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## **1 Scope**

### **1.1 Introduction**

Process assessment is a disciplined evaluation of an organizational unit's processes against a Process Assessment Model (PAM).

The Automotive SPICE® Process Assessment Model (PAM) has been developed by consensus of the car manufacturers within the Automotive Special Interest Group (SIG) of the joint Procurement Forum/SPICE User Group under the Automotive SPICE® initiative.

The Automotive SPICE® Process Assessment Model (PAM) is available for use when performing conformant assessments of the software process capability of automotive suppliers in accordance with the requirements of ISO/IEC 15504-2.

The Automotive SPICE® Process Reference Model (PRM) is used in conjunction with the Automotive SPICE® Process Assessment Model (PAM) when performing an assessment.

The Automotive SPICE® Process Reference Model (PRM), which is defined in a separate document, is derived from Annex F and H of ISO/IEC 12207 AMD1: 2002 and ISO/IEC 12207 AMD2: 2004. It contains a sub set of the processes with minor editorial changes together with a number of other changes to reflect consistency in use of terminology and application in the automotive sector.

The FULL scope of Automotive SPICE® contains ALL the processes from the ISO/IEC 15504 Process Reference Model (PRM). The fact that some processes have not been included within the Automotive SPICE® PRM does not mean that they are not valid.

Supplier organisations should address all processes relevant to their business needs within their organisation. Where a process is not included within the Automotive SPICE® Process Reference Model (PRM) then the relevant process should be included from the ISO/IEC 15504 exemplar Process Assessment Model. The manufacturers will however focus on the set of process defined within the Automotive SPICE® PRM when performing supplier capability assessments.

This Automotive SPICE® Process Assessment Model contains a set of indicators to be considered when interpreting the intent of the Automotive SPICE® Process Reference Model. These indicators may also be used when implementing a process improvement program following an assessment.



## 1.2 Definitions

PAM	Process Assessment Model
PRM	Process Reference Model
SIG	Special Interest Group
SPICE	Software Process Improvement and Capability dEtermination

## 1.3 Terminology

Automotive SPICE® follows the following precedence for use of terminology:

- English dictionary for common terms
- ISO/IEC 15504-1 :2004 for assessment related terminology
- IEEE 630 and BS 7925-1 terminology (as contained in Annex C)

This document should be read in conjunction with ISO/IEC 15504-1 :2004.  
Many terms from ISO/IEC 15504-1 :2004 are used throughout the document.

Other terminology used is defined below

Application parameter	An application parameter is a parameter containing indispensable/essential data applied to the system affecting overall system functions, behaviour or properties. The notion of application parameter is expressed in two ways: firstly, the logical specification (including name, description, unit, value domain or threshold values or characteristic curves, respectively), and, secondly, the actual quantitative data value it receives by means of data application.
Element	One of the parts that makes up a system. An element may comprise hardware, software, mechanical or manual operations.
Integrated software item	A set of components that are integrated into a larger assembly for the purpose of integration testing.
Process Reference Model	A model comprising definitions of processes in a life cycle described in terms of process purpose and outcomes, together with an architecture describing the relationships between the processes

Annex D provides a schematic of key concepts used in the terminology.



### 3 Process Assessment Model

#### 3.1 Introduction

The Automotive SPICE® Process Assessment Model (PAM) comprises a set of assessment indicators of process performance and process capability. The indicators are used as a basis for collecting the objective evidence that enables an assessor to assign ratings.

The Automotive SPICE® Process Reference Model with the associated process attributes defined in ISO/IEC 15504-2 provides a common basis for performing assessments process capability, allowing for the reporting of results using a common rating scale.

The Process Assessment Model defines a two-dimensional model of process capability. In one dimension, the process dimension, the processes are defined and classified into process categories. Within a process category, processes are grouped into process groups at a second level according to the type of activity they address.

In the other dimension, the capability dimension, a set of process attributes grouped into capability levels is defined. The process attributes provide the measurable characteristics of process capability.

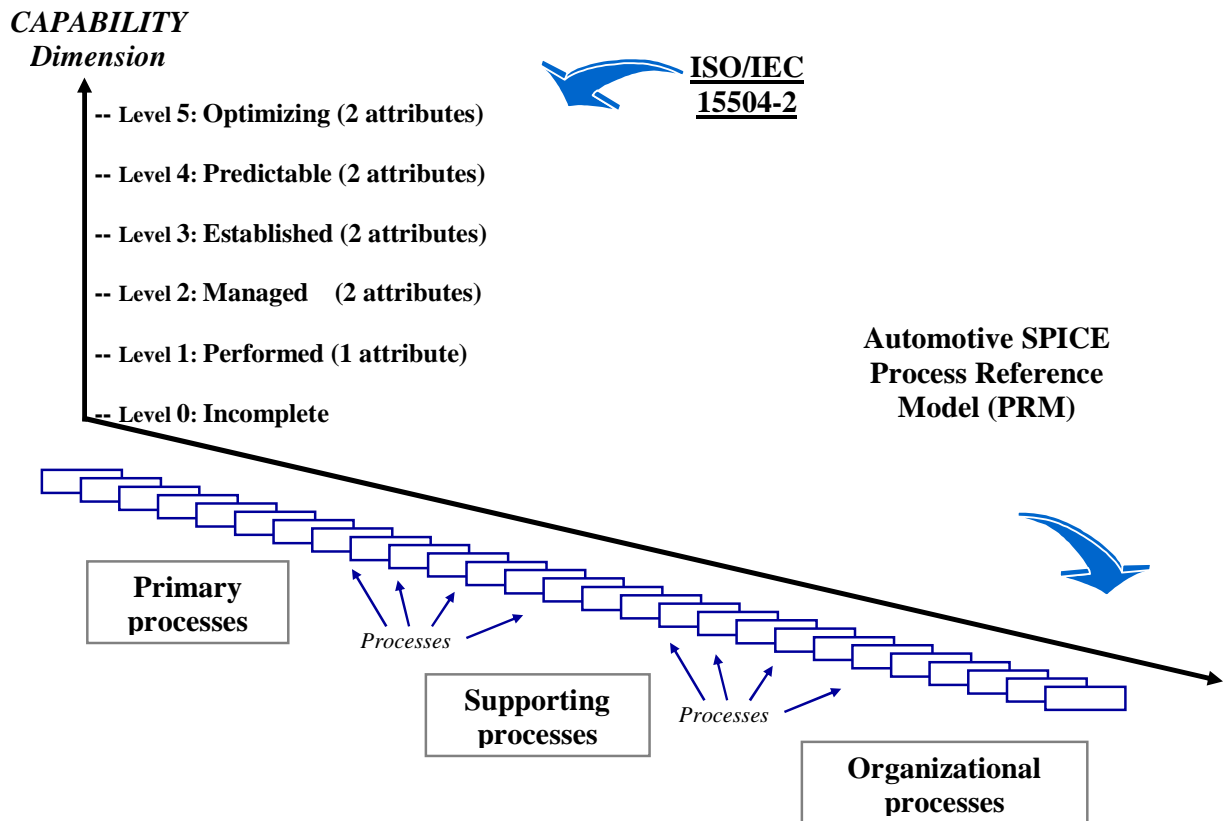


Figure 1 — Relationship between the Process Assessment Model and its inputs

Figure 1 shows the relationship between the general structure of the Process Assessment Model, ISO/IEC 15504-2 and the Automotive SPICE® Process Reference Model.

### 3.2 Process Dimension

For the process dimension, the Automotive SPICE® Process Reference Model (PRM) provides the set of processes.

The processes are classified into Process Categories and Process Groups. There are 3 Process Categories: Primary Life Cycle Processes, Organizational Life Cycle Processes and Supporting Life Cycle Processes. Each process is described in terms of a purpose statement. These statements contain the unique functional objectives of the process when performed in a particular environment. A list of specific outcomes is associated with each of the process purpose statements, as a list of expected positive results of the process performance.

The Process Categories and Process Groups are described below.



### 3.2.1 Primary Life Cycle Processes Category

The Primary life cycle processes category consists of processes that may be used by the customer when acquiring products from a supplier, and by supplier when responding and delivering products to the customer including the engineering processes needed for specification, design, development, integration and testing.

The primary life cycle processes category consists of the following groups:

- the Acquisition process group;
- the Supply process group;
- the Engineering process group;

The **Acquisition** process group (ACQ) consists of processes that are performed by the customer, or by the supplier when acting as a customer for its own suppliers, in order to acquire a product and/or service.

Any contract performed will be managed by processes in the **Management** process group (MAN) and executed by the processes in the **Engineering** process group (ENG).

**Table 1 — Primary Life Cycle Processes – ACQ process group**

Process Identification	PRM Process name
ACQ.3	Contract agreement
ACQ.4	Supplier monitoring
ACQ.11	Technical requirements
ACQ.12	Legal and administrative requirements
ACQ.13	Project requirements
ACQ.14	Request for proposals
ACQ.15	Supplier qualification

The **Supply** process group (SPL) consists of processes performed by the supplier in order to supply a product and/or a service.

**Table 2 — Primary Life Cycle Processes – SPL process group**

Process Identification	Process name
SPL.1	Supplier tendering
SPL.2	Product release



The **Engineering** process group (ENG) consists of processes that directly elicit and manage the customer's requirements, specify, implement, or maintain the software product, its relation to the system.

**Table 3 — Primary Life Cycle Processes – ENG process group**

Process Identification	Process name
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 test
ENG.8	Software testing
ENG.9	System integration test
ENG.10	System testing

### 3.2.2 Supporting Life Cycle Processes Category

The Supporting life cycle processes category consists of processes that may be employed by any of the other processes at various points in the life cycle.

**Table 4 — Supporting Life Cycle Processes - SUP process group**

Process Identification	Process name
SUP.1	Quality assurance
SUP.2	Verification
SUP.4	Joint review
SUP.7	Documentation
SUP.8	Configuration management
SUP.9	Problem resolution management
SUP.10	Change request management

### 3.2.3 Organizational Life Cycle Processes Category

The Organizational life cycle processes category consists of processes that establish the business goals of the organization and develop process,





product, and resource assets which, when used by projects in the organization, will help the organization achieve its business goals. The organizational life cycle processes category consists of the following groups:

- the Management process group;
- the Process Improvement process group;
- the Reuse process group.

The **Management** process group (MAN) consists of processes that contain practices that may be used by anyone who manages any type of project or process within the life cycle.

**Table 5 — Organizational Life Cycle Processes - MAN process group**

Process Identification	Process name
MAN.3	Project management
MAN.5	Risk management
MAN.6	Measurement

The **Process Improvement** process group (PIM) consists of processes performed in order to define, deploy and improve the processes performed in the organizational unit.

**Table 6 — Organizational Life Cycle Processes - PIM process group**

Process Identification	Process name
PIM.3	Process improvement

The **Reuse** process group (REU) consists of processes performed in order to systematically exploit reuse opportunities in organization's reuse programs.

**Table 7 — Organizational Life Cycle Processes - REU process group**

Process Identification	Process name
REU.2	Reuse program management

### 3.3 Capability dimension

For the capability dimension, the process capability levels and process attributes are identical to those defined in ISO/IEC 15504-2.



Evolving process capability is expressed in the Process Assessment Model in terms of process attributes grouped into capability levels. Process attributes are features of a process that can be evaluated on a scale of achievement, providing a measure of the capability of the process. They are applicable to all processes. Each process attribute describes a facet of the overall capability of managing and improving the effectiveness of a process in achieving its purpose and contributing to the business goals of the organization.

A capability level is a set of process attribute(s) that work together to provide a major enhancement in the capability to perform a process. Each level provides a major enhancement of capability in the performance of a process. The levels constitute a rational way of progressing through improvement of the capability of any process and are defined in ISO/IEC 15504-2.

There are six capability levels, incorporating nine process attributes.

**Level 0: Incomplete process**

*The process is not implemented, or fails to achieve its process purpose. At this level, there is little or no evidence of any systematic achievement of the process purpose.*

**Level 1: Performed process**

*The implemented process achieves its process purpose.*

**Level 2: Managed process**

*The previously described Performed process is now implemented in a managed fashion (planned, monitored and adjusted) and its work products are appropriately established, controlled and maintained.*

**Level 3: Established process**

*The previously described Managed process is now implemented using a defined process that is capable of achieving its process outcomes*

**Level 4: Predictable process**

*The previously described Established process now operates within defined limits to achieve its process outcomes.*

**Level 5: Optimizing process**

*The previously described Predictable process is continuously improved to meet relevant current and projected business goals.*

Within the Process Assessment Model, the measure of capability is based upon the nine process attributes (PA) defined in ISO/IEC 15504-2. Process attributes are used to determine whether a process has reached a given capability. Each attribute measures a particular aspect of the process capability.



At each level there is no ordering between the process attributes; each attribute addresses a specific aspect of the capability level. The list of process attributes is shown in Table 10.

**Table 10 — Capability levels and process attributes**

Process Attribute ID	Capability Levels and Process Attributes
	<b>Level 0: Incomplete process</b>
	<b>Level 1: Performed process</b>
<b>PA 1.1</b>	Process performance
	<b>Level 2: Managed process</b>
<b>PA 2.1</b>	Performance management
<b>PA 2.2</b>	Work product management
	<b>Level 3: Established process</b>
<b>PA 3.1</b>	Process definition
<b>PA 3.2</b>	Process deployment
	<b>Level 4: Predictable process</b>
<b>PA 4.1</b>	Process measurement
<b>PA 4.2</b>	Process control
	<b>Level 5: Optimizing process</b>
<b>PA 5.1</b>	Process innovation
<b>PA 5.2</b>	Continuous optimization

The process attributes are evaluated on a four point ordinal scale of achievement, as defined in ISO/IEC 15504-2. They provide insight into the specific aspects of process capability required to support process improvement and capability determination.

### **3.4 Assessment Indicators**

The Process Assessment Model is based on the principle that the capability of a process can be assessed by demonstrating the achievement of process attributes on the basis of evidences related to assessment indicators.

There are two types of assessment indicators: process capability indicators, which apply to capability levels 1 to 5 and process performance indicators, which apply exclusively to capability level 1.

The process attributes in the capability dimension have a set of process capability indicators that provide an indication of the extent of achievement of the attribute in the instantiated process. These indicators concern significant activities, resources or results associated with the achievement of the attribute purpose by a process.



The set of process capability indicators are:

- Generic Practice (GP);
- Generic Resource (GR);

As additional indicators for supporting the assessment of a process at Level 1, each process in the process dimension has a set of process performance indicators which is used to measure the degree of achievement of the process performance attribute for the process assessed.

The process performance indicators are:

- Base Practice (BP);
- Work Product (WP).

The performance of Base Practices (BPs) provides an indication of the extent of achievement of the process purpose and process outcomes. Work Products (WPs) are either used, produced or both, when performing the process.

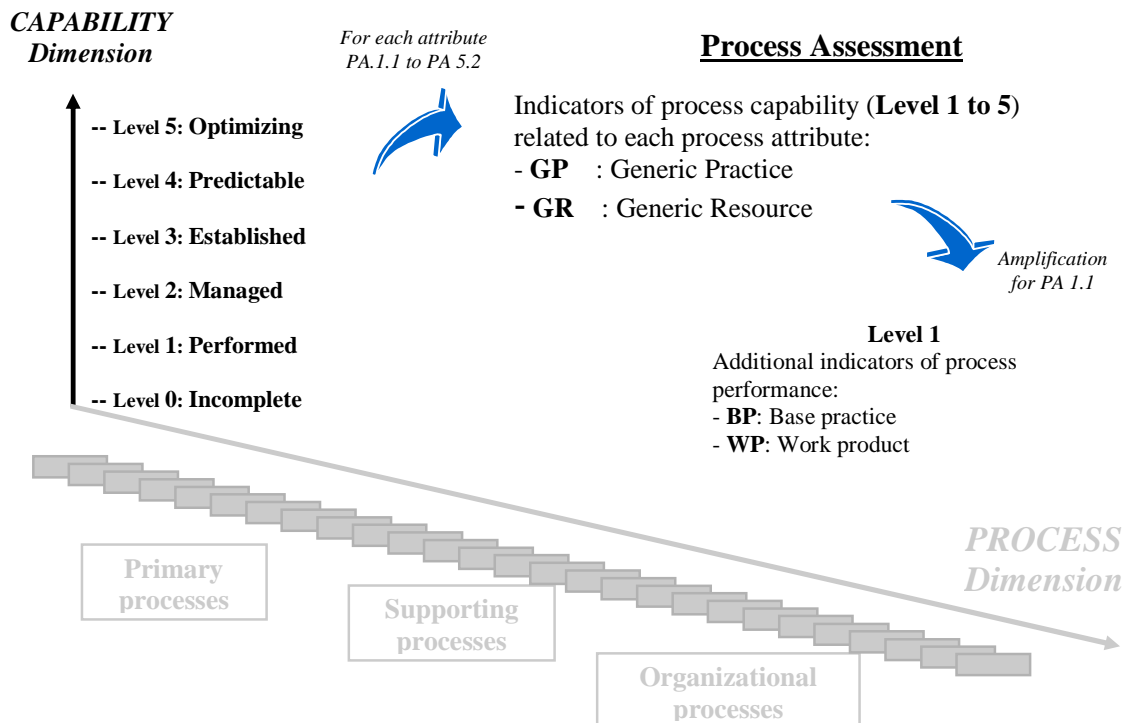


Figure 3 — Assessment indicators

The process performance and process capability indicators defined in the Process Assessment Model represent types of objective evidence that might



be found in an instantiation of a process and therefore could be used to judge achievement of capability.

Figure 3 shows how the assessment indicators are related to process performance and process capability.

### 3.5 Process Capability Indicators

There are two types of process capability indicators related to levels 1 to 5 as identified in Figure 4. They are intended to be applicable to all processes.

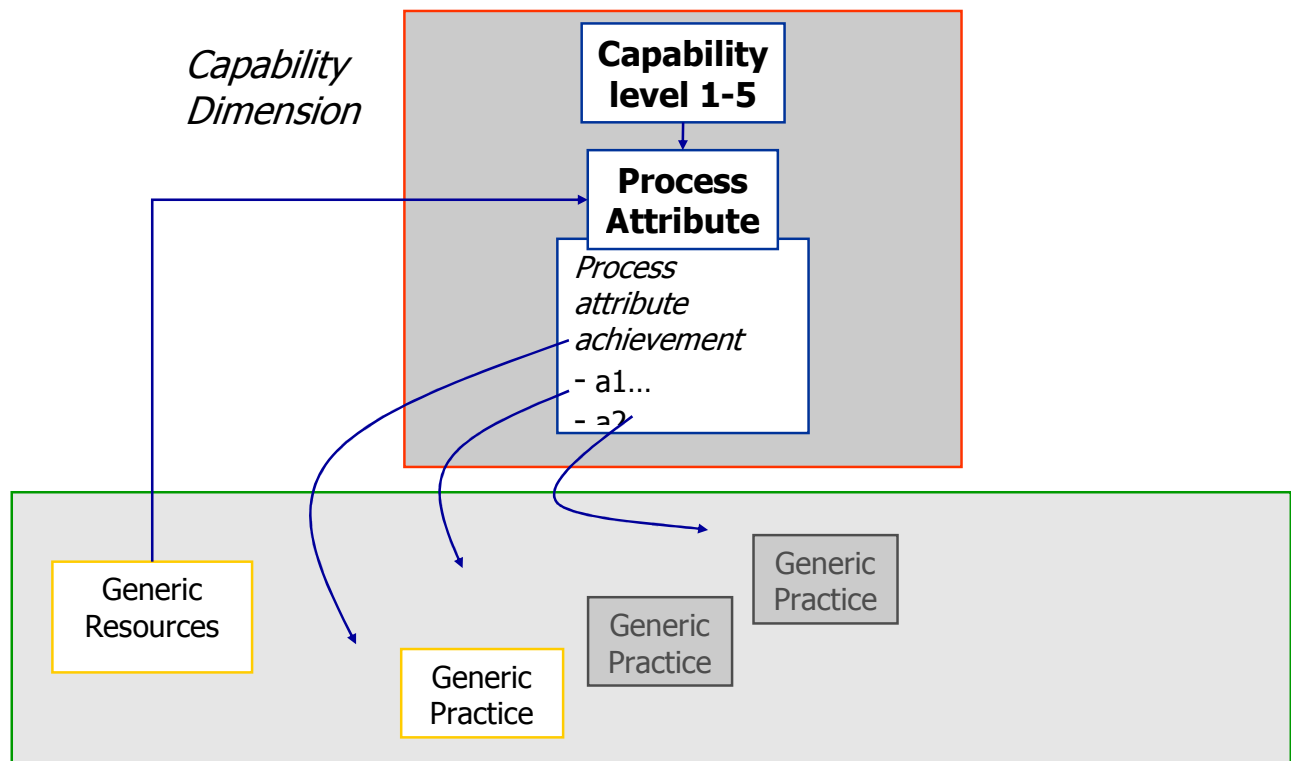


Figure 4 — Process capability indicators

All the process capability indicators relate to the process attributes defined in the capability dimension of the Process Assessment Model. They represent the type of evidence that would substantiate judgments of the extent to which the attributes are achieved. Evidence of their effective performance or existence supports the judgment of the degree of achievement of the attribute. The generic practices are the principal indicators of process capability.

**Generic Practices (GP)** are activities of a generic type and provide guidance on the implementation of the attribute's characteristics. They are designed around the achievement of the process attribute and many of them concern management practices, i.e. practices that are established to support the process performance as it is characterized at level 1.



During the evaluation of process capability, the primary focus is on the instantiation of the generic practices. In general, performance of all generic practices is expected for full achievement of the process attribute

**Generic Resources (GR)** are associated resources that may be used when performing the process in order to achieve the attribute. These resources may include human resources, tools, methods and infrastructure.

The availability of a resource indicates the potential to fulfill the purpose of a specific attribute.

Due to the fact that Level 1 capability of a process is only characterized by the measure of the extent to which the process purpose is achieved, the process performance attribute (PA.1.1) has a single generic practice indicator (GP.1.1.1). In order to support the assessment of PA.1.1 and to amplify the process performance achievement analysis, additional process performance indicators are defined in the Process Assessment Model.

### 3.6 Process Performance Indicators

There are two types of process performance indicators; **Base Practices (BP)** and **Work Products (WP)**. Process performance indicators relate to individual processes defined in the process dimension of the Process Assessment Model and are chosen to explicitly address the achievement of the defined process purpose.

Evidence of performance of the base practices, and the presence of work products with their expected work product characteristics, provide objective evidence of the achievement of the purpose of the process.

A base practice is an activity that addresses the purpose of a particular process. Consistently performing the base practices associated with a process will help the consistent achievement of its purpose. A coherent set of base practices is associated with each process in the process dimension. The base practices are described at an abstract level, identifying "what" should be done without specifying "how".

Implementing the base practices of a process should achieve the basic outcomes that reflect the process purpose. Base Practices represent only the first step in building process capability, but the base practices represent the unique, functional activities of the process, even if that performance is not systematic. The performance of a process produces work products that are identifiable and usable in achieving the purpose of the process. In this assessment model, each work product has a defined set of example work product characteristics that may be used when reviewing the work product to assess the effective performance of a process.



### **3.7 Measuring process capability**

The process performance and process capability indicators in this model give examples of evidence that an assessor might obtain, or observe, in the performance of an assessment. The evidence obtained in the assessment, through observation of the implemented process, can be mapped onto the set of indicators to enable correlation between the implemented process and the processes defined in this assessment model.

These indicators provide guidance for assessors in accumulating the necessary objective evidence to support judgments of capability. They are not intended to be regarded as a mandatory set of checklists to be followed.

An indicator is defined as an objective characteristic of a practice or work product that supports the judgment of the performance or capability of an implemented process. The assessment indicators, and their relationship to process performance and process capability, are shown in Figure 5.

Assessment indicators are used to confirm that certain practices were performed, as shown by observable evidence collected during an assessment. All such evidence comes either from the examination of work products of the processes assessed, or from statements made by the performers and managers of the processes.

The existence of base practices, work products, and work product characteristics, provide evidence of the performance of the processes associated with them. Similarly, the existence of process capability indicators provides evidence of process capability.

The evidence obtained should be recorded in a form that clearly relates to an associated indicator, so that the support for the assessor's judgment can be readily confirmed or verified as required by ISO/IEC 15504-2.

The output from a process assessment is a set of process profiles, one for each process within the scope of the assessment. Each process profile consists of a set of the process attribute ratings for an assessed process. Each attribute rating represents a judgment by the assessor of the extent to which the attribute is achieved.

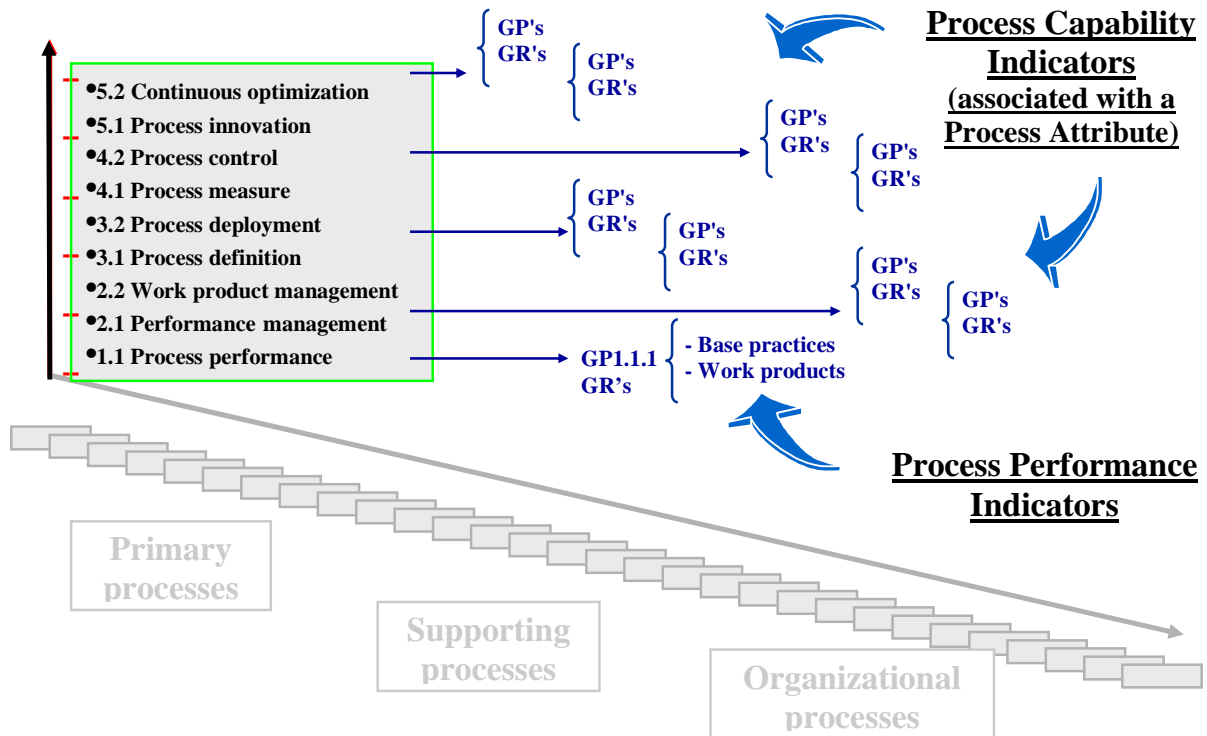


Figure 5 — Relationship between assessment indicators and process capability





## 5 Process Capability Indicators (level 1 to 5)

Process capability indicators are the means of achieving the capabilities addressed by the considered process attributes. Evidence of process capability indicators supports the judgment of the degree of achievement of the process attribute.

The capability dimension of the process assessment model consists of six capability levels matching the capability levels defined in ISO/IEC 15504-2. The process capability indicators for the 9 process attributes included in the capability dimension for level 1 to 5 are described.

Level 0 does not include any type of indicators, as it reflects a non-implemented process or a process which fails to partially achieve any of its outcomes.

NOTE ISO/IEC 15504-2 process attribute definitions and attribute outcomes are duplicated from ISO/IEC 15504-2 in italic font.

### 5.1 Level 1: Performed process

#### 5.1.1 PA 1.1 Process performance attribute.

*The process performance attribute is a measure of the extent to which the process purpose is achieved. As a result of full achievement of this attribute:*

*a) the process achieves its defined outcomes.*

##### 5.1.1.1 Generic Practices for PA 1.1

###### **GP 1.1.1 Achieve the process outcomes**

Perform the intent of the base practices.

Produce work products that evidence the process outcomes.

NOTE 1 The assessment of a performed process is based on process performance indicators, which are defined in Clause 5 of this document [ISO/IEC 15504-2].

NOTE 2 Generic resources and Generic work products do not exist for the assessment of the PA 1.1 attribute.

##### 5.1.1.2 Generic Resources for PA 1.1

Resources are used to perform the intent of process specific base practices. [PA 1.1 Achievement a]



## 5.2 Level 2: Managed process

The previously described *Performed process* is now implemented in a managed fashion (planned, monitored and adjusted) and its work products are appropriately established, controlled and maintained.

The following attributes of the process demonstrate the achievement of this level:

### 5.2.1 PA 2.1 Performance management attribute

*The performance management attribute is a measure of the extent to which the performance of the process is managed. As a result of full achievement of this attribute:*

- a) objectives for the performance of the process are identified;*
- b) performance of the process is planned and monitored;*
- c) performance of the process is adjusted to meet plans;*
- d) responsibilities and authorities for performing the process are defined, assigned and communicated;*
- e) resources and information necessary for performing the process are identified, made available, allocated and used;*
- f) interfaces between the involved parties are managed to ensure both effective communication and also clear assignment of responsibility.*

#### 5.2.1.1 Generic Practices for PA 2.1

**GP 2.1.1 Identify the objectives** for the performance of the process.

NOTE 1: Performance objectives may include – (1) quality of the artefacts produced, (2) process cycle time or frequency (3) resource usage and (4) boundaries of the process.

Performance objectives are identified based on process requirements.

The scope of the process performance is defined.

Assumptions and constraints are considered when identifying the performance objectives.

NOTE 2: At minimum, project performance objectives for resources, effort and schedule should be stated.



<p><b>GP 2.1.2 Plan and monitor the performance</b> of the process to fulfill the identified objectives. Plan(s) for the performance of the process are developed. The process performance cycle is defined. Key milestones for the performance of the process are established. Estimates for process performance attributes are determined and maintained. Process activities and tasks are defined. Schedule is defined and aligned with the approach to performing the process. Process work product reviews are planned. The process is performed according to the plan(s). Process performance is monitored to ensure planned results are achieved.</p>
<p><b>GP 2.1.3 Adjust</b> the performance of the process. Process performance issues are identified. Appropriate actions are taken when planned results and objectives are not achieved. The plan(s) are adjusted, as necessary. Rescheduling is performed as necessary.</p>
<p><b>GP 2.1.4 Define responsibilities and authorities for</b> performing the process. Responsibilities, commitments and authorities to perform the process are defined, assigned and communicated. Responsibilities and authorities to verify process work products are defined and assigned. The needs for process performance experience, knowledge and skills are defined.</p>
<p><b>GP 2.1.5 Identify and make available resources</b> to perform the process according to plan. The human and infrastructure resources necessary for performing the process are identified made available, allocated and used. The information necessary to perform the process is identified and made available. The necessary infrastructure and facilities are identified and made available.</p>
<p><b>GP 2.1.6 Manage the interfaces</b> between involved parties. The individuals and groups involved in the process performance are determined. Responsibilities of the involved parties are assigned. Interfaces between the involved parties are managed. Communication is assured between the involved parties. Communication between the involved parties is effective.</p>

#### 5.2.1.2 Generic Resources for PA 2.1

Human resources with identified objectives, responsibilities and authorities; [PA 2.1 Achievement a, d, e, f]

Facilities and infrastructure resources; [PA 2.1 Achievement a, d, e, f]

Project planning, management and control tools, including time and cost reporting; [PA 2.1 Achievement b, c]

Workflow management system; [PA 2.1 Achievement d, f]

Email and/or other communication mechanisms; [PA 2.1 Achievement d, f]



Information and/or experience repository; [PA 2.1 Achievement b, e]

Problem and issues management mechanisms. [PA 2.1 Achievement c]

#### 5.2.2 PA 2.2 Work product management attribute

*The work product management attribute is a measure of the extent to which the work products produced by the process are appropriately managed. As a result of full achievement of this attribute:*

- a) requirements for the work products of the process are defined;*
- b) requirements for documentation and control of the work products are defined;*
- c) work products are appropriately identified, documented, and controlled;*
- d) work products are reviewed in accordance with planned arrangements and adjusted as necessary to meet requirements.*

*NOTE 1 Requirements for documentation and control of work products may include requirements for the identification of changes and revision status, approval and re-approval of work products, and the creation of relevant versions of applicable work products available at points of use.*

*NOTE 2 The work products referred to in this clause are those that result from the achievement of the process outcomes.*

##### 5.2.2.1 Generic Practices for PA 2.2

###### **GP 2.2.1 Define the requirements for the work products.**

The requirements for the work products to be produced are defined. Requirements may include defining contents and structure.

Quality criteria of the work products are identified.

Appropriate review and approval criteria for the work products are defined.

###### **GP 2.2.2 Define the requirements for documentation and control of the work products.**

Requirements for the documentation and control of the work products are defined. Such requirements may include requirements for (1) distribution, (2) identification of work products and their components (3) traceability

Dependencies between work products are identified and understood.

Requirements for the approval of work products to be controlled are defined.

###### **GP 2.2.3 Identify, document and control the work products.**

The work products to be controlled are identified.

Change control is established for work products.

The work products are documented and controlled in accordance with requirements.

Versions of work products are assigned to product configurations as applicable.

The work products are made available through appropriate access mechanisms.

The revision status of the work products may readily be ascertained.



**GP 2.2.4 Review and adjust work products** to meet the defined requirements.

Work products are reviewed against the defined requirements in accordance with planned arrangements.

Issues arising from work product reviews are resolved.

#### 5.2.2.2 Generic Resources for PA 2.2

Requirement management method/toolset; [PA 2.2 Achievement a, b, c]

Configuration management system; [PA 2.2 Achievement b, c]

Documentation elaboration and support tool; [PA 2.2 Achievement b, c]

Document identification and control procedure; [PA 2.2 Achievement b, c]

Work product review methods and experiences; [PA 2.2 Achievement d]

Review management method/toolset; [PA 2.2 Achievement d]

Intranets, extranets and/or other communication mechanisms; [PA 2.2 Achievement b, c]

Problem and issue management mechanisms. [PA 2.2 Achievement d]

### 5.3 Level 3: Established process

The previously described *Managed process* is now implemented using a defined process capable of achieving its process outcomes.

The following attributes of the process demonstrate the achievement of this level:

#### 5.3.1 PA 3.1 Process definition attribute

*The process definition attribute is a measure of the extent to which a standard process is maintained to support the deployment of the defined process. As a result of full achievement of this attribute:*

- a) a standard process, including appropriate tailoring guidelines, is defined that describes the fundamental elements that must be incorporated into a defined process;*
- b) the sequence and interaction of the standard process with other processes are determined;*
- c) required competencies and roles for performing a process are identified as part of the standard process;*
- d) required infrastructure and work environment for performing a process are identified as part of the standard process;*



*e) suitable methods for monitoring the effectiveness and suitability of the process are determined.*

*NOTE 1 A standard process may be used as-is when deploying a defined process, in which case tailoring guidelines would not be necessary.*

#### 5.3.1.1 Generic Practices for PA 3.1

**GP 3.1.1 Define the standard process** that will support the deployment of the defined process.  
A standard process is developed that includes the fundamental process elements.  
The standard process identifies the deployment needs and deployment context.  
Guidance and/or procedures are provided to support implementation of the process as needed.  
Appropriate tailoring guideline(s) are available as needed.

**GP 3.1.2 Determine the sequence and interaction** between processes so that they work as an integrated system of processes.  
The standard process's sequence and interaction with other processes are determined.  
Deployment of the standard process as a defined process maintains integrity of processes.

**GP 3.1.3 Identify the roles and competencies** for performing the standard process.  
Process performance roles are identified  
Competencies for performing the process are identified.

**GP 3.1.4 Identify the required infrastructure and work environment** for performing the standard process.  
Process infrastructure components are identified (facilities, tools, networks, methods, etc.).  
Work environment requirements are identified.

**GP 3.1.5 Determine suitable methods** to monitor the effectiveness and suitability of the standard process.  
Methods for monitoring the effectiveness and suitability of the process are determined.  
Appropriate criteria and data needed to monitor the effectiveness and suitability of the process are defined.  
The need to establish the characteristics of the process is considered.  
The need to conduct internal audit and management review is established.  
Process changes are implemented to maintain the standard process.

#### 5.3.1.2 Generic Resources for PA 3.1

Process modeling methods/tools; [PA 3.1 Achievement a, b, c, d]

Training material and courses. [PA 3.1 Achievement a, b, c]

Resource management system. [PA 3.1 Achievement b, c]

Process infrastructure. [PA 3.1 Achievement a, b]

Audit and trend analysis tools. [PA 3.1 Achievement e]

Process monitoring method. [PA 3.1 Achievement e]



### 5.3.2 PA 3.2 Process deployment attribute

*The process deployment attribute is a measure of the extent to which the standard process is effectively deployed as a defined process to achieve its process outcomes. As a result of full achievement of this attribute:*

- a) a defined process is deployed based upon an appropriately selected and/or tailored standard process;*
- b) required roles, responsibilities and authorities for performing the defined process are assigned and communicated;*
- c) personnel performing the defined process are competent on the basis of appropriate education, training, and experience;*
- d) required resources and information necessary for performing the defined process are made available, allocated and used;*
- e) required infrastructure and work environment for performing the defined process are made available, managed and maintained;*
- f) appropriate data are collected and analysed as a basis for understanding the behaviour of, and to demonstrate the suitability and effectiveness of the process, and to evaluate where continuous improvement of the process can be made.*

**NOTE 1** Competency results from a combination of knowledge, skills and personal attributes that are gained through education, training and experience.

#### 5.3.2.1 Generic Practices for PA 3.2

**GP 3.2.1 Deploy a defined process** that satisfies the context specific requirements of the use of the standard process.

The defined process is appropriately selected and/or tailored from the standard process.  
Conformance of defined process with standard process requirements is verified.

**GP 3.2.2 Assign and communicate roles, responsibilities and authorities** for performing the defined process.

The roles for performing the defined process are assigned and communicated.

The responsibilities and authorities for performing the defined process are assigned and communicated.

**GP 3.2.3 Ensure necessary competencies** for performing the defined process.

Appropriate competencies for assigned personnel are identified.

Suitable training is available for those deploying the defined process.

**GP 3.2.4 Provide resources and information** to support the performance of the defined process.

Required human resources are made available, allocated and used.

Required information to perform the process is made available, allocated and used.



**GP 3.2.5 Provide adequate process infrastructure** to support the performance of the defined process.

Required infrastructure and work environment is available.

Organizational support to effectively manage and maintain the infrastructure and work environment is available.

Infrastructure and work environment is used and maintained.

**GP 3.2.6 Collect and analyse data about performance of the process** to demonstrate its suitability and effectiveness.

Data required to understand the behaviour, suitability and effectiveness of the defined process are identified.

Data are collected and analysed to understand the behaviour, suitability and effectiveness of the defined process.

Results of the analysis are used to identify where continual improvement of the standard and/or defined process can be made.

#### 5.3.2.2 Generic Resources for PA 3.2

Feedback mechanisms (customer, staff, other stakeholders); [PA 3.2 Achievement f]

Process repository; [PA 3.2 Achievement a, b]

Resource management system; [PA 3.2 Achievement b, c, d]

Knowledge management system. [PA 3.2 Achievement d]

Problem and change management system; [PA 3.2 Achievement f]

Working environment and infrastructure; [PA 3.2 Achievement e]

Data collection analysis system. [PA 3.2 Achievement f]

Process assessment framework; [PA 4.1 Achievement f]

Audit/review system. [PA 3.2 Achievement f]

### 5.4 Level 4: Predictable process

The previously described *Established process* now operates within defined limits to achieve its process outcomes.

The following attributes of the process demonstrate the achievement of this level:

#### 5.4.1 PA 4.1 Process measurement attribute

*The process measurement attribute is a measure of the extent to which measurement results are used to ensure that performance of the process supports the achievement of relevant process performance objectives in support of defined business goals. As a result of full achievement of this attribute:*





- a) *process information needs in support of relevant business goals are established;*
- b) *process measurement objectives are derived from identified process information needs;*
- c) *quantitative objectives for process performance in support of relevant business goals are established;*
- d) *measures and frequency of measurement are identified and defined in line with process measurement objectives and quantitative objectives for process performance;*
- e) *results of measurement are collected, analysed and reported in order to monitor the extent to which the quantitative objectives for process performance are met;*
- f) measurement results are used to characterise process performance.

*NOTE 1 Information needs may typically reflect management, technical, project, process or product needs.*

*NOTE 2 Measures may be either process measures or product measures or both.*

#### 5.4.1.1 Generic Practices for PA 4.1

**GP 4.1.1 Identify process information needs**, in relation with business goals.

Business goals relevant to establishing quantitative process measurement objectives for the process are identified.

Process stakeholders are identified and their information needs are defined.

Information needs support the relevant business goals.

**GP 4.1.2 Derive process measurement objectives** from process information needs.

Process measurement objectives to satisfy defined process information needs are defined.

**GP 4.1.3 Establish quantitative objectives** for the performance of the defined process, according to the alignment of the process with the business goals.

Process performance objectives are defined to explicitly reflect the business goals.

Process performance objectives are verified with organizational management and process owner(s) to be realistic and useful.



<p><b>GP 4.1.4 Identify product and process measures</b> that support the achievement of the quantitative objectives for process performance.</p> <p>Detailed measures are defined to support monitoring, analysis and verification needs of process and product goals.</p> <p>Measures to satisfy process measurement and performance objectives are defined.</p> <p>Frequency of data collection is defined.</p> <p>Algorithms and methods to create derived measurement results from base measures are defined, as appropriate.</p> <p>Verification mechanism for base and derived measures is defined.</p>
<p><b>GP 4.1.5 Collect product and process measurement results</b> through performing the defined process.</p> <p>Data collection mechanism is created for all identified measures.</p> <p>Required data is collected in an effective and reliable manner.</p> <p>Measurement results are created from the collected data within defined frequency.</p> <p>Analysis of measurement results is performed within defined frequency.</p> <p>Measurement results are reported to those responsible for monitoring the extent to which quantitative objectives are met.</p>
<p><b>GP 4.1.6 Use the results of the defined measurement</b> to monitor and verify the achievement of the process performance objectives.</p> <p>Statistical or similar techniques are used to quantitatively understand process performance and capability within defined control limits.</p> <p>Trends of process behaviour are identified.</p>

#### 5.4.1.2 Generic Resources for PA 4.1

Management information (cost, time, reliability, profitability, customer benefits, risks etc.);  
[PA 4.1 Achievement a, c, d, e, f]

Applicable measurement techniques; [PA 4.1 Achievement d]

Product and process measurement tools and results databases. [PA 4.1 Achievement d, e, f]

Process measurement framework. [PA 4.1 Achievement d, e, f]

Tools for data analysis and measurement. [PA 4.1 Achievement b, c, d, e]

#### 5.4.2 PA 4.2 Process control attribute

*The process control attribute is a measure of the extent to which the process is quantitatively managed to produce a process that is stable, capable, and predictable within defined limits. As a result of full achievement of this attribute:*

*a) suitable analysis and control techniques where applicable, are determined and applied;*

*b) control limits of variation are established for normal process performance;*



- c) *measurement data are analysed for special causes of variation;*
- d) *corrective actions are taken to address special causes of variation;*
- e) *control limits are re-established (as necessary) following corrective action.*

#### 5.4.2.1 Generic Practices for PA 4.2

<p><b>GP 4.2.1 Determine analysis and control techniques</b>, appropriate to control the process performance. Process control analysis methods and techniques are defined. Selected techniques are validated against process control objectives.</p>
<p><b>GP 4.2.2 Define parameters</b> suitable to control the process performance. Standard process definition is modified to include selection of parameters for process control. Control limits for selected base and derived measurement results are defined.</p>
<p><b>GP 4.2.3 Analyse process and product measurement results</b> to identify variations in process performance. Measures are used to analyse process performance. All situations are recorded when defined control limits are exceeded. Each out-of-control case is analysed to identify potential cause(s) of variation. Special causes of variation in performance are determined. Results are provided to those responsible for taking action.</p>
<p><b>GP 4.2.4 Identify and implement corrective actions</b> to address assignable causes. Corrective actions are determined to address each assignable cause. Corrective actions are implemented to address assignable causes of variation. Corrective action results are monitored. Corrective actions are evaluated to determine their effectiveness.</p>
<p><b>GP 4.2.5 Re-establish control limits</b> following corrective action. Process control limits are re-calculated (as necessary) to reflect process changes and corrective actions.</p>

#### 5.4.2.2 Generic Resources for PA 4.2

Process control and analysis techniques; [PA 4.2 Achievement a, c]

Statistical analysis tools/applications; [PA 4.2 Achievement b, c, e]

Process control tools/applications. [PA 4.2 Achievement d, e]

### 5.5 Level 5: Optimizing process

The previously described *Predictable process* is continuously improved to meet relevant current and projected business goals.

The following attributes of the process demonstrate the achievement of this level:



#### 5.5.1 PA 5.1 Process innovation attribute

*The process innovation attribute is a measure of the extent to which changes to the process are identified from analysis of common causes of variation in performance, and from investigations of innovative approaches to the definition and deployment of the process. As a result of full achievement of this attribute:*

- a) process improvement objectives for the process are defined that support the relevant business goals;*
- b) appropriate data are analysed to identify common causes of variations in process performance;*
- c) appropriate data are analysed to identify opportunities for best practice and innovation;*
- d) improvement opportunities derived from new technologies and process concepts are identified;*
- e) an implementation strategy is established to achieve the process improvement objectives.*

##### 5.5.1.1 Generic Practices for PA 5.1

**GP 5.1.1 Define the process improvement objectives** for the process that support the relevant business goals.

Directions to process innovation are set.

New business visions and goals are analyzed to give guidance for new process objectives and potential areas of process change.

Quantitative and qualitative process improvement objectives are defined and documented.

**GP 5.1.2 Analyse measurement data** of the process to identify real and potential variations in the process performance.

Measurement data are analysed and made available.

Causes of variation in process performance are identified and classified.

Common causes of variation are analysed to get quantitative understanding of their impact.

**GP 5.1.3 Identify improvement opportunities** of the process based on innovation and best practices.

Industry best practices are identified and evaluated.

Feedback on opportunities for improvement is actively sought.

Improvement opportunities are identified.



**GP 5.1.4 Derive improvement opportunities** of the process from new technologies and process concepts. Impact of new technologies on process performance is identified and evaluated.

Impact of new process concepts are identified and evaluated.

Improvement opportunities are identified,

Emergent risks are considered in identifying improvement opportunities

**GP 5.1.5 Define an implementation strategy** based on long-term improvement vision and objectives.

Commitment to improvement is demonstrated by organizational management and process owner(s).

Proposed process changes are evaluated and piloted to determine their benefits and expected impact on defined business objectives.

Changes are classified and prioritized based on their impact on defined improvement objectives.

Measures that validate the results of process changes are defined to determine expected effectiveness of the process change.

Implementation of the approved change(s) is planned as an integrated program or project.

Implementation plan and impact on business goals are discussed and reviewed by organizational management.

#### 5.5.1.2 Generic Resources for PA 5.1

Process improvement framework; [PA 5.1 Achievement a, d, e]

Process feedback and analysis system (measurement data, causal analysis results etc.);  
[PA 5.1 Achievement b, c]

Piloting and trialing mechanism. [PA 5.1 Achievement c, d]

#### 5.5.2 PA 5.2 Process optimization attribute

*The process optimization attribute is a measure of the extent to which changes to the definition, management and performance of the process result in effective impact that achieves the relevant process improvement objectives. As a result of full achievement of this attribute:*

- a) impact of all proposed changes is assessed against the objectives of the defined process and standard process;*
- b) implementation of all agreed changes is managed to ensure that any disruption to the process performance is understood and acted upon;*
- c) effectiveness of process change on the basis of actual performance is evaluated against the defined product requirements and process objectives to determine whether results are due to common or special causes.*

##### 5.5.2.1 Generic Practices of PA 5.2



<p><b>GP 5.2.1 Assess the impact of each proposed change</b> against the objectives of the defined and standard process.</p> <p>Objective priorities for process improvement are established.</p> <p>Specified changes are assessed against product quality and process performance requirements and goals.</p> <p>Impact of changes to other defined and standard processes is considered.</p>
<p><b>GP 5.2.2. Manage the implementation of agreed changes</b> to selected areas of the defined and standard process according to the implementation strategy.</p> <p>A mechanism is established for incorporating accepted changes into the defined and standard process (es) effectively and completely.</p> <p>The factors that impact the effectiveness and full deployment of the process change are identified and managed, such as:</p> <ul style="list-style-type: none"><li>• Economic factors (productivity, profit, growth, efficiency, quality, competition, resources, and capacity );</li><li>• Human factors (job satisfaction, motivation, morale, conflict/cohesion, goal consensus, participation, training, span of control);</li><li>• Management factors (skills, commitment, leadership, knowledge, ability, organisational culture and risks);</li><li>• Technology factors (sophistication of system, technical expertise, development methodology, need of new technologies).</li></ul> <p>Training is provided to users of the process.</p> <p>Process changes are effectively communicated to all affected parties.</p> <p>Records of the change implementation are maintained.</p>
<p><b>GP 5.2.3 Evaluate the effectiveness of process change</b> on the basis of actual performance against process performance and capability objectives and business goals.</p> <p>Performance and capability of the changed process are measured and compared with historical data.</p> <p>A mechanism is available for documenting and reporting analysis results to management and owners of standard and defined process.</p> <p>Measures are analysed to determine whether results are due to common or special causes.</p> <p>Other feedback is recorded, such as opportunities for further improvement of the standard process.</p>

#### 5.5.2.2 Generic Resources for PA 5.2

Change management system; [PA 5.2 Achievement a, b, c]

Process evaluation system (impact analysis, etc.). [PA 5.2 Achievement a, c]