in determining supplier process capability*
- *Part 9: Vocabulary*

Annexes A to C of this part of ISO/IEC TR 15504 are for information only.

Introduction

The needs and business goals of an organization are often centred around achieving enhanced customer satisfaction and greater competitiveness. For organizations with a dependence on software, these key management concerns become drivers that initiate software process improvement throughout the organization with goals of higher software quality, lower development and maintenance costs, shorter time to market, and increased predictability and controllability of software products and processes.

Software process improvement is best considered as a continuous process, where an organization moves continually around an improvement cycle. Within this cycle improvement is accomplished in a series of steps or specific improvement actions such as introducing new or changed practices into software processes or removing old ones. An important step in the improvement cycle, however, is the execution of some form of data gathering to establish the initial state, and subsequently to confirm the improvements.

This part of ISO/IEC TR 15504 provides guidance on using software process assessment as the primary means of understanding the current state of an organization's software processes, and on using the results of the assessment to formulate and prioritize improvement plans. This guidance is embodied within a general framework for the use of process metrics in software process improvement.

The improvement framework is built on the framework for quality improvement embodied in ISO 9004-4.

This part of ISO/IEC TR 15504 is primarily aimed at the management of an organization considering or undertaking a software process improvement programme, possibly as a result of a process capability determination; members of improvement teams, particularly leaders and facilitators; software engineers; and external consultants helping organizations to undertake software process improvement.

This process improvement guide addresses the following topics:

- an overview of process improvement – the factors which drive software process improvement and general principles which underpin it;
- a methodology for process improvement – an eight step model for improving software processes within a continuous improvement cycle;
- cultural issues – aspects of organizational culture that are critical for successful process improvement;
- management – software process improvement from a management perspective including an overall framework for process measurement.

Annexes provide supplementary information including examples of the use of the process measurement framework; an illustrative case study of application of this part of ISO/IEC TR 15504; and mappings between the steps in the model described in this part of ISO/IEC TR 15504 and ISO 9004-4.

Information technology — Software process assessment —

Part 7: Guide for use in process improvement

1 Scope

This part of ISO/IEC TR 15504 provides guidance on using software process assessment as part of a framework and method for performing software process improvement in a continuous manner. The guidance covers:

- a) invoking a software process assessment;
- b) using the results of a software process assessment;
- c) measuring software process effectiveness and improvement effectiveness;
- d) identifying improvement actions aligned to business goals;
- e) using a process model compatible with the reference model defined in ISO/IEC TR 15504-2 as a framework for improvement;
- f) issues related to organisational culture in the context of software process improvement;
- g) dealing with management issues for software process improvement.

The guidance provided does not presume specific organizational structures, management philosophies, software life cycle models or software development methods. The concepts and principles are appropriate for the full range of different business needs, application domains and sizes of organization, so that they may be used by all types of software organizations to guide their improvement activities.

An organization may select all or any subset of the software processes from the reference model, for assessment and improvement in the light of its particular circumstances and needs. The guidance provided can also be used with other process models.

The guidance provides a framework for implementing improvements in a continuous manner. However, there is no reason why the organization could not employ the guidance for a single cycle of improvement activity.

2 Normative reference

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC TR 15504. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO/IEC TR 15504 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC TR 15504-9:1998, *Information technology — Software process assessment — Part 9: Vocabulary*.

3 Terms and definitions

For the purposes of this part of ISO/IEC TR 15504, the terms and definitions given in ISO/IEC TR 15504-9 apply.

4 Overview of process improvement

4.1 Drivers

The needs and business goals of an organization are often centred around achieving enhanced customer satisfaction, greater competitiveness and improved business value associated with delivery of software or information systems. For organizations with a dependence on software, these key management concerns become drivers that initiate software process improvement throughout the organization with goals of higher software quality, lower development and maintenance costs, shorter time to market, and increased predictability and controllability of software products and processes.

4.2 Process improvement basics

Improvements to the software process may start at any level in the organization. However, senior management leadership is required to launch and sustain a change effort and to provide continuing resources and impetus, although ultimately, everyone in the organization is involved.

In summary:

- software process improvement demands investment, planning, dedicated people, management time and capital investment;
- software process improvement is a team effort;
- effective change requires an understanding of the current process and clear goals for improvement;
- software process improvement is continuous – it involves continual learning and evolution;
- software process changes will not be sustained without conscious effort and periodic reinforcement.

4.3 General principles

The needs and business goals of the organization determine the software process improvement goals that help to identify improvement actions and their priorities. Software process improvement is accomplished in a series of steps or specific improvement actions such as introducing new or changed practices into software processes or removing old ones. A process model may be used to identify practices to be included to improve the capability of each process. Achievement of process improvement goals should be measured quantitatively.

The general principles of software process improvement are:

- software process improvement is based on process assessment results and process effectiveness measures;
- software process assessment produces a current process capability profile which may be compared with a target profile based on the organization's needs and business goals;
- process effectiveness measures help identify and prioritize improvement actions that support organizations in meeting their needs and business goals, and in achieving software process goals;
- software process improvement is a continuous process. Improvement goals identified and agreed within the organization are realized through a process improvement programme that continues through multiple cycles of planning, implementing and monitoring activities;

- improvement actions identified within a process improvement programme are implemented as process improvement projects;
- metrics are used for monitoring the improvement process in order to indicate progress and to make necessary adjustments;
- software process assessment may be repeated in order to confirm that the improvements have been achieved;
- mitigation of risk is a component of process improvement and should be addressed from two viewpoints:
 - the risk inherent in the current situation;
 - the risk of failure in the improvement initiative.

Software process improvement plans and records may be used to support process capability determination, when the proposed process capability needed to meet a contractual requirement exceeds the currently assessed profile (see ISO/IEC TR 15504-8).

4.4 Process improvement context

The context for software process improvement and its major interfaces are shown in figure 1. The interfaces are as follows:

- the organization's needs and business goals which are main stimuli for process improvement;
- industry norms and benchmarks providing reference information for improvement planning;
- improvements in the organizational unit's (OU's) software processes as a result.

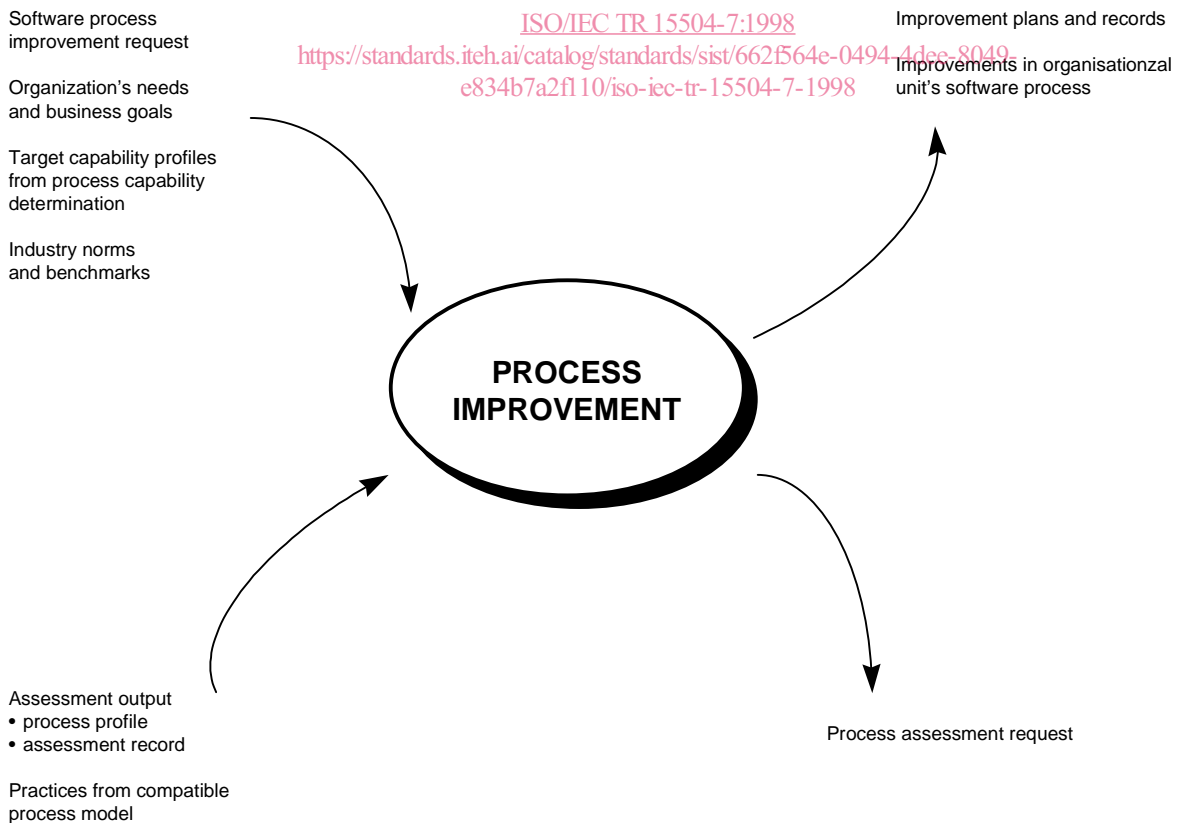


Figure 1 — Process improvement context

Process improvement uses other components of ISO/IEC TR 15504 as follows:

- process assessment (as described in ISO/IEC TR 15504-3 and ISO/IEC TR 15504-4) is performed to establish the current capability;
- the assessment results consist of process profiles and all the contextual information held in the assessment record;
- the process model compatible with the reference model in ISO/IEC TR 15504-2 is used as a framework to define processes to be improved, set priorities and identify improvement actions;
- existing improvement initiatives may need to be adjusted to support a new target capability resulting from a process capability determination (see ISO/IEC TR 15504-8);
- improvement plans and records may assist in establishing customer confidence during process capability determination (see ISO/IEC TR 15504-8).

5 Guidelines for software process improvement

When an organization is well motivated and managed for software process improvement (see clauses 6 and 7), it undertakes and implements a number of process improvement activities. Software process improvement benefits accumulate permanently when an organization pursues process improvement activities in a consistent and disciplined series of steps based on data collection and analysis.

Figure 2 illustrates the steps for continuous software process improvement using the components of ISO/IEC TR 15504.

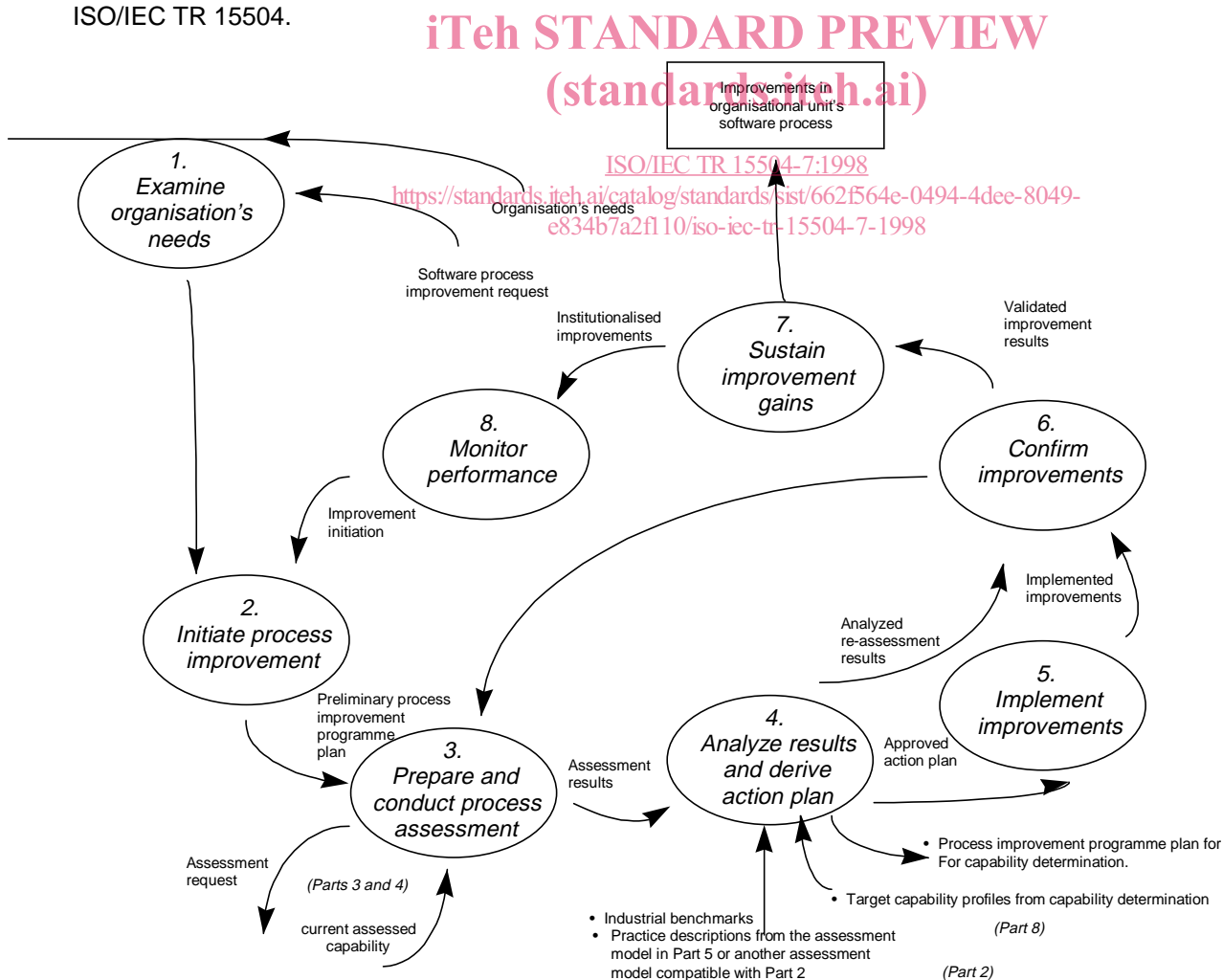


Figure 2 — Software process improvement steps

A comprehensive process improvement programme may identify improvement goals to be attained over several iterations of the improvement cycle. It may contain several process improvement projects, concerned with implementing improvement actions.

The steps in the improvement cycle are described in detail below in terms of their activities and tasks.

5.1 Examine the organization's needs and business goals

A process improvement programme starts with the recognition of the organization's needs and business goals, usually based on one of the main drivers identified in 4.1. This recognition could be derived from any of the following:

- formulation of a mission statement or a long-term vision (see 7.1);
- analysis of organization's business goals;
- analysis of the organization's current shared values (see 6.2);
- the organization's readiness to undertake a process improvement programme;
- data on quality costs;
- other internal or external stimuli.

External stimuli that may trigger a process improvement programme include:

- declining market share;
- marketing analysis;
- feedback from customers;
- competitiveness changes in the market; [ISO/IEC TR 15504-7:1998](https://standards.iteh.ai/catalog/standards/sist/662f564e-0494-4dee-8049-c69-407a21110130/iec-tr-15504-7-1998)
- requirements to meet specific industry benchmarks; <https://standards.iteh.ai/catalog/standards/sist/662f564e-0494-4dee-8049-c69-407a21110130/iec-tr-15504-7-1998>
- new requirements from society.

Internal stimuli that may trigger a process improvement programme include:

- declining or unsatisfactory profitability;
- declining staff satisfaction;
- senior management/ownership change.

From an analysis of the organization's needs and existing stimuli for improvement, the objectives of process improvement may be identified and described in terms of quality, time to market, cost and customer satisfaction, and business value with information services, along with predictability and control of the delivery of information services and related risks.

The final stage of the preliminary definition of the goals for the improvement programme is setting the priorities of the process improvement objectives.

The improvement goals direct the choice of the processes to be assessed, the definition of improvement targets and ultimately the identification of the most effective improvement actions.

After the analysis of the organization's needs and business goals, it is essential to build executive awareness of the necessity for a process improvement programme. This requires both managerial and financial commitments. The objectives of such a process improvement programme should be clearly stated and understood, and expressed using measurable process goals. The process improvement programme should form part of the organization's overall strategic business plan.

The executive decision to undertake improvement, together with the identification of a preliminary process improvement programme budget and the main process improvement priorities, enable the improvement process to progress through the following steps:

- a) initiate process improvement (see 5.2);
- b) carry out a software process assessment in the sectors where improvement is believed to be beneficial (see 5.3);
- c) complete the process improvement programme plan with the action plan resulting from analysis of assessment results (see 5.4);
- d) implement improvements according to process improvement project plans (see 5.5);
- e) confirm the improvements (see 5.6);
- f) sustain the improvement gains by maintaining the new, improved level of performance until stability has been reached (see 5.7);
- g) monitor performance to continue the process improvement programme (see 5.8) comparing results against the measurable goals of the process improvement programme plan developed in 5.2 and 5.4.

5.2 Initiate process improvement

The process improvement programme should be considered as a project in its own right, and planned, resourced and managed accordingly (see process MAN.2 *Project Management* in ISO/IEC TR 15504-2). A process improvement programme plan should be produced at the beginning of the programme and subsequently used to monitor progress. The plan should include the relevant background and history and the current status, if possible expressed in specific, numerical terms. The improvement goals derived from the organization's needs and business goals provide the main requirements for the plan. The plan should include a preliminary identification of the improvement scope in terms of both the organizational boundaries for the improvement programme and the processes to be improved.

The plan should cover all the process improvement steps, although initially the plan may only give outline indications of the later stages. It is important to ensure that key roles are clearly identified, that adequate resources are allocated, that appropriate milestones and review points are established, and that all risks associated with the plan are identified and documented in the plan. The plan should also include activities to keep all those affected by the improvement informed of progress.

5.3 Prepare for and conduct a process assessment

5.3.1 Prepare assessment input

This step gives guidance on how to define the assessment inputs needed to carry out a software process assessment as described in ISO/IEC TR 15504-3.

5.3.1.1 Sponsor

Preparation for an assessment begins with the identification of a sponsor for the assessment. The sponsor is a senior manager, who is committed to the process improvement programme, requires the assessment to be performed, and provides resources for it. The sponsor ensures that the process assessment inputs (purpose, scope, constraints and responsibilities) are adequately defined so as to meet the needs of the process improvement programme. It is likely that the assistance and advice of a competent assessor will be of help to the sponsor in formulating these inputs.

The sponsor has the authority to ensure that the assessment can be carried out effectively, and takes ownership of the assessment output. The sponsor must be committed to the concepts of process improvement through process assessment.

5.3.1.2 Competent assessor

The responsibility for ensuring that an assessment is conducted in accordance with the provisions of ISO/IEC TR 15504 is vested in the competent assessor who leads, or is part of, the assessment team. A key factor in selecting an assessment team, and particularly the competent assessor, is credibility with the management and staff of the organizational unit. Depending on the local circumstances, a competent assessor drawn from outside the organizational unit may appear to be more credible on account of a more independent viewpoint.

5.3.1.3 Assessment purpose

The overall purpose of the assessment is to provide information about the process capability of the organizational unit in the form of the assessment results. The statement of assessment purpose will guide the assessment team during the conduct of the assessment, particularly with regard to the amount, nature and content of the information they should capture during the assessment to aid improvement. The purpose statement should make clear that the assessment is being done as part of a process improvement programme, and should contain clear descriptions of quality improvement goals (see 7.3.4 and 5.1) and specifically the goals whose attainment is expected to be dependent on the assessment results. All the information on the improvement background defined in the previous steps 5.1 and 5.2 should be made available.

5.3.1.4 Assessment scope

The assessment scope defines the boundaries for the assessment, both organizationally and in terms of the processes to be included.

From an improvement point of view the process improvement programme may address an entire organization, part of an organization, a single project, or even a part of a project. A process assessment, however, addresses an organizational unit with a coherent process context, particularly the application domain, size, criticality and complexity, and quality characteristics of its products and/or services. If the process improvement programme spans different organizational units with different types of operation, then each of them should be assessed separately.

The broader the scope of an assessment, the greater the assessment effort needed to arrive at a representative result. Therefore, the sponsor may wish to limit the scope to those processes that are expected to have the greatest potential for improvement. Priority should be given to the processes or process categories that initially appear to affect achievement of improvement goals derived from the organization's needs and business goals. This initial evaluation may change after an assessment is performed and the data is analysed. The scope statement should include any assumptions or expectations in the process improvement programme plan about the strengths and weaknesses of process categories, single processes, or practices.

The sampling of the implemented processes should be done by picking out representative selections that provide a reliable picture of the current status of the software process. Therefore, it is useful to assess projects that are considered both as the worst examples and as the best examples of the organization's current process performance. In this way the variability between the worst and the best cases of the organization can be found and taken into account in the improvement.

The scope is defined initially in terms of the processes operated and understood by the organizational unit. Ultimately, however, the organizational processes need to be mapped to the processes in the process model compatible with the reference model, to enable the assessment team to conduct the assessment. The mapping may be undertaken by the assessment sponsor, or by the assessment team. If an organizational process cannot be mapped on one of the processes in the process model, it should be defined as an extended process.

In addition to specifying the processes to be assessed, the scope should clearly identify the sampling strategy, the organizational unit and its characteristics, and the product or service characteristics (process context). The product or service characteristics, in particular, provide the context within which the assessment team will judge the adequacy of the implemented practices and affect the validity of comparisons with other industry benchmarks.