

Defining Process Objectives (GP 2.1.1)

**A Practical Approach with Focus on
Project Goal &
Product Quality Characteristics**

Introduction

IQI Consulting Services Pvt. Ltd. (IQI)

Knowledge Services

- ❑ Training and Qualification
 - CMMI®
 - Automotive SPICE®
 - Functional Safety
 - Project Management
 - Executive Management
 - Methods

Improvement Services

- ❑ Process Improvements
- ❑ Performance Improvement

Support Services

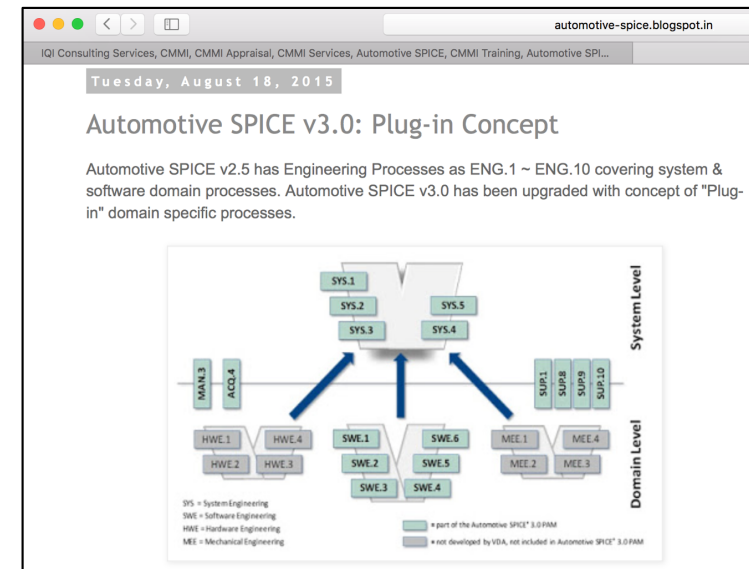
- ❑ Eng. Process Group Management
- ❑ Quality Assurance
- ❑ Program Management

Appraisal Services

- ❑ CMMI® Appraisals
- ❑ Automotive SPICE® Assessments
- ❑ FS Compliance Check



<http://www.iqiconsulting.com>



<http://automotive-spice.blogspot.in>

Praveen Pathak

Industry Experience:

Around 8 years of experience in IT and Automotive Industry

- Process implementation and improvement (including higher maturity organizations)
- More than 5 years of Process consulting, Training & Assessment

Qualification:

- intacs™ Certified Competent Assessor (Registered With VDA)
- CMMI-Institute Certified Applying CMMI Certified(Intermediate)
- CMMI-Institute Certified and Registered Appraisal Team Member
- B.E(Computers) , MBA(International Business)



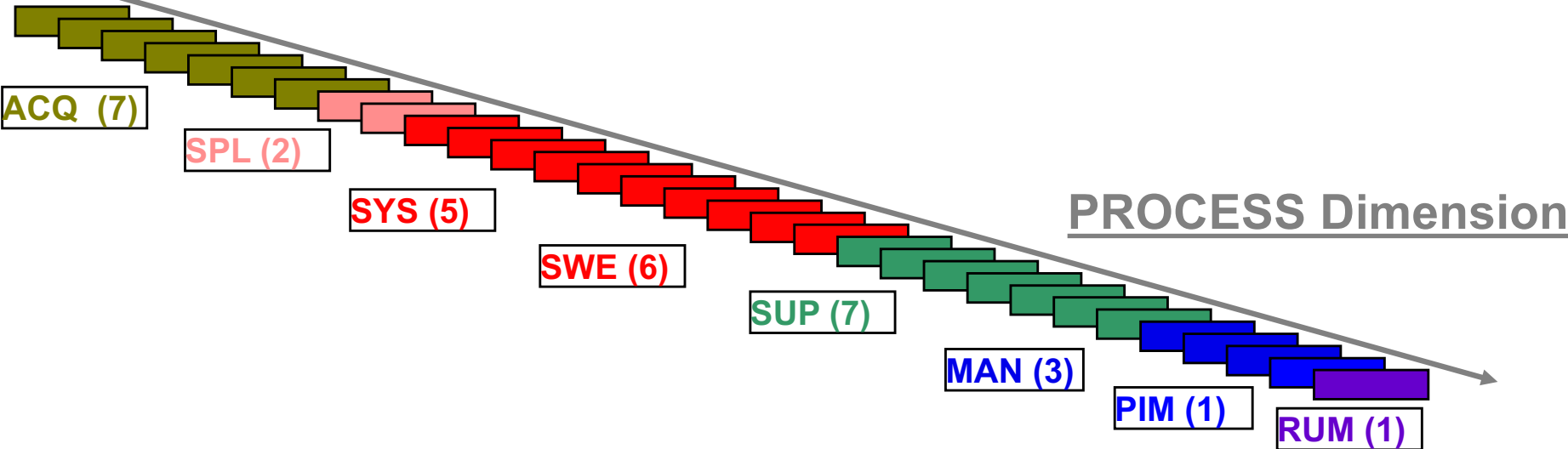
Automotive SPICE®

General Understanding

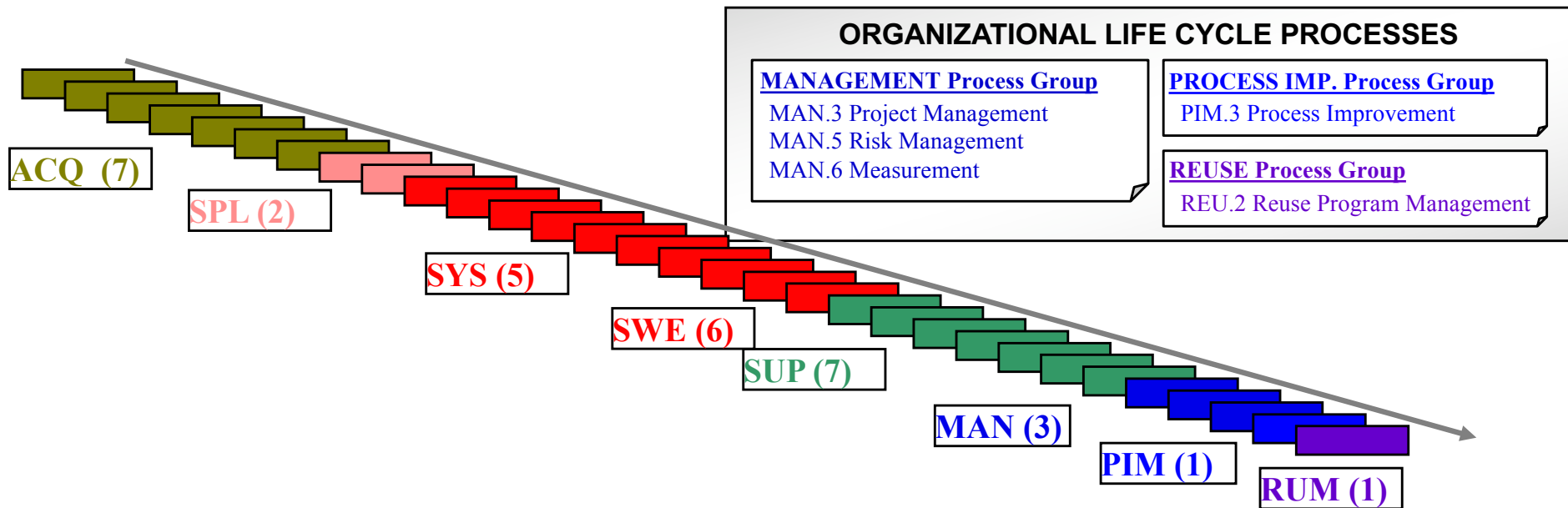
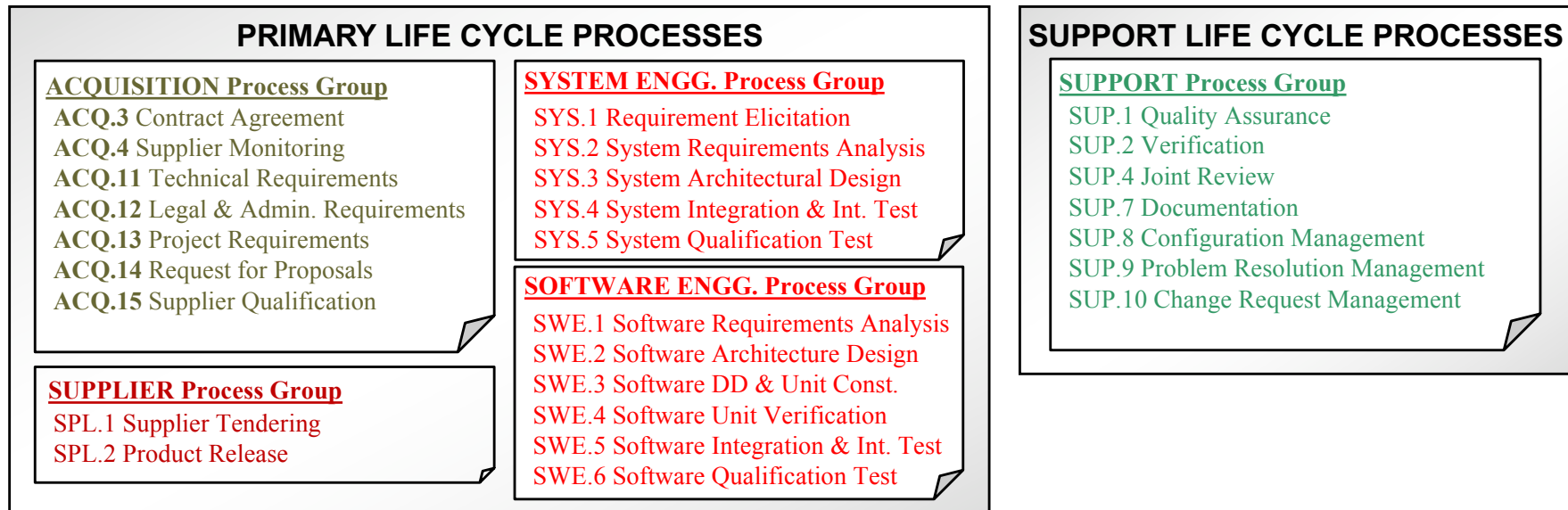
Automotive SPICE® Representation

CAPABILITY Dimension

- Level 5: Innovating
- Level 4: Predictable
- Level 3: Established
- Level 2: Managed
- Level 1: Performed
- Level 0: Incomplete



Process Dimension (Processes)

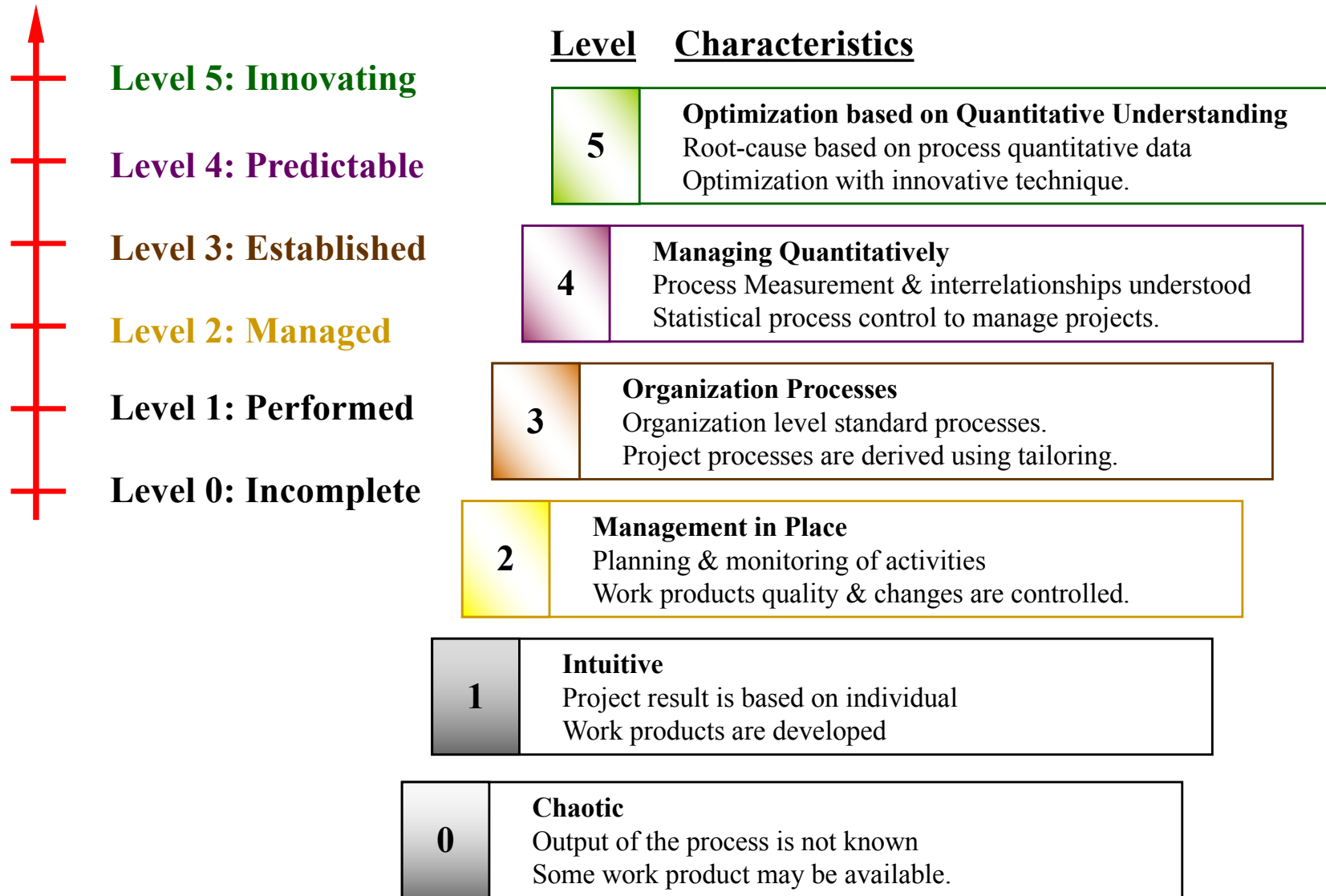


Elements of Processes

4.4.1. SWE.1 Software Requirements Analysis

Process ID	SWE.1																
Process name	Software Requirements Analysis																
Process purpose	The purpose of the Software Requirements Analysis Process is to transform the software related parts of the system requirements into a set of software requirements.																
Process outcomes	<p>As a result of successful implementation of this process:</p> <ol style="list-style-type: none"> 1) the software requirements to be allocated to the software elements of the system and their interfaces are defined; 2) software requirements are categorized and analyzed for correctness and verifiability; 3) the ir 4) priori 5) the s 																
	Base practices	<p>SWE.1.BP1: Specify software requirements. Use the system requirements and the system architecture and changes to system requirements and architecture to identify the required functions and capabilities of the software. Specify functional and non-functional software requirements in a software requirements specification. [OUTCOME 1, 5, 7]</p> <p><i>NOTE 1: Application parameter influencing functions and capabilities are part of the system requirements.</i></p> <p><i>NOTE 2: In case of software development only, the system requirements and the system architecture refer to a given operating environment (see also note 5). In that case, stakeholder requirements should be used as the basis for</i></p>															
	Output work products	<table border="1"> <tr> <td>13-04 Communication record</td> <td>→</td> <td>[OUTCOME 8]</td> </tr> <tr> <td>13-19 Review record</td> <td>→</td> <td>[OUTCOME 6]</td> </tr> <tr> <td>13-21 Change control record</td> <td>→</td> <td>[OUTCOME 5, 7]</td> </tr> <tr> <td>13-22 Traceability record</td> <td>→</td> <td>[OUTCOME 1, 6]</td> </tr> <tr> <td>15-01 Analysis report</td> <td>→</td> <td>[OUTCOME 2, 3, 4, 7]</td> </tr> </table> <ul style="list-style-type: none"> • sorting in a logical order for the project, • categorizing based on relevant criteria for the project, 	13-04 Communication record	→	[OUTCOME 8]	13-19 Review record	→	[OUTCOME 6]	13-21 Change control record	→	[OUTCOME 5, 7]	13-22 Traceability record	→	[OUTCOME 1, 6]	15-01 Analysis report	→	[OUTCOME 2, 3, 4, 7]
13-04 Communication record	→	[OUTCOME 8]															
13-19 Review record	→	[OUTCOME 6]															
13-21 Change control record	→	[OUTCOME 5, 7]															
13-22 Traceability record	→	[OUTCOME 1, 6]															
15-01 Analysis report	→	[OUTCOME 2, 3, 4, 7]															
	13-19 Review record	<ul style="list-style-type: none"> • Provides the context information about the review: <ul style="list-style-type: none"> - what was reviewed - lists reviewers who attended - status of the review • Provides information about the coverage of the review <ul style="list-style-type: none"> - check-lists 															

Capability Dimension - Characteristics



Capability Levels & Process Attributes

<u>Capability Level</u>	<u>Description</u>	<u>Process Attributes</u>
5 Innovating	The process is continuously improved to meet current and projected business goals	Process Innovation Process Inno. Impementation
4 Predictable	The process operates within defined limits to achieve its process outcomes	Process Measurement Process Control
3 Established	The process is implemented using defined process that is capable of achieving its process outcomes	Process Definition Process Deployment
2 Managed	The process is implemented in a managed fashion and its work products are established & maintained	Performance Management Work Product Management
1 Performed	The process is implemented and achieve its purpose	Process Performance
0 Incomplete	The process, if implemented fails to achieve its outcome	

Process Attribute Elements

Capability Level 2

5.3.1. PA 2.1 Performance management process attribute

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

- a) Objectives for the performance of the process are identified;
- b) Performance of the process is planned;
- c) Performance of the process is monitored;
- d) Performance of the process is adjusted to meet plans;
- e) Responsibilities and authorities for performing the process are defined, assigned and

- f)
- g)
- h)

Generic practices

GP 2.1.1 Identify the objectives for the performance of the process. [ACHIEVEMENT a]

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 1: Performance objectives may include

- (1) timely production of artifacts meeting the defined quality criteria,
- (2) process cycle time or frequency
- (3) resource usage; and
- (4) boundaries of the process.

NOTE 2: At minimum, project performance objectives for resources, effort

Generic resources

Human resources with identified objectives, responsibilities and authorities [ACHIEVEMENT e, f]

Facilities and infrastructure resources [ACHIEVEMENT g]

Project planning, management and control tools, including time and cost reporting [ACHIEVEMENT a, b, c, d]

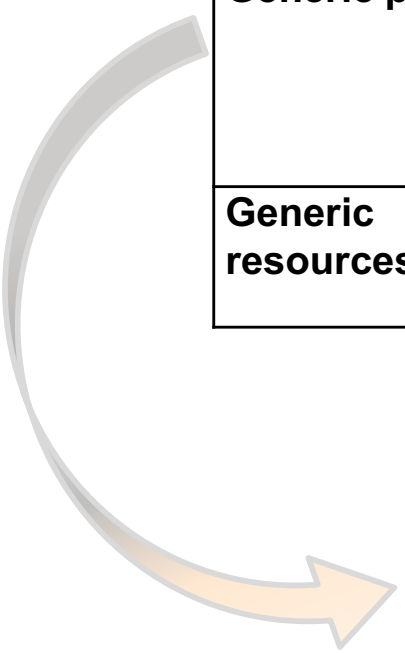
Workflow management system [ACHIEVEMENT d, f, g]

Level 1 : Performed Process

PA 1.1 Process performance

- a) The implemented process achieves its purpose

Generic practices	GP 1.1.1 Achieve the process outcomes [ACHIEVEMENT a] Achieve the intent of the base practices. Produce work products that evidence the process outcomes.
Generic resources	Resources are used to achieve the intent of process specific base practices [ACHIEVEMENT a]
Base practices	<p>SWE.1.BP1: Specify software requirements. Use the system requirements and the system architecture and changes to system requirements and architecture to identify the required functions and capabilities of the software. Specify functional and non-functional software requirements in a software requirements specification. [OUTCOME 1, 5, 7]</p> <p><i>NOTE 1: Application parameter influencing functions and capabilities are part of the system requirements.</i></p> <p><i>NOTE 2: In case of software development only, the system requirements and the system architecture refer to a given operating environment (see also note 5). In that case, stakeholder requirements should be used as the basis for identifying the required functions and capabilities of the software as well as for identifying application parameters influencing software functions and capabilities.</i></p> <p>SWE.1.BP2: Structure software requirements. Structure the software requirements in the software requirements specification by e.g.</p> <ul style="list-style-type: none"> • grouping to project relevant clusters, • sorting in a logical order for the project, • categorizing based on relevant criteria for the project,



Level 2 : Managed Process

PA 2.1 Performance Management

a) Objectives for the performance of the process

GP 2.1.1

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.

GP 2.1.2

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.

...
performance of the process.

GP 2.1.3

The process is performed according to the plan(s).

Process performance is monitored to ensure planned results are achieved and to identify possible deviations

GP 2.1.2 Plan the performance of the process to fulfill the identified objectives. [ACHIEVEMENT b]

GP 2.1.3 Monitor the performance of the process against the plans. [ACHIEVEMENT c]

GP 2.1.4 Adjust the performance of the process. [ACHIEVEMENT d]

GP 2.1.4

Process performance issues are identified.

Appropriate actions are taken when planned results and objectives are not achieved.

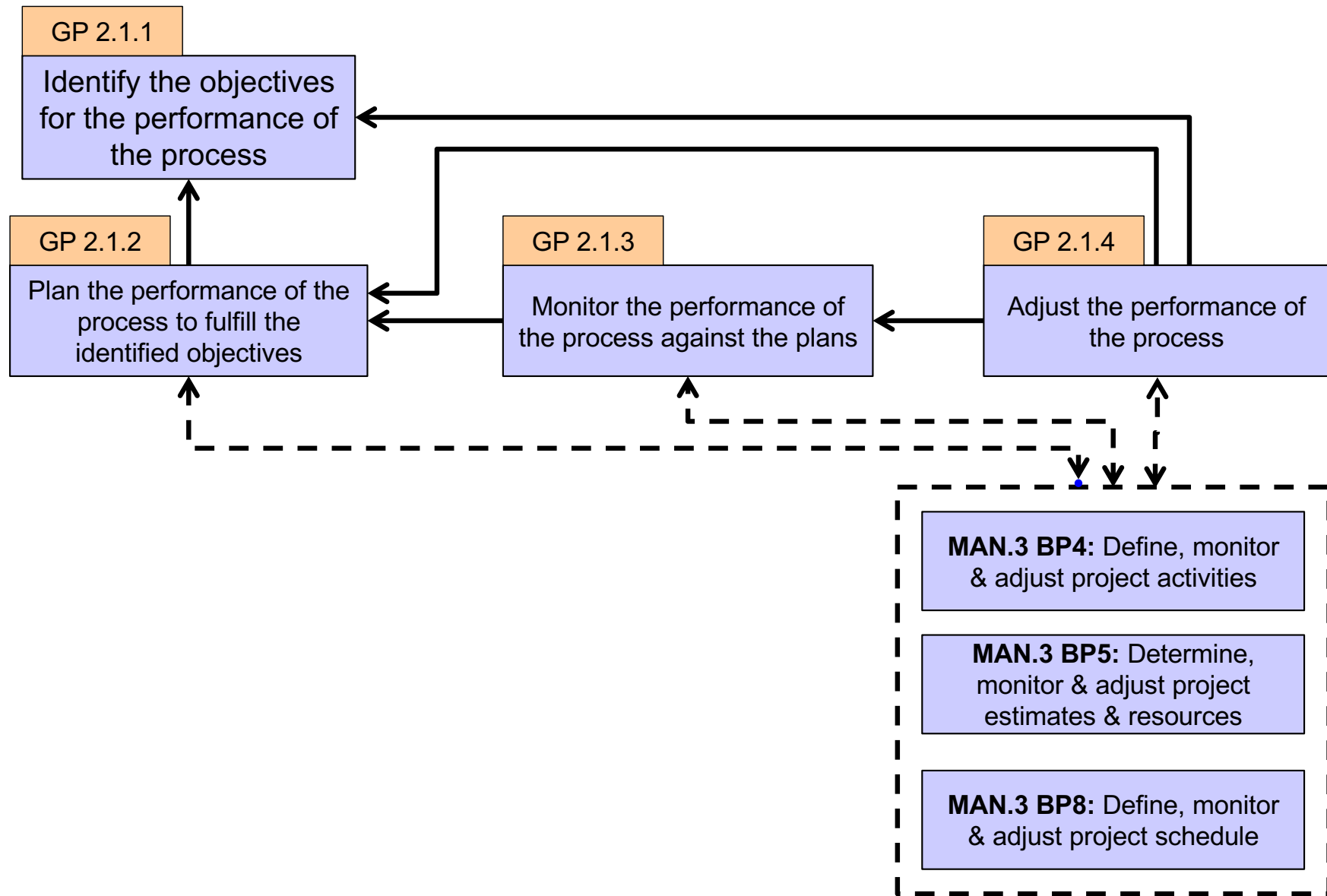
The plan(s) are adjusted, as necessary. Rescheduling is performed as necessary.

GP 2.1.1 Process Performance Objectives

- Process Performance Objectives are defined:
 - a) Requirements regarding necessary activities & tasks in order to fulfill the process purpose are considered.
 - Milestones and/or due dates to be kept
 - Effort
 - Process cycle time or frequency
 - Metrics
 - Usage of qualified human & defined infrastructure resources
 - Quality criteria regarding the process
 - b) Assumptions and constraints are considered, e.g.:
 - Adherence to internal standards
 - Adherence to customer standards, norms, or laws
 - c) Stakeholder requirements have to be considered.

References are taken from Automotive SPICE Guidebook by VDA

Relationship with other GPs & MAN.3



Defining Project Goal & Product Quality Characteristics

GP 2.1.1 Process Objectives : Mapping

Mapping: Project Goal & Process Objectives

Sl. No.	Processes	Project Goal (Objectives)						
		Quality (Q)	Cost (C)	Delivery (D)	Issue Resolution Time	Unit Test coverage	Process Compliance	⋮
1	MAN.3 Project Management		○	○	○		○	
2	SYS.2 System Requirement Analysis	○	○	○			○	
3	SYS.3 System Architecture Design	○	○	○			○	
.	...	○	○	○			○	
.	SWE.3 Software DD & Unit Const.	○	○	○		○	○	
.	...	○	○	○			○	
.	SUP.1 Quality Assurance		○				○	
.	SUP.9 Problem Resolution Mangt.				○		○	
14	SUP.10 Change Request Management		○				○	

Project Goal - Example

Q C D	Organization Goal	Project Goal							
		A Sample		B Sample		C Sample		D Sample	
		I	C	I	C	I	C	I	C
Q	Organization Business Objective : Zero Defects	50	20	40	10	30	5	10	0
Q	Requirement misunderstanding : Zero	5		2		1		0	
				Y: Defect found in-house during testing.				C: Defect Reported by customer after sample release	
Q	Process Compliance	$> 80\% \quad ((\# \text{ Check Points} - \# \text{ NC}) / \# \text{ Check Points}) \times 100$							
D	Schedule deviation	$< 3 \text{ days OR } < 10\%$							
...									

- Defect Management sheet should be designed to provide information like:
 - Defects found during software testing / Software integration testing / SW Unit testing – Sample wise
 - Defect reported by customer – Sample wise
 - Defect inserted in phase (Requirement, Design, Code)

Defining Project Goal & Product Quality Characteristics

GP 2.1.1 Process Objectives : An Example

Product Quality Characteristics (Product Measures)

Type	Measures Description	Target	Explanation	Formula
Q	Unit Test Branch Coverage	$\geq 80\%$	Statement, Branch, MC/DC	
	Module Test Coverage	$\geq 80\%$	Planned test cases for the SW delivery	
	Cyclomatic Complexity	≤ 10	For Non-granted modules	
	Static Code Check Warnings	0	For all Non-granted warnings	
	Complier Warnings	0	For all Non-granted warnings	
	RAM and ROM usage	$< 80\%$		
	CPU Load usage (Worst Case)	$< 95\%$		
	Stack Size Usage (Worst Case)	$< 80\%$	Actual Stack Size usage	
	Integration Test Coverage against SW Architecture	100%	For planned test cases	
	Test Coverage against Requirements	100%	Planned test cases for the SW delivery	
	Development Quality (Testing Efficiency)	$> 90\%$	Delivered Quality	Internal Defects / Total Defect (Total Defect = Internal + Customer defects)
	Defect Density (per KNLOC)	≤ 5.0	NLOC (netto lines of code): Physical source lines of code without pure comment or blank lines.	Total Defects / NKLOC

Product Quality Characteristics (Product Measures)

Type	Measures Description	Target	Explanation	Formula
D	Feature implementation Deviation (Actual vs. Planned)	≤ 5%	For the SW delivery	$\frac{((\text{Planned} - \text{Actual}) / \text{Planned}) \times 100\%}{}$
	Feature Maturity (Delivered Features* / Planned Features)	Interim SW Release ≥ 60% (with no Critical and Major Defects) Full Features Implementation: Interim SW Release ≥ 95% (with no Critical and Major Defects) Final SW – 100%		

*Features tested and passed

Project Goals (Process Measures)

Type	Measures Description	Target	Explanation	Formula
Q	PR Trends			PR In-flow < PR Solving Rate (After Full-Features)
	Review Performance	> 80%		(Actual / Planned) x 100%
	Defect Density (per person month)	< 5	Non-weighted (experience, skill)	Total Defects / Total SW Effort
	Monthly process adherence check	> 80%		(No of NC / Total Number of Check items) x 100
D	Schedule Deviation	< 3 days (for key milestone dates)		Actual - Planned
	Change Request Status	Open Approved Customer CR < 5%		(Open Approved Customer CR / Total Customer CR) x 100%
C	Effort Deviation	< 20%	((Planned Effort - Actual Effort) / Planned Effort) x 100	

Customer stated measures (Goals)

Defining Project Goal & Product Quality Characteristics

GP 2.1.2 Plan the Performance: An Example

Product Quality Characteristics (Product Measures)

Type	Measures Description	Target	Plan	Monitor
Q	Unit Test Branch Coverage	≥ 80%	Unit test schedule	At the end of each unit test cycle.
	Module Test Coverage	≥ 80%	Module test schedule	At the end of each test cycle
	Cyclomatic Complexity	≤ 10	No Plan	At the end of each Unit Test / Integration Test cycle.
	Static Code Check Warnings	0	No Plan	
	Compiler Warnings	0	No Plan	
	RAM and ROM usage	< 80%	No Plan	
	CPU Load usage (Worst Case)	< 95%	No Plan	
	Stack Size Usage (Worst Case)	< 80%	No Plan	
	Integration Test Coverage against SW Architecture	100%	Integration Test Schedule	At the end of each integration test cycle
	Test Coverage against Requirements	100%	Software / System Test Schedule	At the end of each system / software test cycle
	Testing Efficiency	> 90%	No Plan	At each sample release
	Defect Density (per KNLOC)	≤ 5.0	No Plan	At each sample release

- Monitoring frequency / method shall be defined in plan
- Reporting method shall be supported by template

Project Goals (Process Measures)

Type	Measures Description	Target	Plan	Monitor
Q	PR Trends		No Plan	<ul style="list-style-type: none"> - Weekly (During Test Phase) - At the end of each test cycle
	Review Performance	> 80%	Review Plan (schedule)	At each milestone
	Defect Density (per person month)	< 5	No Plan	<ul style="list-style-type: none"> - At each "Sample" delivery
	Monthly process adherence check	> 80%	QA Audit Plan (schedule)	<ul style="list-style-type: none"> - At the completion of each process audit
D	Schedule Deviation	< 3 days	Development schedule (with milestones / phase end)	<ul style="list-style-type: none"> - At each milestone / Phase end / Monthly
	Change Request Status	Open Approved Customer CR < 5%	No Plan	<ul style="list-style-type: none"> - Milestone / Monthly
C	Effort Deviation	< 20%	Development schedule / Effort estimation sheet	<ul style="list-style-type: none"> - At each milestone / Phase end / Monthly

- Monitoring frequency / method shall be defined in plan
- Reporting method shall be supported by template

GP 2.1.1: What is different @ CL-3

- Standard process must include:
 - Organization Goal to be achieved by projects
 - Product characteristics to be taken care of

- Based on organization definitions:
 - Project identifies the goals to be achieved for the project (customization is possible to meet the project requirements)
 - Project identifies the product characteristics applicable for the project
 - Project should also consider customer specific requirements which are not covered in “Organization Goal” & organization level “Product characteristics”.

Rating Rule

GP 2.1.1~ GP 2.1.4

4. Rating guidelines on process capability level 2

[GP 2.1.1]

- ❑ Process Performance Objectives are defined:
 - a) Requirements regarding necessary activities & tasks in order to fulfill the process purpose are considered. This may include:
 - Milestones and/or due dates to be kept
 - Effort
 - Process cycle time or frequency
 - Metrics
 - Usage of qualified human & defined infrastructure resources
 - Quality criteria regarding the process
 - b) Assumptions and constraints are considered, e.g.:
 - Adherence to internal standards
 - Adherence to customer standards, norms, or laws
 - c) Stakeholder requirements have to be considered

Rule ID	Description	Rule
CL2.RL.1	If process objectives do not cover all aspect of a)	✗ P
CL2.RL.2	If process objectives do not cover all aspect of b)	Downrated
CL2.RL.3	If process objectives do not include KPIs but consider a) & b)	No impact

4. Rating guidelines on process capability level 2

[GP 2.1.2]

- ❑ Following aspects must be covered while developing proper plan:
 - a) All requirement activities are defined
 - b) Estimates for the defined process performance attributes (e.g., effort, duration, size of work products, etc.). Requirements regarding necessary activities & tasks in order to fulfill the process purpose are considered.
 - c) Sequence of requirement activities is defined
 - d) A schedule including key milestones in line with stakeholder requirements are defined
 - e) The planning / schedule must:
 - Either include due date, effort, assigned resources, and responsibility (engineering activities)
 - Or as percentage or absolute number of full-time equivalent (MAN.3, SUP.1)
 - f) Work product reviews
 - g) Evidence of planning must available:
 - As part of the project plan
 - As process sceptic document
 - As backlog, task board, Kanban board.
 - As part of an open item link list.

4. Rating guidelines on process capability level 2

[GP 2.1.2]

Rule ID	Description	Rule
CL2.RL.5	If planning does not cover all aspect	Downrated
CL2.RL.6	If planning does not cover the aspects d) and e)	✗ P
CL2.RL.7	If required activities are not separately planned, but cover aspects e) & g)	No impact
CL2.RL8	If supporting activities are not planned explicit activities, but are planned as percentage or absolute hours.	No impact
CL2.RL.9	If no process description including requirement activities and tasks is available, but all aspects above area covered.	No impact

4. Rating guidelines on process capability level 2

[GP 2.1.3]

- ❑ Following aspects have to be monitored:
 - a) the process is performed as planned
 - b) data regarding the defined process performance attributes is continuously collected
 - c) actual data is continuously compared with planned values (this means also that the granularity of planned and actual data is similar):
 - by comparing actual results in given time/duration/effort (regarding aspect e.1) of GP 2.1.2)
 - by comparing booked effort per cost centre to planned values (regarding aspect e.2) of GP 2.1.2)
 - f) the comparison between planned and actual data should:
 - show the current state of progress,
 - ensure that planned results are achieved, or
 - identify deviations from the plan,
 - be performed in an adequate frequency (e.g., in case of delivery every eight weeks, monitoring and comparison every four weeks is inadequate, more adequate would be a lower frequency)
 - f) documentation of monitoring activities, e.g., as:
 - status report
 - status meeting minutes

4. Rating guidelines on process capability level 2

[GP 2.1.3]

Rule ID	Description	Rule
CL2.RL.10	If the monitoring of the process does not cover the aspects above	Downrated
CL2.RL.11	If the level of detail of planned and actual values does not fit together (or if there is no mapping available) (aspect d).	Downrated
CL2.RL.12	If the frequency of monitoring activities does not fit to the project duration (aspect d).	Downrated

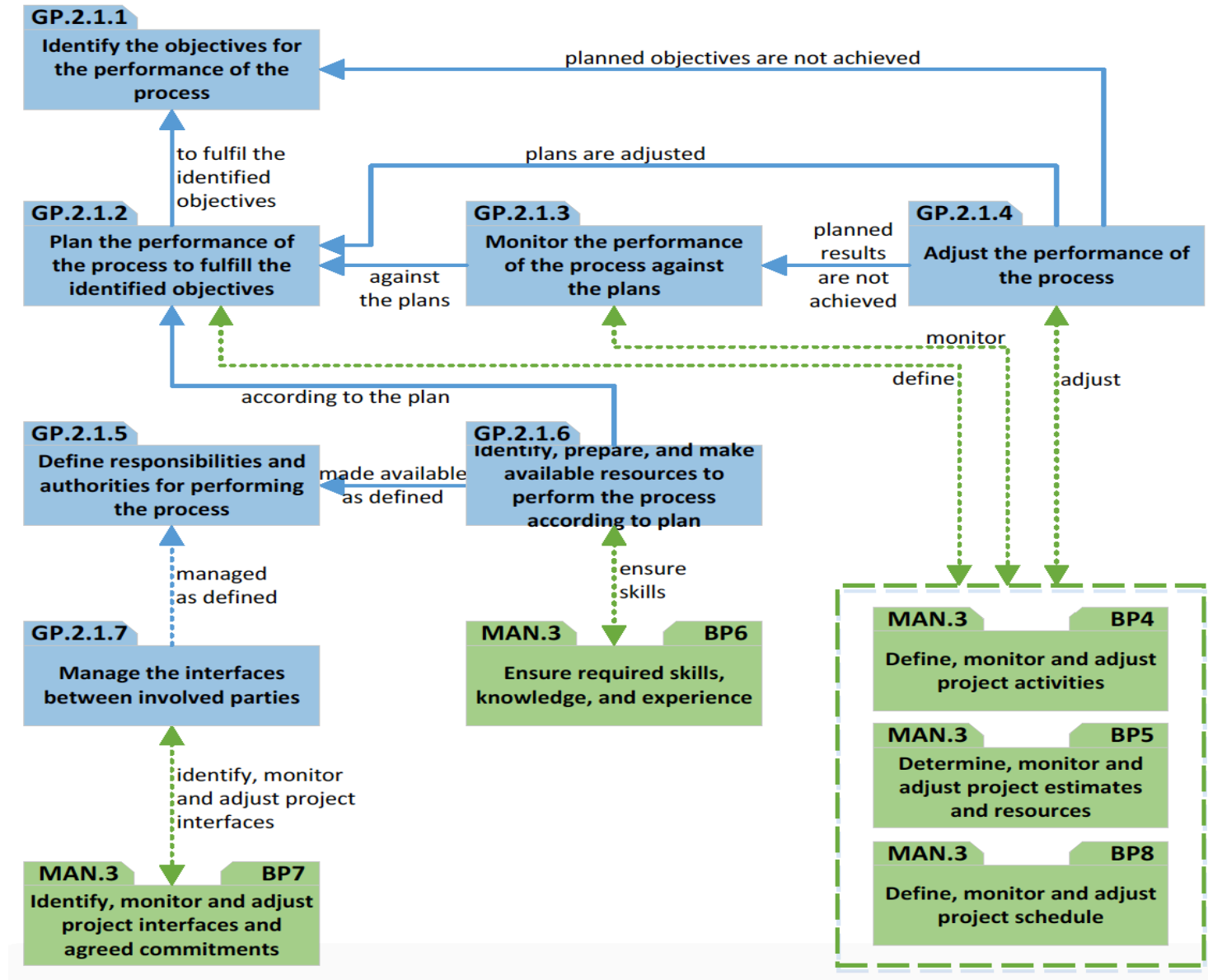
4. Rating guidelines on process capability level 2

[GP 2.1.4]

- ❑ Following aspects have to be covered:
 - a) performance issues have to be identified on the basis of deviations (on basis of the continuously monitored process as required by GP 2.1.3)
 - b) n case of identified deviations regarding the defined process performance attributes (e.g., due dates, effort estimations, resource usage)
 - deviations are analyzed and causes determined, and
 - either corrective measures to align performance with plans have to be taken or
 - plans have to be adapted, and plan changes are still in line with the stakeholder requirements.

Rule ID	Description	Rule
CL2.RL.13	f adjusting the performance of the process does not cover aspect a)	Downrated
CL2.RL.14	If adjusting the performance of the process does not cover aspect b)	Downrated

Rating consistency between GP2.1.x



Q-A Session



Thank you for your attention ...

Contacts

Praveen Pathak

intacs™ Certified Competent Assessor

CMMI-Institute Intermediate Certified

Email: praveen@iqiconsulting.com

Phone: +91-97-1111-5602