



# CKM 楷迈德<sup>®</sup> ASPICE

受 采 纳 的 过 程  
遵 循 简 明 规 则

1st Chinese Edition 中文第一版

Automotive SPICE Guide 指南

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## Introduction to Automotive SPICE ASPICE 简介

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<sup>1</sup>VDA scope <sup>2</sup>extended VDA scope <sup>3</sup>with assessment guideline for rating consistency

<sup>1</sup>VDA 范围 <sup>2</sup>VDA 扩展范围 <sup>3</sup>评定一致性评估指南

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This Knüvener Mackert SPICE Guide offers a wealth of basic and detailed information to help you achieve maximum benefit from Automotive SPICE®.

In the following sections, **red is reserved for the management and supporting processes**, **black is used for the system level**, **blue for the subdomain level**, and **green for the component level**.

This Knüvener Mackert SPICE Guide contains the following sections:

1. An **introduction** to the goals and added value of effective processes and a typical approach to process improvement.
2. An **introduction to Automotive SPICE®** and its application together with agile methods and concepts for functional safety and cyber safety.
3. The processes of Automotive SPICE(R) v3.1
  - 3a. For each practice of the VDA scope the pages and IDs of the related VDA Guideline (1st edition 2017) and recommendations are listed.
  - 3b. For each process of the VDA scope and for the process attributes of level 2 and 3 the rating consistency diagrams from the VDA Guideline (1st edition 2017) are copied.
4. An introduction to **Agile SPICE™** and the process AGL.1.1
5. The processes of **Hardware Engineering SPICE** v2.0
6. The processes of **Mechanical Engineering SPICE** v1.7
7. The process attributes and **generic practices** for capability levels 1 to 5
8. Various instructions for conducting an **assessment** with templates, guidelines and requirements

Knüvener Mackert 楷迈德此 SPICE Guide 指南提供了丰富的基础知识和详细的信息，帮助您最大程度上从 Automotive SPICE® 中受益。

在以下章节中，**红色为管理及支持过程**，**黑色是系统等级**，**蓝色表示子领域等级**，**绿色表示组件等级**。

本Knüvener Mackert 楷迈德 SPICE Guide 指南包含以下部分：

1. **简介**包含有效的过程的目标，和附加值，以及过程改进的典型方法。
2. 对**Automotive SPICE®**的**简介**及其应用，以及敏捷方法，功能安全和网络安全的概念。
3. Automotive SPICE(R) v3.1的过程。
  - 3a. 为每个VDA范围内的实践，列出了VDA Guideline 指南(2017年第1版)相应的页码和ID。
  - 3b. 为VDA范围内的每个过程、2级和3级的过程属性，复制了来自VDA Guideline 指南(2017年第1版)的评定一致性图表。
4. 对 **Agile SPICE™** 的介绍和过程 AGL.1.1
5. **Hardware Engineering SPICE** v2.0 的过程
6. **Mechanical Engineering SPICE** v1.7 的过程
7. 能力等级1级到5级的过程属性和**通用实践**
8. 使用模板、指南和需求对**评估**进行多方位说明

## Automotive SPICE® Guidelines - Rating Consistency Diagrams Automotive SPICE® Guidelines 导论 - 评定一致性图表

The VDA (“Verband der Automobilindustrie”) published Automotive SPICE® Guidelines (1st edition 2017).  
VDA (“Verband der Automobilindustrie”) 于2017年发表Automotive SPICE® Guidelines 导论第一版

### Legend

If practices of the considered process or the considered process attribute are displayed, the corresponding boxes are **blue**, otherwise **green**.

Dependencies between practices of the considered process or process attribute are modeled as lines in **blue**, otherwise in **green**.

If the dependency is based on a rule (RL), the corresponding **solid** line is displayed, otherwise it is **dashed**.

If the evaluation of one practice depends on another, the corresponding line is modeled as an **arrow** to the other practice.

If the lines visualize defined rules (RL) or recommendations (RC), the corresponding numbers (postfixes of the IDs) are listed.

### 说明

若所展示的实践与所列的过程或过程属性相对应，则相应的框为**蓝色**，否则为**绿色**。

实践与所列的过程或过程属性之间存在依赖性，则线为**蓝色**，否则为**绿色**。

若依赖性基于规则 (RL)，则相应的线为**实线**，否则为**虚线**。

若一个实践的评估依赖于另一个实践，则相应的线为由一个指向另一个的**箭头**。

若线显示定义的规则 (RL) 或建议 (RC)，则会列出相应的数字 (ID的后缀)。



**Example 1:** the solid blue arrow visualizes the rule that the rating of one BP depends on another BP of the process under consideration.

**示例1：**实线蓝色箭头表示，在所列过程里，对一个基本实践(BP)的评定依赖于另一个基本实践(BP)。



**Example 2:** the dotted green arrow visualizes a recommendation that the rating of one BP should depend on another BP which is outside the process under consideration.

**示例2：**虚线绿色箭头表示，建议(RC)对一个基本实践(BP)的评定应该依赖于另一个不在所列过程里的基本实践(BP)。

KnüvenerMackert would like to thank the VDA for permission to publish rating consistency diagrams based on the diagrams in the VDA Automotive SPICE® guidelines.

KnüvenerMackert 楷迈德在此鸣谢 VDA 允许我们根据 VDA Automotive SPICE® guidelines 导论中的图表发布评定一致性图表。

The VDA ("Verband der Automobilindustrie") has published rules and recommendations in the VDA Automotive SPICE® Guideline (1st edition 2017). These rules and recommendations are used as rating guidelines in an assessment. They are structured according to

- specific terms (traceability and consistency (TAC), summarize and communicate (SAC), verification criteria (VEC), strategy and plan (SAP)),
- application in specific environments (model-based development (MBD), agile environments (AGE), distributed development (DID), management of third-party software (TPS), management of platform and legacy software (PLS), application parameters (APA)),
- specific processes (VDA scope) or process attributes (level 1 to 3).

All relevant rules and recommendations for a specific practice of the VDA scope are divided into up to 6 different chapters and even more different sections. To facilitate the overview of the rules and recommendations relevant to a practice, this ASPICE guide lists the page numbers and IDs of the rules (RL) and recommendations (RC) under the practice, e.g., for MAN.3.BP1 on page 64 (DID.RL.1), page 72 (PLS.RC.1) and on page 198 (MAN.3.RL.1, MAN.3.RL.2, MAN.3.RL.3, MAN.3.RC.1, MAN.3.RC.2).

VDA ("Verband der Automobilindustrie") 已在 VDA Automotive SPICE® 指南（2017年第1版）中发布了规则和建议。这些规则和建议在评估中用作评定指南。它们是根据

- 特定术语 (可追溯性和一致性 (TAC), 总结和沟通(SAC), 验证标准 (VEC), 策略和计划 (SAP)),
- 特定环境中的应用 (基于模型的开发 (MBD), 敏捷环境 (AGE), 分发开发 (DID), 第三方软件管理 (TPS), 平台及遗留软件的管理(PLS), 应用参数 (APA)),
- 特定过程 (VDA 范围) 或过程属性 (1 到 3 级)。

VDA 范围内特定实践的所有相关规则和建议最多分为6个章节，且章节分为更多不同部分。为了便于对与实践相关的规则和建议进行概述，本 ASPICE 指南列出了实践下的规则 (RL) 和建议 (RC) 的页码与ID。例如：MAN.3.BP1 在 64页(DID.RL.1), 72 页 (PLS.RC.1) 以及198 页(MAN.3.RL.1, MAN.3.RL.2, MAN.3.RL.3, MAN.3.RC.1, MAN.3.RC.2)。

**BP 1** Define the scope of work. Identify the project's goals, motivation and boundaries. [OUTCOME 1]

**定义工作范围。** 识别项目的目标、动机和边界。[成果1]

|                                 |
|---------------------------------|
| 64: DID.RL.1                    |
| 72: PLS.RC.1                    |
| 198: MAN.3.RL.1-3, MAN.3.RC.1-2 |

KnüvenerMackert thanks the VDA for the permission granted to list the page numbers and IDs of the rules and recommendations in this form following the Practices.  
KnüvenerMackert 在此感谢 VDA 允许我们在实践后面的表格中列出规则和推荐的页码与ID。

# INTRODUCTION TO PROCESS QUALITY

## 过程质量简介

## Why process quality? 为什么看重过程质量?

ASPICE® supports the quality of your daily processes

ASPICE® 为您的日常过程质量提供帮助



### **Increase quality**

- Work products (WPs) are based on qualified input
- WPs are verified and validated based on criteria
- WPs are produced as planned and scheduled
- Organizational Learning due to improved standards



### **Reduce cost**

- Early identification and correction of lacks
- Proven processes and templates; experienced team
- Transparent and smooth progress
- Do it right the first time
- Less duplicated work, re-work and extra work
- Productivity increase



### **Manage risks and complexity**

- Manage risks effectively and in time
- Develop increasing functionality in reduced time



### **Meet customers expectation – current and future business**

- Avoid penalty (payments and/or 'high' awareness)
- Win quotations (positive supplier ranking, flexibility)



### **For your own sake**

- Less priority hopping
- Clear responsibilities
- Pride in one's own work
- Less discussions
- No double work
- <please add your personal points here>
- ...



### **提高质量**

- 工作产品 (WPs) 基于合格的输入
- 工作产品 (WPs) 根据准则进行验证与确认
- 按照计划与进度表生产工作产品 (WPs)
- 提高标准带动组织学习



### **降低成本**

- 早期识别并纠正不足
- 经过验证的过程与模板; 经验丰富的团队
- 透明且顺利的过程
- 第一次就做到位
- 减少重复工作、返工及额外工作
- 提高生产率



### **管理风险与复杂性**

- 有效及时地管理风险
- 在更短时间内开发出更多功能



### **满足客户期望——当前及未来业务**

- 避害 (违约金以及/或坏名声)
- 赢得竞标 (良好的供应商排名, 灵活性)

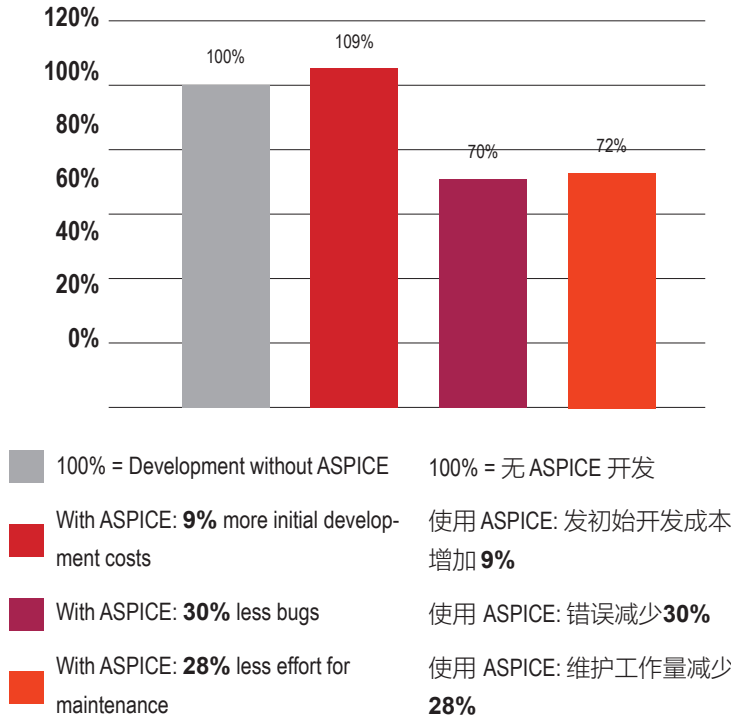


### **您自己的原因**

- 减少对优先次序的“越级”
- 清晰的职责
- 以自己的工作为荣
- 减少讨论
- 避免重复工作
- <请在此处添加您的个人观点>
- ...



## How to invest in quality and cost saving 如何投资于质量和节约成本



Source: Paolo Panaroni, Luca Fogli, Why Automotive SPICE?, IntecsSolutions 2017

资料来源: Paolo Panaroni, Luca Fogli, <为何选择 Automotive SPICE?>, IntecsSolutions 2017

### Provided example:

#### Realization of one complex function

- 280 errors of A or B priority in a C sample costs 2.184.000 US\$.  
**Saving by ASPICE (30%): 655.000 US\$**
- 80 open of A or B priority in SOP costs 6.760.000 US\$.  
**Saving by ASPICE (30%): 2.028.000 US\$**

Source: Frank Lenkeit (K-GQX-S/2), Volkswagen AG,

17 Jahre Automotive SPICE ohne Fortschritt? Gate4SPICE – Berlin 12.06.2018

### 示例

#### 复杂功能的实现

- 样本C中的280个A或B优先级错误成本为2.184.000美元。  
**通过ASPICE节省 (30%) : 655.000美元**
- 在SOP中的80个A或B优先级未解决成本为6.760.000美元。  
**通过ASPICE节省 (30%) : 2.028.000美元**

资料来源: Frank Lenkeit (K-GQX-S/2), 大众汽车公司, 17 Jahre Automotive SPICE ohne Fortschritt?

Gate4SPICE – 柏林 12.06.2018

### Cost of error correction

#### 纠错成本

|                      |            |                          |              |
|----------------------|------------|--------------------------|--------------|
| Concept phase(概念阶段): | \$1.300,00 | SOP(标准操作程序):             | \$84.500,00  |
| A Sample(样品A):       | \$4.550,00 | Production(产出):          | \$104.000,00 |
| B Sample(样品B):       | \$5.200,00 | Ahead of customer(先于客户): | \$117.000,00 |
| C Sample(样品C):       | \$7.800,00 |                          |              |

"Source: Study Audi, BMW, Daimler, Porsche and Volkswagen; Seidler, Southworth, ASPICE Made Easy-Case Studies and Lessons Learned, IBM Rational Automotive Engineering Symposium 2013"

"资料来源: 研究奥迪、宝马、戴姆勒、保时捷和大众; 赛德勒、索斯沃思, ASPICE轻松案例研究和经验教训, 2013年 IBM Rational 汽车工程研讨会"

## How effective are your processes? 您过程的多有成效?

### WHAT MATCHES BEST? 哪些与您更相符?

#### Reduction of quality cost 降低质量成本

- Fewer quality issues and lower warranty cost  
减少质量问题, 降低保证成本
- Early error identification and correction  
早期错误的识别与纠正
- Global learning and prevention  
全球性的学习与预防

☐ or 或 ☐

- Increasing number of quality issues  
越来越多的质量问题
- Poor rectification of root causes  
根本原因的整改不力
- Checks are late or incomplete 检查迟缓或不完整
- Poor / unknown product component mature  
不良/未知的产品组件成熟度

#### Managed risks 风险管理

- Early risk identification  
识别早期风险
- Systemic risk tracking and mitigation  
跟踪并缓解系统化风险
- Certifications are easy to achieve  
容易获得认证

☐ or 或 ☐

- Problems appear ,suddenly'  
问题“突然”出现
- Reputation drops 声誉下降
- Certifications are missing or at risk  
认证丢失 (或有丢失) 的风险
- New bids are hard to win (e.g. for Safety)  
新投标很难中标 (例如: 出于安全考虑)

#### Increase of productivity 提高生产力

- People concentrate on their tasks efficiently  
员工专注于高效完成任务
- Templates and tools are aligned to standards  
模板与工具都符合标准
- Limited maintenance cost for standard tools  
有限的标准工具维护成本

☐ or 或 ☐

- Fire fighting 忙于“救火”
- Unclear responsibilities  
职责不清
- Priority hopping  
优先级“越级”
- Poor tool alignment to specific ways of working  
工具与特定工作方式的一致性不良

#### Customer Satisfaction 客户满意度

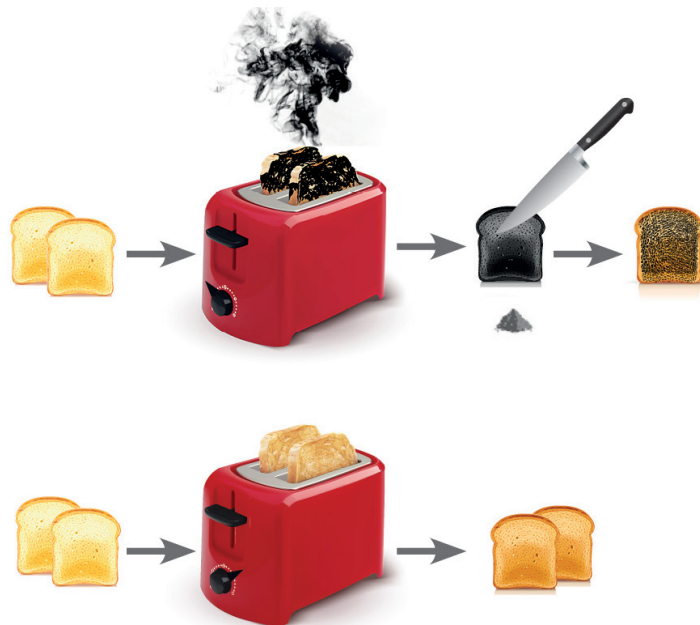
- Flexibility within distributed development  
分布开发中的灵活性
- Detailed insight into progress and status  
详细了解过程与状态
- Easy adaption of products, standards, and tools to project and culture needs  
产品、标准和工具易于根据项目和文化需求进行调整

☐ or 或 ☐

- Internal and external deliverables are late, incomplete, or of poor quality  
内外部交付迟缓、不完整或质量差
- Deliveries are difficult to integrate  
难以集成交付
- Needed flexibility results in extraordinary cost  
所需的灵活性导致成本不菲

## How to benefit from Automotive SPICE® 如何从Automotive SPICE®中获益

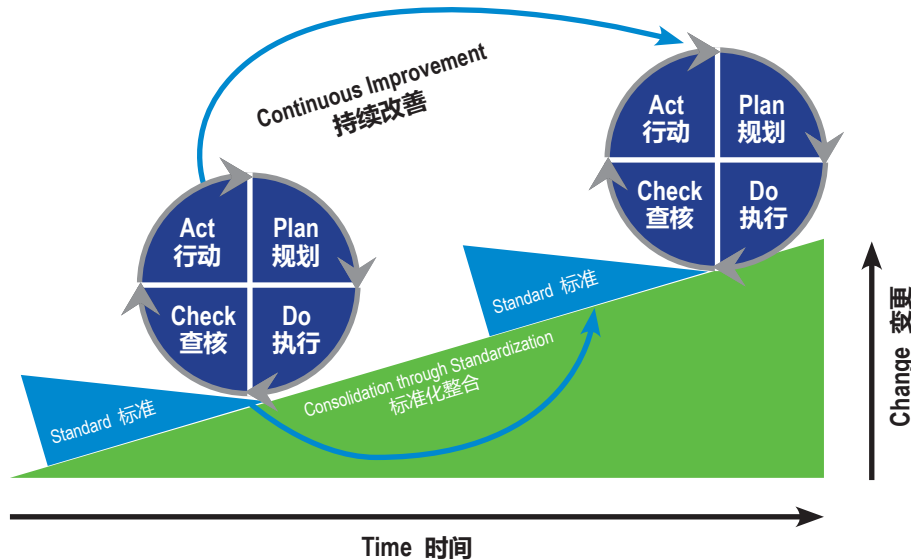
- Identification of development risks and capabilities associated with suppliers of mechatronic systems  
识别与机械系统供应商相关的开发风险与能力
- Identification of risks and capabilities in your own development  
识别自身发展中的风险与能力
- Benchmarking for strengths and potentials of development processes of a project or an organizational unit  
为项目或组织单元开发过程的优势和潜力设立基准
- Evaluation of implemented process changes  
评估已实施的过程变更
- Improve transparency, quality and productivity by clarifying and tracking the responsibilities within the development  
通过明确和跟踪开发中的职责来提高透明度、质量和生产率



**FIX THE PROCESS TO ACHIEVE QUALITY**  
**校正过程以达成目标质量**

## How organizations learn systematically 组织应如何系统地学习

Organizations learn only by improving the standard  
组织须通过不断提升标准来学习



### Plan 计划:

- Inform about ASPICE and define goal  
讲解ASPICE并定义目标
- Analyze where you are  
分析现状
- Plan the roadmap for improvement  
规划改进路线图
- Enable persons and infrastructure for change  
使人员和基础设施有实现变更的能力

### Do 执行:

- Make the management commitment continuously visible  
确保管理承诺持续可见
- Define and agree on process interfaces  
定义并约定过程接口
- Develop the process solution steps with the people  
与相关人员一起开发过程方案步骤

### Check 查核:

- Try the new process solution step-by-step  
逐步尝试新的过程方案
- Check and improve the process and templates  
查核并改进过程和模板

### Act 行动:

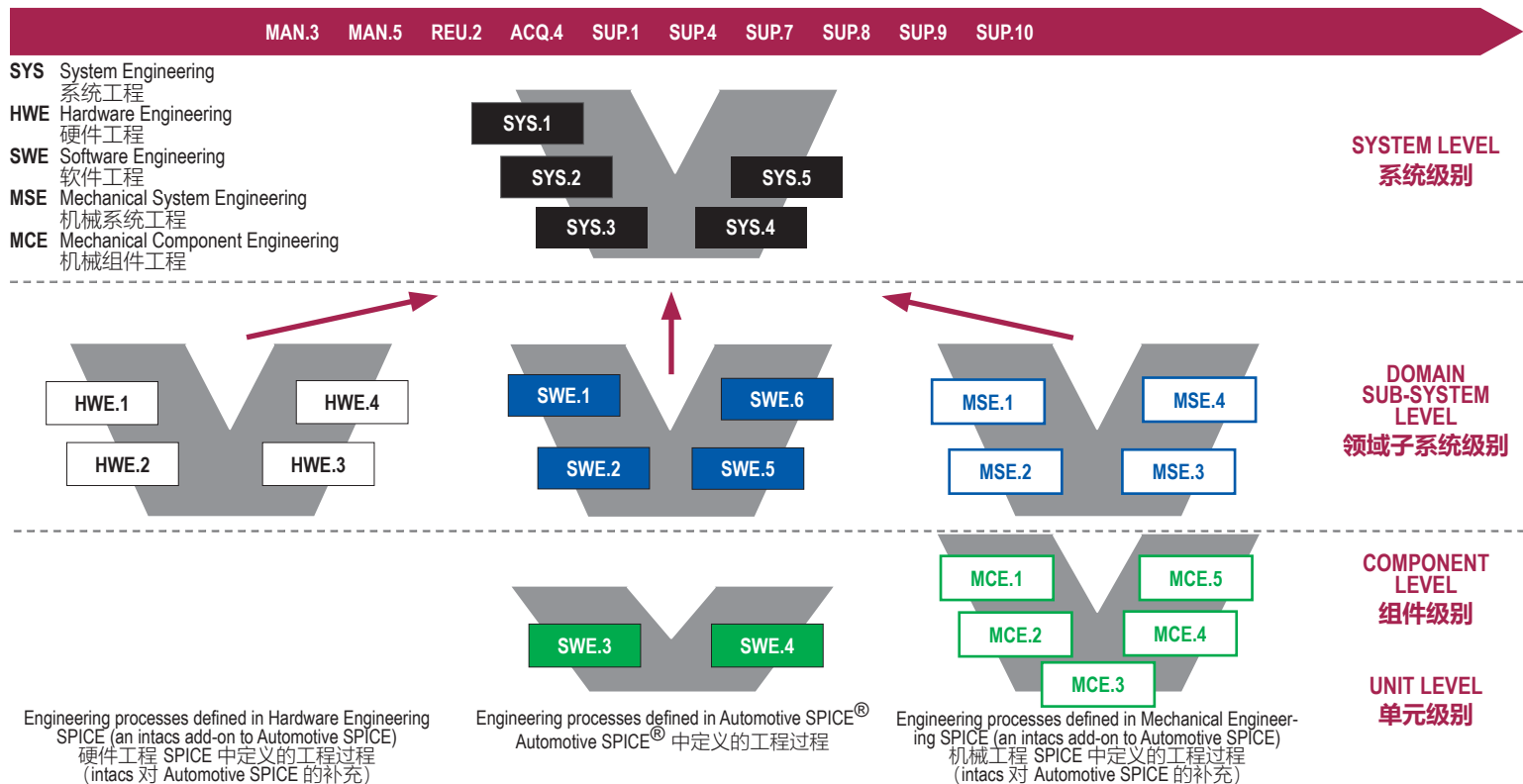
- Plan and execute the process trainings and roll-out  
计划并执行过程培训; 推行

# INTRODUCTION TO AUTOMOTIVE SPICE®

## AUTOMOTIVE SPICE® 简介

Automotive SPICE® is a standard used for improving and evaluating development processes of mechatronic systems. It is a framework which applies to traditional or agile developments. It supports the engineering of products which are critical according to safety or security. With the "Plug-in concept" of Automotive SPICE® version 3.x the processes for development of mechanical and EE parts are more and more in focus.

Automotive SPICE® 是用于改进和评估机械系统开发过程的标准。它是一个适用于传统或敏捷开发的框架。它支持产品工程，根据安全(safety)或安全(security)，这是十分关键的。通过Automotive SPICE® 第3.x版的“插件概念”，机械和EE部分的开发过程越来越受关注。





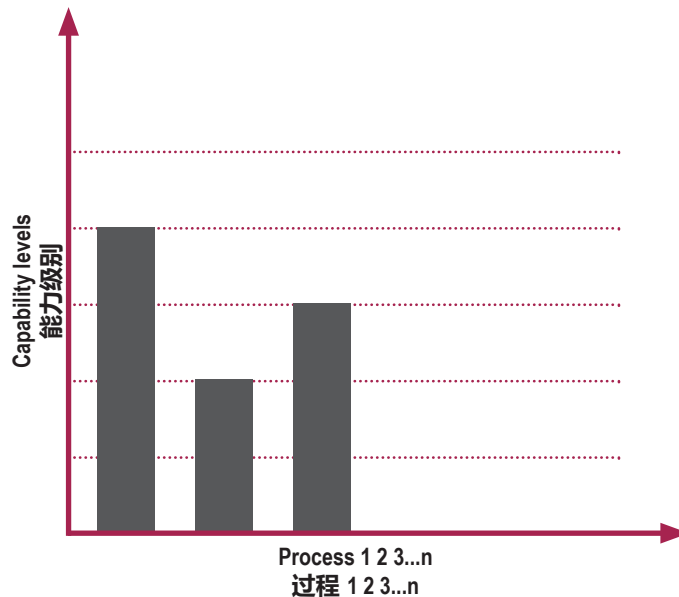
## 2 Dimensions of Automotive SPICE® Automotive SPICE®的两个维度

The concept of process capability determination by using the Automotive SPICE® assessment model is based on a two-dimensional framework. The framework consists of a process dimension and a capability dimension.

使用 Automotive SPICE® 评估模型来确定过程能力的概念是基于一个二维框架。框架包括过程维度与能力维度。

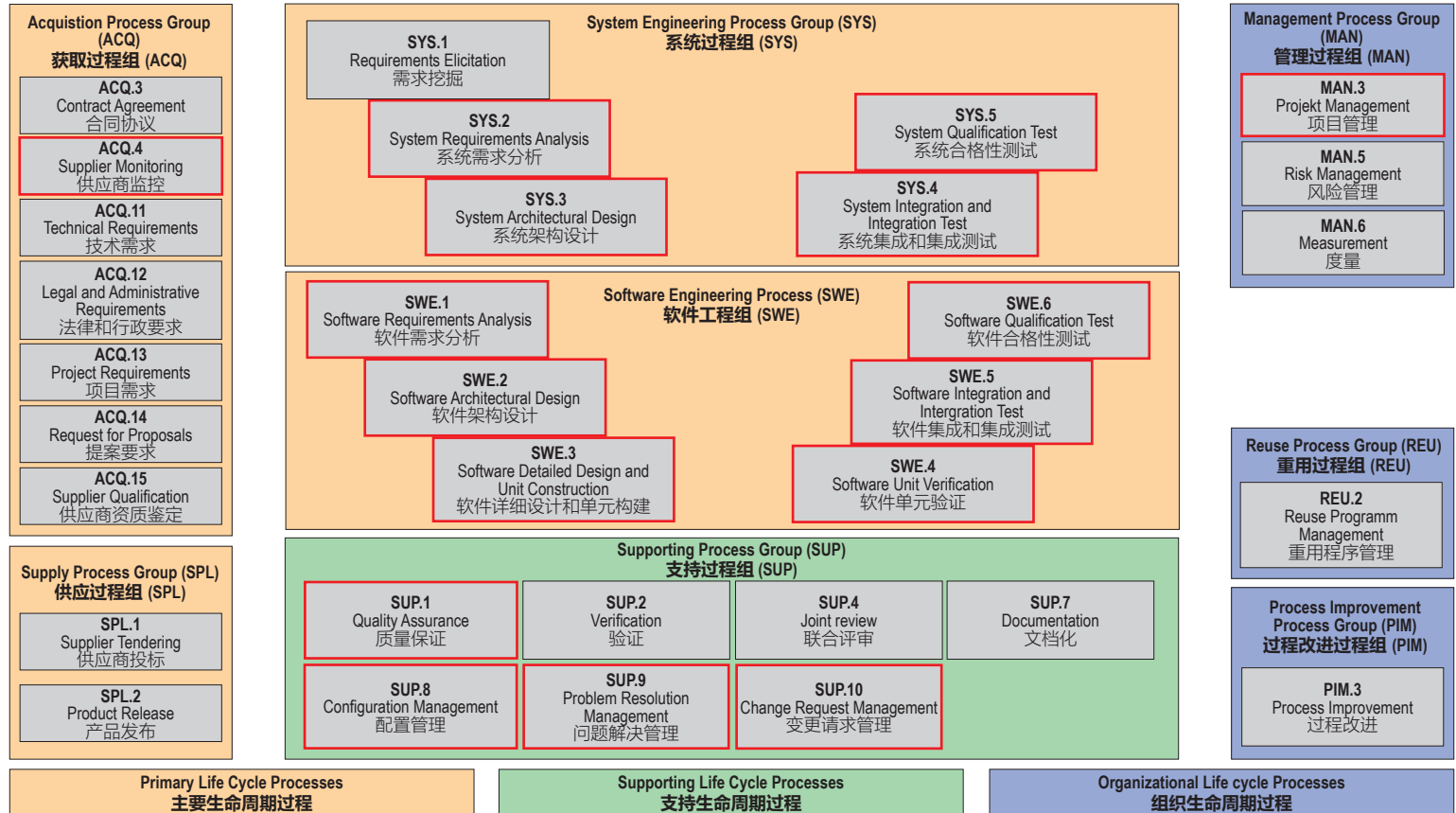
### Capability dimension 能力维度

- Capability levels 能力级别
- Process attributes 过程属性
- Rating 评定
  - Scale 尺度
  - Rating method 评定方法
  - Aggregation method 聚合方法
- Process capability level model 过程能力模型



### Process dimension 过程维度

- Domain and scope 领域和范围
- Processes with purpose and outcomes 过程目的和成果



Explanation: Red frame = processes of VDA scope  
说明: 红色框 = VDA 范围内的过程

Investing in process improvement led by the OU-wide quantitative feedback and causal analysis resolution.

投入到由组织单位范围内的量化反馈与因果分析解决引导的过程改进中。

Quantitative data about process performance is measured, recorded and statistically analysed to allow objective decisions.

对过程实施的量化数据进行度量，记录，统计分析以做出客观决策。

A set of specific standard processes for the organization is used. The organization learns by improving the standards.

为组织使用一组特定标准过程。组织可以通过改进标准来学习。

#### Capability Level 2 Managed 能力等级1级 已管理

PA.2.1 Performance Management 实施管理

PA.2.2 Work Product Management 工作产品管理

Performance is controlled (planned, monitored, adjusted) and responsibilities are defined. Results are quality checked and managed.

对实施进行控制（计划，监控和调整）并定义职责。对结果进行质量检查和管理。

#### Capability Level 1 Performed 能力等级1级 已执行

PA.1.1 Process Performance 过程实施

Process outcomes are achieved.  
实现过程成果。

#### Capability Level 0 Incomplete 能力等级0级 不完整

Process results are incomplete or inappropriate.  
过程结果不完整或不合适。

#### Capability Level 3 Established 能力等级1级 已建立

PA.3.1 Process Definition 过程定义

PA.3.2 Process Deployment 过程部署

**FIRST STABLE LEVEL\***  
首层稳定的等级\*

#### Capability Level 4 Predictable 能力等级1级 可预测

PA.4.1 Process Measurement 过程度量

PA.4.2 Process Control 过程控制

#### Capability Level 5 Innovating 能力等级1级 创新的

PA.5.1 Process Innovation 过程创新

PA.5.2 Process Innovation Implementation 过程创新实施

\* By experience, lower Capability Levels are not stable i.e. either increase or decrease over a period of about 18 months.

\* 根据经验，较低的能力等级不稳定，即在约18个月内能力水平可能会出现提升或降低。

In addition to capability evaluations of single processes, the capability level of an entire organization may be evaluated. One refers to Organizational Maturity Levels (OML) in this case. 除了对单个过程进行能力评估以外，还可以评估整个组织的能力等级。在此情况下指的是组织成熟度等级 (OML)。

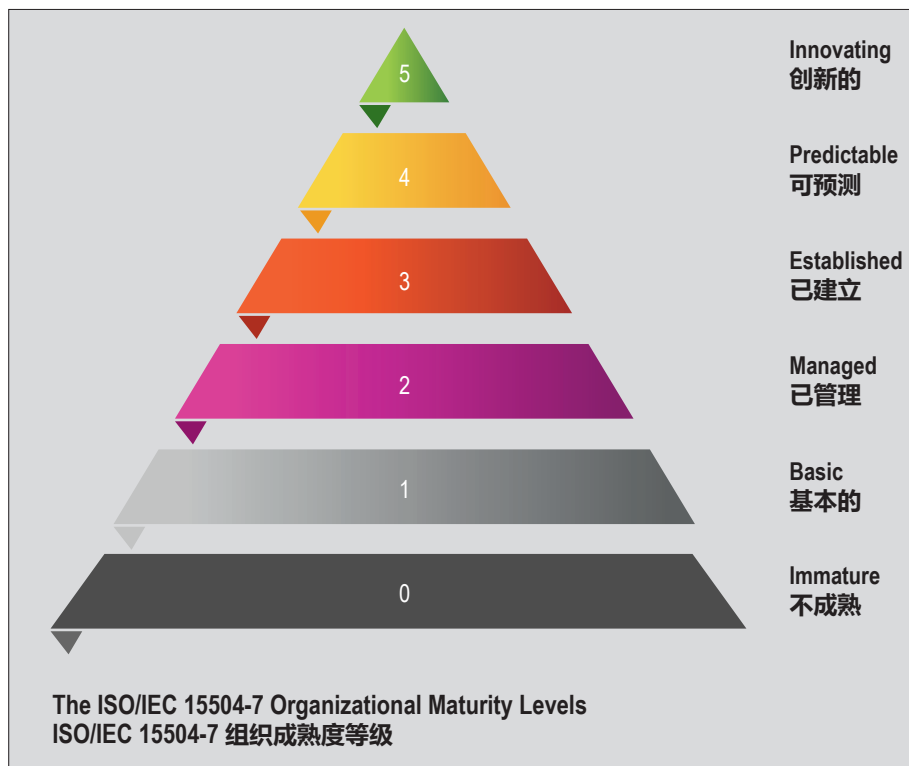
Project assessments dominate currently, but the interest in Organizational Maturity Assessments is growing because of the desire to reduce the effort needed for assessments. 目前，项目评估占主导地位，但出于希望减少评估所费的工时，对组织成熟度评估的兴趣正在与日俱增。

Organizational assessments examine the entire company, including a majority of its projects. Ultimately, it is the organization that makes it possible for the employees in the projects to apply processes effectively.

组织评估需要检查整个公司，包括大部分项目。最终，员工能否在项目中有效地应用过程取决于组织。

These organizational assessments evaluate the capability and maturity of the company, to deliver quality systematically. The basis for this assessment is ISO / IEC 15504-7, which defines the concept of "Organizational Maturity Model". In assessments multiple process instances are investigated.

组织评估将评估公司系统化交付质量的能力与成熟度。此评估基于定义了“组织成熟度模型”概念的ISO/IEC 15504-7。在评估中，将调查多个过程实例。



## Basic Process Set: VDA Scope

- SYS.2-5 System Engineering
- SWE.1-6 Software Engineering
- MAN.3 Project Management
- ACQ.4 Supplier Monitoring
- SUP.1 Quality Assurance
- SUP.8 Configuration Management
- SUP.9 Problem Resolution Management
- SUP.10 Change Request Management

## Extended Process Set Level 2:

- SYS.1 Requirements Elicitation
- MAN.5 Risk Management
- MAN.6 Measurement
- ACQ.3 Contract Agreement
- SUP.4 Joint Review
- SPL.2 Product Release

## Extended Process Set Level 3:

- ORG.1 Process Establishment
- ORG.4 Skill development
- PIM.3 Process Improvement
- REU.2 Reuse Program Management (recommended)

## Extended Process Set Level 4 and 5:

- QNT.1 Quantitative Performance Management (Level 4)
- QNT.2 Quantitative Process Improvement (Level 5)

## 基本过程组: VDA 范围

系统工程  
软件工程  
项目管理  
供应商监控  
质量保证  
配置管理  
问题解决管理  
变更请求管理

## 扩展过程组 2 级:

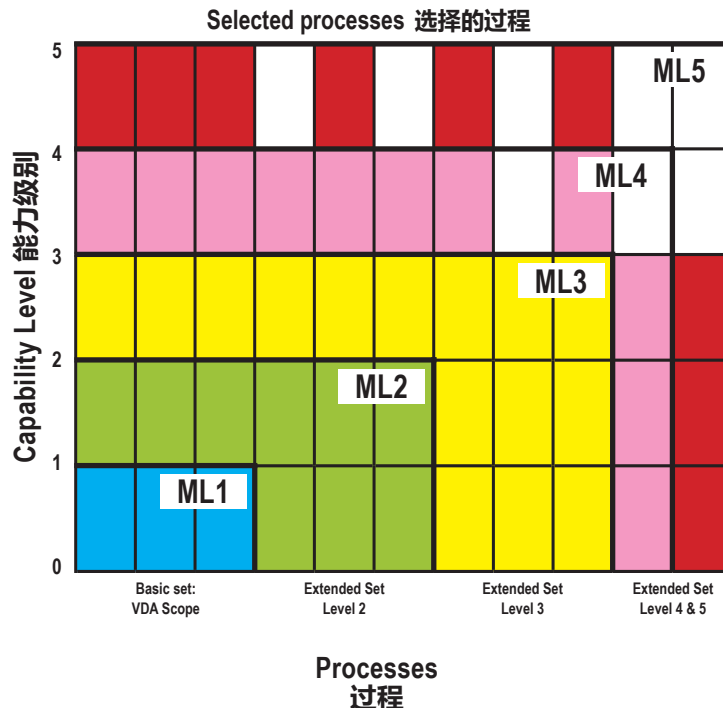
需求挖掘  
风险管理  
度量  
合同协定  
联合评审  
产品发布

## 扩展过程组 3 级:

过程建立  
技能开发  
过程改进  
重用程序管理

## 扩展过程组 4 级 5 级:

定量实施管理 (4级)  
定量过程改进 (5级)



ISO/IEC TR 15504-7 Figure 2 - Rules for deriving maturity levels (ML) from capability levels "Equivalent Staging".  
ISO/IEC TR 15504-7 图2——从“等效阶段”能力级别导出成熟度级别 (ML) 的规则。

## AUTOMOTIVE SPICE® KEY CONCEPTS

## AUTOMOTIVE SPICE® 关键概念



### 1. Use qualified input to aim qualified output

#### 使用合格的输入来达到合格的输出

Each expert shall perform the work using **qualified input** and shall provide **qualified output** to the next one in the value chain. *Hints:*

每位专家均应使用**合格的输入**来进行工作，并应向价值链中的下者提供**合格的输出**。提示：

- Divide the work into small tasks (e.g. < 40h)  
把工作分成小任务（例如<40小时）
- Get the tasks 'done' continuously one after another  
逐个进行，完成任务
- Qualify and approve the work products continuously  
持续对工作产品进行鉴定与批准
- Use clear criteria and efficient methods to qualify  
使用明确的准则和有效的方法进行鉴定

### 2. Agree and summarize

#### 约定与总结

Engineering processes:

工程过程：

- **Agree** on requirements and design 达成需求与设计**共识**
- **Summarize** results of step-by-step verification **总结**逐步验证的结果

Management and support processes:

过程管理与支持：

- **Agree** on strategies, plans and schedules 约定策略、计划和时间表
- **Summarize** the results and report to relevant parties **总结**结果并向相关方报告

### 3. Divide and control

#### 分离与控制

On system, domain, sub-domain and component level:

在系统，领域，子领域与组件级别：

1. **Specify** and **design** the solution.  
**定义并设计**解决方案。
2. **Delegate to lower level** OR implement solution on unit level.  
**下放到较低层级**或在单元级别实施解决方案。
3. **Integrate** and **verify integration** against the design before **qualifying** the solution against the specification.  
在依照规范**鉴定**解决方案之前，依照设计**集成并验证集成**。

### 4. Traceability

#### 可追溯性

Each item (requirement, design element, implementation, test case / result, finding, scheduled activity, ...) has to have a **reference to its source and to its verification**.

每个项（需求，设计要素，实施，测试用例/结果，发现，安排活动.....）都必须**引用其来源及验证**。

The traceability is used ... 使用可追溯性.....

- ... to check for **consistency**,  
.....来检查**一致性**
- ... to analyze its **impact** and  
.....来分析其**影响**并
- ... to show **completeness**.  
.....显示**完整性**。

## Qualification Test Versus Integration Test 合格性测试与集成测试

Some processes have similar purpose, but differ in their level of detail:

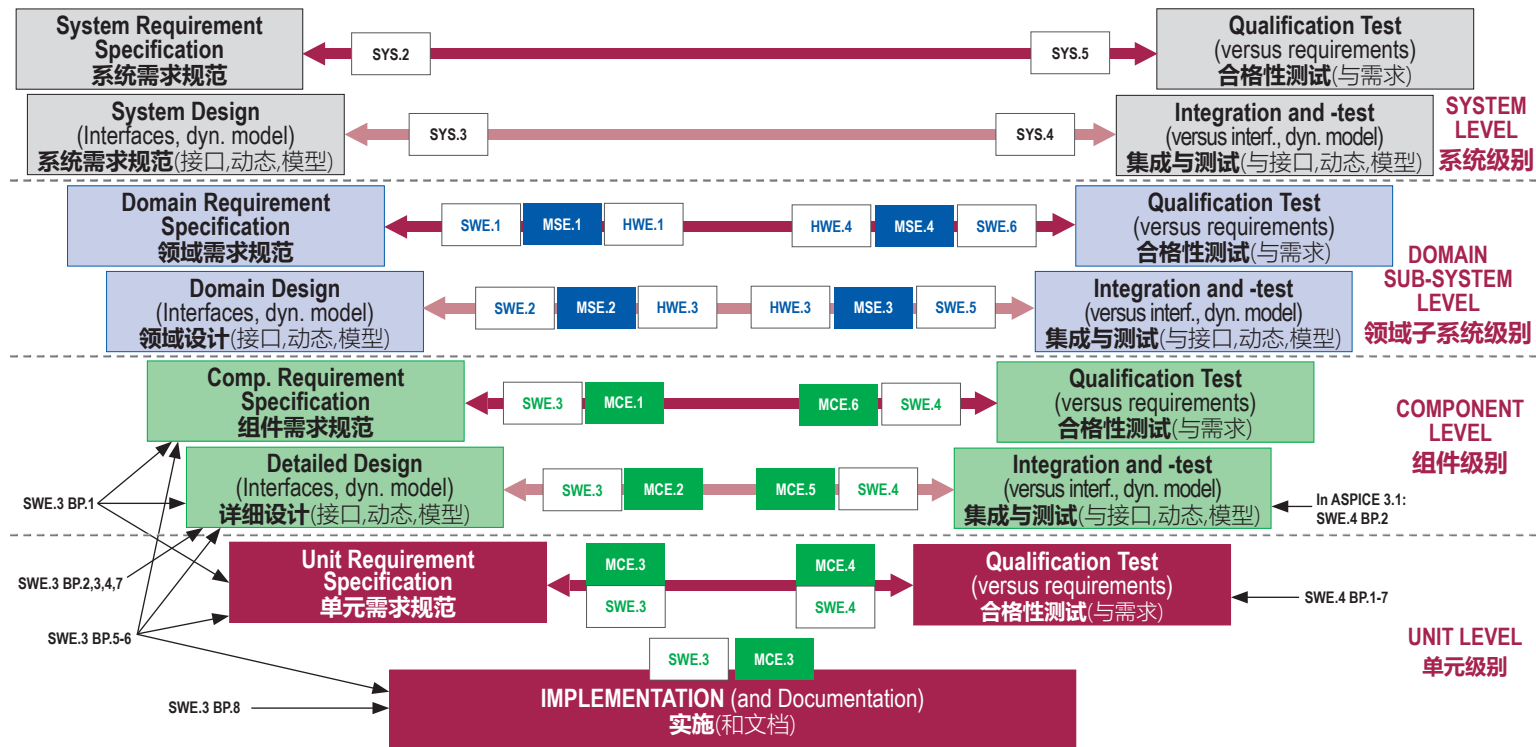
**Left:** In requirements processes the problem is specified; In design processes the planned solutions, their structure elements, interfaces and dynamic behavior are specified

**Right:** Tests verify the test object either versus the related specification (dark red) or versus the related design (light red)

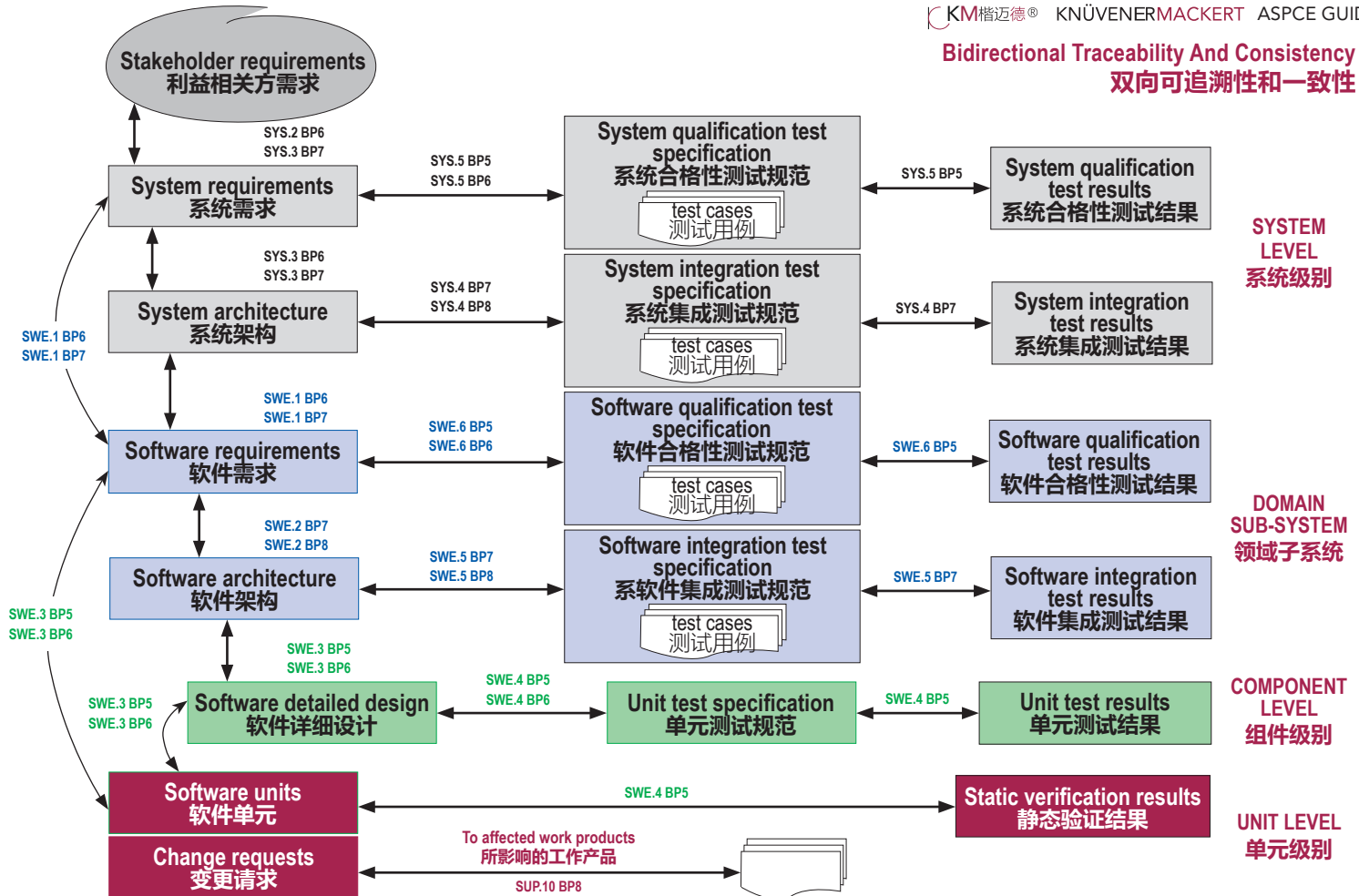
某些过程的目标相似，但详细程度有所不同：

**左：**在需求过程中定义问题，在设计过程中，定义计划的解决方案，他们的结构要素，接口以及动态行为。

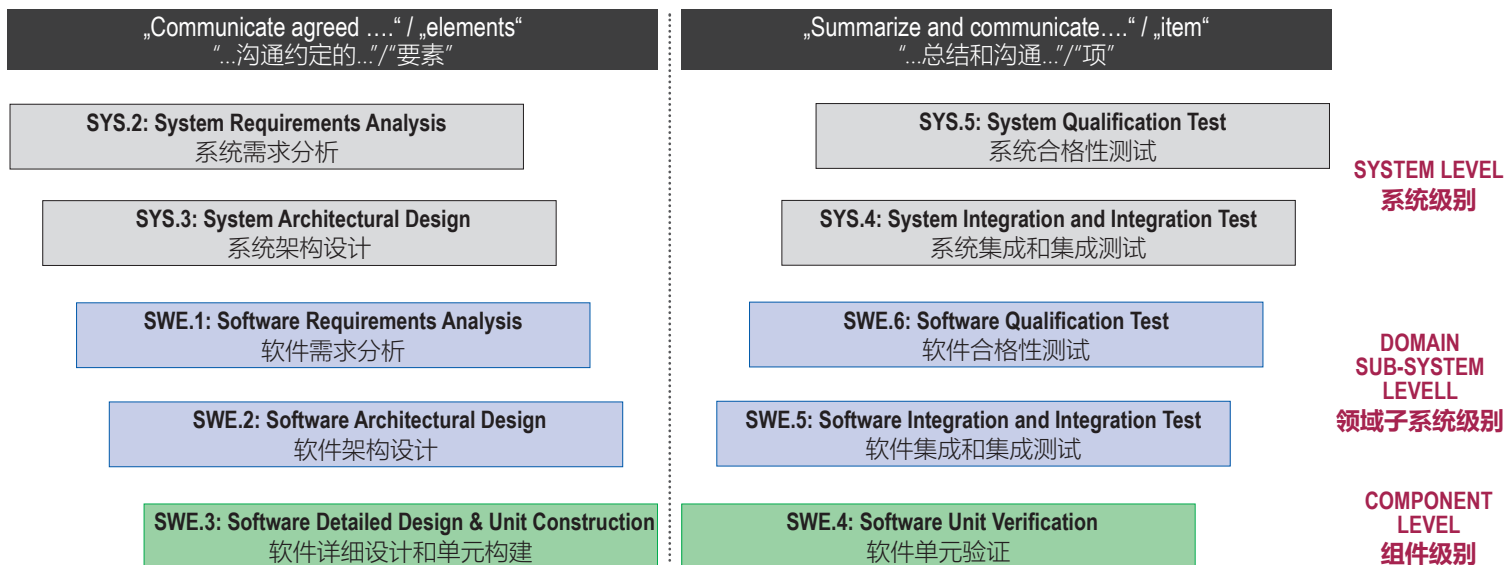
**右：**测试根据相关的规范(深红色)或相关的设计(浅红色)验证测试对象。

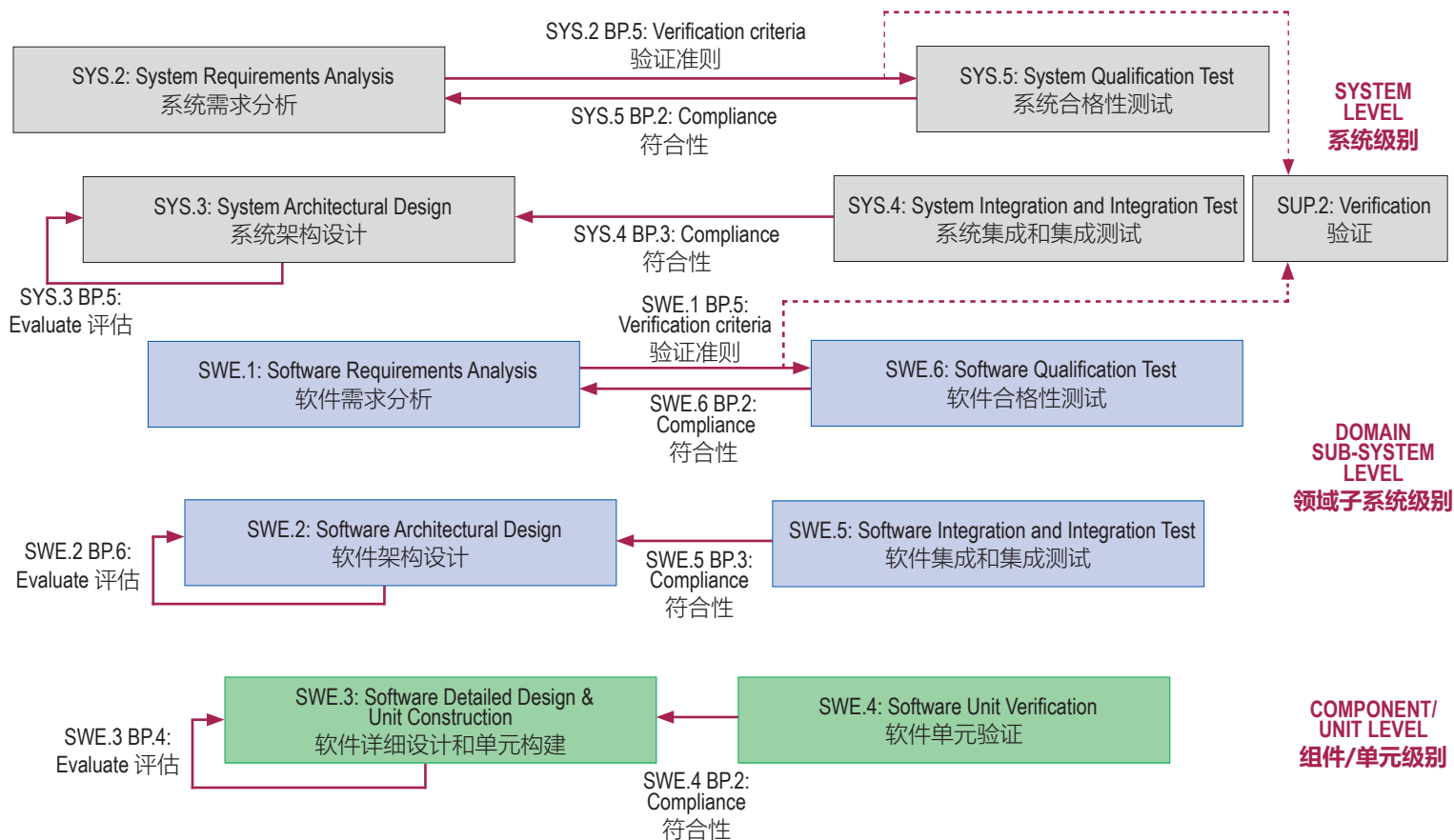


## Bidirectional Traceability And Consistency 双向可追溯性和一致性

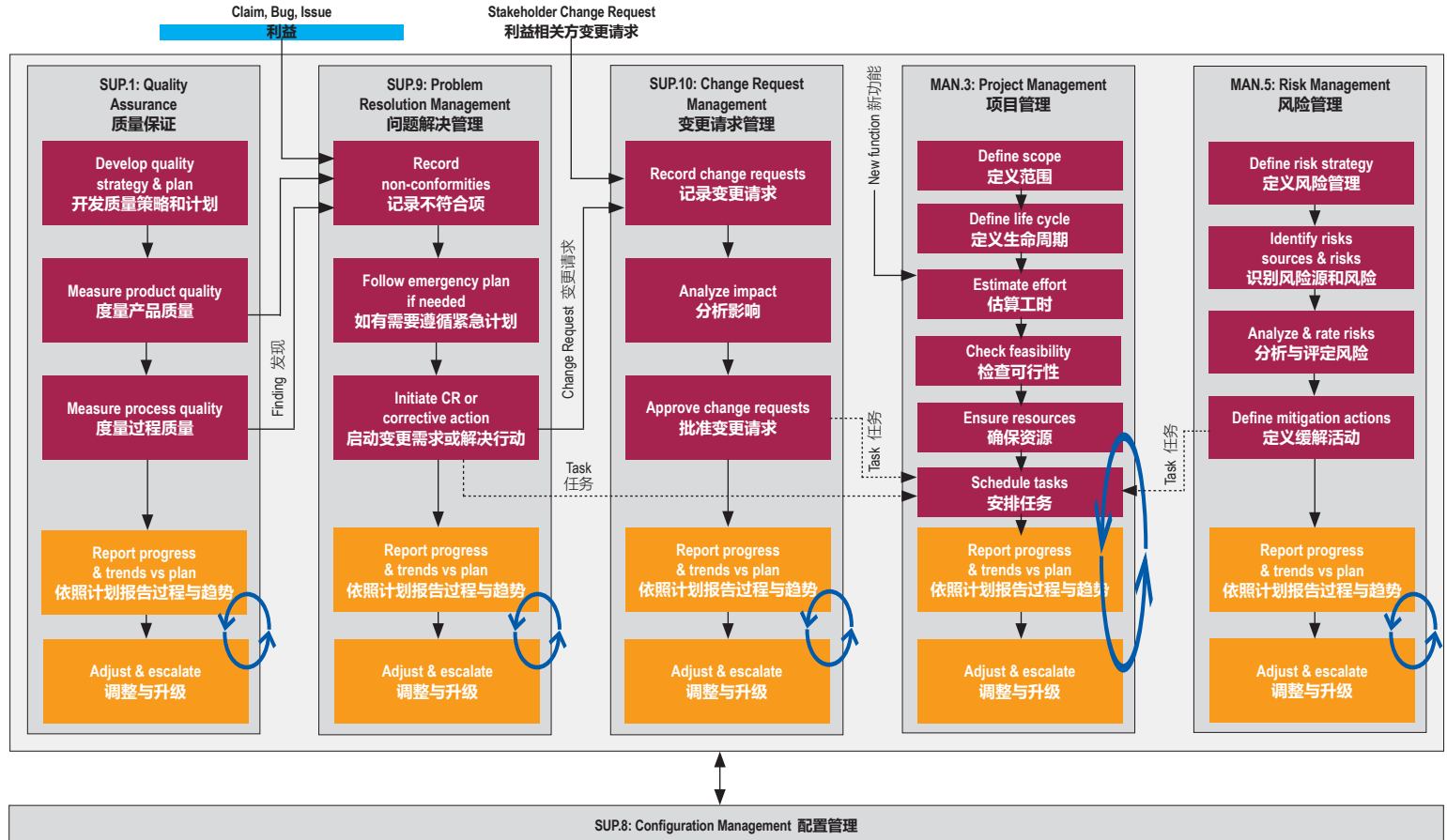


- “Communicate agreed” – there is a joint understanding between affected parties of what is meant by the content of the work product.  
“沟通约定的” —— 指的是在受影响方之间对工作产品的内容有共同的理解。
- “Summarize and communicate” refers to abstracted information resulting from test executions made available to all relevant parties.  
“总结和沟通” —— 指的是测试执行所产生的抽象信息对所有相关方是可用的。
- Note: both concepts do **not** mean formal approval or confirmation (this would be GP 2.1.7 at CL 2).  
注：两个概念**不**代表需要正式的批准或确认（像在2级能力级别GP2.1.7上要求的那样）。
- Note: a part of a specification or design is called “Element” (left); a part of the product is called “Item” (right)  
注：规范或设计的一部分被称为“要素”（左）；产品的一部分被称为“项”（右）





## An interpretation of the main Automotive SPICE® management and support processes 对主要Automotive SPICE® 管理和支持过程的解释





## How to apply the process elements? 如何应用过程要素?

... for process improvement?  
为实现过程改进.....?

What benefit does this process offer?  
本过程可以带来哪些利益?

What are the typical results?  
有哪些典型结果?

What are typical artefacts?  
有哪些典型工作产品?

What are the expected practices to achieve the purpose?  
实现目的的预期实践有哪些?

### REU.2 Reuse Program Management

The purpose of the Reuse Program Management Process is to plan, establish, manage, control, and monitor an organization's reuse program and to systematically exploit reuse opportunities.

#### Process outcomes – as a result of successful implementation of this process

1. the reuse strategy, including its purpose, scope, goals and objectives, is defined;
2. each domain is assessed to determine its reuse potential;
3. the domains in which to investigate reuse opportunities, or in which it is intended to practice reuse, are identified;
4. the organization's systematic reuse capability is assessed;
5. reuse proposals are evaluated to ensure the reuse product is suitable for the proposed application;
6. reuse is implemented according to the reuse strategy;
7. feedback, communication, and notification mechanisms are established, that operate between affected parties; and
8. the reuse program is monitored and evaluated.

#### Output work products

|                           |                |                               |                   |
|---------------------------|----------------|-------------------------------|-------------------|
| 04-02 Domain architecture | [OUTCOME 2]    | 13-04 Communication record    | [OUTCOME 7]       |
| 04-03 Domain model        | [OUTCOME 2]    | 15-07 Reuse evaluation report | [OUTCOME 5, 6, 8] |
| 08-17 Reuse plan          | [OUTCOME 5, 6] | 15-13 Assessment/audit report | [OUTCOME 3, 4]    |
| 09-03 Reuse policy        | [OUTCOME 1]    | 19-05 Reuse strategy          | [OUTCOME 1]       |
| 12-03 Reuse proposal      | [OUTCOME 4]    |                               |                   |

#### REU.2 with 8 Base practices

- BP 1 Define organizational reuse strategy.** Define the reuse program and necessary supporting infrastructure for the organization. [Outcome 1]
- BP 2 Identify domains for potential reuse.** Identify set(s) of systems and their components in terms of common properties that can be organized into a collection of reusable assets that may be used to construct systems in the domain. [OUTCOME 2]
- BP 3 Assess domains for potential reuse.** Assess each domain to identify potential use and applications of reusable components and products. [OUTCOME 3]
- BP 4 Assess reuse maturity.** Gain an understanding of the reuse readiness and maturity of the organization, to provide a baseline and success criteria for reuse program management. [OUTCOME 4]
- BP 5 Evaluate reuse proposals.** Evaluate suitability of the provided reusable components and product(s) to proposed use. [OUTCOME 5]
- BP 6 Implement the reuse program.** Perform the defined activities identified in the reuse program. [OUTCOME 6]
- BP 7 Get feedback from reuse.** Establish feedback, assessment, communication and notification mechanism that operate between affected parties to control the progress of reuse program. [OUTCOME 7, 8]
- 1 Affected parties may include reuse program administrators, asset managers, domain engineers, developers, operators, and maintenance groups.
- BP 8 Monitor reuse.** Monitor the implementation of the reuse program periodically and evaluate its suitability to actual needs. [OUTCOME 6, 8]
- 2 The quality requirements for re-use work products should be defined.

.... in an assessment?  
在评估中.....?

To which degree is the purpose achieved?  
实现目的的需要达到什么程度?

Do the outputs provide sufficient evidence?  
输出是否提供了足够的证据?

Do the work products provide complete information?  
工作产品是否提供了完整的信息?

How effective is the implementation of these practices?  
这些实践的实施效果如何?

WP ID

An identifier number for the work product which is used to reference the work product.

WP Name

Provides an example of a typical name associated with the work product characteristics. Organizations may call these work products by different names and may have several equivalent work products which contain the characteristics defined in one work product type. The formats for the work products can vary. It is up to the assessor and the organizational unit coordinator to map the actual work products produced in their organization to the examples given here.

WP Characteristics

Provides examples of the potential characteristics associated with the work product types. The assessor may look for these in the samples provided by the organizational unit.

WP ID

用于引用工作产品的工作产品的标识编号。

WP 名称

提供与工作产品特性相关联的典型名称的示例。组织可使用其他名称来命名这些工作产品且可有多个等效的工作产品而包含一个工作产品类型中所定义的特性。工作产品的格式可多种多样。由评估师和组织单元协调员，将其组织所产出的实际工作产品映射到这里给出的示例。

WP 特性

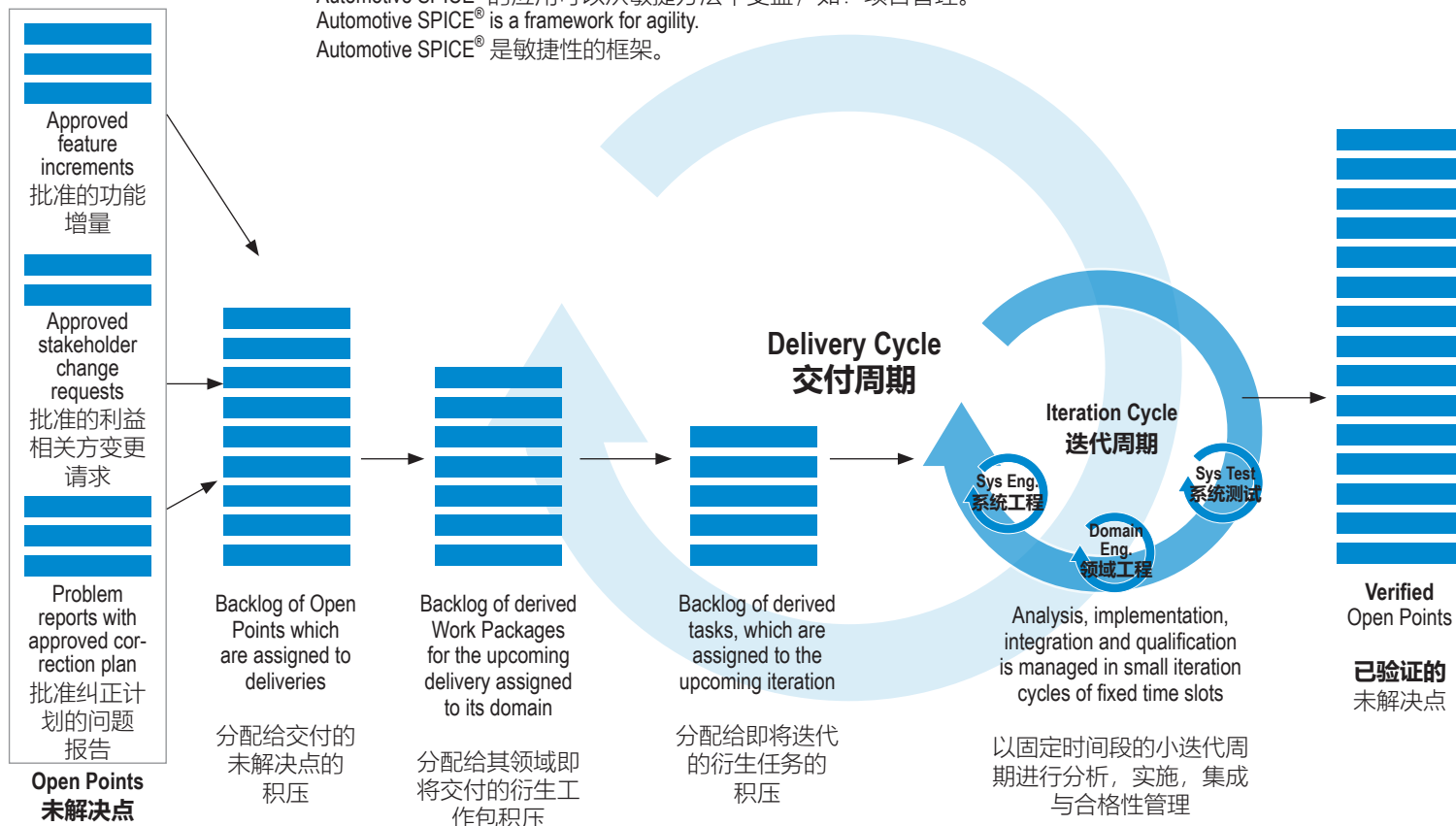
提供与工作产品类型相关联的潜在特性的示例。评估师可在组织单元所提供的样例中寻找这些特性。

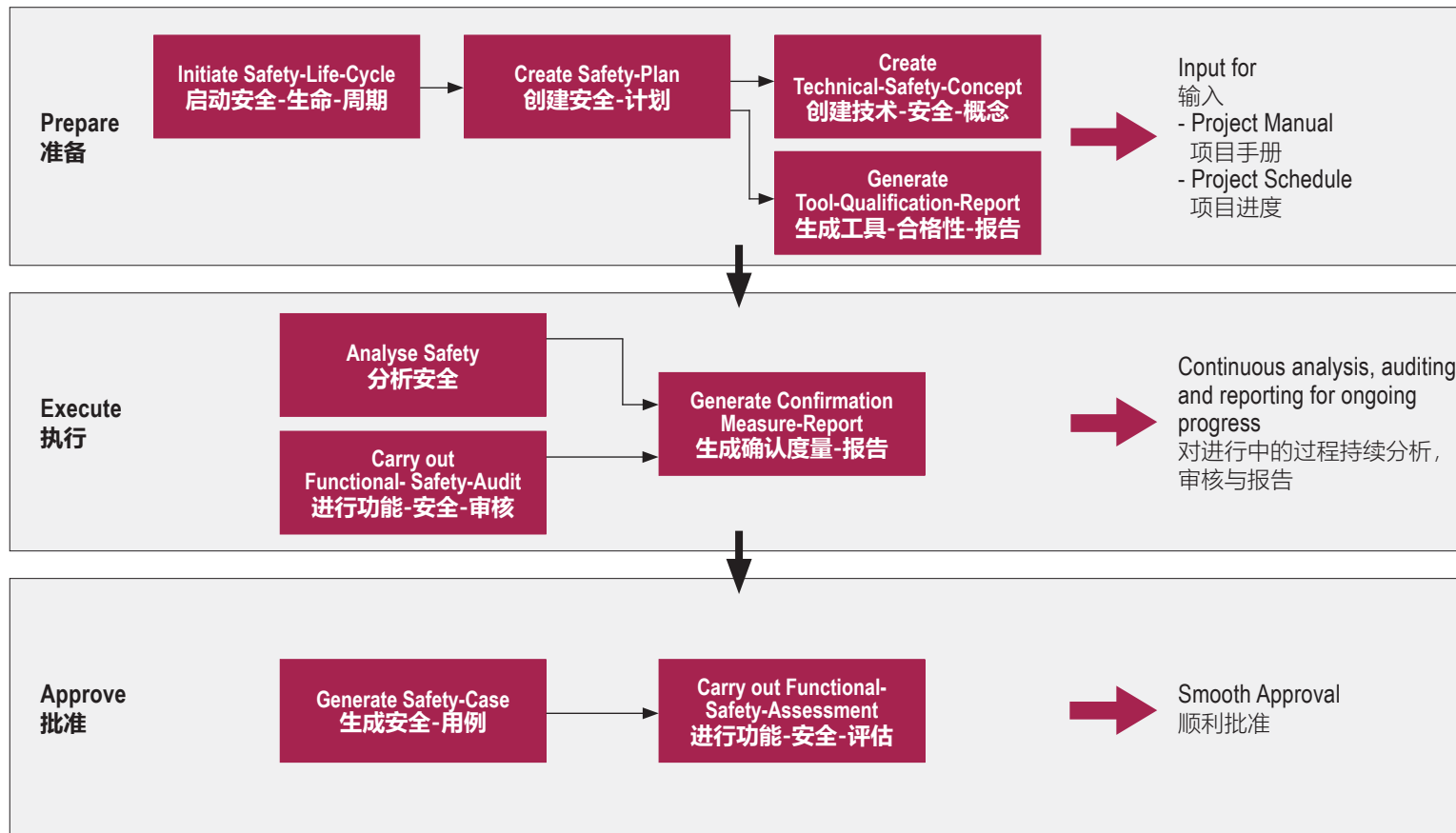
| WP ID | WP Name WP名称 | WP Characteristics WP特性  |
|-------|--------------|--|
| 04-00 | Design 设计    | <div><div>▪ Describes the overall product/system structure 描述总体的产品/系统结构</div><div>▪ Identifies the required product/system elements 识别所需的产品/系统要素</div><div>▪ Identifies the relationship between the elements 识别要素之间的关系</div><div>▪ Consideration is given to:<br/>考虑以下内容:<div><div>- any required performance characteristics 所有所需的性能特性</div><div>- any required interfaces 所有所需的接口</div><div>- any required security characteristics 所有所需的安全（security）特性</div></div></div></div> |

**Work product characteristics – Example in Annex B of Automotive SPICE v3.1**  
**Automotive SPICE® v3.1 Annex B 中的工作产品特性示例**

| WP ID | WP Name WP名称                            | WP Characteristics WP特性  |
|-------|---|--|
| 04-04 | Software architectural design<br>软件架构设计 | <ul style="list-style-type: none"> <li>Describes the overall software structure 描述整体软件结构</li> <li>Describes the operative system including task structure 描述包括任务结构在内的操作系统</li> <li>Identifies inter-task/inter-process communication 识别任务间/进程间的通信</li> <li>Identifies the required software elements 识别所需的软件要素</li> <li>Identifies own developed and supplied code 识别自主开发和供应商的代码</li> <li>Identifies the relationship and dependency between software elements 识别软件要素之间的关系和依赖</li> <li>Identifies where the data (such as application parameters or variables) are stored and which measures (e.g. checksums, redundancy) are taken to prevent data corruption<br/>识别数据（例如应用参数或变量）的存储位置和采用的预防数据损害的措施（如：校验和冗余）</li> <li>Describes how variants for different model series or configurations are derived<br/>描述不同模型系列的变型或配置是如何导出的</li> <li>Describes the dynamic behavior of the software (Start-up, shutdown, software update, error handling and recovery, etc.)<br/>描述软件的动态行为（启动、关闭、软件更新、错误处理和恢复等）</li> <li>Describes which data is persistent and under which conditions 描述在哪些条件下哪些数据是持续存在的</li> <li>Consideration is given to:<br/>考虑以下内容： <ul style="list-style-type: none"> <li>any required software performance characteristics<br/>所有所需的软件性能特性</li> <li>any required software interfaces<br/>所有所需的软件接口</li> <li>any required security characteristics required<br/>所有所需安全（security）特性</li> <li>any database design requirements<br/>所有数据库设计需求</li> </ul> </li> </ul> |

Automotive SPICE® applications can benefit by agile methods, e.g. in project management.  
 Automotive SPICE® 的应用可以从敏捷方法中受益，如：项目管理。  
 Automotive SPICE® is a framework for agility.  
 Automotive SPICE® 是敏捷性的框架。





| Automotive SPICE® |                                  |     | ISO 26262  |
|-------------------|----------------------------------|-----|--|
| MAN.3             | Project Management<br>项目管理       | ++  | Safety management during the concept phase and the product development<br>概念阶段的安全管理与产品开发 |
|                   |                                  | +++ | Item definition (top level) 项目定义（最高等级）   |
|                   |                                  | ++  | Initiation of the safety lifecycle 安全生命周期的启动   |
|                   |                                  | ++  | Initiation of product development at the system level<br>系统级别的产品开发启动                     |
|                   |                                  | ++  | Initiation of product development at the hardware level<br>硬件级别的产品开发启动                   |
|                   |                                  | ++  | Initiation of product development at the software level<br>软件级别的产品开发启动                   |
| ACQ.4             | Supplier Monitoring 供应商监控        | ++  | Interfaces within distributed developments 分布式开发中的接口                                     |
| SUP.1             | Quality Assurance<br>质量保证        | ++  | Safety management during the concept phase and the product development<br>概念阶段的安全管理与产品开发 |
|                   |                                  | +++ | Functional safety assessment 功能安全评估  |
| SUP.2             | Verification 验证                  | +++ | Verification 验证  |
| SUP.7             | Documentation 文档化                | +++ | Documentation 文档化  |
| SUP.8             | Configuration Management 配置管理    | ++  | Configuration Management 配置管理  |
| SUP.10            | Change Request Management 变更请求管理 | ++  | Change Management 变更管理   |
| SPL.2             | Product Release 产品发布             | +++ | Release for production 产品的发布   |

A successful application of Automotive SPICE® supports the compliance to ISO 26262.

Automotive SPICE® 的成功应用支持对 ISO 26262 的符合性。

The related Automotive SPICE® process provides weak / medium / strong (+/++/+++) support to the related chapter in ISO 26262.

Automotive SPICE® 的相关过程为 ISO 26262 的相关章节提供了弱/中/强 (+/++/+++) 支持。

| Automotive SPICE® |   |     | ISO 26262   |
|-------------------|---|-----|---|
| SYS.1             | Requirements Elicitation 需求挖掘                                 | +++ | Item definition (detailed level) 项目定义 (详细等级)                      |
| SYS.2             | System Requirements Analysis<br>系统需求分析                        | +   | Functional safety concept 功能安全概念                                  |
|                   |   | +   | Specification of the technical safety requirements 技术安全需求规范       |
|                   |   | ++  | Specification and management of safety requirements<br>安全需求的规范与管理 |
| SYS.3             | System Architectural Design<br>系统架构设计                         | ++  | System design<br>系统设计   |
| SYS.4             | System Integration and Integration Test<br>系统集成与集成设计          | ++  | Item integration and testing<br>项的集成与测试                           |
| SWE.1             | Software Requirements Analysis<br>软件需求分析                      | ++  | Specificaiton of software safety requirements<br>软件安全需求规范         |
| SWE.2             | Software Architectural Design<br>软件架构设计                       | ++  | Software architectural design<br>软件架构设计                           |
| SWE.3             | Software Detailed Design and Unit Construction<br>软件详细设计和单元构建 | ++  | Software unit design and implementation<br>软件单元设计和实施              |
| SWE.4             | Software Unit Verification<br>软件单元验证                          | ++  | Software unit testing<br>软件单元测试                                   |
| SWE.5             | Software Integration and Integration Tests<br>软件集成和集成测试       | ++  | Software integration and testing<br>软件集成和测试                       |
| SWE.6             | Software Qualification Testing<br>软件合格性测试                     | ++  | Verification of software safety requirements<br>软件安全需求验证          |

If compliance to ISO 26262 is required, the related chapters shall be considered during application of Automotive SPICE®.

如果要求符合 ISO 26262, 则在应用Automotive SPICE®时应考虑相关章节。

| Automotive SPICE® |  | ISO 27001, Annex A   |   |
|-------------------|--|--|---|
| MAN.3             | Project Managment<br>项目管理                        | A.6.1.1 Information security roles and responsibilities 信息安全角色和职责<br>A.6.1.2 Segregation of duties 职责分离<br>A.6.1.5 Information security in project management 项目管理中的信息安全<br>A.12.1.1 Documented operating procedures 文件化的操作规程<br>A.12.1.3 Capacity management 容量管理<br>A.13.2 Information transfer 信息传输<br>A.17.1 Information security continuity 信息安全连续性   | If compliance to ISO 27001 is required, the related chapters of Annex A shall be considered during application of Automotive SPICE. 如果要求符合 ISO 27001, 则在应用 Automotive SPICE®时应考虑 Annex A 的相关章节。 |
| MAN.5             | Risk Management<br>风险管理                          | A.6.1.3 Contact with authorities 与政府部门的联系<br>A.6.1.4 Contact with special interest groups 与特定利益集团的联系<br>A.12.6 Technical vulnerability management 技术脆弱性管理<br>A.12.7 Information systems audit considerations 信息系统审计考虑<br>A.17.1 Information security continuity 信息安全连续性<br>A.17.2 Redundancies 冗余  |   |
| ACQ.4             | Supplier Monitoring 供应商监控                        | A.15.2.1 Monitoring and review of supplier services 监测和审查供应商服务   |   |
| ACQ.11            | Technical Requirements 技术需求                      | A.13.2 Information transfer 信息传输<br>A.15.2.2 Managing changes to supplier services 供应商服务变更管理   |   |
| ACQ.12            | Legal and Administrative Requirements<br>法律和行政要求 | A.13.2 Information transfer 信息传输<br>A.15.1 Information security in supplier relationships 供应关系的信息安全  |   |
| SUP.1             | Quality Assurance<br>质量保证                        | A.5.1.1 Policies for information security 信息安全方针<br>A.5.1.2 Review of the policies for information security 信息安全方针的评审<br>A.12.1.4 Separation of development, testing and operational environments 开发, 测试和运行环境的分离<br>A.12.2 Protection from malware 恶意软件防护<br>A.12.4 Logging and monitoring 记录和监控<br>A.18.1 Compliance with legal and contractual requirements 符合法律和合同的要求<br>A.18.2 Information security reviews 信息安全审查 |   |



|        |   |  |
|--------|---|--|
| SUP.4  | Joint Review 联合评审                       | A.5.1.2 Review of the policies for information security 信息安全方针的评审  |
| SUP.7  | Documentation 文档化                       | A.12.4 Logging and monitoring 记录和监控  |
| SUP.8  | Configuration Management<br>配置管理        | A.8.1.1 Inventory of assets 资产清单<br>A.8.1.2 Ownership of assets 资产责任人<br>A.8.1.3 Acceptable use of assets 资产的允许使用<br>A.8.2 Information classification 信息分类<br>A.12.3 Backup 备份<br>A.12.5 Control of operational software 操作软件的控制 |
| SUP.9  | Problem Resolution Management<br>问题解决管理 | A.6.1.3 Contact with authorities 与政府部门的联系<br>A.12.4 Logging and monitoring 记录和监控<br>A.16.1 Management of information security incidents and improvements<br>信息安全实践管理和持续改进  |
| SUP.10 | Change Request Management<br>变更请求管理     | A.12.1.2 Change management<br>变更管理   |
| SYS.1  | Requirements Elicitation<br>需求挖掘        | A.6.1.3 Contact with authorities 与政府部门的联系<br>A.6.1.4 Contact with special interest groups 与特殊利益团体的联系   |
| SYS.2  | System Requirements Analysis<br>系统需求分析  | A.14.1 Security requirements of information systems 信息系统的安全要求<br>A.14.2 Security in development and support processes 开发和支持过程中的安全  |
| SYS.3  | System Architectural Design<br>系统架构设计   | A.13.1 Network security management 网络安全管理<br>A.13.2 Information transfer 信息传输  |
| SYS.5  | System Qualification Test 系统合格性测试       | A.14.3 Test data 测试数据  |
| PIM.3  | Process Improvement<br>过程改进             | A.16.1 Management of information security incidents and improvements<br>信息安全实践管理和持续改进  |
| n.a.   | n.a.无                                   | A.6.2 Mobile devices and teleworking 移动设备和远程办公<br>A.7 Human resource security 人力资源安全<br>A.8.1.4 Return of assets 资产的归还<br>A.8.3 Media handling 介质处理<br>A.10 Cryptography 密码学<br>A.11 Physical and environmental security 物理和环境安全 |

## AUTOMOTIVE SPICE® PROCESSES

## AUTOMOTIVE SPICE® 过程

MAN.3 Project Management 项目管理

The purpose of the Project Management Process is to identify, establish, and control the activities and resources necessary for a project to produce a product, in the context of the project's requirements and constraints.

项目管理过程的目的是:在项目需求和约束的背景下, 识别、建立和控制项目生成产品所必需的活动和资源。

Process outcomes – as a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

1. the scope of the work for the project is defined;

2. the feasibility of achieving the goals of the project with available resources and constraints is evaluated;

3. the activities and resources necessary to complete the work are sized and estimated;

4. interfaces within the project, and with other projects and organizational units, are identified and monitored;

5. plans for the execution of the project are developed, implemented and maintained;

6. progress of the project is monitored and reported; and

7. corrective action is taken when project goals are not achieved, and recurrence of problems identified in the project is prevented.
1. 定义了项目的工作范围;

2. 在可用资源和约束条件下, 评估了实现项目目标的可行性;

3. 按规模分类并估算了完成工作所必需的活动和资源;

4. 识别和监控了项目内部、该项目与其他项目和组织单位之间的接口;

5. 制订、实施和维护了项目执行计划;

6. 监控和报告了项目的进展;

7. 当项目目标未实现时, 采取了纠正措施, 并预防了项目中已识别的问题的重复发生。

Output work products 输出工作产品 [成果]

|  |                      |   |                 |
|--|----------------------|---|-----------------|
| 08-12 Project plan 项目计划                  | [OUTCOME 1, 3, 4, 5] | 14-06 Schedule 进度表                      | [OUTCOME 3, 5]  |
| 13-04 Communication record 沟通记录          | [OUTCOME 4, 6]       | 14-09 Work breakdown structure 工作分解结构   | [OUTCOME 3,4,5] |
| 13-16 Change request 变更请求                | [OUTCOME 7]          | 14-50 Stakeholder groups list 利益相关方群组清单 | [OUTCOME 4]     |
| 13-19 Review record 评审记录                 | [OUTCOME 2,7]        | 15-06 Project status report 项目状态报告      | [OUTCOME 4,6]   |
| 14-02 Corrective action register 纠正措施登记表 | [OUTCOME 7]          |   |                 |

## BP 1

**Define the scope of work.** Identify the project's goals, motivation and boundaries. [OUTCOME 1]

## BP 2

**Define project life cycle.** Define the life cycle for the project, which is appropriate to the scope, context, magnitude and complexity of the project. [OUTCOME 2]

- 1 *This typically means that the project life cycle and the customer's development process are consistent with each other.*

## BP 3

**Evaluate feasibility of the project.** Evaluate the feasibility of achieving the goals of the project in terms of technical feasibility within constraints with respect to time, project estimates, and available resources. [OUTCOME 2]

## BP 4

**Define, monitor and adjust project activities.** Define, monitor and adjust project activities and their dependencies according to defined project life cycle and estimations. Adjust activities and their dependencies as required. [OUTCOME 3, 5, 7]

- 2 *A structure and a manageable size of the activities and related work packages support an adequate progress monitoring.*
- 3 *Project activities typically cover engineering, management and supporting processes..*

## BP 5

**Define, monitor and adjust project estimates and resources.** Define, monitor and adjust project estimates of effort and resources based on project's goals, project risks, motivation and boundaries. [OUTCOME 2, 3, 7]

- 4 *Appropriate estimation methods should be used.*
- 5 *Examples of necessary resources are people, infrastructure (such as tools, test equipment, communication mechanisms...) and hardware/materials.*
- 6 *Project risks (using MAN.5) and quality criteria (using SUP.1) may be considered.*
- 7 *Estimations and resources typically include engineering, management and supporting processes.*

**定义工作范围。** 识别项目的目标、动机和边界。 [成果 1]

**定义项目生命周期。** 定义符合项目范围、背景、规模和复杂度的项目生命周期。 [成果 2]

- 1 这通常意味项目生命周期和客户的开发过程相一致。

**评估项目的可行性。** 在时间、项目估算和可用资源的约束条件下，从技术可行性方面，来评估实现项目目标的可行性。 [成果 2]

**定义、监控和调整项目活动。** 根据已定义的项目生命周期和估算，定义、监控并调整项目活动和项目活动之间的依赖关系。按需调整 活动和活动之间的依赖关系。 [成果 3, 5, 7]

- 2 结构化的和可管理规模的活动以及相关工作包有助于正确的进展监控。
- 3 项目活动通常覆盖工程、管理和支持过程。

**定义、监控和调整项目估算和资源。** 基于项目目标、风险、动机和边界，定义、监控和调整项目工时和资源的估算。 [成果 2, 3, 7]

- 4 应使用适当的估算方法。
- 5 必需的资源例子为：人员、基础设施（例如工具、测试装备、沟通机制...）和硬件/材料。
- 6 可考虑项目风险（使用 MAN.5）和质量准则（使用 SUP.1）。
- 7 估算和资源通常包括工程、管理和支持过程。

## BP 6

**Ensure required skills, knowledge, and experience.** Identify the required skills, knowledge, and experience for the project in line with the estimates and make sure the selected individuals and teams either have or acquire these in time. [OUTCOME 3, 7]

8 *In the case of deviations from required skills and knowledge trainings are typically provided.*

## BP 7

**Identify, monitor and adjust project interfaces and agreed commitments.** Identify and agree interfaces of the project with other (sub-) projects, organizational units and other affected stakeholders and monitor agreed commitments. [OUTCOME 4, 7]

9 *Project interfaces relate to engineering, management and supporting processes.*

## BP 8

**Define, monitor and adjust project schedule.** Allocate resources to activities, and schedule each activity of the whole project. The schedule has to be kept continuously updated during lifetime of the project. [OUTCOME 3, 5, 7]

10 *This relates to all engineering, management and supporting processes.*

## BP 9

**Ensure consistency.** Ensure that estimates, skills, activities, schedules, plans, interfaces, and commitments for the project are consistent across affected parties. [OUTCOME 3, 4, 5, 7]

## BP 10

**Review and report progress of the project.** Regularly review and report the status of the project and the fulfillment of activities against estimated effort and duration to all affected parties. Prevent recurrence of problems identified. [OUTCOME 6, 7]

11 *Project reviews may be executed at regular intervals by the management. At the end of a project, a project review contributes to identifying e.g. best practices and lessons learned.*

**确保所需的技能、知识和经验。**基于估算，识别项目所需的技能、知识和经验，并确保所选择的个人和团队具备或者能及时获得所需的技能、知识和经验。[成果 3, 7]

8 若与所需的技能和知识存在偏差，通常应提供培训

**识别、监控和调整项目接口及约定的承诺。**识别项目与其他项目（子项目）、组织单元及其他受影响的利益相关方的接口，对识别的接口达成一致，并监控约定的承诺。[成果 4, 7]

9 项目接口与工程、管理和支持过程有关

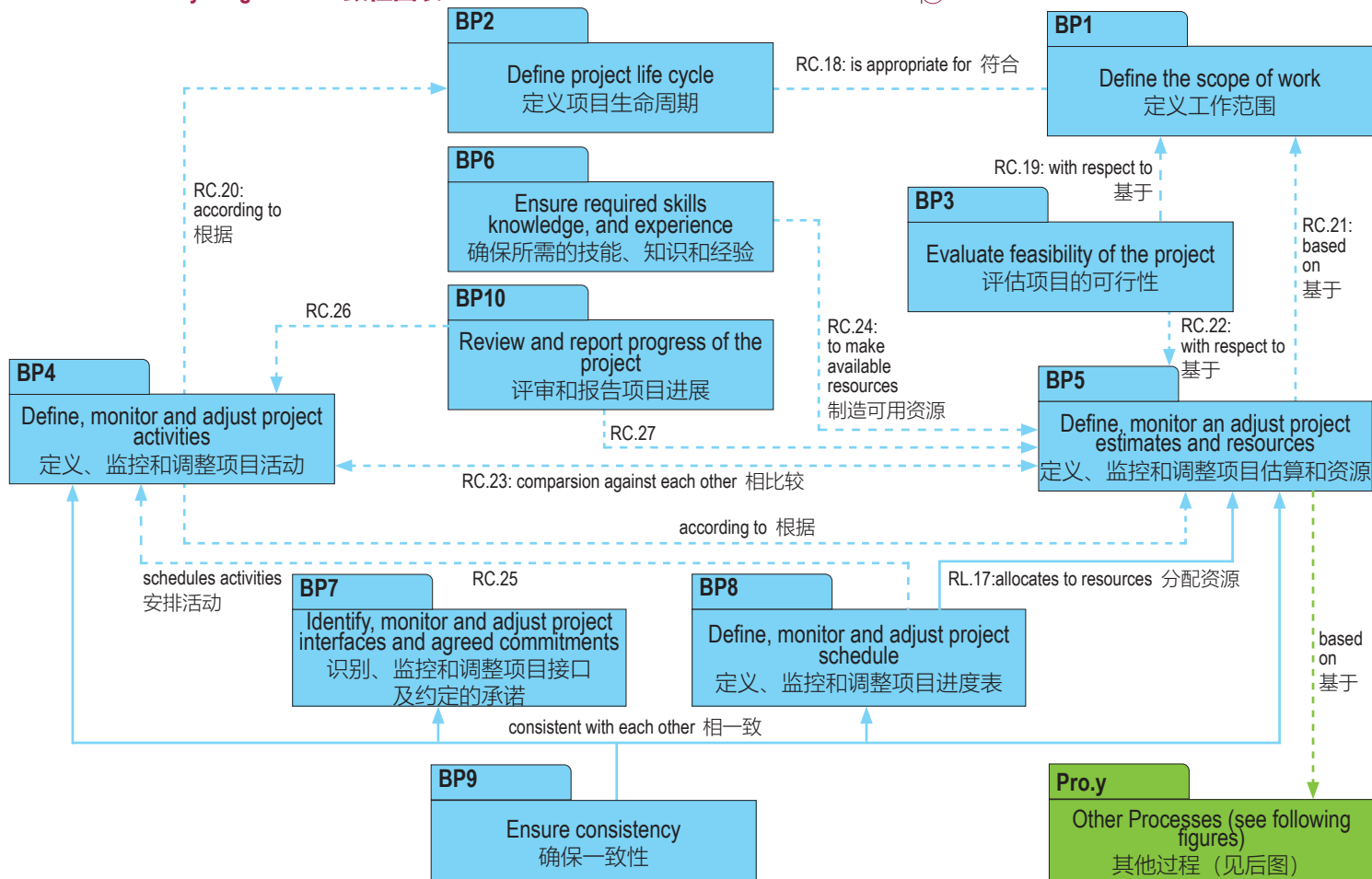
**定义、监控和调整项目进度表。**分配资源给活动，并安排整个项目各活动的进度计划。在项目的整个生命周期内，须持续更新进度表。[成果 3, 5, 7]

10 该基本实践与所有的工程、管理和支持过程有关

**确保一致性。**确保项目的估算、技能、活动、进度表、计划、接口和承诺对各受影响方的一致性。[成果 3, 4, 5, 7]

**评审和报告项目进展。**依照估算的工时和工期，定期评审和报告项目状态和活动完成情况给所有受影响方。预防已识别问题的重复发生。[成果 6, 7]

11 项目评审可由管理层定期进行。在项目的尾声，项目评审有助于识别，例如，最佳实践和经验教训。





The purpose of the Risk Management Process is to identify, analyze, treat and monitor the risks continuously. 风险管理过程的目的是：持续地识别、分析、处理和监控风险。

| Process outcomes – as a result of successful implementation of this process:  | 过程成果 - 成功实施这个过程的结果如下:  |
|---|--|
| <div>1. the scope of the risk management to be performed is determined;</div> <div>2. appropriate risk management strategies are defined and implemented;</div> <div>3. risks are identified as they develop during the conduct of the project;</div> <div>4. risks are analyzed and the priority in which to apply resources to treatment of these risks is determined;</div> <div>5. risk measures are defined, applied, and assessed to determine changes in the status of risk and the progress of the treatment activities; and</div> <div>6. appropriate treatment is taken to correct or avoid the impact of risk based on its priority, probability, and consequence or other defined risk threshold.</div> | <div>1. 确定了执行风险管理的范围；</div> <div>2. 定义和实施了适当的风险管理策略；</div> <div>3. 识别了项目实施过程中产生的风险；</div> <div>4. 分析了风险，并确定了各风险的优先级以按其申请资源进行处理；</div> <div>5. 定义、应用和评估了风险的应对措施，以确定风险状态的变化和处理活动的进度；</div> <div>6. 基于风险的优先级、发生概率和后果或其他定义的风险阈值，实施了适当的处理以纠正或避免风险的影响。</div> |

| Output work products                     | 输出工作产品 [成果]          |
|--|----------------------|
| 07-07 Risk measure 风险措施                  | [OUTCOME 5]          |
| 08-14 Recovery plan 恢复计划                 | [OUTCOME 4, 6]       |
| 08-19 Risk management plan 风险管理计划        | [OUTCOME ALL]        |
| 08-20 Risk mitigation plan 风险缓解计划        | [OUTCOME 3, 4, 5, 6] |
| 13-20 Risk action request 风险措施请求         | [OUTCOME 1, 2, 6]    |
| 14-02 Corrective action register 纠正措施登记表 | [OUTCOME 6]          |
| 14-08 Tracking system 跟踪系统               | [OUTCOME 5, 6]       |
| 15-08 Risk analysis report 风险分析报告        | [OUTCOME 4]          |
| 15-09 Risk status report 风险状态报告          | [OUTCOME 4, 5]       |

| MAN.5 with 7 Base practices   | 基本实践  |
|---|---|
| <div>BP 1</div> <div><b>Establish risk management scope.</b> Determine the scope of risk management to be performed for the project, in accordance with organizational risk management policies. [OUTCOME 1]</div> <div>1 Risks may include technical, economic and timing risks.</div> | <div><b>建立风险管理范围。</b> 确定在项目中执行的风险管理的范围，与组织的风险管理方针相一致。[成果1]</div> <div>1 风险可包括技术、经济和时间的风险。</div> |



## MAN.5 with 7 Base practices

### BP 2

**Define risk management strategies.** Define appropriate strategies to identify risks, mitigate risks and set acceptability levels for each risk or set of risks, both at the project and organizational level. [OUTCOME 2]

### BP 3

**Identify risks.** Identify risks to the project both initially within the project strategy and as they develop during the conduct of the project, continuously looking for risk factors at any occurrence of technical or managerial decisions. [OUTCOME 2, 3]

2 Examples of risk areas that are typically analyzed for potential risk reasons or risks factors include: cost, schedule, effort, resource, and technical.

3 Examples of risk factors may include: unsolved and solved trade-offs, decisions of not implementing a project feature, design changes, lack of expected resources

### BP 4

**Analyze risks.** Analyze risks to determine the priority in which to apply resources to mitigate these risks. [OUTCOME 4]

4 Risks are normally analyzed to determine their probability, consequence and severity.

5 Different techniques may be used to analyze a system in order to understand if risks exist, for example, functional analysis, simulation, FMEA, FTA etc.

### BP 5

**Define risk treatment actions.** For each risk (or set of risks) define, perform and track the selected actions to keep/reduce the risks to acceptable level. [OUTCOME 5, 6]

### BP 6

**Monitor risks.** For each risk (or set of risks) define measures (e.g. metrics) to determine changes in the status of a risk and to evaluate the progress of the mitigation activities. Apply and assess these risk measures. [OUTCOME 5, 6]

6 Major risks may need to be communicated to and monitored by higher levels of management.

### BP 7

**Take corrective action.** When expected progress in risk mitigation is not achieved, take appropriate corrective action to reduce or avoid the impact of risk. [OUTCOME 6]

7 Corrective actions may involve developing and implementing new mitigation strategies or adjusting the existing strategies.

## 基本实践

**定义风险管理策略。**在项目和组织级别分别定义适当的策略以识别风险、缓解风险和设定各风险或一系列风险的可接受级别。[成果2]

**识别风险。**在项目策略的初期识别项目的风险，以及随着风险的发展在项目实施过程中识别项目的风险，持续地在做技术或管理决策时寻找风险因素。[成果2, 3]

2 分析潜在风险原因或风险因素的风险领域，例如：成本、进度、工作量、资源和技术。

3 风险因素的例子可包括：未解决和已解决的权衡利弊、不实施某项目功能的决定、设计变更、预期资源不足。

**分析风险。**分析风险，以确定各风险的优先级用以申请资源进行风险缓解。[成果4]

4 通常分析风险以确定其发生概率、后果和严重度

5 可使用不同的技术来分析系统，以理解是否存在风险。例如：功能性分析，仿真，FMEA，FTA等。

**定义风险处理措施。**针对各风险（或一系列风险），定义、执行并跟踪选定的措施以保持/减轻风险至可接受级别。[成果5, 6]

**监控风险。**针对各风险（或一系列风险），定义措施（例如：度量）以确定风险状态的变化并评估缓解活动的进展。应用并评估这些风险措施。[成果5, 6]

6 重大风险可能需要与更高级别的管理层进行沟通，并由其进行监控。

**实施纠正措施。**如风险缓解未达成预期进展时，实施适当的纠正措施以减轻或避免风险的影响。[成果6]

7 纠正措施可包括制订和实施新的缓解策略或调整当前策略。

The purpose of the Reuse Program Management Process is to plan, establish, manage, control, and monitor an organization's reuse program and to systematically exploit reuse opportunities.

重用程序管理过程的目的是：计划、建立、管理、控制和监控组织的重用 程序，并系统地利用重用机会。

Process outcomes – as a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

- |   |                            |
|---|----------------------------|
| 1. the reuse strategy, including its purpose, scope, goals and objectives, is defined;                                    | 1. 定义了重用策略，包括其目的、范围、目标和目的； |
| 2. each domain is assessed to determine its reuse potential;  | 2. 评估了各领域以确定该领域的重用的潜在可能性；  |
| 3. the domains in which to investigate reuse opportunities, or in which it is intended to practice reuse, are identified; | 3. 识别了调查重用机会的领域和将要实施重用的领域； |
| 4. the organization's systematic reuse capability is assessed;  | 4. 评估了组织的系统化的重用能力；         |
| 5. reuse proposals are evaluated to ensure the reuse product is suitable for the proposed application;                    | 5. 评估了重用提案以确保重用产品适于提议的应用；  |
| 6. reuse is implemented according to the reuse strategy;  | 6. 根据重用策略实施了重用；            |
| 7. feedback, communication, and notification mechanisms are established, that operate between affected parties; and       | 7. 建立了受影响方之间的反馈、沟通和通知机制；   |
| 8. the reuse program is monitored and evaluated.  | 8. 监控和评估了重用程序。             |

Output work products 输出工作产品 [成果]

|                                |                |                                       |                   |
|--------------------------------|----------------|---------------------------------------|-------------------|
| 04-02 Domain architecture 领域架构 | [OUTCOME 2]    | 13-04 Communication record 沟通记录       | [OUTCOME 7]       |
| 04-03 Domain model 领域模型        | [OUTCOME 2]    | 15-07 Reuse evaluation report 重用评估报告  | [OUTCOME 5, 6, 8] |
| 08-17 Reuse plan 重用计划          | [OUTCOME 5, 6] | 15-13 Assessment/audit report 评估/审核报告 | [OUTCOME 3, 4]    |
| 09-03 Reuse policy 重用方针        | [OUTCOME 1]    | 19-05 Reuse strategy 重用策略             | [OUTCOME 1]       |
| 12-03 Reuse proposal 重用提案      | [OUTCOME 4]    |                                       |                   |

BP 1

**Define organizational reuse strategy.** Define the reuse program and necessary supporting infrastructure for the organization.[OUTCOME 1]

**定义组织的重用策略。** 定义组织的重用程序和所必需的基础设施。[成果1]

BP 2

**Identify domains for potential reuse.** Identify set(s) of systems and their components in terms of common properties that can be organized into a collection of reusable assets that may be used to construct systems in the domain. [OUTCOME 2]

**识别潜在的重用领域。** 识别一系列的系统和系统组件的共通属性。该共通属性可构成为可重用资产的集合用于构建领域内的系统。[成果 2]

BP 3

**Assess domains for potential reuse.** Assess each domain to identify potential use and applications of reusable components and products. [OUTCOME 3]

**评估潜在的重用领域。** 评估各领域以识别潜在的使用和重用组件及产品的应用。[成果3]

BP 4

**Assess reuse maturity.** Gain an understanding of the reuse readiness and maturity of the organization, to provide a baseline and success criteria for reuse program management. [OUTCOME 4]

**评估重用成熟度。** 获得对组织的重用准备状态和成熟度的理解以提供重用程序管理的基线和成功准则。[成果4]

BP 5

Evaluate reuse proposals. Evaluate suitability of the provided reusable components and product(s) to proposed use.[OUTCOME 5]

**评估重用提案。** 评估已提供的可重用组件和产品对于提议用途的适用性。[成果5]

BP 6

**Implement the reuse program.** Perform the defined activities identified in the reuse program. [OUTCOME 6]

**实施重用程序。** 执行重用程序中识别的已定义活动。[成果6]

BP 7

**Get feedback from reuse.** Establish feedback, assessment, communication and notification mechanism that operate between affected parties to control the progress of reuse program.[OUTCOME 7, 8]

**从重用中获得反馈。** 建立受影响方之间的反馈、评估、沟通和通知机制，以控制重用程序的进展。[成果7, 8]

1 Affected parties may include reuse program administrators, asset managers, domain engineers, developers, operators, and maintenance groups.

1 受影响方可包括重用程序管理者、资产经理、领域工程师、开发工程师、运行和维护团队。

BP 8

**Monitor reuse.** Monitor the implementation of the reuse program periodically and evaluate its suitability to actual needs.[OUTCOME 6, 8]

**监控重用。** 定期监控重用程序的实施并评估其对于实际需要的适用性。[成果 6, 8]

2 The quality requirements for re-use work products should be defined.

2 应定义重用工作产品的质量需求。

The purpose of the Supplier Monitoring Process is to track and assess the performance of the supplier against agreed requirements.

供应商监控过程的目的是：按照已约定的需求，跟踪并评估供应商的实施情况。

Process outcomes – as a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

1. joint activities, as agreed between the customer and the supplier, are performed as needed;

2. all information, agreed upon for exchange, is communicated regularly between the supplier and customer;

3. performance of the supplier is monitored against the agreements; and

4. changes to the agreement, if needed, are negotiated between the customer and the supplier and documented in the agreement.
1. 根据需要，执行了客户和供应商之间约定的联合活动;

2. 在供应商和客户之间定期沟通了所有约定交换的信息;

3. 依照协议，监控了供应商的实施情况;

4. 根据需要，客户和供应商对协议的变更进行了协商，并将变更记录在协议中。

Output work products 输出工作产品 [成果]

|                                     |                |  |             |
|-------------------------------------|----------------|--|-------------|
| 02-01 Commitment/agreement 承诺/协议    | [OUTCOME 4]    | 13-16 Change request 变更请求                | [OUTCOME 4] |
| 13-01 Acceptance record 验收记录        | [OUTCOME 3]    | 13-19 Review record 评审记录                 | [OUTCOME 2] |
| 13-04 Communication record 沟通记录     | [OUTCOME 1, 2] | 14-02 Corrective action register 纠正措施登记表 | [OUTCOME 4] |
| 13-09 Meeting support record 会议支持记录 | [OUTCOME 1]    | 15-01 Analysis report 分析报告               | [OUTCOME 3] |
| 13-14 Progress status record 进展状态记录 | [OUTCOME 2]    |  |             |

## BP 1

**Agree on and maintain joint processes.** joint interfaces, and information to be exchanged. Establish and maintain an agreement on information to be exchanged and on joint processes and joint interfaces, responsibilities, type and frequency of joint activities, communications, meetings, status reports and reviews. [OUTCOME 1, 2, 4]

- 1 Joint processes and interfaces usually include project management, requirements management, change management, configuration management, problem resolution, quality assurance and customer acceptance.
- 2 Joint activities to be performed should be mutually agreed between the customer and the supplier.
- 3 The term customer in this process refers to the assessed party. The term supplier refers to the supplier of the assessed party.

## BP 2

**Exchange all agreed information.** Use the defined joint interfaces between customer and supplier for the exchange of all agreed information. [OUTCOME 1, 2, 3]

- 4 Agreed information should include all relevant work products.

## BP 3

**Review technical development with the supplier.** Review development with the supplier on the agreed regular basis, covering technical aspects, problems and risks and also track open items to closure. [OUTCOME 1, 3, 4]

## BP 4

**Review progress of the supplier.** Review progress of the supplier regarding schedule, quality, and cost on the agreed regular basis. Track open items to closure and perform risk mitigation activities. [OUTCOME 1, 3, 4]

## BP 5

**Act to correct deviations.** Take action when agreed objectives are not achieved to correct deviations from the agreed project plans and to prevent reoccurrence of problems identified. Negotiate changes to objectives and document them in the agreements. [OUTCOME 4]

**约定并维护联合过程、联合接口及需要交换的信息。** 建立并维护协议，包括交换信息、联合过程和联合接口、职责以及联合活动、沟通、会议、状态汇报、评审的类别和频率。[成果 1, 2, 4]

- 1 联合过程和接口通常包括项目管理、需求管理、变更管理、配置管理、问题解决、质量保证和客户验收。
- 2 需要实施的联合活动应在客户和供应商之间达成共识。
- 3 此过程中，术语“客户”是指被评估方。术语“供应商”是指被评估方的供应商。

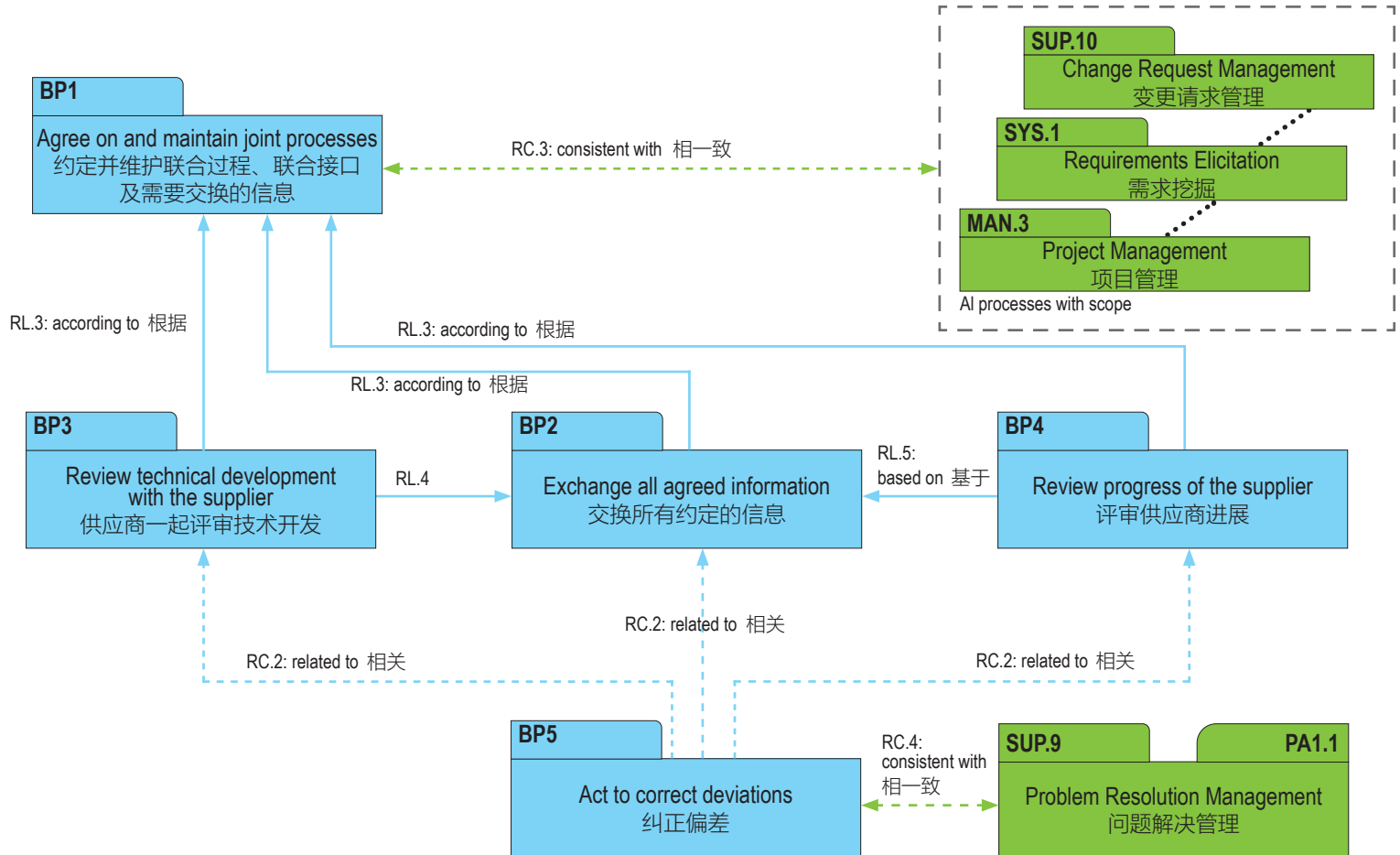
**交换所有约定的信息。** 使用客户和供应商之间已定义的联合接口交换所有约定信息。[成果 1, 2, 3]

- 4 约定信息应包括所有相关工作产品

**与供应商一起评审技术开发。** 与供应商一起按照约定的频率评审开发，覆盖技术、问题和风险并跟踪未解决事项直至关闭。[成果 1, 3, 4]

**评审供应商进展。** 按照约定的频率评审供应商有关进度，质量和成本的进展。跟踪未解决事项直至关闭并实施风险缓解活动。[成果 1, 3, 4]

**纠正偏差。** 当约定的目标没有被实现时，采取措施以纠正与约定的项目计划的偏差并预防已识别问题的重复发生。协商目标的变更并将其记录在协议中。[成果 4]





The purpose of the Quality Assurance Process is to provide independent and objective assurance that work products and processes comply with predefined provisions and plans and that non-conformances are resolved and further prevented.

质量保证过程的目的是：提供独立和客观的保证，使工作产品和过程符合预先定义的规定和计划，并使不符合项得到解决和进一步预防。

Process outcomes – as a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

1. a strategy for performing quality assurance is developed, implemented, and maintained;

2. quality assurance is performed independently and objectively without conflicts of interest;

3. non-conformances of work products, processes, and process activities with relevant requirements are identified, recorded, communicated to the relevant parties, tracked, resolved, and further prevented;

4. conformance of work products, processes and activities with relevant requirements is verified, documented, and communicated to the relevant parties;

5. authority to escalate non-conformances to appropriate levels of management is established; and

6. management ensures that escalated non-conformances are resolved.
1. 制订、实施和维护了执行质量保证的策略;

2. 独立且客观地执行了质量保证，没有利益冲突;

3. 识别、记录并与相关方沟通了工作产品、过程、过程活动与相关需求的不符合项，并对其跟踪、解决且进一步预防;

4. 验证、文档化并与相关方沟通了工作产品、过程、过程活动与相关需求的符合性;

5. 建立了将不符合项升级到适当管理层的权限;

6. 管理层确保已升级的不符合项得到解决。

Output work products 输出工作产品 [成果]

|                                 |                   |  |                   |
|---------------------------------|-------------------|--|-------------------|
| 08-13 Quality plan 质量计划         | [OUTCOME 1,2]     | 13-19 Review record 评审记录                 | [OUTCOME 2, 3, 4] |
| 13-04 Communication record 沟通记录 | [OUTCOME 3, 4, 5] | 14-02 Corrective action register 纠正措施登记表 | [OUTCOME 3, 5, 6] |
| 13-07 Problem record 问题记录       | [OUTCOME 3, 5]    | 18-07 Quality criteria 质量准则              | [OUTCOME 1]       |
| 13-18 Quality record 质量记录       | [OUTCOME 2, 3, 4] |  |                   |



## BP 1

**Develop a project quality assurance strategy.** Develop a strategy in order to ensure that work product and process quality assurance is performed at project level independently and objectively without conflicts of interest. [OUTCOME 1, 2]

- 1 Aspects of independence may be financial and/or organizational structure.
- 2 Quality assurance may be coordinated with, and make use of, the results of other processes such as verification, validation, joint review, audit and problem management.
- 3 Process quality assurance may include process assessments and audits, problem analysis, regular check of methods, tools, documents and the adherence to defined processes, reports and lessons learned that improve processes for future projects.
- 4 Work product quality assurance may include reviews, problem analysis, reports and lessons learned that improve the work products for further use.

## BP 2

**Assure quality of work products.** Perform the activities according to the quality assurance strategy and the project schedule to ensure that the work products meet the defined work product requirements and document the results. [OUTCOME 2, 3, 4]

- 5 Relevant work product requirements may include requirements from applicable standards.
- 6 Non-conformances detected in work products may be entered into the problem resolution management process (SUP.9) to document, analyze, resolve, track to closure and prevent the problems.

**制订项目质量保证策略。** 制订策略以确保工作产品和过程的质量保证在项目层面上独立而客观地执行，不存在利益冲突。[成果 1, 2]

- 1 独立性可为财务和 / 或组织架构方面的独立性。
- 2 质量保证可与其他过程的结果协调并加以使用（例如：验证、确认、联合评审、审核和问题管理等）。
- 3 过程质量保证可包括过程评估和审核、问题分析、方法 / 工具 / 文件 / 已定义过程的符合性的定期检查、报告和用来改进未来项目过程的经验教训。
- 4 工作产品质量保证可包括评审、问题分析、报告和用来改进工作产品以供进一步使用的经验教训。

**保证工作产品的质量。** 根据质量保证策略和项目进度执行活动，以确保工作产品满足定义的工作产品需求，并记录结果。[成果 2, 3, 4]

- 5 相关工作产品需求可包括来自适用标准的需求。
- 6 工作产品中发现的不符合项可进入问题解决管理过程（SUP.9）中，对问题进行记录、分析、解决、跟踪直至关闭和预防。

## BP 3

**Assure quality of process activities.** Perform the activities according to the quality assurance strategy and the project schedule to ensure that the processes meet their defined goals and document the results. [OUTCOME 2, 3, 4]

7 Relevant process goals may include goals from applicable standards.

8 Problems detected in the process definition or implementation may be entered into a process improvement process (PIM.3) to describe, record, analyze, resolve, track to closure and prevent the problems.

## BP 4

**Summarize and communicate quality assurance activities and results.** Regularly report performance, deviations, and trends of quality assurance activities to relevant parties for information and action according to the quality assurance strategy. [OUTCOME 3, 4]

## BP 5

**Ensure resolution of non-conformances.** Deviations or non-conformance found in process and product quality assurance activities should be analyzed, tracked, corrected, and further prevented. [OUTCOME 3,6]

## BP 6

**Implement an escalation mechanism.** Establish and maintain an escalation mechanism according to the quality assurance strategy that ensures that quality assurance may escalate problems to appropriate levels of management and other relevant stakeholders to resolve them. [OUTCOME 5, 6]

**保证过程活动的质量。**根据质量保证策略和项目进度执行活动，以确保过程满足既定目标，并记录结果。[成果 2, 3, 4]

7 相关的过程目标可包括来自适用标准的目标。

8 过程定义或实施过程中发现的问题可进入过程改进过程（PIM.3）中，对问题进行描述、记录、分析、解决、跟踪直至问题关闭和预防

**总结和沟通质量保证活动和结果。**根据质量保证策略，定期向相关方报告质量保证活动的执行、偏差和趋势以提供信息和采取行动。[成果 3, 4]

**确保不符合项的解决。**对过程质量和产品质量保证活动中发现的偏差或不符合项进行分析、跟踪、纠正和进一步预防。[成果 3, 6]

**实施升级机制。**根据质量保证策略，建立和维护升级机制，以确保质量保证可将问题升级到适当的管理层和其他相关的利益相关方，使问题得以解决。[成果 5, 6]



The purpose of the Verification Process is to confirm that each work product of a process or project properly reflects the specified requirements.

验证过程的目的是：确认过程或项目的每个工作产品正确地反映了定义的要求。

Process outcomes – as a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

1. a verification strategy is developed, implemented and maintained;

2. criteria for verification of all required work products are identified;

3. required verification activities are performed;

4. defects are identified, recorded and tracked; and

5. results of the verification activities are made available to the customer and other involved parties.
1. 制订、实施和维护了验证策略;

2. 识别了所有所需工作产品的验证标准;

3. 执行了所需的验证活动;

4. 识别、记录和跟踪了缺陷;

5. 提供验证活动的结果给客户和其他相关方。

Output work products 输出工作产品 [成果]

|                                 |                      |  |             |
|---------------------------------|----------------------|--|-------------|
| 13-04 Communication record 沟通记录 | [OUTCOME 5]          | 14-02 Corrective action register 纠正措施登记表 | [OUTCOME 4] |
| 13-07 Problem record 问题记录       | [OUTCOME 3, 4, 5]    | 18-07 Quality criteria 质量准则              | [OUTCOME 2] |
| 13-25 Verification results 验证结果 | [OUTCOME 2, 3, 4, 5] | 19-10 Verification strategy 验证策略         | [OUTCOME 1] |

## BP 1

**Develop a verification strategy.** Develop and implement a verification strategy, including verification activities with associated methods, techniques, and tools; work product or processes under verification; degrees of independence for verification and schedule for performing these activities. [OUTCOME 1]

- 1 Verification strategy is implemented through a plan.
- 2 Software and system verification may provide objective evidence that the outputs of a particular phase of the software development life cycle (e.g. requirements, design, implementation, testing) meet all of the specified requirements for that phase.
- 3 Verification methods and techniques may include inspections, peer reviews (see also SUP.4), audits, walkthroughs and analysis.

## BP 2

**Develop criteria for verification.** Develop the criteria for verification of all required technical work products. [OUTCOME 2]

## BP 3

**Conduct verification.** Verify identified work products according to the specified strategy and to the developed criteria to confirm that the work products meet their specified requirements. The results of verification activities are recorded. [OUTCOME 3]

## BP 4

**Determine and track actions for verification results.** Problems identified by the verification should be entered into the problem resolution management process (SUP.9) to describe, record, analyze, resolve, track to closure and prevent the problems. [OUTCOME 4]

## BP 5

**Report verification results.** Verification results should be reported to all affected parties. [OUTCOME 5]

**制订验证策略。**制订和实施验证策略，包括与方法、技术和工具相关的验证活动，验证中的工作产品或过程，验证独立性的程度和执行这些活动的进度安排。[成果 1]

- 1 验证策略是通过一个计划来实现的。
- 2 软件和系统验证可提供客观证据，即软件开发生命周期的特定阶段的输出（例如：需求、设计、实现、测试）满足该阶段的所定义的所有要求。
- 3 验证方法和技术可包含检验、同行评审（参见 SUP.4）、审核、走查和分析。

**制订验证准则。**制订验证所需技术工作产品的验证准则。[成果 2]

**执行验证。**根据定义的策略和制订的准则，验证已识别的工作产品，以确认工作产品符合其规定的要求，记录验证活动的结果。[成果 3]

**确定和跟踪验证结果的行动。**应将验证中所识别的问题纳入问题解决管理过程（SUP.9），以描述、记录、分析、解决、跟踪关闭和预防问题。[成果 4]

**报告验证结果。**报告验证结果给所有受影响方。[成果 5]

The purpose of the Joint review process is to maintain a common understanding with the stakeholders of the progress against the objectives of the agreement and what should be done to help ensure development of a product that satisfies the stakeholders. Joint reviews are at both project management and technical levels and are held throughout the life of the project.

联合评审过程的目的是：维护与利益相关方关于协议的目标和所应完成工作的进展的共识，以帮助确保满足利益相关方要求的产品开发。联合评审在项目管理和技术两个层面开展，并贯穿整个项目生命周期。

Process outcomes – as a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

- 1. management and technical reviews are held based on the needs of the project;
  - 2. the status and products of an activity of a process are evaluated through joint review activities between the stakeholders;
  - 3. review results are made known to all affected parties;
  - 4. action items resulting from reviews are tracked to closure; and
  - 5. problems are identified and recorded.
- 1 Joint review should be performed at specific milestones during project/product development. The scope and the goals of joint review may be different depending on project/ product development phase (for example, in the early stage of a project joint review may be „conceptual“ in order to analyze the customer requirements; in later stages joint review may be concerned with the implementation).
- 2 Joint review should be performed to verify different aspects (for example: hardware resources utilization; the introduction of new requirements and new technologies; modification to the working team structure; technology changes).

- 1. 基于项目的需要，开展了管理和技术评审；
  - 2. 通过和利益相关方的联合评审活动来评估各过程活动的状态和产品；
  - 3. 通知了所有受影响方评审的结果；
  - 4. 跟踪了评审产生的行动项，直到关闭；
  - 5. 识别和记录了问题。
- 1 联合评审应在项目 / 产品开发过程中特定的里程碑实施。联合评审的范围和目标因项目 / 产品的开发阶段不同而不同（例如：在项目早期联合评审可以是“概念上的”，用以分析客户需求；在项目后期联合评审可关注实施）。
- 2 联合评审应在不同方面实施验证（例如：硬件资源利用，新需求和新技术的引入，工作团队架构的改变，技术变更）。

Output work products 输出工作产品 [成果]

|                                     |                   |  |                   |
|-------------------------------------|-------------------|--|-------------------|
| 13-04 Communication record 沟通记录     | [OUTCOME 3]       | 14-02 Corrective action register 纠正措施登记表 | [OUTCOME 3, 4, 5] |
| 13-05 Contract review record 合同评审记录 | [OUTCOME 1, 2, 3] | 14-08 Tracking system 跟踪系统               | [OUTCOME 3, 4, 5] |
| 13-07 Problem record 问题记录           | [OUTCOME 3, 5]    | 15-01 Analysis report 分析报告               | [OUTCOME 3, 5]    |
| 13-09 Meeting support record 会议支持记录 | [OUTCOME 1,2]     | 15-13 Assessment/audit report 评估/审核报告    | [OUTCOME 1,2]     |
| 13-19 Review record 评审记录            | [OUTCOME ALL]     | 15-16 Improvement opportunity 改进机会       | [OUTCOME 3, 4]    |

BP 1

**Define review elements.** Based on the needs of the project, identify the schedule, scope and participants of management and technical reviews, agree all resources required to conduct the reviews (this includes personnel, location and facilities) and establish review criteria for problem identification, resolution and agreement. [OUTCOME 1]

BP 2

**Establish a mechanism to handle review outcomes.** Establish mechanisms to ensure that review results are made available to all affected parties that problems detected during the reviews are identified and recorded and that action items raised are recorded for action. [OUTCOME 3]

BP 3

**Prepare joint review.** Collect, plan, prepare and distribute review material as appropriate in preparation for the review. [OUTCOME 1]

- 1 The following items may be addressed: Scope and purpose of the review; Products and problems to be reviewed; Entry and exit criteria; Meeting agenda; Roles and participants; Distribution list; Responsibilities; Resource and facility requirements; Used tools (checklists, scenario for perspective based reviews etc.).

BP 4

**Conduct joint reviews.** Conduct joint management and technical reviews as planned. Record the review results. [OUTCOME 1, 2]

BP 5

**Distribute the results.** Document and distribute the review results to all the affected parties. [OUTCOME 3]

BP 6

**Determine actions for review results.** Analyze the review results, propose actions for resolution and determine the priority for actions. [OUTCOME 4]

**定义评审要素。**基于项目需要，识别进度表、范围、管理的和技术的评审的参与者，约定实施评审所需的资源（包括人、地点和设施），并建立问题识别，解决和同意的评审准则。[成果 1]

**建立评审成果的处理机制。**建立机制以确保评审结果提供给所有受影响方，确保识别和记录评审中发现的问题，并确保为采取行动的行动项被记录。[成果 3]

**准备联合评审。**适当地收集、计划、准备并分发评审材料以备评审。[成果 1]

- 1 可表述以下项：评审的范围和目的、评审的产品和问题、进入和退出准则、会议议程、角色和参与人员、分发列表、职责、资源和设施需求、使用的工具（检查表，不同视角的评审场景等）。

**实施联合评审。**按计划实施管理和技术联合评审。记录评审结果。[成果 1, 2]

**分发结果。**文档化评审结果，并分发给所有受影响方。[成果 3]

**确定评审结果的措施。**分析评审结果，提议解决措施并确定措施的优先级。[成果 4]

## BP 7

**Track actions for review results.** Track actions for resolution of identified problems in a review to closure. [OUTCOME 4]

**跟踪评审结果的措施。** 跟踪在评审中识别的问题的解决措施，直到关闭。[成果 4]

## BP 8

**Identify and record problems.** Identify and record the problems detected during the reviews according to the established mechanism. [OUTCOME 5]

**识别和记录问题。** 根据已建立的机制，识别和记录在评审中发现的问题。[成果 5]





The purpose of the Documentation Process is to develop and maintain the recorded information produced by a process. 文档化过程的目的是：开发和维护由过程产出的记录信息。

| Process outcomes – as a result of successful implementation of this process:   | 过程成果 - 成功实施这个过程的结果如下:         |
|--|-------------------------------|
| 1. a strategy identifying the documentation to be produced during the life cycle of the product or service is developed; | 1. 制定了策略以识别在产品或服务生命周期中要产出的文档; |
| 2. the standards to be applied for the development of the documentation are identified;                                  | 2. 识别了适用于文档制订的标准;             |
| 3. documentation to be produced by the process or project is identified;   | 3. 识别了由过程或项目产出的文档;            |
| 4. the content and purpose of all documentation is specified, reviewed and approved;                                     | 4. 定义、评审和批准了所有文档的内容和目的;       |
| 5. documentation is developed and made available in accordance with identified standards; and                            | 5. 按照已识别的标准, 制订了文档并使其可用;      |
| 6. documentation is maintained in accordance with defined criteria.  | 6. 按照已定义的准则, 维护了文档。           |

| Output work products           | 输出工作产品 [成果]   |
|--------------------------------|---|
| 08-26 Documentation plan 文档化计划 | [OUTCOME 1,2] 14-01 Change history 变更历史 [OUTCOME 5, 6]    |
| 13-01 Acceptance record 验收记录   | [OUTCOME 4, 5] 14-11 Work product list 工作产品清单 [OUTCOME 3] |
| 13-19 Review record 评审记录       | [OUTCOME 4, 5]  |

SUP.7 with 8 Base practices 基本实践

|      |  |  |
|------|--|--|
| BP 1 | <p><b>Develop a documentation management strategy.</b> Develop a documentation management strategy which addresses where, when and what should be documented during the life cycle of the product/service.[OUTCOME 1]</p> <p>1 A documentation management strategy may define the controls needed to approve documentation for adequacy prior to issue; to review and update as necessary and re-approve documentation; to ensure that changes and the current revision status of documentation are identified; to ensure that relevant versions of documentation are available at points of issue; to ensure that documentation remain legible and readily identifiable; to ensure the controlled distribution of documentation; to prevent unintended use of obsolete documentation ; and may also specify the levels of confidentiality, copyright or disclaimers of liability for the documentation.</p> | <p><b>制订文档管理策略。</b> 制订文档管理策略,说明在产品或服务生命周期中何时何地文档化什么。[成果 1]</p> <p>1 文档管理策略可定义以下控制要求：发布前对文档适当性的批准；对文档的评审、必要时的更新及再批准；确保识别文档的变更及当前的修订状态；确保相关版本的文档在发布时可用；确保文档保持易读及易于识别；确保文档分发得到控制；防止意外使用旧版文档；定义文档的保密级别、著作权或免责声明。</p> |
|------|--|--|

## BP 2

**Establish standards for documentation.** Establish standards for developing, modifying and maintaining documentation. [OUTCOME 2]

**建立文档化的标准。** 建立制订、修改和维护文档化的标准。 [成果 2]

## BP 3

**Specify documentation requirements.** Specify requirements for documentation such as title, date, identifier, version history, author(s), reviewer, authorizer, outline of contents, purpose, and distribution list. [OUTCOME 2]

**定义文档化需求。** 定义文档化的需求, 例如标题、日期、标识、版本历史、作者、评审者、批准者、内容大纲、目的和分发列表。 [成果 2]

## BP 4

**Identify the relevant documentation to be produced.** For any given development life cycle, identify the documentation to be produced. [OUTCOME 3]

**识别产出的相关文档。** 识别在任何开发生命周期中所需产出的文档。 [成果 3]

## BP 5

**Develop documentation.** Develop documentation at required process points according to established standards and policy, ensuring the content and purpose is reviewed and approved as appropriate. [OUTCOME 4, 5]

**制订文档。** 根据建立的标准和方针, 在要求的过程节点制订文档, 确保该文档的内容和目的得到适当地评审和批准。 [成果 4, 5]

## BP 6

**Check documentation.** Review documentation before distribution, and authorize documentation as appropriate before distribution or release. [OUTCOME 5]

**检查文档。** 在分发前评审文档, 并在分发或发布前适当地对文档进行授权。 [成果 5]

2 The documentation intended for use by system and software users should accurately describe the system and software and how it is to be used in clear and useful manner for them.

2 由系统和软件用户使用的文档应采取清晰和有用的方式, 对系统、软件以及如何操作做出正确的表述。

3 Documentation should be checked through verification or validation process.

3 应通过验证或确认过程对文档进行检查。

## BP 7

**Distribute documentation.** Distribute documentation according to determined modes of distribution via appropriate media to all affected parties, confirming delivery of documentation, where necessary. [OUTCOME 5]

**分发文档。** 根据确定的分发模式, 通过适当的媒介将文档分发给所有受影响方, 必要时确认文档的交付。 [成果 5]

## BP 8

**Maintain documentation.** Maintain documentation in accordance with the determined documentation strategy. [OUTCOME 6]

**维护文档。** 按照确定的文档化策略, 维护文档。 [成果 6]

4 If the documentation is part of a product baseline or if its control and stability are important, it should be modified and distributed in accordance with process SUP.8 Configuration management.

4 如果文档是某产品基线的一部分, 或其控制和稳定性非常重要, 则应按照 SUP.8 配置管理过程对该文档进行变更和分发。

The purpose of the Configuration Management Process is to establish and maintain the integrity of all work products of a process or project and make them available to affected parties.

配置管理过程的目的是: 建立和维护过程或项目的所有工作产品的完整性, 并使其对受影响方可用。

Process outcomes – as a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

- |   |                                       |
|---|---------------------------------------|
| 1. a configuration management strategy is developed;  | 1. 制订了配置管理策略;                         |
| 2. all configuration items generated by a process or project are identified, defined and base-lined according to the configuration management strategy; | 2. 根据配置管理策略, 识别、定义和基线化了过程或项目生成的所有配置项; |
| 3. modifications and releases of the configuration items are controlled;  | 3. 控制了配置项的修改和发布;                      |
| 4. modifications and releases are made available to affected parties;   | 4. 使修改和发布对受影响方可用;                     |
| 5. the status of the configuration items and modifications is recorded and reported;  | 5. 记录和报告了配置项状态和修改状态;                  |
| 6. the completeness and consistency of the baselines is ensured; and  | 6. 保证了基线的完整性和一致性;                     |
| 7. storage of the configuration items is controlled.  | 7. 控制了配置项的存储。                         |

Output work products 输出工作产品 [成果]

|  |                         |  |                   |
|--|-------------------------|--|-------------------|
| 06-02 Handling and storage guide 处理和存储指南 | [OUTCOME 3, 4, 5, 7]    | 13-10 Configuration management record 配置管理记录 | [OUTCOME 2, 5, 7] |
| 08-04 Configuration management 配置管理计划    | [OUTCOME 1, 2, 7]       | 14-01 Change history 变更历史                    | [OUTCOME 3]       |
| 08-14 Recovery plan 恢复计划                 | [OUTCOME 1,7]           | 16-03 Configuration management system 配置管理系统 | [OUTCOME 1, 3, 4] |
| 13-08 Baseline 基线                        | [OUTCOME 2, 3, 4, 5, 6] |  |                   |

## BP 1

**Develop a configuration management strategy.** Develop a configuration management strategy, including

- responsibilities;
- tools and repositories;
- criteria for configuration items;
- naming conventions;
- access rights;
- criteria for baselines;
- merge and branch strategy;
- the revision history approach for configuration items [OUTCOME 1]

- 1 *The configuration management strategy typically supports the handling of product/software variants which may be caused by different sets of application parameters or by other causes.*
- 2 *The branch management strategy specifies in which cases branching is permissible, whether authorization is required, how branches are merged, and which activities are required to verify that all changes have been consistently integrated without damage to other changes or to the original software.*

## BP 2

**Identify configuration items.** Identify and document configuration items according to the configuration management strategy. [OUTCOME 2]

- 3 *Configuration control is typically applied for the products that are delivered to the customer, designated internal work products, acquired products, tools and other configuration items that are used in creating and describing these work products.*

## BP 3

**Establish a configuration management system.** Establish a configuration management system according to the configuration management strategy. [OUTCOME 1, 2, 3, 4, 6, 7]

**制订配置管理策略。** 制订配置管理策略，包括：

- 职责；
- 工具和储存库；
- 配置项准则；
- 命名规则；
- 访问权限；
- 基线准则；
- 合并和分支策略；
- 配置项修订历史的方法。[成果1]

- 1 配置管理策略通常有助于处理由不同组的应用参数或其它原因所导致的产品/软件变型。
- 2 分支管理策略定义在哪些情况下分支是允许的，是否需要授权，分支是如何合并的，以及需要哪些活动以验证所有的变更都一致地集成且不损坏其它变更或原始软件。

**识别配置项。** 根据配置管理策略，识别和记录配置项。[成果 2]

- 3 配置控制通常应用于交付给客户的产品、指定的内部工作产品、获得的产品、工具和用于创建和描述这些工作产品的其他配置项。

**建立配置管理系统。** 根据配置管理策略，建立配置管理系统。[成果1, 2, 3, 4, 6, 7]

## BP 4

**Establish branch management.** Establish branch management according to the configuration management strategy where applicable for parallel developments that use the same base. [OUTCOME 1, 3, 4, 6, 7]

## BP 5

**Control modifications and releases.** Establish mechanisms for control of the configuration items according to the configuration management strategy, and control modifications and releases using these mechanisms. [OUTCOME 3, 4, 5]

## BP 6

**Establish baselines.** Establish baselines for internal purposes and for external delivery according to the configuration management strategy. [OUTCOME 2]

4 For baseline issues refer also to the product release process SPL.2.

## BP 7

**Report configuration status.** Record and report status of configuration items to support project management and other relevant processes. [OUTCOME 5]

5 Regular reporting of the configuration status (e.g. how many configuration items are currently under work, checked in, tested, released, etc.) supports project management activities and dedicated project phases like software integration.

## BP 8

**Verify the information about configured items.** Verify that the information about configured items, and their baselines is complete and ensure the consistency of baselines. [OUTCOME 6]

6 A typical implementation is performing baseline and configuration management audits.

## BP 9

**Manage the storage of configuration items and baselines.** Ensure the integrity and availability of configuration items and baselines through appropriate scheduling and resourcing of storage, archiving (long term storage) and backup of the used CM systems. [OUTCOME 4, 5, 6, 7]

7 Backup, storage and archiving may need to extend beyond the guaranteed lifetime of available storage media. Relevant configuration items affected may include those referenced in 2 and 3 Availability may be specified by contract requirements.

**建立分支管理。**根据配置管理策略，在适用的情况下建立使用同一基础进行并行开发的分支管理。[成果1, 3, 4, 6, 7]

**控制修改和发布。**根据配置管理策略，建立配置项的控制机制，并使用这些机制控制修改和发布。[成果3, 4, 5]

**建立基线。**根据配置管理策略，为内部目的和外部交付建立基线。[成果2]

4 关于基线问题，也见产品发布过程SPL.2。

**报告配置状态。**记录和报告配置项的状态，以支持项目管理和其他相关的过程。[成果5]

5 配置状态的定期报告（例如，目前有多少配置项目正在进行中、已检入、已测试、已发布等）支持项目管理活动和特定的项目阶段，如软件集成。

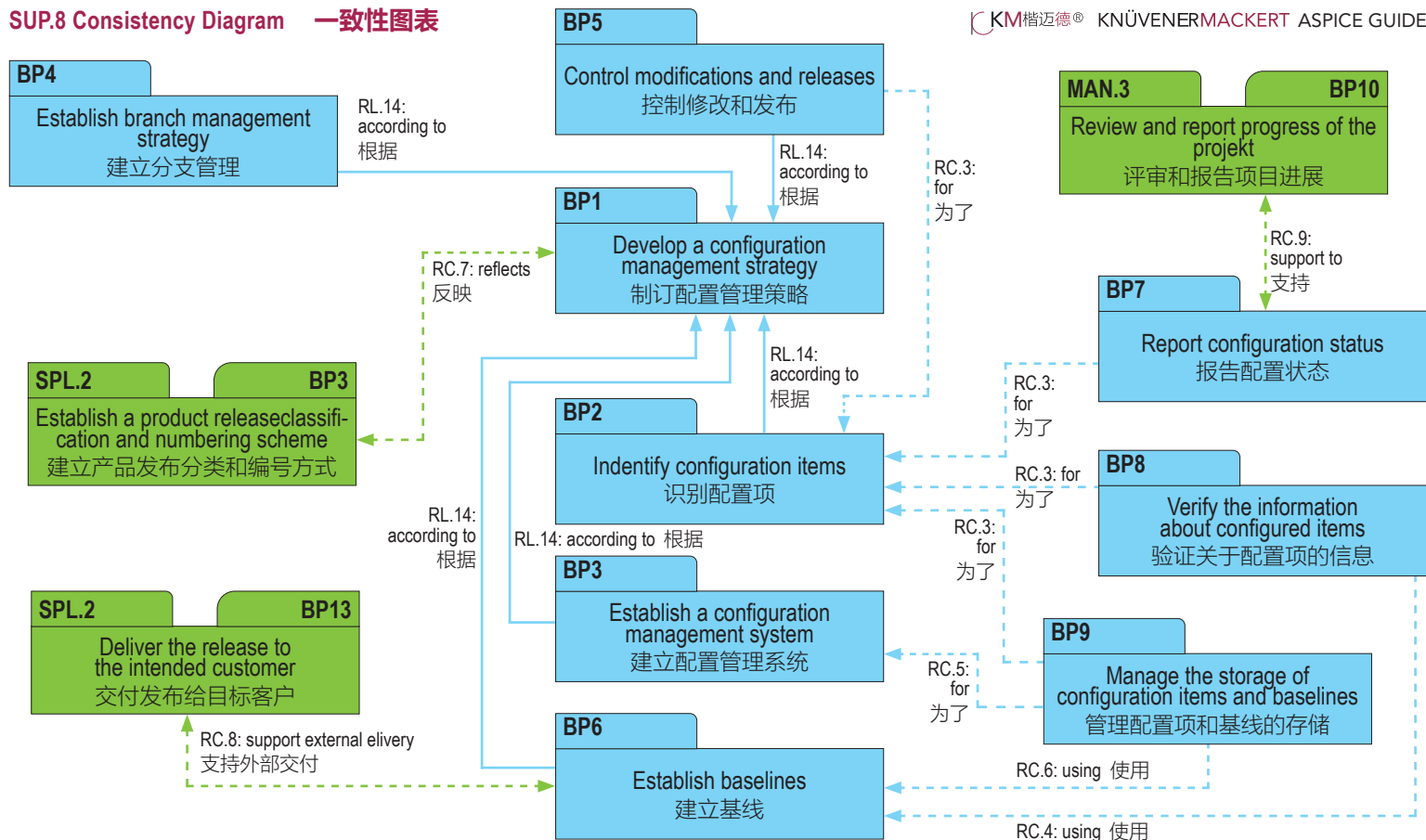
**验证关于配置项的信息。**验证关于配置项及其基线的信息是否完整，并确保基线的一致性。[成果6]

6 典型的实现方式是执行基线审核和配置管理审核。

**管理配置项和基线的存储。**通过对所使用的配置管理系统的存储、归档（长期存储）和备份进行适当的进度安排和资源安排，确保配置项和基线的完整性和可用性。[成果4, 5, 6, 7]

7 备份、存储和归档可能需要超出可用存储介质所保证的寿命。受影响的相关配置项可包括 2 和 3 中所提及的配置项。可用性可由合同要求来定义。

## SUP.8 Consistency Diagram 一致性图表



The purpose of the Problem Resolution Management Process is to ensure that problems are identified, analyzed, managed and controlled to resolution.

问题解决管理过程的目的是：确保问题被识别、分析、管理和控制，并得以解决。

Process outcomes – as a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

- |  |                        |
|--|------------------------|
| 1. a problem resolution management strategy is developed;                  | 1. 制订了问题解决管理策略;        |
| 2. problems are recorded, uniquely identified and classified;              | 2. 对问题进行了记录、唯一标识和分类;   |
| 3. problems are analyzed and assessed to identify an appropriate solution; | 3. 分析和评估了问题以识别适当的解决方案; |
| 4. problem resolution is initiated;  | 4. 启动了问题的解决;           |
| 5. problems are tracked to closure; and                                    | 5. 跟踪了问题直至关闭;          |
| 6. the status of problems and their trend are known.                       | 6. 了解了问题的状态及趋势         |

Output work products 输出工作产品 [成果]

|                                      |                      |                                    |             |
|--------------------------------------|----------------------|------------------------------------|-------------|
| 08-27 Problem management plan 问题管理计划 | [OUTCOME 1]          | 15-05 Evaluation report 评估报告       | [OUTCOME 3] |
| 13-07 Problem record 问题记录            | [OUTCOME 2, 3, 4, 5] | 15-12 Problem status report 问题状态报告 | [OUTCOME 6] |
| 15-01 Analysis report 分析报告           | [OUTCOME 3]          |                                    |             |



## BP 1

**Develop a problem resolution management strategy.** Develop a problem resolution management strategy, including problem resolution activities, a status model for the problems, alert notifications, responsibilities for performing these activities and an urgent resolution strategy. Interfaces to affected parties are defined and definitions are maintained. [OUTCOME 1]

- 1 Problem resolution activities can be different during the product life cycle, e.g. during prototype construction and series development.

## BP 2

**Identify and record the problem.** Each problem is uniquely identified, described and recorded. Supporting information should be provided to reproduce and diagnose the problem. [OUTCOME 2]

- 2 Supporting information typically includes the origin of the problem, how it can be reproduced, environmental information, by whom it has been detected, etc.
- 3 Unique identification supports traceability to changes made.

## BP 3

**Record the status of problems.** A status according to the status model is assigned to each problem to facilitate tracking. [OUTCOME 6]

## BP 4

**Diagnose the cause and determine the impact of the problem.** Investigate the problem and determine its cause and impact in order to categorize the problem and to determine appropriate actions. [OUTCOME 2, 3]

- 4 Problem categorization (e.g. A, B, C, light, medium, severe) may be based on severity, impact, criticality, urgency, relevance for the change process, etc.

## BP 5

**Authorize urgent resolution action.** If according to the strategy a problem requires an urgent resolution, authorization shall be obtained for immediate action also according to the strategy. [OUTCOME 4]

**制订问题解决管理策略。**制订问题管理策略，包括问题解决活动、问题的状态模型、警报通知，以及执行这些活动的职责和紧急解决策略。定义与受影响方的接口，并加以维护。[成果1]

- 1 问题解决活动在产品的生命周期中可以是不同的，例如原型构建和量产开发阶段。

**识别和记录问题。**每个问题都被唯一识别、描述和记录。应提供支持信息以重现和诊断问题。[成果2]

- 2 支持信息通常包括问题的起源、问题如何重现、环境信息、问题发现者等。
- 3 唯一标识有助于变更的追溯。

**记录问题的状态。**根据状态模型，给每个问题分配状态以便跟踪。[成果6]

**诊断原因并确定问题的影响。**调查问题并确定其原因和影响，以便对问题进行分类和确定适当的行动。[成果2, 3]

- 4 可基于严重度、影响、关键性、紧急性、变更流程的相关性等，对问题分类（例如：A, B, C，轻度、中度、重度）

**授权紧急解决行动。**如果根据策略需要紧急解决问题，也应根据策略获得立即采取行动的授权。[成果4]

## BP 6

**Raise alert notifications.** If according to the strategy the problem has a high impact on other systems or other affected parties, an alert notification needs to be raised also according to the strategy. [OUTCOME 4]

## BP 7

**Initiate problem resolution.** Initiate appropriate actions according to the strategy to resolve the problem including review of those actions, or initiate a change request. [OUTCOME 4]

5 Appropriate actions may include the initiating of a change request. See SUP.10 for managing of change requests.

6 The implementation of process improvements (to prevent problems) is done in the process improvement process (PIM.3). The implementation of generic project management improvements (e.g. lessons learned) are part of the project management process (MAN.3). The implementation of generic work product related improvements are part of the quality assurance process (SUP.1).

## BP 8

**Track problems to closure.** Track the status of problems to closure including all related change requests. A formal acceptance has to be authorized before closing the problem. [OUTCOME 5, 6]

## BP 9

**Analyze problem trends.** Collect and analyze problem resolution management data, identify trends, and initiate project related actions, according to the strategy. [OUTCOME 6]

7 Collected data typically contains information about where the problems occurred, how and when they were found, what were their impacts, etc.

**发出警报通知。** 根据策略，如果问题对于其他系统或其他受影响方有较大的影响，则也需要根据策略发出警报通知。[成果4]

**启动问题的解决。** 根据策略发起适当的行动（包括对行动的评审）以解决问题，或发起变更请求。[成果4]

5 适当的行动可包括发起变更请求。关于变更请求管理，见 SUP.10。

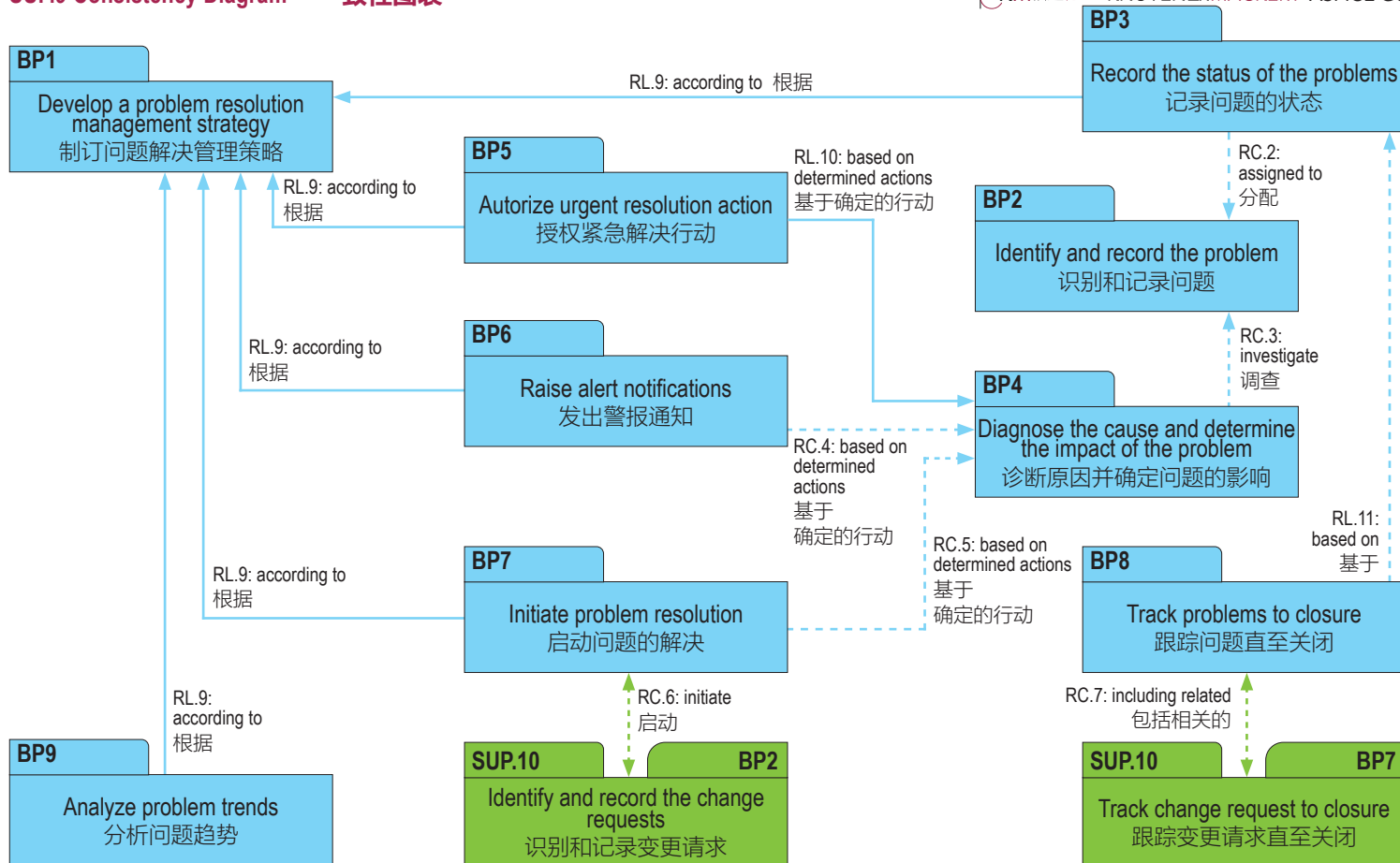
6 实施过程改进（为预防问题）是在过程改进过程(PIM.3)中进行的。通用项目管理改进的实施（例如：经验教训）是项目管理过程(MAN.3)的一部分。通用工作产品相关的改进的实施是质量保证过程(SUP.1)的一部分。

**跟踪问题直至关闭。** 跟踪问题的状态（包括所有相关的变更请求）直至关闭。在关闭问题前，需要得到正式验收的授权。[成果5,6]

**分析问题趋势。** 根据策略，收集和分析问题解决管理数据，识别趋势，并发起项目相关的行动。[成果6]

7 收集的数据通常包含的信息有：问题是在哪里发生的、是如何及何时被发现的、有什么影响等。

## SUP.9 Consistency Diagram 一致性图表



The purpose of the Change Request Management Process is to ensure that change requests are managed, tracked and implemented.

变更请求管理过程的目的是：确保变更请求被管理、跟踪和实  
施。

Process outcomes – as a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

- |   |                               |
|---|-------------------------------|
| 1. a change request management strategy is developed;   | 1. 制订了变更请求管理策略;               |
| 2. requests for changes are recorded and identified;  | 2. 记录和识别了变更请求;                |
| 3. dependencies and relationships to other change requests are identified;                              | 3. 识别了与其它变更请求之间的依赖与关系;        |
| 4. criteria for confirming implementation of change requests are defined;                               | 4. 定义了变更请求实施的确认准则;            |
| 5. requests for change are analyzed, and resource requirements are estimated;                           | 5. 分析了变更请求及估算了资源需求;           |
| 6. changes are approved and prioritized on the basis of analysis results and availability of resources; | 6. 基于分析结果和可用资源，批准了变更并进行优先级排序。 |
| 7. approved changes are implemented and tracked to closure;   | 7. 实施了已批准的变更，并跟踪直至关闭;         |
| 8. the status of all change requests is known; and  | 8. 了解了所有变更请求的状态;              |
| 9. bi-directional traceability is established between change requests and affected work products..      | 9. 建立了变更请求与受影响工作产品之间的双向可追溯性。  |

Output work products 输出工作产品 [成果]

|                                     |                            |                                    |               |
|-------------------------------------|----------------------------|------------------------------------|---------------|
| 08-28 Change management plan 变更管理计划 | [OUTCOME 1]                | 13-19 Review record 评审记录           | [OUTCOME 7]   |
| 13-16 Change request 变更请求           | [OUTCOME 2, 3, 4, 5, 6, 7] | 13-21 Change control record 变更控制记录 | [OUTCOME 8,9] |

## BP 1

**Develop a change request management strategy.** Develop a change request management strategy, including change request activities, a status model for the change requests, analysis criteria, and responsibilities for performing these activities. Interfaces to affected parties are defined and maintained. [OUTCOME 1]

- 1 A status model for change requests may contain: open, under investigation, approved for implementation, allocated, implemented, fixed, closed, etc.
- 2 Typical analysis criteria are: resource requirements, scheduling issues, risks, benefits, etc.
- 3 Change request activities ensure that change requests are systematically identified, described, recorded, analyzed, implemented, and managed.
- 4 The change request management strategy may cover different proceedings across the product life cycle, e.g. during prototype construction and series development.

## BP 2

**Identify and record the change requests.** Each change request is uniquely identified, described, and recorded according to the strategy, including the initiator and reason of the change request. [OUTCOME 2, 3]

## BP 3

**Record the status of change requests.** A status according to the status model is assigned to each change request to facilitate tracking. [OUTCOME 8]

## BP 4

**Analyze and assess change requests.** Change requests are analyzed according to the strategy including their dependencies to affected work products and other change requests. Assess the impact of the change requests and establish criteria for confirming implementation. [OUTCOME 3, 4, 5, 9]

## 基本实践

**制订变更请求管理策略。**制订包括变更请求活动、变更请求的状态模型、分析准则以及执行这些活动的职责在内的变更请求管理策略。定义和维护与受影响方的接口。[成果1]

- 1 变更请求的状态模型可包括：未解决、调查中、批准实施、已分配、已实施、已解决、已关闭等。
- 2 分析准则通常有：资源需求、进度问题、风险、利益等。
- 3 变更请求活动应确保变更请求被系统化地识别、描述、记录、分析、实施和管理。
- 4 变更请求管理策略可覆盖在产品生命周期中不同的程序，例如：在原型构建和量产开发中。

**识别和记录变更请求。**根据策略，每个变更请求被唯一标识、描述和记录，包括变更请求的发起者和原因。[成果 2, 3]

**记录变更请求的状态。**根据状态模型，给每个变更请求分配状态以便跟踪。[成果 8]

**分析和评估变更请求。**根据策略分析变更请求，包括其与受影响工作产品和其他变更请求的依赖。评估变更请求的影响，并建立实施的确认准则。[成果 3, 4, 5, 9]

## BP 5

**Approve change requests before implementation.** Change requests are prioritized based on analysis results and availability of resources before implementation and approved according to the strategy. [OUTCOME 6]

5 *A Change Control Board (CCB) is a common mechanism used to approve change requests.*

6 *Prioritization of change requests may be done by allocation to releases.*

## BP 6

**Review the implementation of change requests.** The implementation of change requests is reviewed before closure to ensure that their criteria for confirming implementation are satisfied, and that all relevant processes have been applied. [OUTCOME 7, 8]

## BP 7

**Track change requests to closure.** Change requests are tracked until closure. Feedback to the initiator is provided. [OUTCOME 7, 8]

## BP 8

**Establish bidirectional traceability.** Establish bidirectional traceability between change requests and work products affected by the change requests. In case that the change request is initiated by a problem, establish bidirectional traceability between change requests and the corresponding problem reports. [OUTCOME 9]

7 *Bidirectional traceability supports consistency, completeness and impact analysis.*

**在实施前批准变更请求。** 在实施前对变更请求进行基于分析结果和可用资源的优先级排序，并根据策略进行批准。[成果 6]

5 通过变更控制委员会（CCB）批准变更请求是常用的机制。

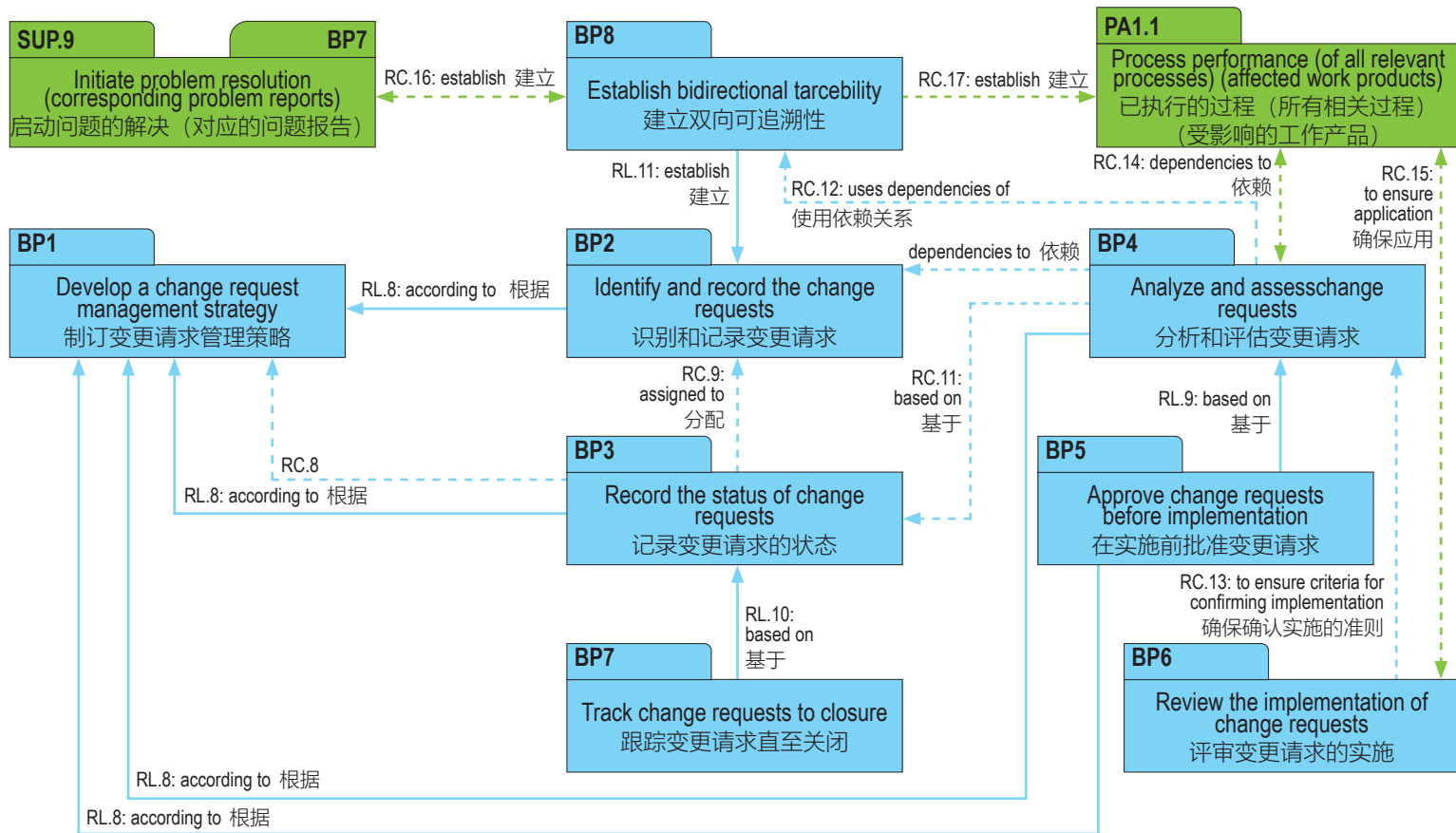
6 变更请求的优先级可通过分配变更到不同的发布来体现。

**评审变更请求的实施。** 在关闭前评审变更请求的实施，以确保满足实施的确认准则及相关过程得以应用。[成果 7, 8]

**跟踪变更请求直至关闭。** 跟踪变更请求直至关闭。提供反馈给发起者。[成果 7, 8]

**建立双向可追溯性。** 建立变更请求与受变更请求影响的工作产品之间的双向可追溯性。如果变更请求是由问题所导致的，在变更请求与对应的问题报告之间建立双向可追溯性。[成果 9]

7 双向可追溯性有助于一致性、完整性和影响分析。



The purpose of the Product Release Process is to control the release of a product to the intended customer. 产品发布过程的目的是：控制对目标客户的产品发布。

| Process outcomes – as a result of successful implementation of this process:   | 过程成果 - 成功实施这个过程的结果如下:   |
|--|---|
| 1. the contents of the product release are determined;<br>2. the release is assembled from configured items;<br>3. the release documentation is defined and produced;<br>4. the release delivery mechanism and media are determined;<br>5. release approval is effected against defined criteria;<br>6. the product release is made available to the intended customer; and<br>7. confirmation of release is obtained. | 1. 确定了产品发布的内容;<br>2. 发布由被配置的项构建;<br>3. 定义并生成了发布文档;<br>4. 确定了发布的交付机制和媒介;<br>5. 依照定义的准则, 批准了发布;<br>6. 提供了产品发布给目标客户;<br>7. 获得了发布的确认。 |

| Output work products 输出工作产品 [成果]         |                      |   |                |
|--|----------------------|---|----------------|
| 08-16 Release plan 发布计划                  | [OUTCOME 1, 3]       | 13-06 Delivery record 交付记录                    | [OUTCOME 6,7]  |
| 11-03 Product release information 产品发布信息 | [OUTCOME 1, 3, 4, 6] | 13-13 Product release approval record 产品发布批准录 | [OUTCOME 5]    |
| 11-04 Product release package 产品发布包      | [OUTCOME 2, 3, 6]    | 15-03 Configuration status report 配置状态报告      | [OUTCOME 2]    |
| 11-07 Temporary solution 临时解决方案          | [OUTCOME 6]          | 18-06 Product release criteria 产品发布准则         | [OUTCOME 5, 7] |



## BP 1

**Define the functional content of releases.** Establish a plan for releases that identifies the functionality to be included in each release. [OUTCOME 1, 3]

- 1 The plan should point out which application parameters influencing the identified functionality are effective for which release.

## BP 2

**Define release products.** The products associated with the release are defined. [OUTCOME 1]

- 2 The release products may include programming tools where these are stated. In automotive terms a release may be associated with a sample e.g. A, B, C.

## BP 3

**Establish a product release classification and numbering scheme.** A product release classification and numbering scheme are established based upon the intended purpose and expectations of the release(s). [OUTCOME 2]

- 3 A release numbering implementation may include
  - the major release number
  - the feature release number
  - the defect repair number
  - the alpha or beta release
  - the iteration within the alpha or beta release

## BP 4

**Define the build activities and build environment.** A consistent build process is established and maintained. [OUTCOME 2]

- 4 A specified and consistent build environment should be used by all parties.

## BP 5

**Build the release from configured items.** The release is built from configured items to ensure integrity. [OUTCOME 2]

- 5 Where relevant the software release should be programmed onto the correct hardware revision before release.

**定义发布的功能性内容。** 建立发布计划以识别各发布所包含的功能。[成果 1, 3]

- 1 该发布计划应指明，影响已识别功能的各应用参数是对哪个发布有效。

**定义发布产品。** 定义与发布相关联的产品。[成果 1]

- 2 发布产品可包括：编程工具（如有声明）。在汽车行业术语中，发布可与样件相关联（例如：A，B，C）。

**建立产品发布分类和编号方式。** 基于发布的预期目的和期望，建立产品发布的分类和编号方式。[成果 2]

- 3 发布编号方式的实施可包括：
  - 主要发布编号
  - 功能发布编号
  - 缺陷修复编号
  - alpha 或 beta 发布
  - alpha 或 beta 发布内的迭代

**定义构建活动和构建环境。** 建立并维护一致的构建过程。[成果 2]

- 4 所有方应使用指定的和一致的构建环境。

**从被配置的项构建发布。** 从被配置的项构建发布以确保完整性。[成果 2]

- 5 如果适用，软件发布应在发布之前刷写进正确的硬件版本。

BP 6

**Communicate the type, service level and duration of support for a release.** The type, service level and duration of support for a release are identified and communicated. [OUTCOME 3]

**沟通发布的类型，服务级别和提供支持的持续时间。** 识别并沟通发布的类型，服务级别和提供支持的持续时间。 [成果 3]

BP 7

**Determine the delivery media type for the release.** The media type for product delivery is determined in accordance with the needs of the customer. [OUTCOME 4]

**确定发布的交付媒介类型。** 确定与客户要求一致的产品交付的媒介类型。 [成果 4]

6 *The media type for delivery may be intermediate (placed on an adequate media and delivered to customer), or direct (such as delivered in firmware as part of the package) or a mix of both. The release may be delivered electronically by placement on a server. The release may also need to be duplicated before delivery.*

6 交付的媒介类型可以是：间接的（记录在适当的媒介并交付给客户）或直接的（例如用交付包内的固件进行交付）或两者的混合。发布可上传至服务器进行电子交付。发布也需要在交付前进行备份。

BP 8

**Identify the packaging for the release media.** The packaging for different types of media is identified. [OUTCOME 4]

**识别发布媒介的包装。** 识别不同类型媒介的包装。 [成果 4]

7 *The packaging for certain types of media may need physical or electronic protection for instance specific encryption techniques.*

7 某些类型媒介的包装可能需要物理或电子保护，例如特定的加密技术。

BP 9

**Define and produce the product release documentation/release notes.** Ensure that all documentation to support the release is produced, reviewed, approved and available. [OUTCOME 3]

**定义和生成产品发布文档/发布说明。** 确保生成、评审、批准并提供所有支持发布的文档。 [成果 3]

BP 10

**Ensure product release approval before delivery.** Criteria for the product release are satisfied before release takes place. [OUTCOME 5]

**确保交付前对产品发布的批准。** 在发布前，产品发布准则得到满足。 [成果 5]

BP 11

**Ensure consistency.** Ensure consistency between software release number, paper label and EPROM-Label (if relevant). [OUTCOME 5]

**确保一致性。** 确保软件发布编号、纸质标签和EEPROM标签（如果适用）之间的一致性。 [成果 5]

## BP 12

**Provide a release note.** A release is supported by information detailing key characteristics of the release. [OUTCOME 6]

- 8 The release note may include an introduction, the environmental requirements, installation procedures, product invocation, new feature identification and a list of defect resolutions, known defects and workarounds.

## BP 13

**Deliver the release to the intended customer.** The product is delivered to the intended customer with positive confirmation of receipt. [OUTCOME 6, 7]

- 9 Confirmation of receipt may be achieved by hand, electronically, by post, by telephone or through a distribution service provider.
- 10 These practices are typically supported by the SUP.8 Configuration Management Process.

**提供发布说明。** 通过提供发布关键特性的详细信息来支持发布。[成果 6]

- 8 发布说明可包括：简介、环境需求、安装程序、产品调用、新功能的标识和缺陷解决方案清单、已知缺陷和变通方法的清单。

**交付发布给目标客户。** 交付产品给目标客户并获得确认凭据。[成果 6, 7]

- 9 确认凭据可通过手写、电子、邮件、电话或配送服务商实现。
- 10 以上实践通常通过 SUP.8 配置管理过程支持。

The purpose of the Requirements Elicitation Process is to gather, process, and track evolving stakeholder needs and requirements throughout the lifecycle of the product and/or service so as to establish a requirements baseline that serves as the basis for defining the needed work products.

需求挖掘过程的目的是：在产品 and/或服务的整个生命周期内收集、处理和跟踪不断变化的利益相关方的需要和需求，从而建立一个需求基线，作为定义所需工作产品的基础。

Process outcomes – as a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

1. continuing communication with the stakeholder is established;

2. agreed stakeholder requirements are defined and baselined;

3. a change mechanism is established to evaluate and incorporate changes to stakeholder requirements into the baselined requirements based on changing stakeholder needs;

4. a mechanism is established for continuous monitoring of stakeholder needs;

5. a mechanism is established for ensuring that customers can easily determine the status and disposition of their requests; and

6. changes arising from changing technology and stakeholder needs are identified, the associated risks assessed and their impact managed.
1. 建立了与利益相关方的持续沟通;

2. 定义和基线化了约定的利益相关方需求;

3. 建立了变更机制，以便基于利益相关方需要的变化，评估利益相关方需求的变更并将其纳入需求基线;

4. 建立了持续监控利益相关方需要的机制;

5. 建立了机制，以确保客户可以容易地判定其要求的状态和处置结果

6. 识别了因技术或利益相关方需要的变化而引发的变更，评估相关的风险并管理其带来的影响

Output work products 输出工作产品 [成果]

|                                   |                |  |                   |
|-----------------------------------|----------------|--|-------------------|
| 08-19 Risk management plan 风险管理计划 | [OUTCOME 6]    | 13-21 Change control record 变更控制记录     | [OUTCOME 3, 4]    |
| 08-20 Risk mitigation plan 风险缓解计划 | [OUTCOME 6]    | 15-01 Analysis report 分析报告             | [OUTCOME 2, 3, 6] |
| 13-04 Communication record 沟通记录   | [OUTCOME 1, 4] | 17-03 Stakeholder Requirements 利益相关方需求 | [OUTCOME 1, 2]    |
| 13-19 Review record 评审记录          | [OUTCOME 4, 5] |  |                   |

## BP 1

**Obtain stakeholder requirements and requests.** Obtain and define stakeholder requirements and requests through direct solicitation of customer input and through review of customer business proposals (where relevant), target operating and hardware environment, and other documents bearing on customer requirements. [OUTCOME 1, 4]

- 1 *Requirements elicitation may involve the customer and the supplier.*
- 2 *The agreed stakeholder requirements and evaluation of any change may be based on feasibility studies and/or cost and time analyzes.*
- 3 *The information needed to keep traceability for each customer requirement has to be gathered and documented.*

## BP 2

**Understand stakeholder expectations.** Ensure that both supplier and customer understand each requirement in the same way. [OUTCOME 2]

- 4 *Reviewing the requirements and requests with the customer supports a better understanding of customer needs and expectations. Refer to the process SUP.4 Joint Review.*

## BP 3

**Agree on requirements.** Obtain an explicit agreement from all relevant parties to work on these requirements. [OUTCOME 2]

## BP 4

**Establish stakeholder requirements baseline.** Formalize the stakeholder's requirements and establish them as a baseline for project use and monitoring against stakeholder needs. The supplier should determine the requirements not stated by the stakeholder but necessary for specified and intended use and include them in the baseline. [OUTCOME 2,3]

**获得利益相关方需求和要求。**通过直接征求客户意见并通过评审客户业务提案（相关部分）、目标运行和硬件环境以及其它影响客户需求的文档来获取并定义利益相关方的需求和要求。[成果1, 4]

- 1 需求挖掘可能需要客户和供应商的参与。
- 2 约定的利益相关方需求和对变更的评估可基于可行性研究和 / 或成本和时间分析。
- 3 必须收集并记录保持每个客户需求可追溯性所需的信息。

**理解利益相关方的期望。**确保供应商和客户对每个需求有同样的理解。[成果 2]

- 4 与客户一起评审需求和要求有助于更好的理解客户需要和期望。参过程 SUP.4 联合评审。

**达成需求共识。**获得所有相关方关于需求的明确协议，以便于开展工作。[成果 2]

**建立利益相关方需求基线。**将利益相关方的需求正式化，并建立基线以便项目使用和依照利益相关方需要进行监控。供应商应确定利益相关方未说明的但对指定和预期用途有必要的需求，并将其包括在基线中。[成果 2,3 ]

## BP 5

**Manage stakeholder requirements changes.** Manage all changes made to the stakeholder requirements against the stakeholder requirements baseline to ensure enhancements resulting from changing technology and stakeholder needs are identified and that those who are affected by the changes are able to assess the impact and risks and initiate appropriate change control and mitigation actions. [OUTCOME 3, 6]

- 5 *Requirements change may arise from different sources as for instance changing technology and stakeholder needs, legal constraints.*
- 6 *An information management system may be needed to manage, store and reference any information gained and needed in defining agreed stakeholder requirements.*

## BP 6

**Establish customer-supplier query communication mechanism.** Provide means by which the customer can be aware of the status and disposition of their requirements changes and the supplier can have the ability to communicate necessary information, including data, in a customer-specified language and format. [OUTCOME 5]

- 7 *Any changes should be communicated to the customer before implementation in order that the impact, in terms of time, cost and functionality can be evaluated.*
- 8 *This may include joint meetings with the customer or formal communication to review the status for their requirements and requests; Refer to the process SUP.4 Joint Review.*
- 9 *The formats of the information communicated by the supplier may include computer-aided design data and electronic data exchange.*

**管理利益相关方需求变更。**依照利益相关方需求基线来管理所有利益相关方需求的变更，以确保识别技术和利益相关方需要的变化而带来的改进，以及确保受变化影响的人能够评估影响和风险，并启动适当的变更控制和缓解措施。[成果 3, 6]

- 5 需求变化可有不同的来源，例如技术和利益相关方需求的变化、法律约束。
- 6 在定义约定的利益相关方需求时所获的和所需的信息可能需要信息管理系统来进行管理、存储和引用。

**建立客户 - 供应商查询沟通机制。**给客户可以提供可以了解其需求变更状态和处置结果的方法，供应商能够以客户指定的语言和形式沟通包括数据在内的必要信息。[成果 5]

- 7 任何变更在实施之前都应和客户沟通，以便评估时间、成本和功能性的影响。
- 8 这可包括与客户的联合会议或正式沟通，以评审其需求和要求的状态。参过程 SUP.4 联合评审。
- 9 供应商沟通的信息格式可包括计算机辅助设计数据和电子数据交换。



The purpose of the System Requirements Analysis Process is to transform the defined stakeholder requirements into a set of system requirements that will guide the design of the system.

系统需求分析过程的目的是：将已定义的利益相关方需求转换成一组系统需求，以指导系统设计。

Process outcomes – As a result of successful implementation of this process:    过程成果 - 成功实施这个过程的结果如下:

- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>1. a defined set of system requirements is established;</li><li>2. system requirements are categorized and analyzed for correctness and verifiability;</li><li>3. the impact of system requirements on the operating environment is analyzed;</li><li>4. prioritization for implementing the system requirements is defined;</li><li>5. the system requirements are updated as needed;</li><li>6. consistency and bidirectional traceability are established between stakeholder requirements and system requirements;</li><li>7. the system requirements are evaluated for cost, schedule and technical impact; and</li><li>8. the system requirements are agreed and communicated to all affected parties.</li></ul> | <ul style="list-style-type: none"><li>1. 建立了一组定义的系统需求;</li><li>2. 对系统需求进行分类, 并分析了其正确性和可验证性;</li><li>3. 分析了系统需求对运行环境的影响;</li><li>4. 定义了系统需求实施的优先级;</li><li>5. 根据需要更新了系统需求;</li><li>6. 建立了利益相关方需求和系统需求之间的一致性和双向可追溯性;</li><li>7. 从成本、进度和技术影响来评估系统需求;</li><li>8. 约定了系统需求, 并与所有受影响方沟通。</li></ul> |
|--|---|

Output work products    输出工作产品 [成果]

|                                    |             |   |                      |
|------------------------------------|-------------|---|----------------------|
| 13-04 Communication record 沟通记录    | [OUTCOME 8] | 15-01 Analysis report 分析报告                        | [OUTCOME 2, 3, 4, 7] |
| 13-19 Review record 评审记录           | [OUTCOME 6] | 17-08 Interface requirements specification 接口需求规范 | [OUTCOME 1, 3]       |
| 13-21 Change control record 变更控制记录 | [OUTCOME 1] | 17-12 System requirements specification 系统需求规范    | [OUTCOME 1, 5]       |
| 13-22 Traceability record 追溯记录     | [OUTCOME 6] | 17-50 Verification criteria 验证准则                  | [OUTCOME 2]          |



## BP 1

**Specify system requirements.** Use the stakeholder requirements and changes to the stakeholder requirements to identify the required functions and capabilities of the system. Specify functional and non-functional system requirements in a system requirements specification. [OUTCOME 1, 5, 7]

- 1 *Application parameter influencing functions and capabilities are part of the system requirements.*
- 2 *For changes to the stakeholder's requirements SUP.10 applies.*

## BP 2

**Structure system requirements.** Structure the system requirements in the system requirements specification by e.g.

- grouping to project relevant clusters,
- sorting in a logical order for the project,
- categorizing based on relevant criteria for the project,
- prioritizing according to stakeholder needs.

[OUTCOME 2, 4]

- 3 *Prioritizing typically includes the assignment of functional content to planned releases. Refer to SPL.2.BP1.*

## BP 3

**Analyze system requirements.** Analyze the specified system requirements including their interdependencies to ensure correctness, technical feasibility and verifiability, and to support risk identification. Analyze the impact on cost, schedule and the technical impact. [OUTCOME 1, 2, 7]

- 4 *The analysis of impact on cost and schedule supports the adjustment of project estimates. Refer to MAN.3.BP5.*

## BP 4

**Analyze the impact on the operating environment.** Identify the interfaces between the specified system and other elements of the operating environment. Analyze the impact that the system requirements will have on these interfaces and the operating environment. [OUTCOME 3, 7]

**定义系统需求。** 使用利益相关方需求及其变更，以识别系统所需的功能和能力。在系统需求规范中定义功能性和非功能性系统需求。[成果1, 5, 7]

- 1 影响功能和应用参数的应用参数是系统需求的一部分。
- 2 关于利益相关方需求的变更，适用 SUP.10

**结构化系统需求。** 在系统需求规范中结构化系统需求，例如：

- 按项目相关集群进行分组，
- 按项目中逻辑顺序排序，
- 基于项目相关准则进行分类，
- 根据利益相关方需要进行优先级排序。

[成果 2, 4]

- 3 优先级排序通常包括将功能性内容分配给已计划的发布。参见SPL.2.BP1。

**分析系统需求。** 分析已定义的系统需求（包括它们的相互依赖关系），以确保正确性、技术可行性和可验证性，并且支持风险识别。分析对成本、进度和技术的影响。[成果 1, 2, 7]

- 4 对成本和进度的影响分析有助于项目估算的调整。参见MAN.3.BP5。

**分析对运行环境的影响。** 识别定义的系统 and 运行环境中其他要素之间的接口。分析系统需求对这些接口和运行环境的影响。[成果 3, 7]

## BP 5

**Develop verification criteria.** Develop the verification criteria for each system requirement that define the qualitative and quantitative measures for the verification of a requirement. [OUTCOME 2, 7]

5 *Verification criteria demonstrate that a requirement can be verified within agreed constraints and is typically used as the input for the development of the system test cases or other verification measures that ensures compliance with the system requirements.*

6 *Verification which cannot be covered by testing is covered by SUP.2.*

## BP 6

**Establish bidirectional traceability.** Establish bidirectional traceability between stakeholder requirements and system requirements. [OUTCOME 6]

7 *Bidirectional traceability supports coverage, consistency and impact analysis.*

## BP 7

**Ensure consistency.** Ensure consistency between stakeholder requirements and system requirements. [OUTCOME 6]

8 *Consistency is supported by bidirectional traceability and can be demonstrated by review records.*

## BP 8

**Communicate agreed system requirements.** Communicate the agreed system requirements and updates to system requirements to all relevant parties. [OUTCOME 8]

**制订验证准则。**对每一个系统需求制订验证准则，定义定性的和定量的措施用于需求验证。[成果 2, 7]

5 验证准则证明了需求可以在约定的约束范围内得到验证，并且通常被用作系统测试用例开发或其它证明符合系统需求的验证措施的输入。

6 测试不能覆盖的验证由 SUP.2覆盖。

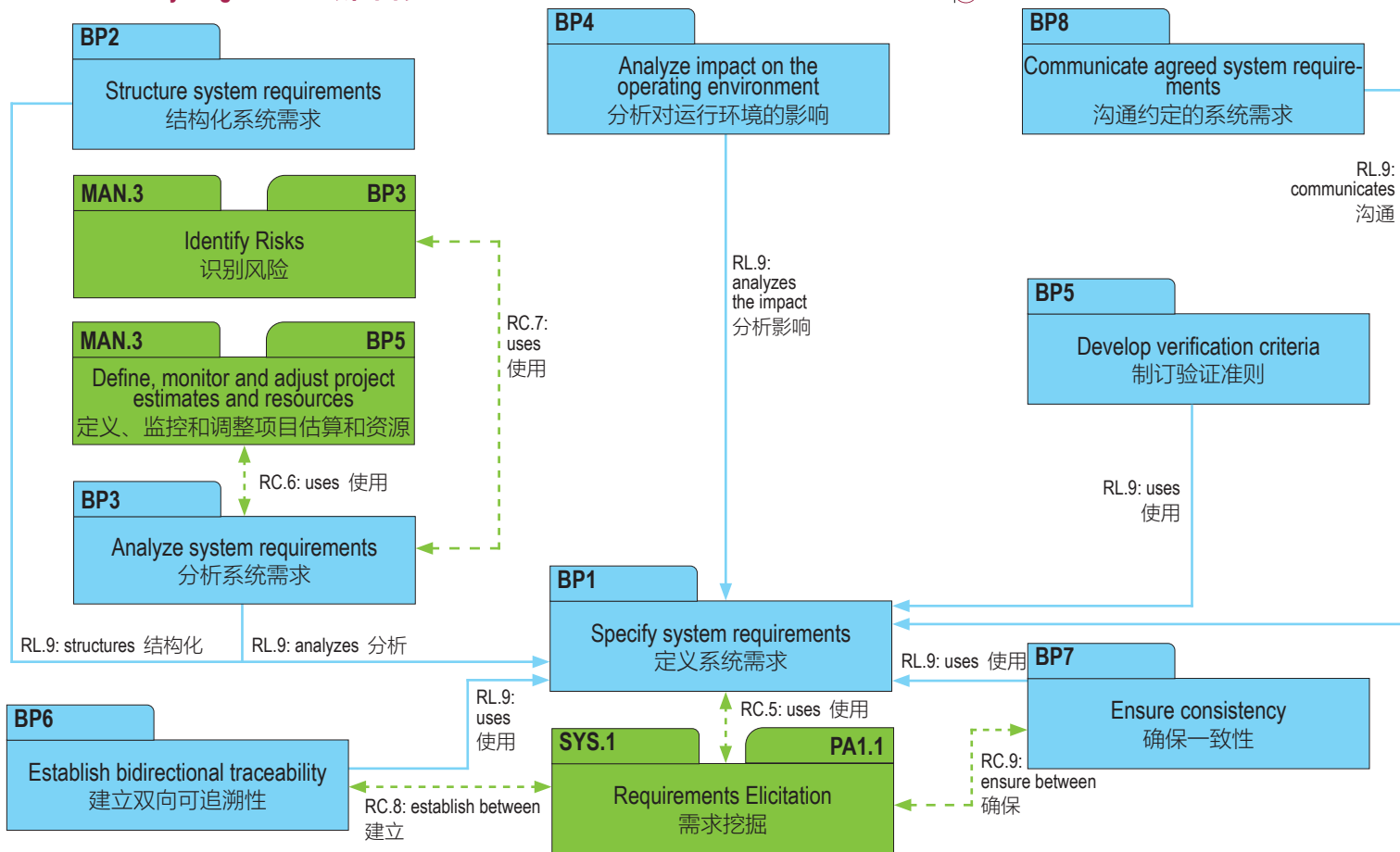
**建立双向可追溯性。**建立利益相关方需求和系统需求之间的双向可追溯性。[成果 6]

7 双向可追溯性有助于覆盖率、一致性和影响分析。

**确保一致性。**确保利益相关方需求和系统需求之间的一致性。[成果 6]

8 一致性由双向可追溯性支持，并可通过评审记录来证明。

**沟通约定的系统需求。**与所有相关方沟通约定的系统需求及对系统需求的更新。[成果 8]



The purpose of the System Architectural Design Process is to establish a system architectural design and identify which system requirements are to be allocated to which elements of the system, and to evaluate the system architectural design against defined criteria.

系统架构设计过程的目的是：建立系统架构设计，识别将哪些系统需求分配给哪些系统要素，并依照已定义的准则评估系统架构设计。

Process outcomes – As a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>1. a system architectural design is defined that identifies the elements of the system;</li><li>2. the system requirements are allocated to the elements of the system;</li><li>3. the interfaces of each system element are defined;</li><li>4. the dynamic behavior of the system elements is defined;</li><li>5. consistency and bidirectional traceability are established between system requirements and system architectural design; and</li><li>6. the system architectural design is agreed and communicated to all affected parties.</li></ul> | <ul style="list-style-type: none"><li>1. 定义了识别系统要素的系统架构设计；</li><li>2. 将系统需求分配给系统的要素；</li><li>3. 定义了每个系统要素的接口；</li><li>4. 定义了系统要素的动态行为；</li><li>5. 建立了系统需求和系统架构设计之间的一致性和双向可追溯性；</li><li>6. 约定了系统架构设计，并与所有受影响方沟通。</li></ul> |
|--|---|

Output work products 输出工作产品 [成果]

|  |                         |   |             |
|--|-------------------------|---|-------------|
| 04-06 System architectural design 系统架构设计 | [OUTCOME 1, 2, 3, 4, 5] | 13-22 Traceability record 追溯记录                    | [OUTCOME 5] |
| 13-04 Communication record 沟通记录          | [OUTCOME 6]             | 17-08 Interface requirements specification 接口需求规范 | [OUTCOME 3] |
| 13-19 Review record 评审记录                 | [OUTCOME 5]             |   |             |

## BP 1

**Develop system architectural design.** Develop and document the system architectural design that specifies the elements of the system with respect to functional and non-functional system requirements. [OUTCOME 1]

- 1 *The development of system architectural design typically includes the decomposition into elements across appropriate hierarchical levels.*

## BP 2

**Allocate system requirements.** Allocate the system requirements to the elements of the system architectural design. [OUTCOME 2]

## BP 3

**Define interfaces of system elements.** Identify, develop and document the interfaces of each system element. [OUTCOME 3]

## BP 4

**Describe dynamic behavior.** Evaluate and document the dynamic behavior of the interaction between system elements. [OUTCOME 4]

- 2 *Dynamic behavior is determined by operating modes (e.g. start-up, shut-down, normal mode, calibration, diagnosis, etc.).*

## BP 5

**Evaluate alternative system architectures.** Define evaluation criteria for the architecture. Evaluate alternative system architectures according to the defined criteria. Record the rationale for the chosen system architecture. [OUTCOME 1]

- 3 *Evaluation criteria may include quality characteristics (modularity, maintainability, expandability, scalability, reliability, security realization and usability) and results of make-buy-reuse analysis.*

**开发系统架构设计。** 开发并文档化系统架构设计，该设计基于系统功能性需求和非功能性需求定义系统要素。[成果 1]

- 1 系统架构设计的开发通常包括在适当的各层级上分解成要素。

**分配系统需求。** 将系统需求分配给系统架构设计的要素。[成果 2]

**定义系统要素的接口。** 识别、开发并文档化每个系统要素的接口。[成果 3]

**描述动态行为。** 评估并文档化系统要素之间相互作用的动态行为。[成果 4]

- 2 动态行为取决于运行模式（例如：启动、关机、正常模式、标定和诊断等）。

**评估备选的系统架构。** 定义架构设计的评估准则。根据已定义的准则，评估备选的系统架构。记录被选定的系统架构的选择理由。[成果 1]

- 3 评估准则可以包括质量特性（模块性、可维护性、可扩展性、可伸缩性、可靠性、安全（security）可实现性、易用性）和开发-购买-重用分析的结果。

## BP 6

**Establish bidirectional traceability.** Establish bidirectional traceability between system requirements and elements of the system architectural design. [OUTCOME 5]

- 4 *Bidirectional traceability covers allocation of system requirements to the elements of the system architectural design.*
- 5 *Bidirectional traceability supports coverage, consistency and impact analysis.*

## BP 7

**Ensure consistency.** Ensure consistency between system requirements and the system architectural design. [OUTCOME 1, 2, 5, 6]

- 6 *Consistency is supported by bidirectional traceability and can be demonstrated by review records.*
- 7 *System requirements typically include system architectural requirements. Refer to BP5.*

## BP 8

**Communicate agreed system architectural design.** Communicate the agreed system architectural design and updates to system architectural design to all relevant parties. [OUTCOME 6]

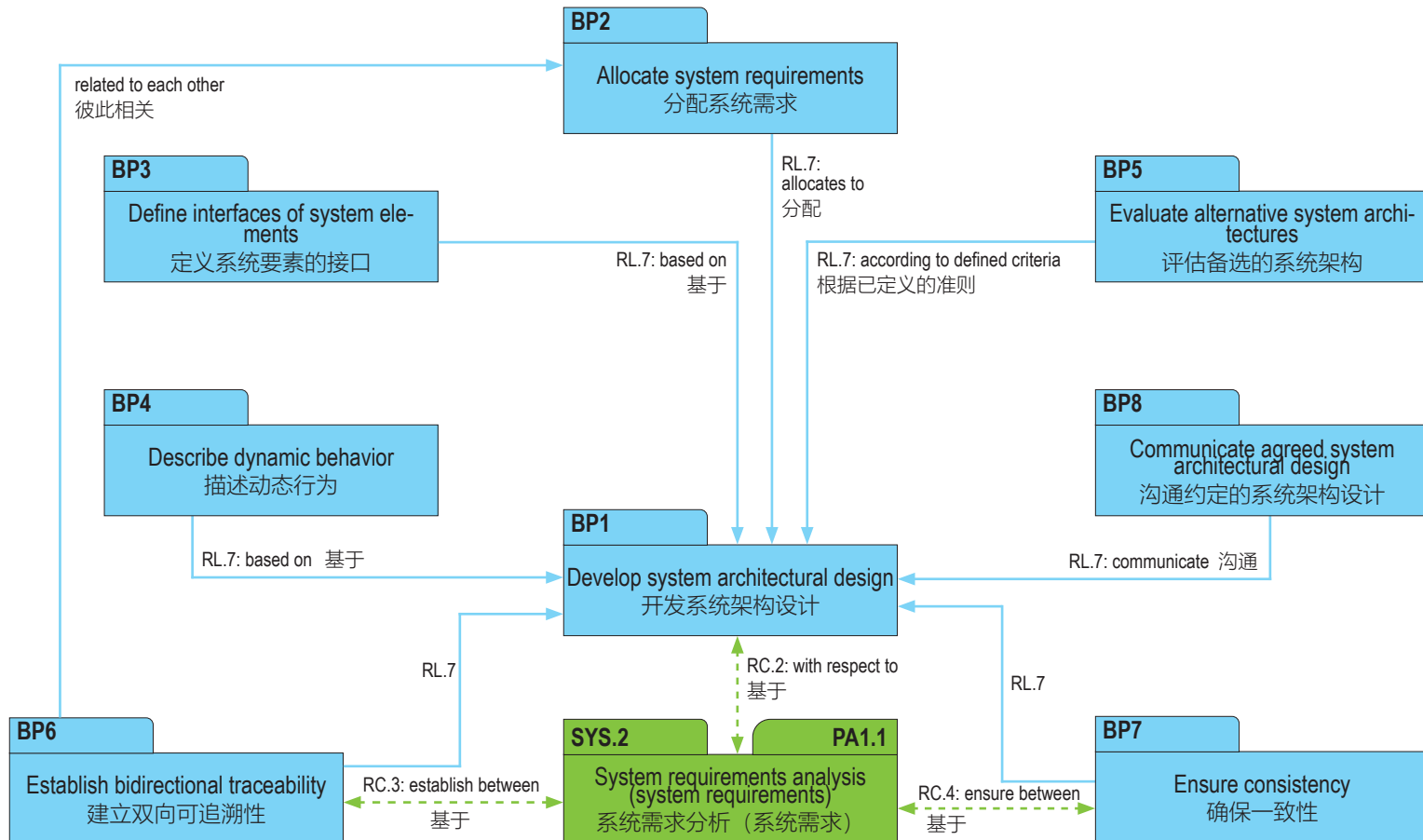
**建立双向可追溯性。** 建立系统需求和系统架构设计的要素之间的双向可追溯性。[成果 5]

- 4 双向可追溯性覆盖系统需求向系统架构设计的要素的分配。
- 5 双向可追溯性有助于覆盖率、一致性和影响分析。

**确保一致性。** 确保系统需求和系统架构设计间的一致性。[成果 1, 2, 5, 6]

- 6 一致性由双向可追溯性支持，并可通过评审记录来证明。
- 7 系统需求通常包括系统架构需求。参见 BP5。

**沟通约定的系统架构设计。** 与所有相关方沟通已约定的系统架构设计及对系统架构设计的更新。[成果 6]



The purpose of the System Integration and Integration Test Process is to integrate the system items to produce an integrated system consistent with the system architectural design and to ensure that the system items are tested to provide evidence for compliance of the integrated system items with the system architectural design, including the interfaces between system items.

系统集成与集成测试过程的目的是：集成系统项以产生与系统架构设计相一致的集成系统，并确保系统项得到测试，以提供集成的系统项符合系统架构设计（包括系统项之间的接口）的证据。

#### Process outcomes – As a result of successful implementation of this process:

1. a system integration strategy consistent with the project plan, the release plan and the system architectural design is developed to integrate the system items;
2. a system integration test strategy including the regression test strategy is developed to test the system item interactions;
3. a specification for system integration test according to the system integration test strategy is developed that is suitable to provide evidence for compliance of the integrated system items with the system architectural design, including the interfaces between system items;
4. system items are integrated up to a complete integrated system according to the integration strategy;
5. test cases included in the system integration test specification are selected according to the system integration test strategy and the release plan;
6. system item interactions are tested using the selected test cases and the results of system integration testing are recorded;
7. consistency and bidirectional traceability between the elements of the system architectural design and test cases included in the system integration test specification and bidirectional traceability between test cases and test results is established; and
8. results of the system integration test are summarized and communicated to all affected parties.

#### 过程成果 - 成功实施这个过程的结果如下:

1. 制订了与项目计划、发布计划和系统架构设计相一致的系统集成策略，以集成系统项；
2. 制订了包括回归测试策略在内的系统集成测试策略，以测试系统项之间的交互；
3. 根据系统集成测试策略，制订了系统集成测试规范，以适于提供集成的系统项符合系统架构设计（包括系统项之间的接口）的证据；
4. 根据集成策略将系统项集成为完整的集成系统；
5. 根据系统集成测试策略和发布计划，选择了系统集成测试规范中的测试用例；
6. 使用选定的测试用例测试了系统项之间的交互，并记录了系统集成测试结果；
7. 建立了系统架构设计的要素和系统集成测试规范中的测试用例之间的一致性和双向可追溯性，并建立了测试用例和测试结果之间的双向可追溯性；
8. 总结了系统集成测试结果，并与所有受影响方沟通。



Output work products    输出工作产品 [成果]

|                                 |                |                                |                |
|---------------------------------|----------------|--------------------------------|----------------|
| 08-50 Test specification 测试规范   | [OUTCOME 3, 5] | 13-19 Review record 评审记录       | [OUTCOME 7]    |
| 08-52 Test plan 测试计划            | [OUTCOME 1, 2] | 13-22 Traceability record 追溯记录 | [OUTCOME 7]    |
| 11-06 System 系统                 | [OUTCOME 4]    | 13-50 Test result 测试结果         | [OUTCOME 6, 8] |
| 13-04 Communication record 沟通记录 | [OUTCOME 8]    |                                |                |

SYS.4 with 9 Base practices    基本实践

|      |   |  |
|------|---|--|
| BP 1 | <b>Develop system integration strategy.</b> Develop a strategy for integrating the system items consistent with the project plan and the release plan. Identify system items based on the system architectural design and define a sequence for integrating them. [OUTCOME 1]                               | <b>制订系统集成策略。</b> 制订与项目计划和发布计划相一致的系统项集成策略。基于系统架构设计识别系统项，并定义其集成顺序。[成果 1]                   |
| BP 2 | <b>Develop system integration test strategy including regression test strategy.</b> Develop a strategy for testing the integrated system items following the integration strategy. This includes a regression test strategy for re-testing integrated system items if a system item is changed. [OUTCOME 2] | <b>制订包括回归测试策略在内的系统集成测试策略。</b> 遵循集成策略，制订集成系统项的测试策略。该策略包括当系统项变更时对集成的系统项实施再测试的回归测试策略。[成果 2] |

## BP 3

**Develop specification for system integration test.** Develop the test specification for system integration test including the test cases for each integration step of a system item according to the system integration test strategy. The test specification shall be suitable to provide evidence for compliance of the integrated system items with the system architectural design. [OUTCOME 3]

- 1 *The interface descriptions between system elements are an input for the system integration test cases.*
- 2 *Compliance to the architectural design means that the specified integration tests are suitable to prove that the interfaces between the system items fulfill the specification given by the system architectural design.*
- 3 *The system integration test cases may focus on*
  - *the correct signal flow between system items*
  - *the timeliness and timing dependencies of signal flow between system items*
  - *the correct interpretation of signals by all system items using an interface*
  - *the dynamic interaction between system items*
- 4 *The system integration test may be supported using simulation of the environment (e.g. Hardware-in-the-Loop simulation, vehicle network simulations, digital mock-up).*

## BP 4

**Integrate system items.** Integrate the system items to an integrated system according to the system integration strategy. [OUTCOME 4]

- 5 *The system integration can be performed step wise integrating system items (e.g. the hardware elements as prototype hardware, peripherals (sensors and actuators), the mechanics and integrated software) to produce a system consistent with the system architectural design.*

**开发系统集成测试规范。**根据系统集成测试策略，开发系统集成测试规范（包括系统项的各集成步骤的测试用例）。测试规范应适于提供集成的系统项符合系统架构设计的证据。[成果 3]

- 1 系统要素之间的接口描述是系统集成测试用例的输入。
- 2 符合系统架构设计是指，定义的集成测试适于证明系统项之间的接口满足系统架构设计的规范。
- 3 系统集成测试用例可关注：
  - 系统项之间的正确信号流
  - 系统项之间信号流的时效性和时序依赖性
  - 使用接口正确解释所有系统项的信号
  - 系统项之间的动态交互
- 4 可使用仿真环境（例如：硬件在环仿真，车载网络仿真，数字原型）支持系统集成测试。

**集成系统项。**根据系统集成策略，将系统项集成为集成系统。[成果 4]

- 5 系统集成可逐步集成系统项（例如：作为原型硬件的硬件要素，外设（传感器和执行器），机械和集成软件），以产生与系统架构设计相一致的系统。

## BP 5

**Select test cases.** Select test cases from the system integration test specification. The selection of test cases shall have sufficient coverage according to the system integration test strategy and the release plan. [OUTCOME 5]

## BP 6

**Perform system integration test.** Perform the system integration test using the selected test cases. Record the integration test results and logs. [OUTCOME 6]

6 See SUP.9 for handling of non-conformances.

## BP 7

**Establish bidirectional traceability.** Establish bidirectional traceability between elements of the system architectural design and test cases included in the system integration test specification. Establish bidirectional traceability between test cases included in the system integration test specification and system integration test results. [OUTCOME 7]

7 Bidirectional traceability supports coverage, consistency and impact analysis.

## BP 8

**Ensure consistency.** Ensure consistency between elements of the system architectural design and test cases included in the system integration test specification. [OUTCOME 7]

8 Consistency is supported by bidirectional traceability and can be demonstrated by review records.

## BP 9

**Summarize and communicate results.** Summarize the system integration test results and communicate them to all affected parties. [OUTCOME 8]

9 Providing all necessary information from the test case execution in a summary enables other parties to judge the consequences

**选择测试用例。**从系统集成测试规范中选择测试用例。测试用例的选择应根据系统集成测试策略和发布计划具备足够的覆盖率。[成果 5]

**执行系统集成测试。**使用选定的测试用例执行系统集成测试。记录集成测试结果和日志。[成果 6]

6 不符合项的处理，见 SUP.9。

**建立双向可追溯性。**建立系统架构设计要素与系统集成测试规范中的测试用例之间的双向可追溯性。建立系统集成测试规范中的测试用例与系统集成测试结果之间的双向可追溯性。[成果 7]

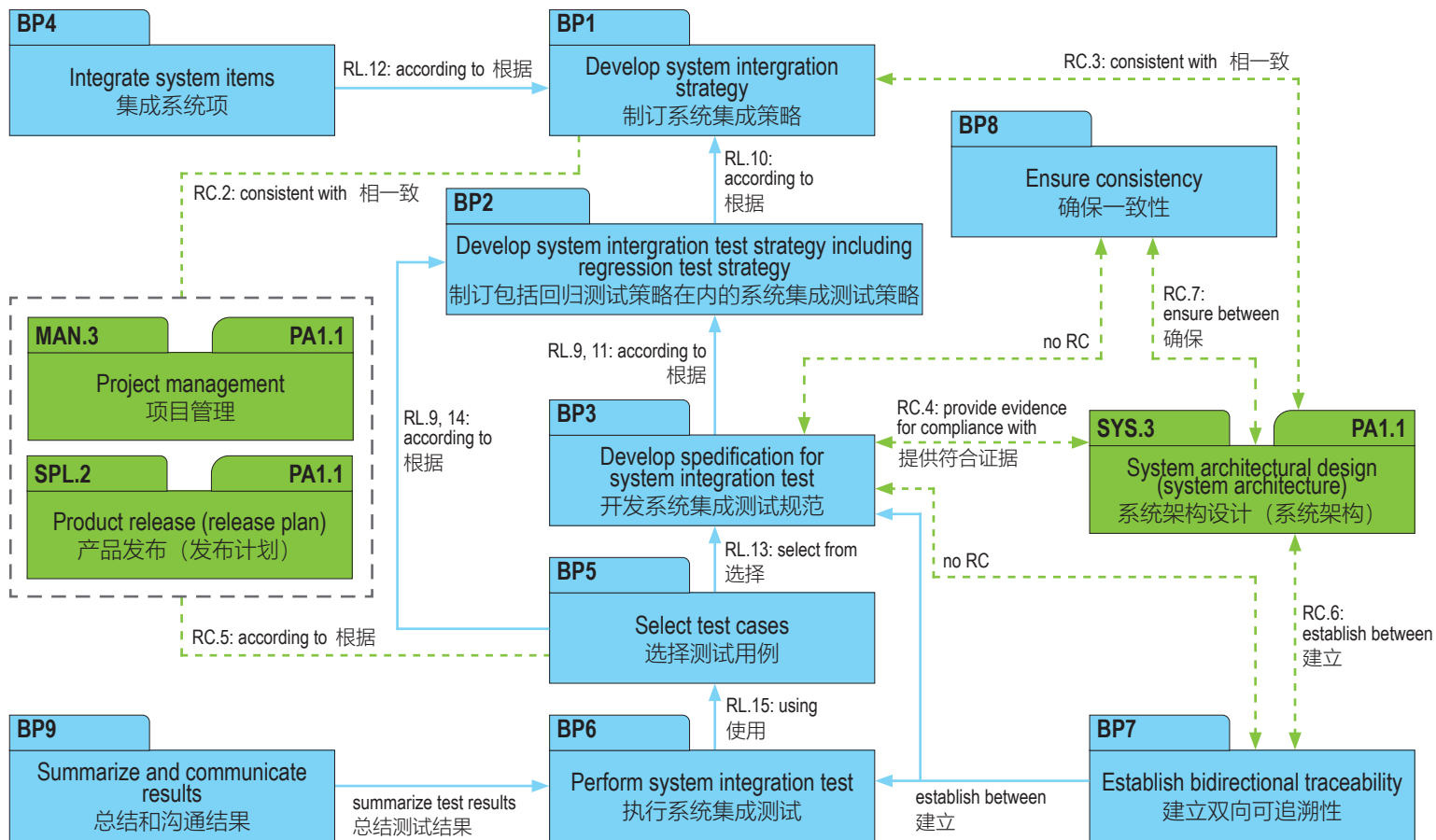
7 双向可追溯性有助于覆盖率、一致性和影响分析。

**确保一致性。**确保系统架构设计要素与系统集成测试规范中的测试用例之间的一致性。[成果 7]

8 一致性由双向可追溯性支持，并可通过评审记录来证明。

**总结和沟通结果。**总结系统集成测试结果，并与所有受影响方沟通。[成果 8]

9 在总结中提供来自测试用例执行的所有必要信息，以便其他方判断结果。





The purpose of the System Qualification Test Process is to ensure that the integrated system is tested to provide evidence for compliance with the system requirements and that the system is ready for delivery.

系统合格性测试过程的目的是：确保集成系统得到测试，以提供符合系统需求的证据，并确保系统可用于交付。

Process outcomes – As a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

- 1. a system qualification test strategy including regression test strategy consistent with the project plan and release plan is developed to test the integrated system;
- 2. a specification for system qualification test of the integrated system according to the system qualification test strategy is developed that is suitable to provide evidence for compliance with the system requirements;
- 3. test cases included in the system qualification test specification are selected according to the system qualification test strategy and the release plan;
- 4. the integrated system is tested using the selected test cases and the results of system qualification test are recorded;
- 5. consistency and bidirectional traceability are established between system requirements and test cases included in the system qualification test specification and between test cases and test results; and
- 6. results of the system qualification test are summarized and communicated to all affected parties.

- 1. 制订了与项目计划和发布计划相一致的系统合格性测试策略（包括回归测试策略），以测试已集成的系统。
- 2. 根据系统合格性测试策略，制订了已集成系统的系统合格性测试规范，以适于提供符合系统需求的证据。
- 3. 根据系统合格性测试策略和发布计划，选择了系统合格性测试规范中的测试用例。
- 4. 使用选择的测试用例测试了已集成的系统，并记录了系统合格性测试的结果。
- 5. 建立了系统需求与系统合格性测试规范中测试用例之间的一致性和双向可追溯性，并建立了测试用例与测试结果之间的一致性和双向可追溯性。
- 6. 总结了系统合格性测试结果，并与所有受影响方沟通。

Output work products 输出工作产品 [成果]

|                                 |                |                                |                |
|---------------------------------|----------------|--------------------------------|----------------|
| 08-50 Test specification 测试规范   | [OUTCOME 2, 3] | 13-19 Review record 评审记录       | [OUTCOME 5]    |
| 08-52 Test plan 测试计划            | [OUTCOME 1]    | 13-22 Traceability record 追溯记录 | [OUTCOME 5]    |
| 13-04 Communication record 沟通记录 | [OUTCOME 6]    | 13-50 Test result 测试结果         | [OUTCOME 4, 6] |

SYS.5 with 7 Base practices 基本实践

**BP 1** **Develop system qualification test strategy including regression test strategy.** Develop a strategy for system qualification test consistent with the project plan and the release plan. This includes a regression test strategy for re-testing the integrated system if a system item is changed. [OUTCOME 1]

**制订包括回归测试策略在内的系统合格性测试策略。** 制订与项目计划和发布计划相一致的系统合格性测试策略。该策略包括当系统项变更时，对已集成系统实施再测试的回归测试策略。[成果 1]

BP 2

**Develop specification for system qualification test.** Develop the specification for system qualification test including test cases based on the verification criteria according to the system qualification test strategy. The test specification shall be suitable to provide evidence for compliance of the integrated system with the system requirements. [OUTCOME 2]

BP 3

**Select test cases.** Select test cases from the system qualification test specification. The selection of test cases shall have sufficient coverage according to the system qualification test strategy and the release plan. [OUTCOME 3]

BP 4

**Test integrated system.** Test the integrated system using the selected test cases. Record the system qualification test results and logs. [OUTCOME 4]

1 See SUP.9 for handling of non-conformances.

BP 5

**Establish bidirectional traceability.** Establish bidirectional traceability between system requirements and test cases included in the system qualification test specification. Establish bidirectional traceability between test cases included in the system qualification test specification and system qualification test results. [OUTCOME 5]

2 Bidirectional traceability supports coverage, consistency and impact analysis.

BP 6

**Ensure consistency.** Ensure consistency between system requirements and test cases included in the system qualification test specification. [OUTCOME 5]

3 Consistency is supported by bidirectional traceability and can be demonstrated by review records.

BP 7

**Summarize and communicate results.** Summarize the system qualification test results and communicate them to all affected parties. [OUTCOME 6]

4 Providing all necessary information from the test case execution in a summary enables other parties to judge the consequences.

**开发系统合格性测试规范。** 根据系统合格性测试策略，开发系统合格性测试规范（包括基于验证准则的测试用例）。该规范应适于提供集成系统符合系统需求的证据。[成果 2]

**选择测试用例。** 从系统合格性测试规范中选择测试用例。对于系统合格性测试策略和发布计划而言，所选择的测试用例应具备足够的覆盖率。[成果 3]

**测试已集成的系统。** 使用已选择的测试用例测试已集成的系统。记录系统合格性测试的结果和日志。[成果 4]

1 不符合项的处理，见 SUP.9。

**建立双向可追溯性。** 建立系统需求与系统合格性测试规范中的测试用例之间的双向可追溯性。建立系统合格性测试规范中的测试用例与系统合格性测试结果之间的双向可追溯性。[成果 5]

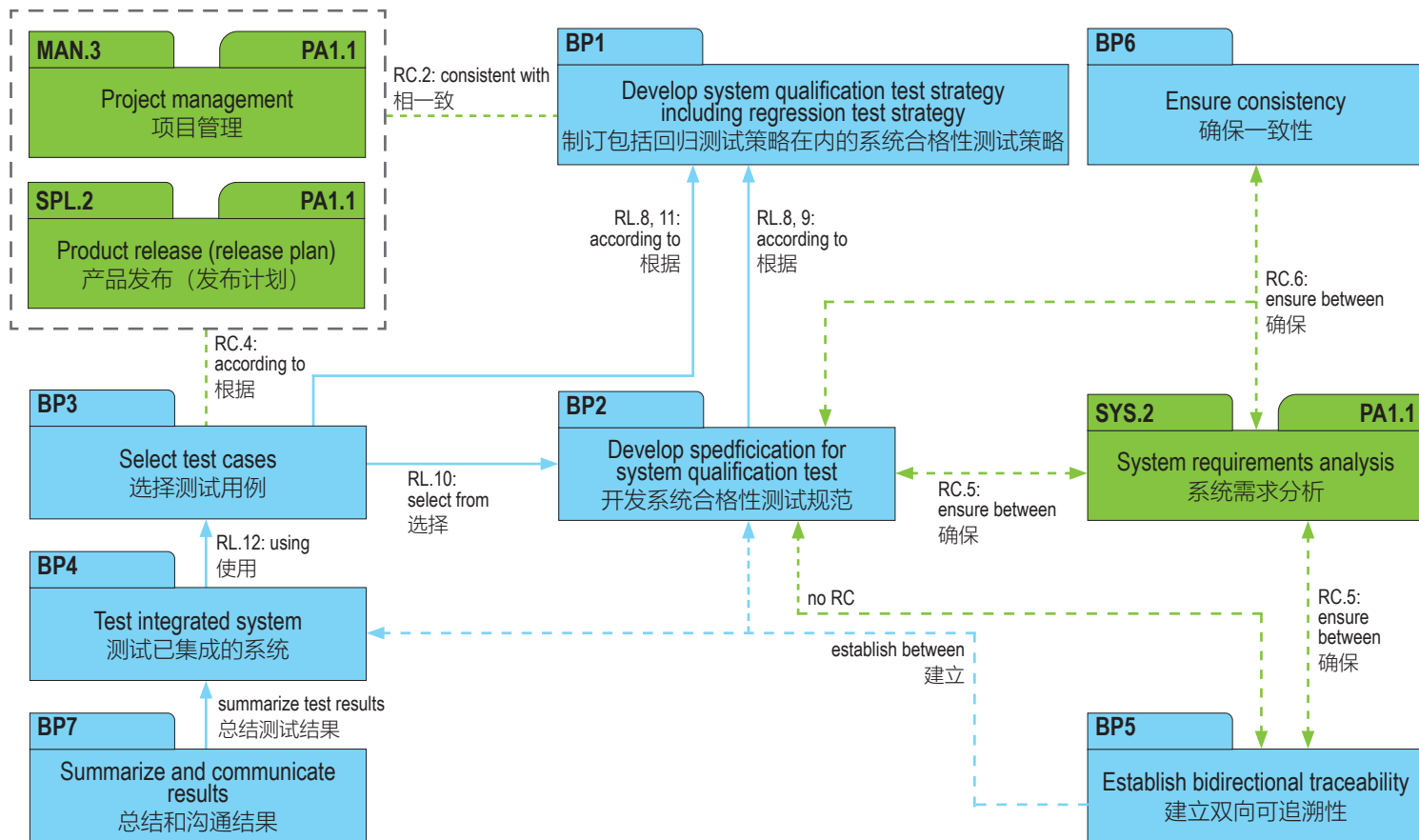
2 双向可追溯性有助于覆盖率、一致性和影响分析。

**确保一致性。** 确保系统需求和系统合格性测试规范中的测试用例之间的一致性。[成果 5]

3 一致性由双向可追溯性支持，并可通过评审记录来证明。

**总结和沟通结果。** 总结系统合格性测试结果，并与所有受影响方沟通。[成果 6]

4 在总结中提供来自测试用例执行的所有必要信息，以便其他方判断结果。







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.

软件需求分析过程的目的是：将系统需求中与软件相关的部分转化为一组软件需求。

Process outcomes – As a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

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 impact of software requirements on the operating environment is analyzed;

4. prioritization for implementing the software requirements is defined;

5. the software requirements are updated as needed;

6. consistency and bidirectional traceability are established between system requirements and software requirements; and consistency and bidirectional traceability are established between system architectural design and software requirements;

7. the software requirements are evaluated for cost, schedule and technical impact; and

8. the software requirements are agreed and communicated to all affected parties.
1. 定义了系统中分配给软件要素的软件需求及其接口；

2. 将软件需求进行分类，并分析了其正确性和可验证性；

3. 分析了软件需求对运行环境的影响；

4. 定义了软件需求实现的优先级；

5. 根据需要更新了软件需求；

6. 在系统需求与软件需求之间、在系统架构设计与软件需求之间建立了一致性和双向可追溯性；

7. 从成本、进度和技术影响来评估软件需求；

8. 约定了软件需求，并与所有受影响方沟通。

Output work products 输出工作产品 [成果]

|                                    |               |   |                      |
|------------------------------------|---------------|---|----------------------|
| 13-04 Communication record 沟通记录    | [OUTCOME 8]   | 15-01 Analysis report 分析报告                        | [OUTCOME 2, 3, 4, 7] |
| 13-19 Review record 评审记录           | [OUTCOME 6]   | 17-08 Interface requirements specification 接口需求规范 | [OUTCOME 1, 3]       |
| 13-21 Change control record 变更控制记录 | [OUTCOME 5,7] | 17-11 System requirements specification 软件需求规范    | [OUTCOME 1]          |
| 13-22 Traceability record 追溯记录     | [OUTCOME 1,6] | 17-50 Verification criteria 验证准则                  | [OUTCOME 2]          |

## BP 1

**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 nonfunctional software requirements in a software requirements specification. [OUTCOME 1, 5, 7]

- 1 *Application parameter influencing functions and capabilities are part of the system requirements.*
- 2 *In case of software development only, the system requirements and the system architecture refer to a given operating environment (see also 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.*

## BP 2

**Structure software requirements.** Structure the software requirements in the software requirements specification by e.g.

- grouping to project relevant clusters,
- sorting in a logical order for the project,
- categorizing based on relevant criteria for the project,
- prioritizing according to stakeholder needs.

[OUTCOME 2, 4]

- 3 *Prioritizing typically includes the assignment of software content to planned releases. Refer to SPL.2.BP1.*

## BP 3

**Analyze software requirements.** Analyze the specified software requirements including their interdependencies to ensure correctness, technical feasibility and verifiability, and to support risk identification. Analyze the impact on cost, schedule and the technical impact. [OUTCOME 2, 7]

- 4 *The analysis of impact on cost and schedule supports the adjustment of project estimates. Refer to MAN.3.BP5.*

**定义软件需求。**使用系统需求和系统架构及其变更来识别软件所需的功能和能力。在软件需求规范中定义功能性和非功能性软件需求。[成果 1, 5, 7]

- 1 影响功能和应用参数的应用参数是系统需求的一部分。
- 2 如果只有软件开发，系统需求和系统架构是指给定的运行环境（参见注 5）。在这种情况下，应将利益相关方需求作为识别软件所需功能、能力以及识别影响软件功能、能力的应用参数的基础。

**结构化软件需求。**在软件需求规范中结构化软件需求，例如：

- 按项目相关集群进行分组，
- 按项目中逻辑顺序排序，
- 基于项目相关准则进行分类，
- 根据利益相关方需要进行优先级排序。

[成果 2, 4]

- 3 优先级排序通常包括将软件内容分配给已计划的发布。参见 SPL.2.BP1。

**分析软件需求。**分析已定义的软件需求，包括其相互依赖关系，以确保正确性、技术可行性和可验证性，并支持风险识别。分析对成本、进度和技术的影响。[成果 2, 7]

- 4 对成本和进度的影响分析有助于项目估算的调整。参见 MAN.3.BP5。

## BP 4

**Analyze the impact on the operating environment.** Analyze the impact that the software requirements will have on interfaces of system elements and the operating environment. [OUTCOME 3, 7]

- 5 *The operating environment is defined as the system in which the software executes (e.g. hardware, operating system, etc.).*

## BP 5

**Develop verification criteria.** Develop the verification criteria for each software requirement that define the qualitative and quantitative measures for the verification of a requirement. [OUTCOME 2, 7]

- 6 *Verification criteria demonstrate that a requirement can be verified within agreed constraints and is typically used as the input for the development of the software test cases or other verification measures that should demonstrate compliance with the software requirements.*
- 7 *Verification which cannot be covered by testing is covered by SUP2.*

## BP 6

**Establish bidirectional traceability.** Establish bidirectional traceability between system requirements and software requirements. Establish bidirectional traceability between the system architecture and software requirements. [OUTCOME 6]

- 8 *Redundancy should be avoided by establishing a combination of these approaches that covers the project and the organizational needs.*
- 9 *Bidirectional traceability supports coverage, consistency and impact analysis.*

**分析对运行环境的影响。** 分析软件需求对系统要素接口及运行环境的影响。[成果 3, 7]

- 5 运行环境是指软件运行所在的系统（例如：硬件、操作系统等）

**制订验证准则。** 对每个软件需求制订验证准则，定义定性的和定量的措施以用于需求验证。[成果 2, 7]

- 6 验证准则证明了需求可以在约定的约束范围内得到验证，并且通常被用作软件测试用例开发或其它证明符合软件需求的验证措施的输入。
- 7 测试不能覆盖的验证由 SUP2 覆盖。

**建立双向可追溯性。** 建立系统需求与软件需求之间的双向可追溯性，建立系统架构设计与软件需求之间的双向追溯性。[成果 6]

- 8 应通过建立同时满足项目和组织要求的方法来避免冗余。
- 9 双向可追溯性有助于覆盖率、一致性和影响分析。

## BP 7

**Ensure consistency.** Ensure consistency between system requirements and software requirements. Ensure consistency between the system architecture and software requirements. [OUTCOME 6]

10 Consistency is supported by bidirectional traceability and can be demonstrated by review records.

11 In case of software development only, the system requirements and system architecture refer to a given operating environment (see also 2). In that case, consistency and bidirectional traceability have to be ensured between stakeholder requirements and software requirements.

## BP 8

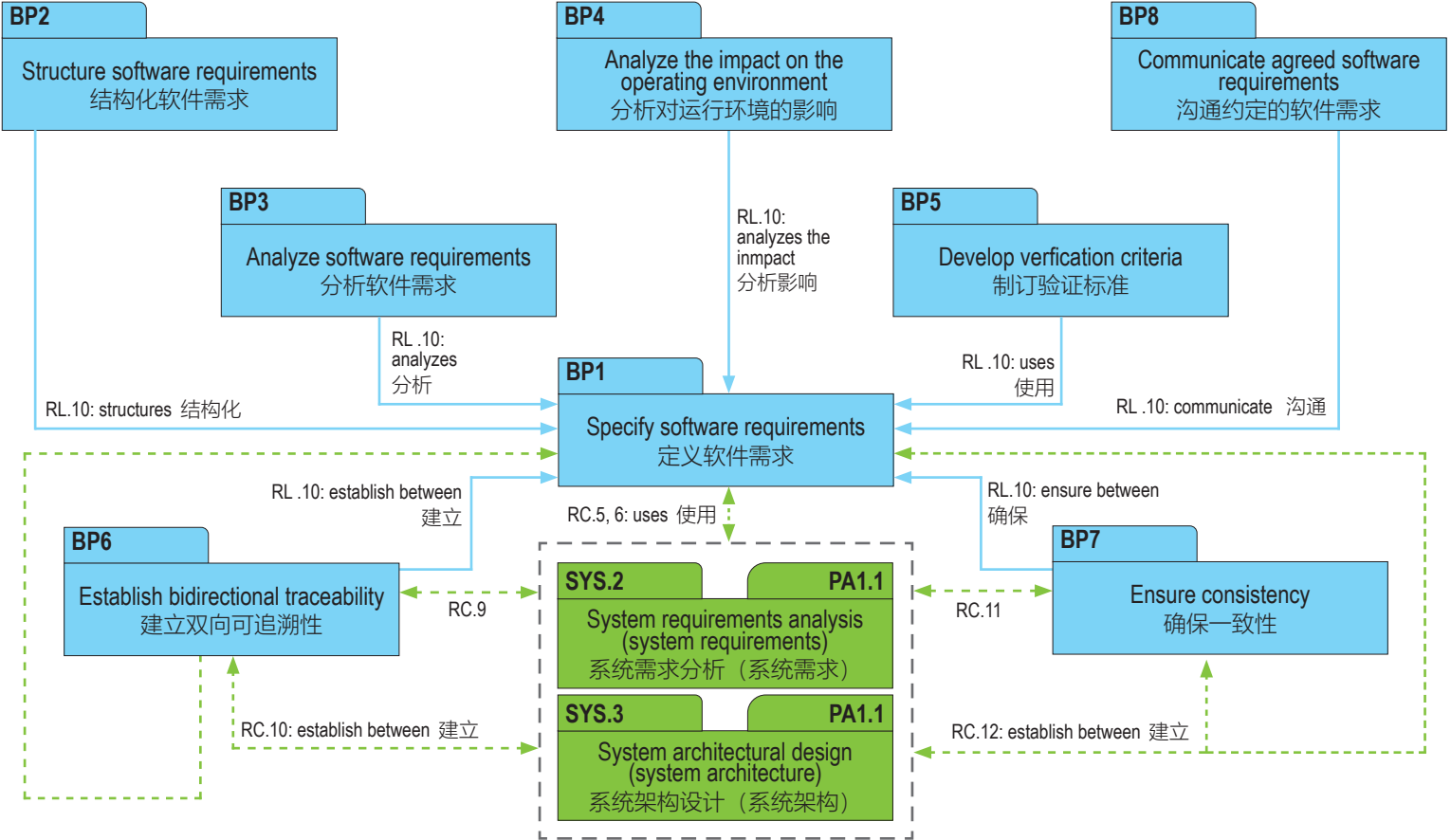
**Communicate agreed software requirements.** Communicate the agreed software requirements and updates to software requirements to all relevant parties. [OUTCOME 8]

**确保一致性。** 确保系统需求与软件需求之间的一致性，确保系统架构与软件需求之间的一致性。[成果 6]

10 一致性由双向可追溯性支持，并可通过评审记录来证明。

11 如果只有软件开发，系统需求和系统架构是指软件的运行环境（参见注 2）。在这种情况下，必须确保利益相关方需求与软件需求之间的一致性和双向可追溯性。

**沟通约定的软件需求。** 与所有相关方沟通约定的软件需求及对软件需求的更新。[成果 8]





The purpose of the Software Architectural Design Process is to establish an architectural design and to identify which software requirements are to be allocated to which elements of the software, and to evaluate the software architectural design against defined criteria.

软件架构设计过程的目的是: 建立软件架构设计, 识别将哪些软件需求分配给软件的哪些要素, 并依照定义的准则来评估软件架构设计。

Process outcomes – As a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

- |  |                                 |
|--|---------------------------------|
| 1. a software architectural design is defined that identifies the elements of the software;  | 1. 定义了识别软件要素的软件架构设计;            |
| 2. the software requirements are allocated to the elements of the software;  | 2. 将软件需求分配给软件的要素;               |
| 3. the interfaces of each software element are defined;  | 3. 定义了每个软件要素的接口;                |
| 4. the dynamic behavior and resource consumption objectives of the software elements are defined;                                  | 4. 定义了软件要素的动态行为和资源消耗目标;         |
| 5. consistency and bidirectional traceability are established between software requirements and software architectural design; and | 5. 建立了软件需求与软件架构设计之间的一致性和双向可追溯性; |
| 6. the software architectural design is agreed and communicated to all affected parties.   | 6. 约定了软件架构设计, 并与所有受影响方沟通。       |

Output work products 输出工作产品 [成果]

|  |                         |   |             |
|--|-------------------------|---|-------------|
| 04-04 Software architectural design 软件架构设计 | [OUTCOME 1, 2, 3, 4, 5] | 13-22 Traceability record 追溯记录                    | [OUTCOME 5] |
| 13-04 Communication record 沟通记录            | [OUTCOME 6]             | 17-08 Interface requirements specification 接口需求规范 | [OUTCOME 3] |
| 13-19 Review record 评审记录                   | [OUTCOME 5]             |   |             |



## BP 1

**Develop software architectural design.** Develop and document the software architectural design that specifies the elements of the software with respect to functional and non-functional software requirements. [OUTCOME 1]

- 1 *The software is decomposed into elements across appropriate hierarchical levels down to the software components (the lowest level elements of the software architectural design) that are described in the detailed design.*

## BP 2

**Allocate software requirements.** Allocate the software requirements to the elements of the software architectural design. [OUTCOME 2]

## BP 3

**Define interfaces of software elements.** Identify, develop and document the interfaces of each software element. [OUTCOME 3]

## BP 4

**Describe dynamic behavior.** Evaluate and document the timing and dynamic interaction of software elements to meet the required dynamic behavior of the system. [OUTCOME 4]

- 2 *Dynamic behavior is determined by operating modes (e.g. start-up, shut-down, normal mode, calibration, diagnosis, etc.), processes and process intercommunication, tasks, threads, time slices, interrupts, etc.*
- 3 *During evaluation of the dynamic behavior the target platform and potential loads on the target should be considered.*

## BP 5

**Define resource consumption objectives.** Determine and document the resource consumption objectives for all relevant elements of the software architectural design on the appropriate hierarchical level. [OUTCOME 4]

- 4 *Resource consumption is typically determined for resources like Memory (ROM, RAM, external / internal EEPROM or Data Flash), CPU load, etc.*

**开发软件架构设计。** 开发并文档化软件架构设计，该设计基于软件功能性需求和非功能性需求定义软件要素。[成果 1]

- 1 将软件分解为适当的各层级上的要素，直至软件架构设计的最低层级要素，即详细设计中描述的软件组件。

**分配软件需求。** 将软件需求分配到软件架构设计的要素。[成果 2]

**定义软件要素的接口。** 识别、开发并记录软件要素的接口。[成果 3]

**描述动态行为。** 评估并记录软件要素的时序和动态交互，以满足系统所需的动态行为。[成果 4]

- 2 动态行为取决于运行模式（例如：启动、关机、正常模式、标定、诊断等）、进程及进程间相互通信、任务、线程、时间片、中断等。
- 3 在评估动态行为时，宜考虑目标平台和目标对象的潜在负载。

**定义资源消耗目标。** 在适当的层级上确定并文档化软件架构设计的所有相关要素的资源消耗目标。[成果 4]

- 4 资源消耗通常取决于资源，如：内存（ROM、RAM、外部/内部EEPROM或数据闪存）、CPU负载等。

## BP 6

**Evaluate alternative software architectures.** Define evaluation criteria for the architecture. Evaluate alternative software architectures according to the defined criteria. Record the rationale for the chosen software architecture. [OUTCOME 1, 2, 3, 4, 5]

- 5 *Evaluation criteria may include quality characteristics (modularity, maintainability, expandability, scalability, reliability, security realization and usability) and results of make-buy-reuse analysis.*

## BP 7

**Establish bidirectional traceability.** Establish bidirectional traceability between software requirements and elements of the software architectural design. [OUTCOME 5]

- 6 *Bidirectional traceability covers allocation of software requirements to the elements of the software architectural design.*
- 7 *Bidirectional traceability supports coverage, consistency and impact analysis.*

## BP 8

**Ensure consistency.** Ensure consistency between software requirements and the software architectural design. [OUTCOME 1, 2, 5, 6]

- 8 *Consistency is supported by bidirectional traceability and can be demonstrated by review records.*

## BP 9

**Communicate agreed software architectural design.** Communicate the agreed software architectural design and updates to software architectural design to all relevant parties. [OUTCOME 6]

**评估备选的软件架构。** 定义架构的评估准则。根据定义的准则评估备选的软件架构，记录被选定的软件架构的选择理由。[成果 1, 2, 3, 4, 5]

- 5 评估准则可包括质量特性（模块性、可维护性、可扩展性、可扩缩性、可靠性、安全（security）可实现性和易用性）以及开发-购买-重用分析的结果。

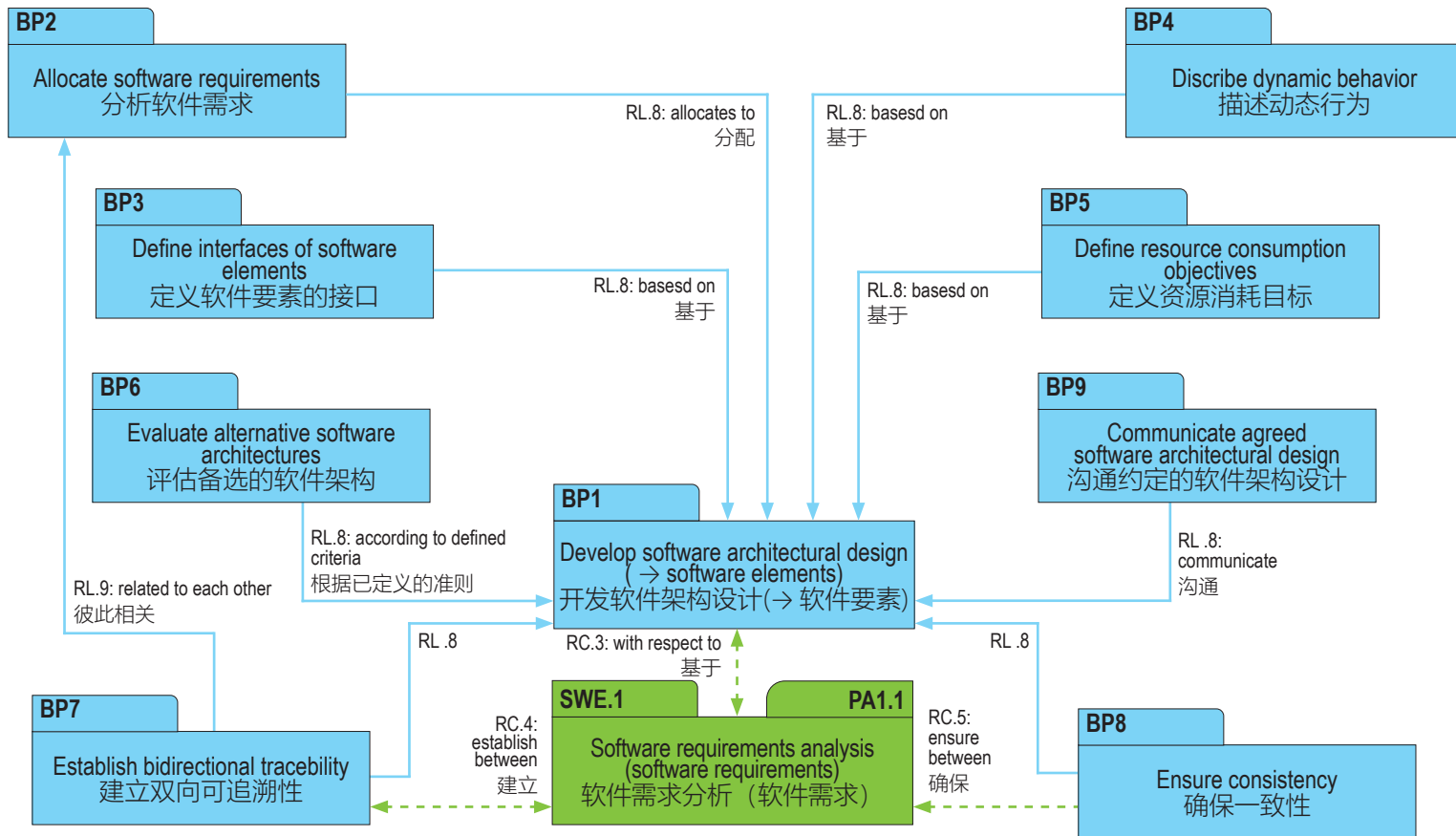
**建立双向可追溯性。** 建立软件需求与软件架构设计要素之间的双向可追溯性。[成果 5]

- 6 双向可追溯性覆盖软件需求向软件架构设计的要素的分配。
- 7 双向可追溯性有助于覆盖率、一致性和影响分析。

**确保一致性。** 确保软件需求与软件架构设计之间的一致性。[成果 1, 2, 5, 6]

- 8 一致性由双向可追溯性支持，并可通过评审记录来证明。

**沟通约定的软件架构设计。** 与所有相关方沟通已约定的软件架构设计及对软件架构设计的更新。[成果 6]



The purpose of the Software Detailed Design and Unit Construction Process is to provide an evaluated detailed design for the software components and to specify and to produce the software units.

软件详细设计和单元构建过程的目的是：为软件组件提供经过评估的详细设计，并定义和生成软件单元。

Process outcomes – As a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

1. a detailed design is developed that describes software units;

2. interfaces of each software unit are defined;

3. the dynamic behavior of the software units is defined;

4. consistency and bidirectional traceability are established between software requirements and software units; and consistency and bidirectional traceability are established between software architectural design and software detailed design; and consistency and bidirectional traceability are established between software detailed design and software units;

5. the software detailed design and the relationship to the software architectural design is agreed and communicated to all affected parties; and

6. software units defined by the software detailed design are produced.
1. 开发了描述软件单元的详细设计;

2. 定义了各软件单元的接口;

3. 定义了软件单元的动态行为;

4. 建立了软件需求与软件单元之间的一致性和双向可追溯性; 建立了软件架构设计与软件详细设计之间的一致性和双向可追溯性; 建立了软件详细设计与软件单元之间一致性和双向可追溯性;

5. 约定了软件详细设计及该设计与软件架构设计的关系, 并和所有受影响方沟通;

6. 生成了软件详细设计所定义的软件单元。

Output work products 输出工作产品 [成果]

|                                       |                   |                                |             |
|---------------------------------------|-------------------|--------------------------------|-------------|
| 04-05 Software detailed design 软件详细设计 | [OUTCOME 1, 2, 3] | 13-19 Review record 评审记录       | [OUTCOME 4] |
| 11-05 Software unit 软件单元              | [OUTCOME 6]       | 13-22 Traceability record 追溯记录 | [OUTCOME 4] |
| 13-04 Communication record 沟通记录       | [OUTCOME 5]       |                                |             |

## SWE.3 with 8 Base practices

## 基本实践

BP1

**Develop software detailed design.** Develop a detailed design for each software component defined in the software architectural design that specifies all software units with respect to functional and non-functional software requirements. [OUTCOME 1]

**开发软件详细设计。** 开发软件架构设计中定义的各软件组件的详细设计，该设计基于软件功能性需求和非功能性需求定义软件单元。[成果 1]

BP2

**Define interfaces of software units.** Identify, specify and document the interfaces of each software unit. [OUTCOME 2]

**定义软件单元的接口。** 识别、定义和文档化各软件单元的接口。[成果 2]

BP3

**Describe dynamic behavior.** Evaluate and document the dynamic behavior of and the interaction between relevant software units. [OUTCOME 3]

**描述动态行为。** 评估并文档化相关软件单元之间的动态行为和交互。[成果 3]

1 *Not all software units have dynamic behavior to be described.*

1 并非所有的软件单元都有动态行为可描述。

BP4

**Evaluate software detailed design.** Evaluate the software detailed design in terms of interoperability, interaction, criticality, technical complexity, risks and testability. [OUTCOME 1,2,3,4]

**评估软件详细设计。** 从互操作性、交互、关键性、技术复杂性、风险和可测试性方面对软件详细设计进行评估。[成果 1,2,3,4]

2 *The results of the evaluation can be used as input for software unit verification.*

2 评估结果能作为软件单元验证的输入。

BP5

**Establish bidirectional traceability.** Establish bidirectional traceability between software requirements and software units. Establish bidirectional traceability between the software architectural design and the software detailed design. Establish bidirectional traceability between the software detailed design and software units. [OUTCOME 4]

**建立双向可追溯性。** 建立软件需求与软件单元之间的双向可追溯性。建立软件架构设计与软件详细设计之间的双向可追溯性。建立软件详细设计与软件单元之间的双向可追溯性。[成果 4]

3 *Redundancy should be avoided by establishing a combination of these approaches that covers the project and the organizational needs.*

3 对以上方法进行组合，覆盖项目和组织需要，避免冗余。

4 *Bidirectional traceability supports coverage, consistency and impact analysis.*

4 双向可追溯性有助于覆盖率、一致性和影响分析。

## BP6

**Ensure consistency.** Ensure consistency between software requirements and software units. Ensure consistency between the software architectural design, the software detailed design and software units. [OUTCOME 4]

5 NOTE 5: Consistency is supported by bidirectional traceability and can be demonstrated by review records.

## BP7

**Communicate agreed software detailed design.** Communicate the agreed software detailed design and updates to the software detailed design to all relevant parties. [OUTCOME 5]

## BP8

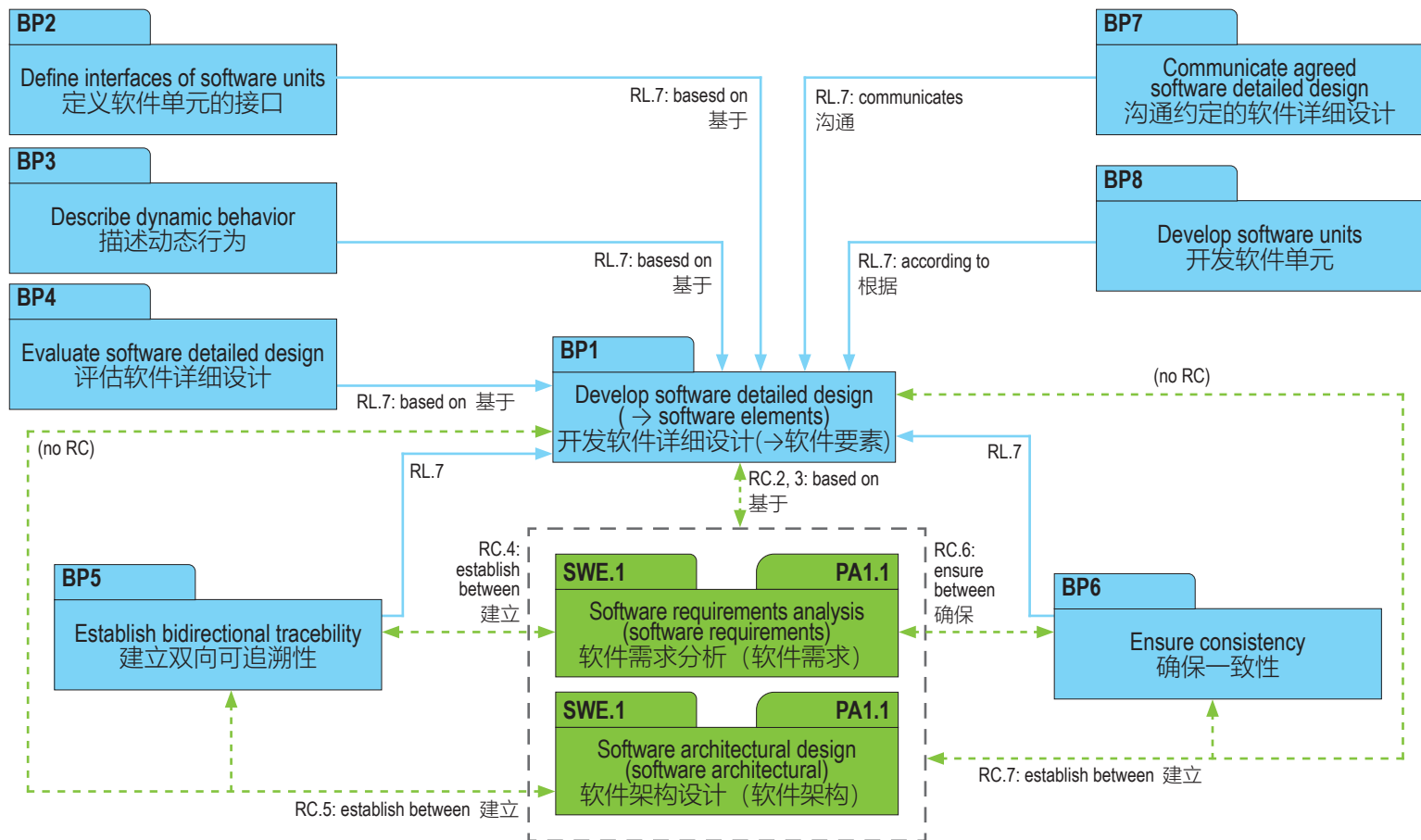
**Develop software units.** Develop and document the executable representations of each software unit according to the software detailed design. [OUTCOME 6]

**确保一致性。** 确保软件需求与软件单元之间的一致性。确保软件架构设计、软件详细设计及软件单元之间的一致性。[成果 4]

5 一致性由双向可追溯性支持，并可通过评审记录来证明。

**沟通约定的软件详细设计。** 与所有相关方沟通已约定的软件详细设计及对软件详细设计的更新。[成果 5]

**开发软件单元。** 根据软件详细设计，开发并文档化各软件单元的可执行形式。[成果 6]



The purpose of the Software Unit Verification Process is to verify software units to provide evidence for compliance of the software units with the software detailed design and with the non-functional software requirements.

软件单元验证过程的目的是：验证软件单元，以提供软件单元符合软件详细设计和非功能性软件需求的证据。

Process outcomes – As a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

1. a software unit verification strategy including regression strategy is developed to verify the software units;

2. criteria for software unit verification are developed according to the software unit verification strategy that are suitable to provide evidence for compliance of the software units with the software detailed design and with the non-functional software requirements;

3. software units are verified according to the software unit verification strategy and the defined criteria for software unit verification and the results are recorded;

4. consistency and bidirectional traceability are established between software units, criteria for verification and verification results; and

5. results of the unit verification are summarized and communicated to all affected parties.
1. 制订了包括回归策略在内的软件单元验证策略，以验证软件单元；

2. 根据软件单元验证策略，制订了软件单元验证准则，以适于提供软件单元符合软件详细设计及非功能性软件需求的证据；

3. 根据软件单元验证策略及软件单元验证准则，验证了软件单元并记录了结果；

4. 建立了软件单元、验证准则及验证结果之间的双向可追溯性和一致性；

5. 总结了单元验证结果，并与所有受影响方沟通。

Output work products 输出工作产品 [成果]

|                                 |                |                                 |                |
|---------------------------------|----------------|---------------------------------|----------------|
| 08-50 Test specification E 测试规范 | [OUTCOME 2]    | 13-22 Traceability record 追溯记录  | [OUTCOME 4]    |
| 08-52 Test plan 测试计划            | [OUTCOME 1]    | 13-25 Verification results 验证结果 | [OUTCOME 3, 5] |
| 13-04 Communication record 沟通记录 | [OUTCOME 5]    | 13-50 Test result 测试结果          | [OUTCOME 3, 5] |
| 13-19 Review record 评审记录        | [OUTCOME 3, 4] | 15-01 Analysis report 分析报告      | [OUTCOME 3]    |



## BP1

**Develop software unit verification strategy including regression strategy.**

Develop a strategy for verification of the software units including regression strategy for re-verification if a software unit is changed. The verification strategy shall define how to provide evidence for compliance of the software units with the software detailed design and with the non-functional requirements. [OUTCOME 1]

- 1 Possible techniques for unit verification include static/dynamic analysis, code reviews, unit testing etc.

## BP2

**Develop criteria for unit verification.** Develop criteria for unit verification that are suitable to provide evidence for compliance of the software units, and their interactions within the component, with the software detailed design and with the non-functional requirements according to the verification strategy. For unit testing, criteria shall be defined in a unit test specification. [OUTCOME 2]

- 2 Possible criteria for unit verification include unit test cases, unit test data, static verification, coverage goals and coding standards such as the MISRA rules.
- 3 The unit test specification may be implemented e.g. as a script in an automated test bench.

## BP3

**Perform static verification of software units.** Verify software units for correctness using the defined criteria for verification. Record the results of the static verification. [OUTCOME 3]

- 4 Static verification may include static analysis, code reviews, checks against coding standards and guidelines, and other techniques.
- 5 See SUP.9 for handling of non-conformances.

## BP4

**Test software units.** Test software units using the unit test specification according to the software unit verification strategy. Record the test results and logs. [OUTCOME 3]

- 6 See SUP.9 for handling of non-conformances.

**制订包括回归策略在内的软件单元验证策略。**制订软件单元验证策略（包括软件单元变更时实施再验证的回归策略）。验证策略应定义如何提供软件单元符合软件详细设计和非功能性需求的证据。[成果 1]

- 1 可能的单元验证的方法包括静态 / 动态分析、代码评审、单元测试等。

**制订单元验证准则。**根据验证策略，制订单元验证准则，以适于提供软件单元及其在组件内的交互符合软件详细设计及非功能性需求的证据。对单元测试而言，该准则应定义在单元测试规范中。[成果 2]

- 2 可能的单元验证准则包括单元测试用例、单元测试数据、静态验证、覆盖率目标及编码规范（如 MISRA 规则）。
- 3 单元测试规范的实施形式可为：例如自动测试台上的脚本。

**执行软件单元的静态验证。**使用已定义的验证准则来验证软件单元的正确性。记录静态验证的结果。[成果 3]

- 4 静态验证可包括静态分析、代码评审、依照编码规范和指南的检查、及其它方法。
- 5 不符合项的处理，见 SUP.9。

**测试软件单元。**根据软件单元验证策略，使用单元测试规范测试软件单元。记录测试结果和日志。[成果 3]

- 6 不符合项的处理，见 SUP.9。

## BP5

**Establish bidirectional traceability.** Establish bidirectional traceability between software units and static verification results. Establish bidirectional traceability between the software detailed design and the unit test specification. Establish bidirectional traceability between the unit test specification and unit test results. [OUTCOME 4]

7 *Bidirectional traceability supports coverage, consistency and impact analysis.*

## BP6

**Ensure consistency.** Ensure consistency between the software detailed design and the unit test specification. [OUTCOME 4]

8 *Consistency is supported by bidirectional traceability and can be demonstrated by review records.*

## BP7

**Summarize and communicate results.** Summarize the unit test results and static verification results and communicate them to all affected parties. [OUTCOME 5]

9 *Providing all necessary information from the test case execution in a summary enables other parties to judge the consequences.*

**建立双向可追溯性。**建立软件单元与静态验证结果之间的双向可追溯性。建立软件详细设计与单元测试规范之间的双向可追溯性。建立单元测试规范与单元测试结果之间的双向可追溯性。[成果 4]

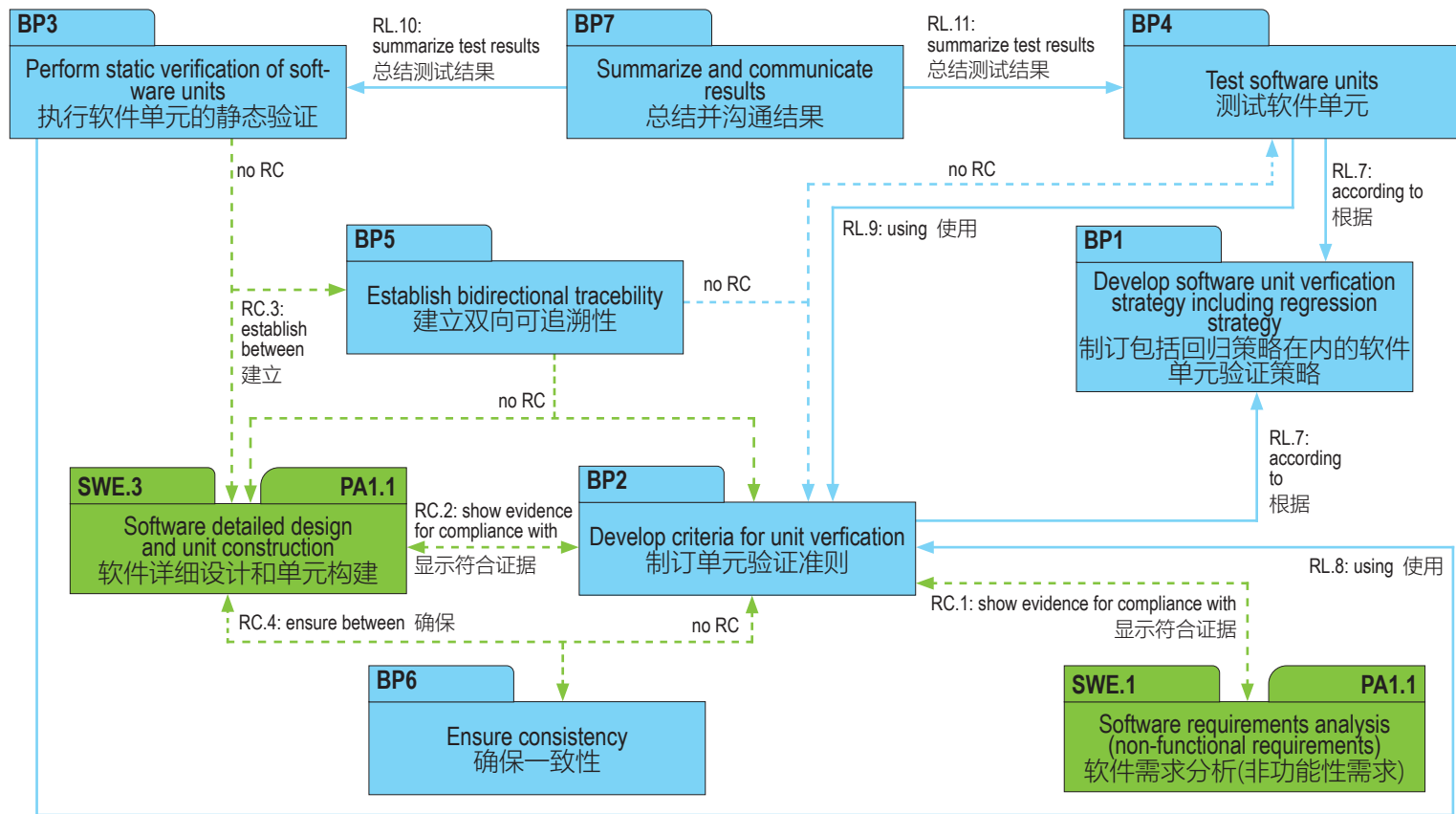
7 双向可追溯性有助于覆盖率、一致性和影响分析。

**确保一致性。**确保软件详细设计与单元测试规范之间的一致性。[成果 4]

8 一致性由双向可追溯性支持，并可通过评审记录来证明。

**总结并沟通结果。**总结单元测试结果和静态验证结果，并与所有受影响方沟通。[成果 5]

9 在总结中提供来自测试用例执行的所有必要信息，以便其他方得以判断结果。



The purpose of the Software Integration and Integration Test Process is to integrate the software units into larger software items up to a complete integrated software consistent with the software architectural design and to ensure that the software items are tested to provide evidence for compliance of the integrated software items with the software architectural design, including the interfaces between the software units and between the software items..

软件集成和集成测试过程的目的是：将软件单元集成到更大的软件项，直至与软件架构设计相一致的完整的集成软件，并确保集成的软件项得到测试，以提供集成的软件项符合软件架构设计（包括软件单元之间和软件项之间的接口）的证据。

#### Process outcomes – As a result of successful implementation of this process:

1. a software integration strategy consistent with the project plan, release plan and the software architectural design is developed to integrate the software items;
2. a software integration test strategy including the regression test strategy is developed to test the software unit and software item interactions;
3. a specification for software integration test according to the software integration test strategy is developed that is suitable to provide evidence for compliance of the integrated software items with the software architectural design, including the interfaces between the software units and between the software items;
4. software units and software items are integrated up to a complete integrated software according to the integration strategy;
5. test cases included in the software integration test specification are selected according to the software integration test strategy, and the release plan;
6. integrated software items are tested using the selected test cases and the results of software integration test are recorded;
7. consistency and bidirectional traceability are established between the elements of the software architectural design and the test cases included in the software integration test specification and between test cases and test results; and
8. results of the software integration test are summarized and communicated to all affected parties.

#### 过程成果 - 成功实施这个过程的结果如下:

1. 制订了与项目计划、发布计划和软件架构设计相一致的软件集成策略，以集成软件项；
2. 制订了包括软件回归测试策略在内的软件集成测试策略，以测试软件单元之间和软件项之间的交互；
3. 根据软件集成测试策略，开发了软件集成测试规范，以适于提供集成的软件项符合软件架构设计（包括软件单元之间和软件项之间的接口）的证据；
4. 根据集成策略集成了软件单元和软件项直至完整的集成软件；
5. 根据软件集成测试策略和发布计划，选择了软件集成测试规范中的测试用例；
6. 使用选定的测试用例测试了集成的软件项，并记录了测试结果；
7. 建立了软件架构设计要素与软件集成测试规范中的测试用例之间的一致性和双向可追溯性，并建立了测试用例与测试结果之间的一致性和双向可追溯性；
8. 总结了软件集成测试结果，并与所有受影响方沟通。

## Output work products 输出工作产品 [成果]

|                                 |               |                                |                |
|---------------------------------|---------------|--------------------------------|----------------|
| 01-03 Software item 软件项         | [OUTCOME 4]   | 13-19 Review record 评审记录       | [OUTCOME 7]    |
| 01-50 Integrated software 集成软件  | [OUTCOME 4]   | 13-22 Traceability record 追溯记录 | [OUTCOME 7]    |
| 08-50 Test specification 测试规范   | [OUTCOME 3,5] | 13-50 Test result 测试结果         | [OUTCOME 6, 8] |
| 08-52 Test plan 测试计划            | [OUTCOME 1,2] | 17-02 Build list 编译清单          | [OUTCOME 4, 7] |
| 13-04 Communication record 沟通记录 | [OUTCOME 8]   |                                |                |

## SWE.5 with 9 Base practices

## 基本实践

BP1

**Develop software integration strategy.** Develop a strategy for integrating software items consistent with the project plan and release plan. Identify software items based on the software architectural design and define a sequence for integrating them. [OUTCOME 1]

**制订软件集成策略。** 制订与项目计划和发布计划相一致的软件项集成策略。基于软件架构设计识别软件项，并定义其集成顺序。[成果 1]

BP2

**Develop software integration test strategy including regression test strategy.** Develop a strategy for testing the integrated software items following the integration strategy. This includes a regression test strategy for re-testing integrated software items if a software item is changed. [OUTCOME 2]

**制订包含回归测试策略在内的软件集成测试策略。** 遵循集成策略，制订集成的软件项的测试策略。该策略包括当软件项发生变更时，对集成的软件项实施再测试的回归测试策略。[成果 2]

## BP3

**Develop specification for software integration test.** Develop the test specification for software integration test including the test cases according to the software integration test strategy for each integrated software item. The test specification shall be suitable to provide evidence for compliance of the integrated software items with the software architectural design. [OUTCOME 3]

- 1 *Compliance to the architectural design means that the specified integration tests are suitable to prove that the interfaces between the software units and between the software items fulfill the specification given by the software architectural design.*
- 2 *The software integration test cases may focus on*
  - *the correct dataflow between software items*
  - *the timeliness and timing dependencies of dataflow between software items*
  - *the correct interpretation of data by all software items using an interface*
  - *the dynamic interaction between software items*
  - *the compliance to resource consumption objectives of interfaces*

## BP4

**Integrate software units and software items.** Integrate the software units to software items and software items to integrated software according to the software integration strategy. [OUTCOME 4]

## BP5

**Select test cases.** Select test cases from the software integration test specification. The selection of test cases shall have sufficient coverage according to the software integration test strategy and the release plan. [OUTCOME 5]

**开发软件集成测试规范。**根据软件集成测试策略，为各集成的软件项开发测试规范（包括各集成的软件项的测试用例）。测试规范应适于提供集成的软件项符合软件架构设计的证据。[成果 3]

- 1 符合架构设计是指，定义的集成测试适于证明软件单元之间的接口以及软件项之间的接口满足软件架构设计的规范。
- 2 软件集成测试用例可关注：
  - 软件项之间正确的数据流
  - 软件项之间数据流的时效和时序依赖性
  - 所有软件项接口的数据的正确解释
  - 软件项之间的动态交互
  - 与接口的资源消耗目标的符合性

**集成软件单元和软件项。**根据软件集成策略，将软件单元集成到软件项，进而将软件项集成到集成软件。[成果 4]

**选择测试用例。**从软件集成测试规范中选择测试用例。根据软件合格性测试策略和发布计划，选定的测试用例应具备足够的覆盖率。[成果 5]

## BP6

**Perform software integration test.** Perform the software integration test using the selected test cases. Record the integration test results and logs. [OUTCOME 6]

3 See SUP.9 for handling of non-conformances.

4 The software integration test may be supported by using hardware debug interfaces or simulation environments (e.g. Software-in-the-Loop-Simulation).

## BP7

**Establish bidirectional traceability.** Establish bidirectional traceability between elements of the software architectural design and test cases included in the software integration test specification. Establish bidirectional traceability between test cases included in the software integration test specification and software integration test results. [OUTCOME 7]

5 Bidirectional traceability supports coverage, consistency and impact analysis.

## BP8

**Ensure consistency.** Ensure consistency between elements of the software architectural design and test cases included in the software integration test specification. [OUTCOME 7]

6 Consistency is supported by bidirectional traceability and can be demonstrated by review records.

## BP9

**Summarize and communicate results.** Summarize the software integration test results and communicate them to all affected parties. [OUTCOME 8]

7 Providing all necessary information from the test case execution in a summary enables other parties to judge the consequences.

**执行软件集成测试。** 使用选定的测试用例执行软件集成测试，并记录集成测试结果和日志。[成果 6]

3 不符合项的处理，见 SUP.9

4 可用硬件的调试接口或仿真环境（例如，软件在环仿真）支持软件集成测试。

**建立双向可追溯性。** 建立软件架构设计要素与软件集成测试规范中的测试用例之间的双向可追溯性。建立软件集成测试规范中的测试用例与软件集成测试结果之间的双向可追溯性。[成果 7]

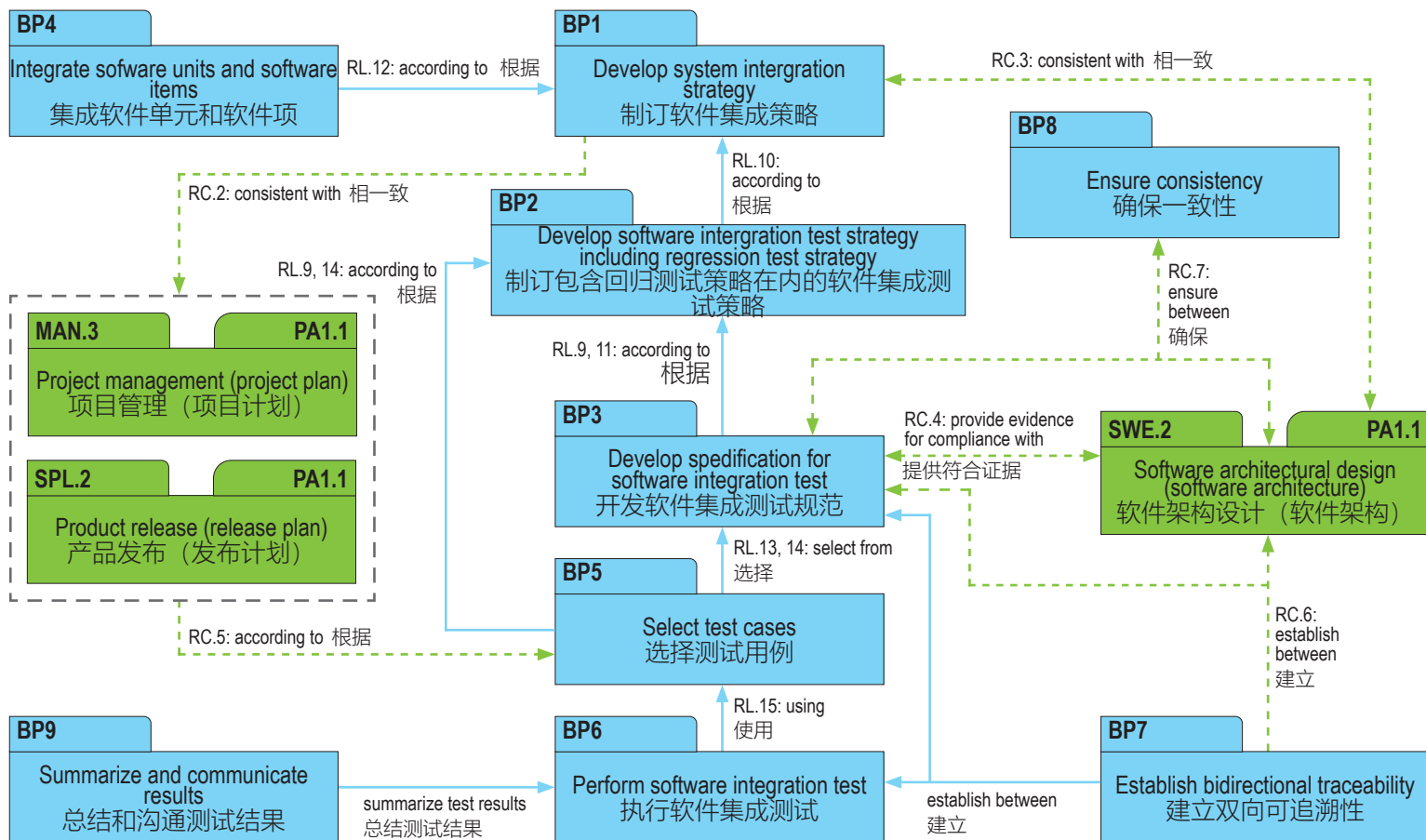
5 双向可追溯性有助于覆盖率、一致性和影响分析。

**确保一致性。** 确保软件架构设计要素与软件集成测试规范中的测试用例之间的一致性。[成果 7]

6 一致性由双向可追溯性支持，并可通过评审记录来证明。

**总结和沟通测试结果。** 总结软件集成测试结果，并与所有受影响方沟通。[成果 8]

7 在总结中提供来自测试用例执行的所有必要信息，以便其他方可以判断结果。







The purpose of the Software Qualification Test Process is to ensure that the integrated software is tested to provide evidence for compliance with the software requirements.

软件合格性测试的目的是：确保集成软件得到测试，以提供符合软件需求的证据。

Process outcomes – As a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

1. a software qualification test strategy including regression test strategy consistent with the project plan and release plan is developed to test the integrated software;

2. a specification for software qualification test of the integrated software according to the software qualification test strategy is developed that is suitable to provide evidence for compliance with the software requirements;

3. test cases included in the software qualification test specification are selected according to the software qualification test strategy and the release plan;

4. the integrated software is tested using the selected test cases and the results of software qualification test are recorded;

5. consistency and bidirectional traceability are established between software requirements and software qualification test specification including test cases and between test cases and test results; and

6. results of the software qualification test are summarized and communicated to all affected parties.
1. 制订了与项目计划和发布计划相一致的包括回归测试策略在内的软件合格性测试策略，以测试集成软件；

2. 根据软件合格性测试策略，开发了集成软件软件合格性测试规范，以适于提供符合软件需求的证据；

3. 根据软件合格性测试策略和发布计划，选择了软件合格性测试规范中的测试用例；

4. 使用选定的测试用例测试了集成软件，并记录了软件合格性测试结果；

5. 建立了软件需求与软件合格性测试规范中的测试用例之间的一致性和双向可追溯性，建立了测试用例与测试结果之间的一致性和双向的可追溯性；

6. 总结了软件合格性测试结果，并与所有受影响方沟通。

Output work products 输出工作产品 [成果]

|                                 |                |                                |                |
|---------------------------------|----------------|--------------------------------|----------------|
| 08-50 Test specification 测试规范   | [OUTCOME 2, 3] | 13-19 Review record 评审记录       | [OUTCOME 5]    |
| 08-52 Test plan 测试计划            | [OUTCOME 1]    | 13-22 Traceability record 追溯记录 | [OUTCOME 5]    |
| 13-04 Communication record 沟通记录 | [OUTCOME 6]    | 13-50 Test result 测试结果         | [OUTCOME 4, 6] |

## BP1

**Develop software qualification test strategy including regression test strategy.**

Develop a strategy for software qualification testing consistent with the project plan and the release plan. This includes a regression test strategy for re-testing the integrated software if a software item is changed. [OUTCOME 1]

## BP2

**Develop specification for software qualification test.** Develop the specification for software qualification test including test cases based on the verification criteria, according to the software test strategy. The test specification shall be suitable to provide evidence for compliance of the integrated software with the software requirements. [OUTCOME 2]

## BP3

**Select test cases.** Select test cases from the software test specification. The selection of test cases shall have sufficient coverage according to the software test strategy and the release plan. [OUTCOME 3]

## BP4

**Test integrated software.** Test the integrated software using the selected test cases. Record the software test results and logs. [OUTCOME 4]

1 See SUP.9 for handling of non-conformances.

## BP5

**Establish bidirectional traceability.** Establish bidirectional traceability between software requirements and test cases included in the software qualification test specification. Establish bidirectional traceability between test cases included in the software qualification test specification and software qualification test results. [OUTCOME 5]

2 Bidirectional traceability supports coverage, consistency and impact analysis.

**制订包括回归测试策略在内的软件合格性测试策略。**制订与项目计划和发布计划相一致的软件合格性测试策略。该策略包括当软件项发生变更时，对集成软件实施再测试的回归测试策略。[成果 1]

**开发软件合格性测试规范。**根据软件合格性测试策略，基于验证准则，开发包含测试用例在内的软件合格性测试规范。测试规范应适于提供集成软件符合软件需求的证据。[成果 2]

**选择测试用例。**从测试规范中选择测试用例。根据软件合格性测试策略和发布计划，选定的测试用例应具备足够的覆盖率。[成果 3]

**测试集成软件。**使用选定的测试用例测试集成软件。记录测试结果和日志。[成果 4]

1 不符合项的处理，见 SUP9。

**建立双向可追溯性。**建立软件需求与软件合格性测试规范中的测试用例之间的双向可追溯性。建立软件合格性测试规范中的测试用例与软件合格性测试结果之间的双向可追溯性。[成果 5]

2 双向可追溯性有助于覆盖率、一致性和影响分析。

## BP6

**Ensure consistency.** Ensure consistency between software requirements and test cases included in the software qualification test specification. [OUTCOME 5]

- 3 *Consistency is supported by bidirectional traceability and can be demonstrated by review records.*

## BP7

**Summarize and communicate results.** Summarize the software qualification test results and communicate them to all affected parties. [OUTCOME 6]

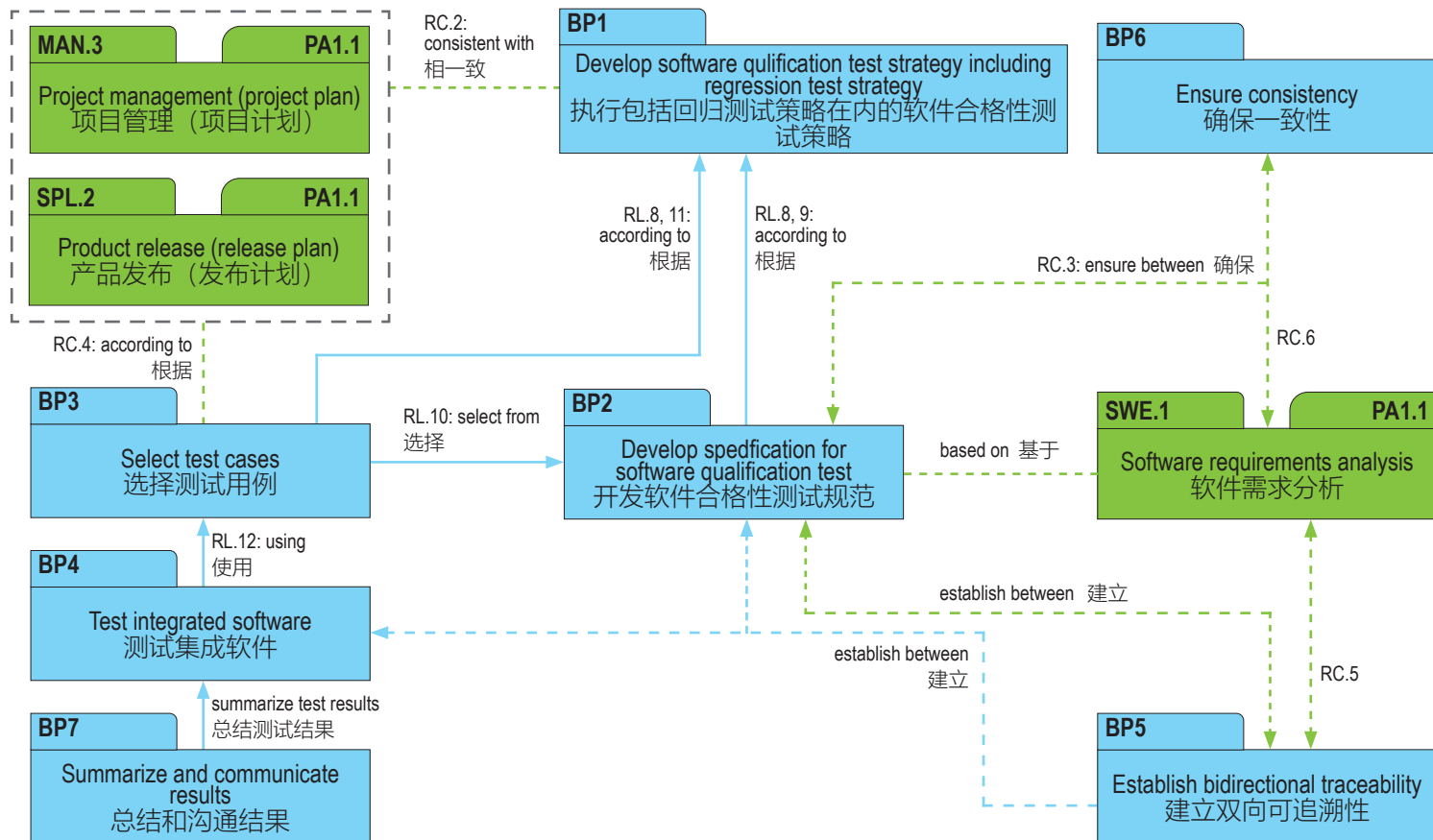
- 4 *Providing all necessary information from the test case execution in a summary enables other parties to judge the consequences.*

**确保一致性。** 确保软件需求与软件合格性测试规范中的测试用例的一致性。[成果 5]

- 3 一致性由双向可追溯性支持，并可通过评审记录来证明。

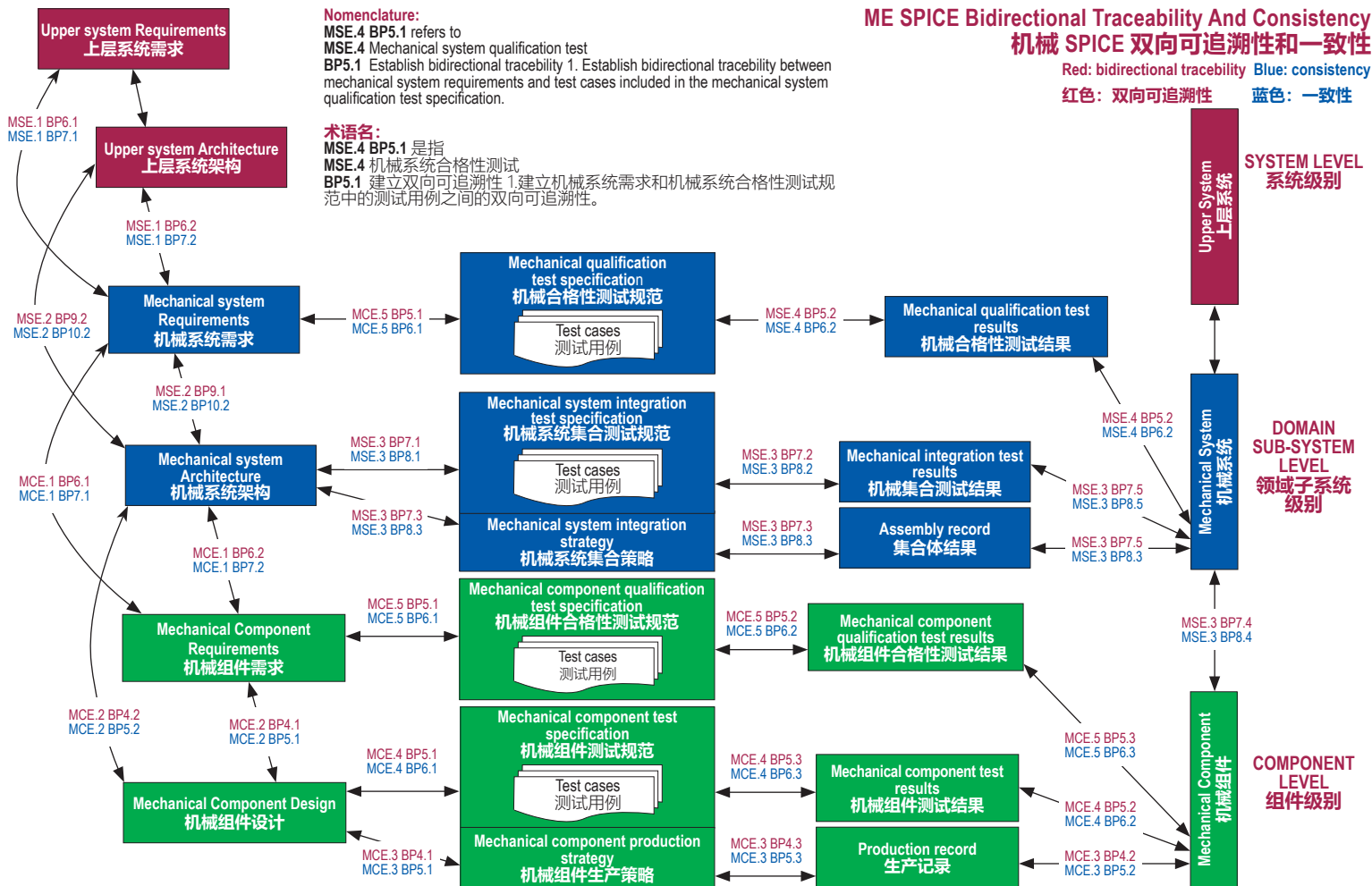
**总结和沟通结果。** 总结软件合格性测试结果，并与所有受影响方沟通。[成果 6]

- 4 在总结中提供来自测试用例执行的所有必要信息，以便其他方判断结果。



## **MECHANICAL ENGINEERING SPICE Version 1.7**

### **机械工程 SPICE 1.7**



MSE.1 Mechanical System Requirements Analysis 机械系统需求分析

The purpose of the Mechanical System Requirements Analysis process is to derive the mechanical sys-tem requirements from the upper system requirements together with all affected stakeholders.

机械系统需求分析过程的目的是：与所有受影响利益相关方一起从上层系统需求中导出机械系统需求。

Process outcomes – as a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

- 1. the mechanical system requirements are derived from the upper system requirements and the upper system architecture;
- 2. Note: If the mechanical system is the highest system the source of these requirements are the only the stakeholders, in other cases the requirements' source is the upper system requirements and the upper system architecture.
- 3. the mechanical system requirements are categorized and analyzed for correctness and verifiability;
- 4. the impact of mechanical system requirements on the operating environment is analyzed and com-municated;
- 5. prioritization for implementing the mechanical system requirements is defined;
- 6. the mechanical system requirements are updated as needed;
- 7. consistency and bidirectional traceability are established between upper system require-ments and mechanical system requirements; and consistency and bidirectional traceability are established between upper system architecture and mechanical system requirements;
- 8. the mechanical system requirements are evaluated for cost, schedule and technical impact; and
- 9. the mechanical system requirements are agreed and communicated to all affected stake-holders.

- 1. 机械系统需求来自上层系统需求和上层系统架构;
- 2. 注：如果机械系统是最高系统则需求来源是唯一利益相关方，在其他情况下需求来源是上层系统需求和上层系统架构;
- 3. 对机械系统需求进行分类，并分析了其正确性和可验证性;
- 4. 分析并沟通了机械系统需求对运行环境的影响;
- 5. 定义了机械系统需求实施的优先级;
- 6. 根据需要更细了机械系统需求;
- 7. 建立了上层系统需求和机械系统需求之间的一致性和双向可追溯性; 建立了上层系统架构和机械系统需求之间的一致性和双向可追溯性;
- 8. 从成本、进度和技术影响来评估机械系统需求;
- 9. 约定了机械系统需求，并与所有受影响方沟通。

Output work products 输出工作产品 [成果]

|                                    |                |   |                      |
|------------------------------------|----------------|---|----------------------|
| 01-51 Application parameter 应用参数   | [OUTCOME 1]    | 15-01 Analysis report 分析报告                                    | [OUTCOME 2, 3, 4, 7] |
| 13-04 Communication record 沟通记录    | [OUTCOME 8]    | 17-08 Interface requirements specification [1] 接口需求规范         | [OUTCOME 1]          |
| 13-19 Review record 评审记录           | [OUTCOME 6]    | 17-ME01 Mechanical system requirements specification 机械系统需求规范 | [OUTCOME 1]          |
| 13-21 Change control record 变更控制记录 | [OUTCOME 5, 7] | 17-50 Verification criteria 验证准则                              | [OUTCOME 2]          |
| 13-22 Traceability record 追溯记录     | [OUTCOME 1, 6] |   |                      |



## BP1

**Specify mechanical system requirements.**

Use the upper system requirements and the upper system architecture as well as changes to the upper system requirements and architecture to identify the required functions and capabilities of the mechanical system. Specify functional and non-functional mechanical system requirements in a mechanical system requirements specification. [OUTCOME 1, 5, 7]

- 1 *Non-functional requirements may include e.g. production, maintenance, exchangeability of systems and components in the field, logistic, packaging, sizing, weight, price per unit, producibility, environmental, design guidelines, modelling guidelines and patents.*
- 2 *Mechanical system requirements should include tolerances as necessary.*

## BP2

**Structure mechanical system requirements.**

Structure the mechanical system requirements in the mechanical system requirements specification by e.g.

- grouping to project relevant clusters like architecture elements,
- sorting in a logical order for the project,
- categorizing based on relevant criteria for the project,
- prioritizing according to stakeholder needs.

[OUTCOME 2, 4]

- 3 *Prioritizing typically includes the assignment of mechanical content to planned releases. Refer to SPL.2 BP1.*

## BP3

**Analyze mechanical system requirements.**

Analyze the specified mechanical system requirements including their interdependencies to ensure correctness, technical feasibility and verifiability, and to support risk identification. Analyze the impact on cost, schedule and the technical impact. [OUTCOME 2, 7]

- 4 *The analysis of impact on cost, schedule and quality supports the adjustment of project estimates. Refer to MAN.3 BP5.*

**定义机械系统需求。**

使用上层系统需求和上层系统架构及其变更，以识别机械系统所需的功能和能力。在机械系统需求规范中定义功能性和非功能性机械系统需求。[成果 1, 5, 7]

- 1 非功能性需求可包括例如生产、维护、系统和组件在现场的交换性、物流、包装、尺寸、重量、单位价格、可生产性、环境、设计指南、建模指南和专利。
- 2 机械系统需求应包括必要的公差。

**结构化机械系统需求。**

在机械系统需求规范中结构化机械系统需求，例如：

- 按项目相关集群（如架构要素）进行分组，
- 按项目中逻辑顺序排序，
- 基于项目相关准则进行分类，
- 根据利益相关方需要进行优先级排序。

[成果 2, 4]

- 3 优先级排序通常包括将机械内容分配给已计划的发布。参见 SPL.2.BP1。

**分析机械系统需求。**

分析已定义的机械系统需求（包括它们的相互依赖关系），以确保正确性、技术可行性和可验证性，并且支持风险识别。分析对成本、进度和技术的影响。[成果 2, 7]

- 4 对成本、进度和质量的影响分析有助于项目估算的调整。参见 MAN.3.BP5。

## BP4

**Analyze the impact on the operating environment.**

Analyze the impact that the mechanical system requirements will have on upper system elements and the operating environment. [OUTCOME 3, 7]

## BP5

**Develop verification criteria.**

Develop the verification criteria for each mechanical system requirement that define the qualitative and quantitative measures for the verification of a requirement. [OUTCOME 2, 7]

5 *Verification criteria demonstrate that a requirement can be verified within agreed constraints and is typically used as the input for the development of the test cases or other verification measures that should demonstrate compliance with the mechanical system requirements.*

6 *Verification which cannot be covered by testing is covered by SUP.2.*

## BP6

**Establish bidirectional traceability.**

1. Establish bidirectional traceability between upper system requirements and mechanical system requirements.
2. Establish bidirectional traceability between the upper system architecture and mechanical system requirements.

[OUTCOME 6]

7 *Bidirectional traceability supports coverage, consistency and impact analysis.*

**分析对运行环境的影响。**

分析机械系统需求对上层系统要素和运行环境的影响。 [成果 3,7]

**制订验证准则。**

对每一个机械系统需求制订验证准则，定义定性的和定量的措施用于需求验证。 [成果 2, 7]

5 验证准则证明了需求可以在约定的约束范围内得到验证，并且通常被用作测试用例开发或其它应证明符合机械系统需求的验证措施的输入。

6 测试不能覆盖的验证由 SUP.2覆盖。

**建立双向可追溯性。**

1. 建立上层系统需求和机械系统需求之间的双向可追溯性。
2. 建立上层系统架构和机械系统需求之间的双向可追溯性。

[成果 6]

7 双向可追溯性有助于覆盖率、一致性和影响分析。

## BP7

**Ensure consistency.**

1. Ensure consistency between upper system requirements and mechanical system requirements.
2. Ensure consistency between the upper system architecture and mechanical system requirements.

[OUTCOME 6]

8 Consistency is supported by bidirectional traceability and can be demonstrated by review records.

9 In case of mechanical development only, the upper system requirements and upper system architecture refer to a given operating environment. In that case, consistency and bidirectional traceability has to be ensured between stakeholder requirements and mechanical system requirements.

## BP8

**Communicate agreed mechanical requirements.**

Communicate the agreed mechanical system requirements and updates to mechanical system requirements to all relevant stakeholders. [OUTCOME 8]

**确保一致性。**

1. 确保上层系统需求和机械系统需求之间的一致性。
2. 确保上层系统架构和机械系统需求之间的一致性。

[成果 6]

8 一致性由双向可追溯性支持，并可通过评审记录来证明。

9 如果只有机械开发，上层系统需求和上层系统架构是指给定的运行环境。在这种情况下，必须确保利益相关方需求与机械系统需求之间的一致性和双向可追溯性。

**沟通约定的机械需求。**

与所有利益相关方沟通约定的机械系统需求及对机械系统需求的更新。  
[成果 8]

The purpose of the Mechanical System Architectural Design Process is to establish an architectural design and to identify which mechanical system requirements are to be allocated to which elements of the mechanism, and to evaluate the mechanical system architectural design against defined criteria.

机械系统架构设计过程的目的是：建立系统架构设计，识别将哪些机械系统需求分配给哪些机械要素，并依照已定义的准则评估机械系统架构设计。

Process outcomes – as a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

- 1. a mechanical system architectural design is defined that identifies the elements of the mechanical system;
- 2. the mechanical system requirements are allocated to the elements of the mechanical system;
- 3. the interfaces of each mechanical system elements are defined;
- 4. the static and dynamic behaviour and design constraints of the mechanical system elements are de-fined;
- 5. consistency and bidirectional traceability are established between mechanical system requirements and mechanical system architectural design; and
- 6. the mechanical system architectural design is agreed and communicated to all affected stakeholders.

- 1. 定义了识别机械系统要素的机械系统架构设计；
- 2. 将机械系统需求分配给机械系统的要素；
- 3. 定义了每个机械系统要素的接口；
- 4. 定义了机械系统要素的静态/动态行为以及设计约束；
- 5. 建立了机械系统需求和机械系统架构设计之间的一致性和双向可追溯性；
- 6. 约定了机械系统架构设计，并与所有受影响利益相关方沟通。

Output work products 输出工作产品 [成果]

|   |                         |  |             |
|---|-------------------------|--|-------------|
| 04-ME01 Mechanical system architectural design 机械系统架构设计 | [OUTCOME 1, 2, 3, 4, 5] | 13-22 Traceability record 追溯记录                       | [OUTCOME 5] |
| 13-04 Communication record 沟通记录                         | [OUTCOME 6]             | 17-08 Interface requirement specification 接口需求规范     | [OUTCOME 3] |
| 13-19 Review record 评审记录                                | [OUTCOME 5]             | 13-ME01 Characteristics classification record 特性分类记录 | [OUTCOME 1] |

## BP1

**Develop mechanical system architectural design.**

Develop and document the mechanical system architectural design that specifies the elements of the mechanical system with respect to functional and non-functional mechanical system requirements. [OUTCOME 1]

- 1 *The mechanical system is decomposed into elements across appropriate hierarchical levels down to the mechanical components (the elements on the lowest level of the mechanical system architectural design) that are described in the mechanical component design.*
- 2 *Consider make, buy and reuse options.*
- 3 *Model-based development (e.g. FEM, SysML) may facilitate the collaboration of the different engineering domains.*

## BP2

**Allocate mechanical system requirements.**

Allocate all mechanical system requirements to the elements of the mechanical system architectural design. [OUTCOME 2]

## BP3

**Define interfaces of mechanical elements.**

Identify, develop and document the interfaces of each mechanical system element. [OUTCOME 3]

## BP4

**Identify special characteristics.**

Identify and document special characteristics of the mechanical system elements. [OUTCOME 1]

- 4 *The identification of special characteristics is supported by e.g. simulation, risk analyses, sizing calculations.*

## BP5

**Describe dynamic and static behaviour.**

Evaluate and document the dynamic and static behaviour of and the interaction between mechanical system elements. [OUTCOME 4]

- 5 *Static and dynamic behaviour is determined by e.g. stress, force, pressure, strain, temperature, operating modes (open, closed, in motion, misuse, emergency, etc.)*

**开发机械系统架构设计。**

开发并文档化机械系统架构设计，该设计基于机械系统功能性需求和非功能性需求定义机械系统要素。[成果 1]

- 1 将机械系统分解为适当的各层级上的要素，直至机械系统架构设计的最低层级要素，即详细设计中描述的机械组件。
- 2 考虑制造、购买和重用选项。
- 3 基于模型的开发（例如FEM，SysML）可以促进不同工程领域的协作。

**分配机械系统需求。**

将所有机械系统需求分配到机械系统架构设计的要素。[成果 2]

**定义机械要素的接口。**

识别、开发并记录机械系统要素的接口。[成果 3]

**识别特殊特性。**

识别并记录机械系统要素的特殊特性。[成果 1]

- 4 通过例如：仿真、风险分析、尺寸计算来支持对特殊特性的识别。

**描述动态和静态行为。**

评估并文档化机械系统要素之间相互作用的动态和静态行为。[成果 4]

- 5 静态和动态行为取决于如：压力、力、挤压、张力、温度和运行模式（例如：打开、关闭、运行、误用和紧急等）。

## BP6

**Consider, determine, and document design constraints.**

Determine and document design constraints for all mechanical system elements and take them into account for creating the mechanical system architecture. [OUTCOME 4]

## BP7

**Evaluate alternative mechanical system architectures.**

Define evaluation criteria for architectural design. Evaluate alternative mechanical system architectures according to the defined criteria. Record the rationale for the chosen mechanical system architecture. [OUTCOME 1, 2, 3, 4, 5]

- 6 *Evaluation criteria may include quality characteristics (cost, weight, packaging, modularity, maintainability, expandability, scalability, reliability, safety and usability) and results of make-buy-reuse analysis.*

## BP8

**Verify mechanical system architectural design.**

Ensure that the mechanical system architectural design meets all mechanical system requirements. [Outcomes 4, 5]

- 7 *Verification of mechanic system architectural design may include FEA, simulation, or Product FMEA.*

## BP9

**Establish bidirectional traceability.**

1. Establish bidirectional traceability between mechanical system requirements and elements of the mechanical system architectural design.
2. Establish bidirectional traceability between elements of the mechanical system architectural design and elements of the system architectural design.

[OUTCOME 5]

- 8 *Bidirectional traceability covers allocation of mechanical system requirements to the elements of the mechanical system architectural design.*
- 9 *Bidirectional traceability supports coverage, consistency and impact analysis.*

**考虑、确定和文档化设计约束。**

为所有机械系统要素确定并文档化设计约束，并在创建机械系统架构时用其作为参考。[成果 4]

**评估备选的机械系统架构。**

定义架构的评估准则。根据定义的准则评估备选的机械系统架构，记录被选定的机械系统架构的选择理由。[成果 1, 2, 3, 4, 5]

- 6 评估准则可包括质量特性（成本、重量、包装、模块性、可维护性、可扩展性、可扩缩性、可靠性、安全（safety）和易用性）以及开发-购买-重用分析的结果。

**验证机械系统架构设计。**

确保机械系统架构设计符合所有机械系统需求。[成果 4, 5]

- 7 对机械系统架构设计的验证可能包括FEA,仿真或FMEA。

**建立双向可追溯性。**

1. 建立机械系统需求与机械系统架构设计要素之间的双向可追溯性。
2. 建立机械系统架构设计要素与系统架构设计要素之间的双向可追溯性。

[成果 5]

- 8 双向可追溯性覆盖机械系统需求向机械系统架构设计的要素的分配。
- 9 双向可追溯性有助于覆盖率、一致性和影响分析。

## BP10

**Ensure consistency.**

1. Ensure consistency between mechanical system requirements and the mechanical system architectural design.
2. Ensure consistency between elements of the mechanical system architectural design and elements of the system architectural design.

[OUTCOME 1, 2, 5, 6]

**10** Consistency is supported by bidirectional traceability and can be demonstrated by review records.

**11** Mechanical system requirements include mechanical system architectural requirements, refer to BP7.

## BP11

**Communicate agreed mechanical system architectural design.**

Communicate the agreed mechanical system architectural design and updates to mechanical system architectural design to all relevant stakeholders. [OUTCOME 6]

**确保一致性。**

1. 确保机械系统需求与机械系统架构设计之间的一致性。
2. 确保机械系统架构设计要素与系统架构设计要素之间的一致性。

[成果 1, 2, 5, 6]

**10** 一致性由双向可追溯性支持，并可通过评审记录来证明。

**11** 机械系统需求包括机械系统架构需求。参见BP7。

**沟通约定的机械系统架构设计。**

与所有利益相关方沟通已约定的机械系统架构设计及对机械系统架构设计的更新。 [成果 6]

The purpose of the Mechanical System Integration and Integration Test Process is to integrate the mechanical items (mechanical component items and/or mechanical system items) into larger mechanical items up to a complete integrated mechanical system item consistent with the mechanical system architectural design and to ensure that the mechanical items are tested to provide evidence for compliance of the integrated mechanical items with the mechanical system architectural design, including the inter-faces between the mechanical items.

机械系统集成与集成测试过程的目的是: 将机械项 (机械组件项和/或机械系统项) 集成到更大的机械项, 直至与机械系统架构设计相一致的完整的集成机械系统项, 并确保机械项得到测试, 以提供集成的机械项符合机械系统架构设计 (包括机械项之间的接口) 的证据。

#### Process outcomes – as a result of successful implementation of this process:

1. a mechanical system integration strategy consistent with the project plan, release plan and the mechanical system architectural design is developed to integrate the mechanical items;
2. a mechanical system integration test strategy including the regression test strategy is developed to test the mechanical items interactions;
3. a specification for mechanical system integration test according to the mechanical system integration test strategy is developed that is suitable to provide evidence for compliance of the integrated mechanical items with the mechanical system architectural design, including the interfaces between the mechanical items;
4. mechanical items are integrated up to a complete integrated mechanical system according to the integration strategy;
5. test cases included in the mechanical system integration test specification are selected according to the mechanical system integration test strategy, and the release plan;
6. integrated mechanical items are tested using the selected test cases and the results of mechanical system integration testing are recorded;
7. consistency and bidirectional traceability are established between the elements of the mechanical system architectural design and the test cases included in the mechanical system integration test specification, between test cases and test results and between integrated mechanic items and recorded process data; and
8. the results of the mechanical system integration test are summarized and communicated to all affected stakeholders.

#### 过程成果 - 成功实施这个过程的结果如下:

1. 制订了与项目计划、发布计划和机械系统架构设计相一致的机械系统集成策略, 以集成机械项;
2. 制订了包括机械系统回归测试策略在内的机械系统集成测试策略, 以测试机械项之间的交互;
3. 根据机械系统集成测试策略, 开发了机械系统集成测试规范, 以适于提供集成的机械项符合机械系统架构设计 (包括机械项之间的接口) 的证据;
4. 根据集成策略集成了机械项直至完整的集成机械系统;
5. 根据机械系统集成测试策略和发布计划, 选择了机械系统集成测试规范中的测试用例;
6. 使用选定的测试用例测试了集成的机械项, 并记录了测试结果;
7. 建立了机械系统架构设计要素与机械系统集成测试规范中的测试用例之间的一致性和双向可追溯性, 并建立了测试用例与测试结果之间的一致性和双向可追溯性; 还建立了集成机械项和过程数据记录之间的一致性和双向可追溯性;
8. 总结了机械系统集成测试结果, 并与所有受影响利益相关方沟通。



Output work products 输出工作产品 [成果]

|                                    |               |  |                   |
|------------------------------------|---------------|--|-------------------|
| 08-ME01 Sample control plan 样品控制计划 | [OUTCOME 1,2] | 13-22 Traceability record 追溯记录                             | [OUTCOME 7]       |
| 17-ME02 Assembly instruction 集合体指导 | [OUTCOME 1]   | 17-ME03 Bill of material (BOM, Build list) 材料清单 (BOM,编译清单) | [OUTCOME 3, 4, 7] |
| 13-ME02 Assembly record 集合体记录      | [OUTCOME 4]   | 11-ME01 Mechanical System 机械系统                             | [OUTCOME 4]       |
| 08-50 Test specification 测试规范      | [OUTCOME 3,5] | 13-04 Communication record 沟通记录                            | [OUTCOME 8]       |
| 13-50 Test result 测试结果             | [OUTCOME 6,8] | 13-19 Review record 评审记录                                   | [OUTCOME 7]       |

MSE.3 with 9 Base practices

基本实践

BP1

Develop mechanical system integration strategy.

Develop a strategy for integrating mechanical sub-systems consistent with the project plan and the re-lease plan. Identify mechanical sub-systems based on the mechanical system architectural design and define a sequence for integrating them. [OUTCOME 1]

制定机械系统集成策略。

制订与项目计划和发布计划相一致的机械子系统集成策略。基于机械系统架构设计识别机械子系统，并定义其集成顺序。[成果 1]

BP2

Develop mechanical system integration test strategy including regression test strategy.

Develop a strategy for testing the integrated mechanical item following the mechanical system integration strategy. This includes a regression test strategy for re-testing integrated mechanical item if a mechanical item is changed. [OUTCOME 2]

制订包含回归测试策略在内的机械系统集成测试策略。

遵循机械系统集成策略，制订集成的机械项的测试策略。该策略包括当机械项发生变更时，对集成的机械项实施再测试的回归测试策略。[成果 2]

BP3

Develop specification for mechanical system integration test.

Develop the test specification for mechanical system integration test including the test cases according to the mechanical system integration test strategy for each integrated mechanical item. The test specification shall be suitable to provide evidence for compliance of the integrated mechanical items with the mechanical system architectural design. [OUTCOME 3]

开发软件集成测试规范。

根据机械系统集成测试策略，为各集成的机械项开发测试规范（包括各集成的机械项的测试用例）。测试规范应适于提供集成的机械项符合机械系统架构设计的证据。[成果 3]

1

Compliance to the architectural design means that the specified integration tests are suitable to prove that the interfaces between the mechanical items fulfill the specification (e.g. special characteristics) given by the mechanical system architectural design.

1

符合架构设计是指，定义的集成测试适于证明机械项之间的接口满足机械系统架构设计的规范（例如特殊特性）。

**BP4 Integrate mechanical items.**

Integrate the mechanical items to integrated mechanical system item according to the mechanical system integration strategy and record process data according to the integration strategy. [OUTCOME 4]

**BP5 Select test cases.**

Select test cases from the mechanical system integration test specification. The selection of test cases shall have sufficient coverage according to the mechanical system integration test strategy and the release plan. [OUTCOME 5]

**BP6 Perform mechanical system integration test.**

Perform the mechanical system integration test using the selected test cases. Record the integration test results and logs. [OUTCOME 6]

2 See SUP.9 for handling of non-conformances

3 Capable test environment as defined in the test strategy needs to be available for performing mechanical system integration and integration test.

**BP7 Establish bidirectional traceability.**

1. Establish bidirectional traceability between elements of the mechanical system architectural design and test cases included in the mechanical system integration test specification.
2. Establish bidirectional traceability between test cases included in the mechanical system integration test specification and mechanical system integration test results.
3. Establish bidirectional traceability between integrated mechanical items and recorded process data according to the mechanical system integration strategy.
4. Establish bidirectional traceability between integrated mechanical items and the considered mechanical system item.
5. Establish bidirectional traceability between the mechanical integration test results and the integrated mechanical systems.[OUTCOME 7]

4 Bidirectional traceability supports coverage, consistency and impact analysis.

**集成机械项。**

根据机械系统集成策略，将机械项集成为集成系统，根据集成策略记录过程数据。[成果 4]

**选择测试用例。**

从机械系统集成测试规范中选择测试用例。测试用例的选择应根据机械系统集成测试策略和发布计划具备足够的覆盖率。[成果 5]

**执行机械系统集成测试。**

使用选定的测试用例执行机械系统集成测试。记录集成测试结果和日志。[成果 6]

2 不符合项的处理，见 SUP.9。

3 测试策略中定义的能力测试环境需可用于执行机械系统集成和集成测试。

**建立双向可追溯性。**

1. 建立机械系统架构设计要素与机械系统集成测试规范中的测试用例之间的双向可追溯性。
2. 建立机械系统集成测试规范中的测试用例与机械系统集成测试结果之间的双向可追溯性。
3. 根据机械系统集成策略建立集成机械项与记录过程数据之间的双向可追溯性。
4. 建立集成机械项与考虑机械系统项之间的双向可追溯性。
5. 建立机械集成测试结果与集成机械系统之间的双向可追溯性。

[成果 7]

4 双向可追溯性有助于覆盖率、一致性和影响分析。

## BP8

**Ensure consistency.**

1. Ensure consistency between elements of the mechanical system architectural design and test cases included in the mechanical system integration test specification.
2. Ensure consistency between test cases included in the mechanical system integration test specification and mechanical system integration test results.
3. Ensure consistency between integrated mechanical items and recorded process data according to the mechanical system integration strategy.
4. Ensure consistency between integrated mechanical items and the considered mechanical system item.
5. Ensure consistency between the mechanical integration test results and the integrated mechanical systems.

**[OUTCOME 7]**

- 5 Consistency is supported by bidirectional traceability and can be demonstrated by review records.

## BP9

**Summarize and communicate results.**

Summarize the mechanical system integration test results and communicate them to all affected stakeholders. **[OUTCOME 8]**

- 6 Providing all necessary information (e.g. test results, recorded process data) from the test case execution in a summary enables stakeholders to judge the consequences.

**确保一致性。**

1. 确保机械系统架构设计要素与机械系统集成测试规范中的测试用例之间的一致性。
2. 确保机械系统集成测试规范中的测试用例与机械系统集成测试结果之间的一致性。
3. 确保集成机械项与根据机械系统集成策略记录过程数据之间的一致性。
4. 确保集成机械项与考虑机械系统项之间的一致性。
5. 确保机械集成测试结果与集成机械系统之间的一致性。

**[成果 7]**

- 5 一致性由双向可追溯性支持，并可通过评审记录来证明。

**总结和沟通结果。**

总结机械系统集成测试结果，并与所有利益相关方沟通。 **[成果 8]**

- 6 在总结中提供来自测试用例执行的所有必要信息（例如：测试结果、记录过程数据），以便利益相关方判断结果。

The purpose of the Mechanical System Qualification Test Process is to ensure that the integrated mechanical system is tested to provide evidence for compliance with the mechanical system requirements.

机械系统合格性测试过程的目的是：确保集成机械系统得到测试，以提供符合系统需求的证据。

Process outcomes – as a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

1. a mechanical system qualification test strategy including regression test strategy consistent with the project plan and the release plan is developed to test the integrated mechanical system;

2. a specification for mechanical system qualification test of the integrated mechanical system according to the mechanical system qualification test strategy is developed that is suitable to provide evidence for compliance with the mechanical system requirements;

3. test cases included in the mechanical system qualification test specification are selected according to the mechanical system qualification test strategy and the release plan;

4. the integrated mechanical system is tested using the selected test cases and the results of mechanical system qualification test are recorded;

5. consistency and bidirectional traceability are established between mechanical system requirements and mechanical system qualification test specification including test cases and between test cases and test results; and

6. results of the mechanical system qualification test are summarized and communicated to all affected stakeholders.
1. 制订了与项目计划和发布计划相一致的机械系统合格性测试策略（包括回归测试策略），以测试已集成的系统；

2. 根据机械系统合格性测试策略，制订了已集成机械系统的机械系统合格性测试规范，以适于提供符合机械系统需求的证据；

3. 根据机械系统合格性测试策略和发布计划，选择了机械系统合格性测试规范中的测试用例；

4. 使用选择的测试用例测试了已集成的机械系统，并记录了机械系统合格性测试的结果；

5. 建立了机械系统需求与机械系统合格性测试规范中测试用例之间的一致性和双向可追溯性，并建立了测试用例与测试结果之间的一致性和双向可追溯性；

6. 总结了机械系统合格性测试结果，并与所有受影响利益相关方沟通。

Output work products 输出工作产品 [成果]

|                               |                   |                                 |             |
|-------------------------------|-------------------|---------------------------------|-------------|
| 08-52 Test plan (DVP) 测试计划    | [OUTCOME 1, 2, 6] | 13-22 Traceability record 追溯记录  | [OUTCOME 5] |
| 08-50 Test specification 测试规范 | [OUTCOME 2, 3]    | 13-04 Communication record 沟通记录 | [OUTCOME 6] |
| 13-50 Test result 测试结果        | [OUTCOME 4, 6]    | 13-19 Review record 评审记录        | [OUTCOME 5] |

## BP1

**Develop mechanical system qualification test strategy including a regression test strategy.**

Develop a strategy for mechanical system qualification testing consistent with the project plan and the release plan. This includes a regression test strategy for retesting the integrated mechanical system if a mechanical subsystem is changed. [OUTCOME 1]

## BP2

**Develop specification for mechanical system qualification test.**

Develop the specification for mechanical system qualification testing including test cases based on the verification criteria according to the mechanical system test strategy. The test specification shall be suitable to provide evidence for compliance of the integrated mechanical system with the mechanical system requirements. [OUTCOME 2]

## BP3

**Select test cases.**

Select test cases from the mechanical system qualification test specification. The selection of test cases shall have sufficient coverage according to the mechanical system qualification test strategy and the release plan. [OUTCOME 3]

## BP4

**Test the integrated mechanical system.**

Test the mechanical system using the selected test cases. Record the mechanical system qualification test results and logs. [OUTCOME 4]

1 See SUP.9 for handling of non-conformances

2 Capable test environment as defined in the test strategy needs to be available for performing mechanical system qualification testing.

**制订包括回归测试策略在内的机械系统合格性测试策略。**

制订与项目计划和发布计划相一致的机械系统合格性测试策略。该策略包括当机械子系统项变更时，对已集成机械系统实施再测试的回归测试策略。[成果 1]

**开发机械系统合格性测试规范。**

根据机械系统测试策略，开发机械系统合格性测试规范（包括基于验证准则的测试用例）。该规范应适于提供集成的机械系统符合机械系统需求的证据。[成果 2]

**选择测试用例。**

从机械系统合格性测试规范中选择测试用例。测试用例的选择应根据机械系统合格性测试策略和发布计划具备足够的覆盖率。[成果 3]

**测试集成的机械系统。**

使用选择的测试用例测试机械系统，记录机械系统合格性测试结果和日志。[成果 4]

1 不符合项的处理，见 SUP.9。

2 测试策略中定义的能力测试环境需可用于对机械系统合格性测试的执行。

## BP5

**Establish bidirectional traceability.**

1. Establish bidirectional traceability between mechanical system requirements and test cases included in the mechanical system qualification test specification.
2. Establish bidirectional traceability between test cases included in the mechanical system qualification test specification and mechanical system qualification test results.
3. Establish bidirectional traceability between the mechanical system qualification test results and the integrated mechanical systems.

**[OUTCOME 5]**

- 3** *Bidirectional traceability supports coverage, consistency and impact analysis.*

## BP6

**Ensure consistency.**

1. Ensure consistency between mechanical system requirements and test cases included in the mechanical system qualification test specification.
2. Ensure consistency between test cases included in the mechanical system qualification test specification and mechanical system qualification test results.
3. Ensure consistency between the mechanical system qualification test results and the integrated mechanical systems.

**[OUTCOME 5]**

- 4** *Consistency is supported by bidirectional traceability and can be demonstrated by review records.*

## BP7

**Summarize and communicate results.**

Summarize the mechanical system qualification test results and communicate them to all affected stakeholders.

**[OUTCOME 6]**

- 5** *Providing all necessary information from the test case execution in a summary enables stakeholders to judge the consequences.*

**建立双向可追溯性。**

1. 建立机械系统需求与机械系统合格性测试规范中的测试用例之间的双向可追溯性。
2. 建立机械系统合格性测试规范中的测试用例与机械系统合格性测试结果之间的双向可追溯性。
3. 建立机械系统合格性测试结果与集成机械系统之间的双向可追溯性。

**[成果 5]**

- 3** 双向可追溯性有助于覆盖率、一致性和影响分析。

**确保一致性。**

1. 确保机械系统需求和机械系统合格性测试规范中的测试用例之间的一致性。
2. 确保机械系统合格性测试规范中的测试用例与机械系统合格性测试结果之间的一致性。
3. 确保机械系统合格性测试结果与集成机械系统之间的一致性。

**[成果 5]**

- 4** 一致性由双向可追溯性支持，并可通过评审记录来证明。

**总结和沟通结果。**

总结机械系统合格性测试结果，并与所有受影响利益相关方沟通。

**[成果 6]**

- 5** 在总结中提供来自测试用例执行的所有必要信息，以便利益相关方判断结果。



MCE.1 Mechanical Component Requirements Analysis 机械组件需求分析

The purpose of the Mechanical Component Requirements Analysis process is to establish the requirements for the mechanical component.

机械组件需求分析过程的目的是：为机械组件建立需求。

Process outcomes – as a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

- 1. the mechanical component requirements are derived from the upper system requirements and upper system architecture;
- 2. mechanical component requirements are categorized and analyzed for completeness, correctness, and verifiability;
- 3. the impact of mechanical component requirements on the operating environment is analyzed;
- 4. prioritization for implementing the mechanical component requirements is defined;
- 5. the mechanical component requirements are updated as needed;
- 6. consistency and bidirectional traceability are established between upper system requirements and mechanical component requirements; and consistency and bidirectional traceability are established between upper system architectural design and mechanical component requirements;
- 7. the mechanical component requirements are evaluated for cost, schedule and technical impact; and
- 8. the mechanical component requirements are agreed and communicated to all affected stakeholders.

- 1. 机械组件需求来自上层系统需求和上层系统架构;
- 2. 对机械组件需求进行分类, 并分析了其完整性、正确性和可验证性;
- 3. 分析了机械组件需求对运行环境的影响;
- 4. 定义了机械组件需求实施的优先级;
- 5. 根据需要更细了机械组件需求;
- 6. 建立了上层系统需求和机械组件需求之间的一致性和双向可追溯性; 建立了上层系统架构设计和机械组件需求之间的一致性和双向可追溯性;
- 7. 从成本、进度和技术影响来评估机械组件需求;
- 8. 约定了机械组件需求, 并与所有受影响利益相关方沟通。

Output work products 输出工作产品 [成果]

|                                    |                |  |                      |
|------------------------------------|----------------|--|----------------------|
| 13-04 Communication record 沟通记录    | [OUTCOME 8]    | 15-01 Analysis report 分析报告                                       | [OUTCOME 2, 3, 4, 7] |
| 13-19 Review record 评审记录           | [OUTCOME 6]    | 17-08 Interface requirements specification 接口需求规范                | [OUTCOME 1]          |
| 13-21 Change control record 变更控制记录 | [OUTCOME 5,7]  | 17-ME04 Mechanical component requirements specification 机械组件需求规范 | [OUTCOME 1]          |
| 13-22 Traceability record 追溯记录     | [OUTCOME 1, 6] | 17-50 Verification criteria 验证准则                                 | [OUTCOME 2]          |



## BP1

**Specify mechanical component requirements.**

Use the upper system requirements and the upper system architecture and changes to the upper system requirements and the upper system architecture to identify the required functions and capabilities of the mechanical component. Specify functional and non-functional mechanical component requirements in a mechanical component requirements specification. [OUTCOME 1, 5, 7]

- 1 *If the system requirements and the system architectural design refer to a given operating environment, then the stakeholder requirements should be used as the basis for identifying the required functions and capabilities of the mechanic component.*
- 2 *Non-functional requirements may include e.g. production, maintenance, logistic, environmental.*

## BP2

**Structure mechanical component requirements.**

Structure the mechanical component requirements in the mechanical component requirements specification by e.g.

- grouping to project relevant clusters,
- sorting in a logical order for the project,
- categorizing based on relevant criteria for the project,
- prioritizing according to stakeholder needs.

[OUTCOME 2, 4]

- 3 *Prioritizing typically includes the assignment of mechanical content to planned releases. Refer to SPL.2 BP1.*

**定义机械组件需求。**

使用上层系统需求和上层系统架构及其变更来识别软件所需的功能和能力。在机械组件需求规范中定义功能性和非功能性机械组件需求。

[成果 1, 5, 7]

- 1 如果系统需求和系统架构设计是指给定的运行环境，那么，应将利益相关方需求作为识别机械组件所需功能和能力。
- 2 非功能性需求可包括例如生产、维护、物流及环境。

**结构化机械组件需求。**

在机械组件需求规范中结构化机械组件需求，例如：

- 按项目相关集群进行分组，
- 按项目中逻辑顺序排序，
- 基于项目相关准则进行分类，
- 根据利益相关方需要进行优先级排序。

[成果 2, 4]

- 3 优先级排序通常包括将机械内容分配给已计划的发布。参见 SPL.2.BP1。

## BP3

**Analyze mechanical component requirements.**

Analyze the specified mechanical component requirements including their interdependencies to ensure correctness, technical feasibility, producibility and verifiability, and to support risk identification. Analyze the impact on cost, schedule and the technical impact. [OUTCOME 2, 7]

- 4 *The analysis of impact on cost, schedule and quality supports the adjustment of project estimates. Refer to MAN.3 BP5.*

## BP4

**Analyze the impact on the operating environment.**

Analyze the impact that the mechanical component requirements will have on interfaces of system elements and the operating environment. [OUTCOME 3, 7]

## BP5

**Develop verification criteria.**

Develop the verification criteria for each mechanical component requirement that define the qualitative and quantitative measures for the verification of a requirement. [OUTCOME 2, 7]

- 5 *Verification criteria demonstrate that a requirement can be verified within agreed constraints and are typically used as the input for the development of the test cases or other verification measures that should demonstrate compliance with the mechanic component requirements.*
- 6 *Verification which cannot be covered by testing is covered by SUP.2.*

## BP6

**Establish bidirectional traceability.**

1. Establish bidirectional traceability between upper system requirements and mechanical component requirements.
2. Establish bidirectional traceability between the upper system architecture and mechanical component requirements.

[OUTCOME 6]

- 7 *Redundancy should be avoided by establishing a combination of the approaches BP6.1 and BP6.2 that covers the project and the organizational needs.*
- 8 *Bidirectional traceability supports coverage, consistency and impact analysis.*

**分析机械组件需求。**

分析已定义的机械组件需求（包括它们的相互依赖关系），以确保正确性、技术可行性、可生产性和可验证性，并且支持风险识别。分析对成本、进度和技术的影响。[成果 2, 7]

- 4 对成本、进度和质量的影响分析有助于项目估算的调整。参见MAN.3.BP5。

**分析对运行环境的影响。**

分析机械组件需求对系统要素接口和运行环境的影响。[成果 3, 7]

**制定验证规则。**

对每一个机械组件需求制订验证准则，定义定性的和定量的措施用于需求验证。[成果 2, 7]

- 5 验证准则证明了需求可以在约定的约束范围内得到验证，并且通常被用作测试用例开发或其它应证明符合机械组件需求的验证措施的输入。
- 6 测试不能覆盖的验证由 SUP.2覆盖。

**建立双向可追溯性。**

1. 建立上层系统需求和机械组件需求之间的双向可追溯性。
2. 建立上层系统架构和机械组件需求之间的双向可追溯性。

[成果 6]

- 7 应通过建立同时满足项目和组织要求的方法BP6.1和BP6.2来避免冗余。
- 8 双向可追溯性有助于覆盖率、一致性和影响分析。

## BP7

**Ensure consistency.**

1. Ensure consistency between upper system requirements and mechanical component requirements.
2. Ensure consistency between the upper system architecture and mechanical component requirements.

**[OUTCOME 6]**

- 9 *Consistency is supported by bidirectional traceability and can be demonstrated by review records.*
- 10 *If the system requirements and the system architectural design refer to a given operating environment, then the stakeholder requirements should be used as the basis for identifying the required functions and capabilities of the mechanic component.*

## BP8

**Communicate agreed mechanical component requirements.**

Communicate the agreed mechanical component requirements and updates to mechanical component requirements to all relevant stakeholders. **[OUTCOME 8]**

**确保一致性。**

1. 确保上层系统需求与机械组件需求之间的一致性。
2. 确保上层系统架构与机械组件需求之间的一致性。

**[成果 6]**

- 9 一致性由双向可追溯性支持，并可通过评审记录来证明。
- 10 如果系统需求和系统架构设计是指给定的运行环境，那么，应将利益相关方需求作为识别机械组件所需功能和能力。

**沟通约定的机械组件需求。**

与所有相关利益相关方沟通约定的机械组件需求及对机械组件需求的更新。 **[成果 8]**

The purpose of the Mechanical Component Design process is to provide an evaluated design for the mechanical component.

机械组件设计过程的目的是：为机械组件提供评估设计。

| Process outcomes – as a result of successful implementation of this process:  | 过程成果 - 成功实施这个过程的结果如下:  |
|---|--|
| <div>1. a design is developed that describes the mechanical component;</div> <div>2. interfaces of the mechanical component are defined;</div> <div>3. consistency and bidirectional traceability are established between mechanical component requirements and mechanical component design; and consistency and bidirectional traceability are established between upper system architecture and mechanical component design; and</div> <div>4. the mechanical component design is agreed and communicated to all affected stakeholders.</div> | <div>1. 开发了描述机械组件的设计；</div> <div>2. 定义了机械组件的接口；</div> <div>3. 建立了机械组件需求和机械组件设计之间的一致性和双向可追溯性；建立了上层系统架构和机械组件设计之间的一致性和双向可追溯性；</div> <div>4. 约定了机械组件设计，并与所有受影响方沟通。</div> |

| Output work products 输出工作产品 [成果]           |               |                                 |             |
|--|---------------|---------------------------------|-------------|
| 04-ME02 Mechanical component design 机械组件设计 | [OUTCOME 1,2] | 13-04 Communication record 沟通记录 | [OUTCOME 4] |
| 13-22 Traceability record 追溯记录             | [OUTCOME 3]   |                                 |             |

## BP1

**Develop mechanical component design.**

Develop a design for the mechanical component using the functional and non-functional mechanical component requirements including interfaces. [OUTCOME 1]  
While developing the mechanical component design the requirements and data relevant for production are identified and documented.

- 1 *Non-functional requirements may include e.g. price per unit, maintenance, logistic, packaging, size, weight, manufacturability, environmental constraints, design guidelines, modelling guidelines, failure times.*
- 2 *Design for Manufacturing and Design for Assembly may be used to ensure manufacturability.*

## BP2

**Evaluate mechanical component design.**

Evaluate the mechanical component design in terms of interaction, criticality, technical complexity, risks, measurability and verifiability. [OUTCOME 1,2]

- 3 *The results of the evaluation can be used as input for test against mechanical component design.*

## BP3

**Verify mechanical component design.**

Ensure that the mechanical component design meets all mechanical component requirements. [Outcomes 4, 5]

- 4 *Verification of mechanic component design may include FEA, simulation, or Product FMEA.*

**开发机械组件设计。**

使用包括接口的机械组件系统功能性需求和非功能性需求开发机械组件设计。[成果 1]

当开发机械组件设计时，识别并文档化与产品相关的需求和数据。

- 1 非功能性需求可能包括如：单位价格，维护，物流，包装，尺寸，重量，可制造性，环境约束，设计指南，建模指南，故障时间。
- 2 为制造业和集合体的设计可用来确保可制造性。

**评估机械组件设计。**

从交互、关键性、技术复杂性、风险、可度量性和可验证性方面对机械组件设计进行评估。[成果 1, 2]

- 3 评估结果能作为测试机械组件设计的输入。

**验证机械组件设计。**

从确保机械组件设计全部达到机械组件需求。[成果 4, 5]

- 4 机械组件设计验证可能包括如：FEA、仿真或产品FMEA。

## BP4

**Establish bidirectional traceability.**

1. Establish bidirectional traceability between mechanical component requirements and mechanical component design.
2. Establish bidirectional traceability between the mechanical system architectural design and mechanical component design.

**[OUTCOME 3]**

- 5 *Redundancy should be avoided by establishing a combination of the approaches BP4.1 and BP4.2 that covers the project and the organizational needs.*
- 6 *Bidirectional traceability supports coverage, consistency and impact analysis.*

## BP5

**Ensure consistency.**

1. Ensure consistency between mechanical component requirements and mechanical component design.
2. Ensure consistency between the mechanical system architectural design and mechanical component design.

**[OUTCOME 3]**

- 7 *Consistency is supported by bidirectional traceability and can be demonstrated by review records.*

## BP6

**Communicate agreed mechanical component design.**

Communicate the agreed mechanical component design and updates to the mechanical component design to all relevant stakeholders. **[OUTCOME 4]**

**建立双向可追溯性。**

1. 建立机械组件需求和机械组件设计之间的双向可追溯性。
2. 建立机械系统架构设计和机械组件设计之间的双向可追溯性。

**[成果 3]**

- 5 对 BP4.1和 BP4.2 进行组合，覆盖项目和组织需要，避免冗余。
- 6 双向可追溯性有助于覆盖率、一致性和影响分析。

**确保一致性。**

1. 确保机械组件需求和机械组件设计之间的一致性。
2. 确保机械系统架构设计和机械组件设计之间的一致性。

**[成果 3]**

- 7 一致性由双向可追溯性支持，并可通过评审记录来证明。

**沟通约定的机械组件设计。**

与所有相关利益相关方沟通已约定的机械组件设计及对机械组件设计的更新。 **[成果 4]**



The purpose of the Mechanical Component Sample Production process is to produce a mechanical component item that reflects properly the mechanical component design and mechanical component production strategy.

机械组件样品生产过程的目的是生产出正确反映机械组件设计和机械组件生产策略的机械组件项。

Process outcomes – as a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

1. a mechanical component production strategy is developed, communicated to, and agreed on with all affected stakeholders,

2. mechanical component items are produced according to the mechanical component design,

3. bidirectional traceability are established between the produced mechanical component and recorded process data according to the mechanical component production strategy; and consistency and bidirectional traceability are established between recorded process data and the mechanical component production strategy (control plan), and

4. information gathered during production is communicated to all affected stakeholders.
1. 与所有受影响利益相关方一起开发、沟通、约定了机械组件生产策略;

2. 根据机械设计生产机械组件项;

3. 根据机械组件生产策略, 建立生产的机械组件和记录的过程数据之间的双向可追溯性; 建立记录的过程数据和机械组件生产策略(控制计划)之间的一致性和双向可追溯性;

4. 将生产中收集的信息传达给所有受影响的利益相关方。

Output work products 输出工作产品 [成果]

|  |               |                                      |             |
|--|---------------|--------------------------------------|-------------|
| 11-ME02 Mechanical Component 机械组件  | [OUTCOME 1,2] | 13-22 Traceability record [3] 可追溯性记录 | [OUTCOME 3] |
| 19-ME01 Production strategy 生产策略   | [OUTCOME 1]   | 13-04 Communication record 沟通记录      | [OUTCOME 4] |
| 13-ME03 Production record 生产记录   | [OUTCOME 2,4] | 15-01 Analysis report 分析报告           | [OUTCOME 4] |
| (Containing analyses results of e.g. suitability of chosen production method regarding effectiveness, timing, cost)<br>(所包含的分析结果, 如: 所选生产方法在有效性、时间、成本方面的适用性) |               |                                      |             |



## BP1

**Develop mechanical component production strategy.**

Develop a strategy for production of the mechanical component item. The mechanical component production strategy shall be consistent with the mechanical component design, project plan (e.g. estimation of number of built items needed), release plan (e.g. definition of releases and their content), and test strategy (e.g. mapping of test methods to releases). [OUTCOME 1] The mechanical component production strategy may contain the definition of the production method(s), verification method(s) (control plan).

## BP2

**Agree on mechanical component production strategy.**

Communicate the agreed mechanical component production strategy between all involved stakeholders (e.g. engineering, sample shop, production). [OUTCOME 1]

- 1 *The communication of the mechanical component production strategy to suppliers is handled by ACQ.4 Supplier monitoring.*

## BP3

**Ensure and support production of mechanical components.**

Ensure and support production of mechanical component items according to:

- the mechanical component design
- mechanical component production strategy
- the requirements and data relevant for production.

Record process data according to the mechanical component production strategy. [OUTCOME 2, 4]

- 2 *Production here means only sample phases (e.g. prototype building, pre-series production) and does not cover the process of industrialization.*

**制定机械组件生产策略。**

制定机械组件项生产策略。机械组件生产策略应与机械组件设计、项目计划（如估计编译项所需的数量）、发布计划（如发布定义及其内容）和测试策略（如测试方法到发布的映射）保持一致。[成果 1]机械组件生产策略需包含对生产方法，验证方法（控制计划）的定义。

**约定机械组件生产策略。**

与所有相关的利益相关方（如工程师，样品店，生产）沟通并约定机械组件生产策略。[成果 1]

- 1 机械组件生产策略与供应商的沟通由ACQ.4供应商监控处理。

**确保并支持机械组件生产。**

根据如下内容确保并支持机械组件项的生产：

- 机械组件设计
- 机械组件生产策略。
- 与生产相关的需求和数据。

根据机械组件生产策略记录过程数据。[成果 2, 4]

- 2 这里的生产仅指样品阶段（如原型构建，生产）且不包括工业化过程。

## BP4

**Establish bidirectional traceability.**

1. Establish bidirectional traceability between mechanical component production strategy and mechanical component design.
2. Establish bidirectional traceability between the produced mechanical component item and recorded process data according to the mechanical component production strategy.
3. Establish bidirectional traceability between recorded process data and mechanical component production strategy (control plan).

**[OUTCOME 3]**

- 3 Bidirectional traceability supports coverage, consistency and impact analysis..

## BP5

**Ensure consistency.**

1. Ensure consistency between recorded process data and mechanical component production strategy (control plan).
2. Ensure consistency between produced mechanical component item and recorded process data according to the mechanical component production strategy.
3. Ensure consistency between recorded process data and mechanical component production strategy (control plan).

**[OUTCOME 3]**

- 4 Consistency is supported by bidirectional traceability and can be demonstrated by review records.

**建立双向可追溯性。**

1. 建立机械组件生产策略和机械组件设计之间的双向可追溯性。
2. 根据机械组件生产策略建立生产的机械组件项和记录的过程数据之间的双向可追溯性。
3. 建立记录的过程数据和机械组件生产策略（控制计划）之间的双向可追溯性。

**[成果 3]**

- 3 双向可追溯性有助于覆盖率、一致性和影响分析。

**确保一致性。**

1. 确保记录的过程数据和机械组件生产策略（控制计划）之间的一致性。
2. 根据机械组件生产策略确保生产的机械组件项和记录的过程数据之间的一致性。
3. 确保记录的过程数据和机械组件生产策略（控制计划）之间的一致性。

**[成果 3]**

- 4 一致性由双向可追溯性支持，并可通过评审记录来证明。

## BP6

**Provide feedback to all affected stakeholders**

Communicate information gathered during the production of the mechanical component to all affected stakeholders.

**[OUTCOME 4]**

These information may contain:

- Capability of chosen production method
- Manufacturability of the mechanic component
- Improvement potentials for future releases
- Process data and information

**5** See SUP.9 for handling of non-conformances

**6** The communication of information mentioned above is handled by ACQ.4 Supplier monitoring in case of production at a supplier's site

Affected stakeholders may be:

- Industrialization
- Series production
- Mechanical engineering
- Project management

**向所有受影响利益相关方提供反馈。**

与所有受影响的利益相关方沟通生产过程中收集的信息。

**[成果 4]**

此信息可能包括：

- 选择生产方法的能力
- 机械组件的可制造性
- 未来发布的改进潜力
- 处理数据与信息

**5** 不符合项的处理，见SUP.9。

**6** 上述提到的信息交流由 ACQ.4 供应商监控处理，以备在供应商现场生产。

受影响的利益相关方可能是：

- 工业化
- 系列化生产
- 机械工程
- 项目管理

The purpose of the Test against mechanical component design process is to test the mechanical component item to provide evidence for compliance of the mechanical component item with the mechanical component design.

对机械组件设计测试的目的是：测试机械组件项，以提供机械组件项符合机械组件设计的证据。

| Process outcomes – as a result of successful implementation of this process:  | 过程成果 - 成功实施这个过程的结果如下:   |
|---|---|
| <div>1. a strategy for test against mechanical component design including regression test strategy is developed;</div> <div>2. a specification for test against mechanical component design is developed according to the strategy for test against mechanical component design that is suitable to provide evidence for compliance of the mechanical component item with the mechanical component design;</div> <div>3. test cases included in the test specification for test against mechanical component design are selected according to the test strategy for test against the mechanical component design and the release plan;</div> <div>4. the mechanical component item is tested according to the strategy for test against mechanical component design and the test specification for test against mechanical component design and the results are recorded;</div> <div>5. consistency and bidirectional traceability are established between the mechanical component design and the test specification for test against mechanical component design as well as between the test specification for test against mechanical component design and test results; and</div> <div>6. results of the test against mechanical component design are summarized and communicated to all affected stakeholders.</div> | <div>1. 制订了包括回归测试策略在内的对机械组件设计测试的策略；</div> <div>2. 根据对机械组件设计测试的策略，制订了对机械组件设计的测试规范，以适于提供机械组件项符合机械组件设计的证据；</div> <div>3. 根据对机械组件设计测试的测试策略和发布计划，选择了对细节组件设计测试的测试规范中的测试用例；</div> <div>4. 根据对机械组件设计测试的策略与测试规范，测试机械组件项，并记录结果；</div> <div>5. 建立了机械组件设计和对机械组件设计测试的测试规范之间的一致性和双向可追溯性，并建立了对机械组件设计测试的测试规范和测试结果之间的双向可追溯性；</div> <div>6. 总结了对机械组件设计测试的结果，并与所有受影响利益相关方沟通。</div> |

| Output work products       | 输出工作产品 | 成果                |
|----------------------------|--------|-------------------|
| 08-50 Test specification   | 测试规范   | [OUTCOME 2]       |
| 08-52 Test plan            | 测试计划   | [OUTCOME 1]       |
| 13-04 Communication record | 沟通记录   | [OUTCOME 5]       |
| 13-19 Review record        | 评审记录   | [OUTCOME 3,4]     |
| 13-22 Traceability record  | 追溯记录   | [OUTCOME 4]       |
| 13-50 Test result          | 测试结果   | [OUTCOME 3, 5, 6] |

## BP1

**Develop strategy for test against mechanical component design including regression test strategy.**

Develop a strategy for test against mechanical component design including regression test strategy for retest if the mechanical component design is changed. The test strategy shall define how to provide evidence for compliance of the mechanical component item with the mechanical component design. [OUTCOME 1]

- 1 *The test strategy shall contain a planning of needed items for testing and the allocation of tests to be performed within different releases. The needed amount of items for dedicated tests shall consider that random and systematic faults have to be detected.*

## BP2

**Develop test specification for test against mechanical component design.**

Develop test specification for test against mechanical component design including test cases that are suitable to provide evidence for compliance of the mechanical component item with the mechanical component design according to the test strategy. [OUTCOME 2]

## BP3

**Select test cases.**

Select test cases from the test specification for test against mechanical component design. The selection of test cases shall have sufficient coverage according to the test strategy for test against mechanical component design and the release plan. [OUTCOME 3]

## BP4

**Test mechanical component item.**

Test the mechanical component item using the test specification for test against mechanical component design according to the strategy for test against mechanical component design. Record the test results and measured values. [OUTCOME 4]

- 2 *See SUP.9 for handling of non-conformances.*
- 3 *Capable test environment as defined in the test strategy needs to be available for performing test against mechanical component design.*

**制定包括回归测试策略在内的对机械组件设计测试的策略。**

制订包括当机械组件设计变更时，对机械组件设计测试再测试的回归测试策略。该测试策略应定义如何提供机械组件项符合机械组件设计的证据。[成果 1]

- 1 测试策略应包含在不同发布中，测试的所需项及待执行测试的分配的计划。特定测试的所需量应考虑必须能够发现随机故障及系统故障。

**开发对机械组件设计测试的测试规范。**

根据测试策略，开发对机械组件设计的测试规范（包括适用于提供机械组件项符合机械组件设计的测试用例）。[成果 2]

**选择测试用例。**

从测试规范中为对机械组件设计的测试选择测试用例。对于对机械组件设计的测试和发布计划而言，所选的测试用例应具备足够的覆盖率。

[成果 3]

**测试机械组件项。**

根据对机械组件设计测试的策略，使用对机械组件设计的测试规范测试机械组件项。记录测试结果并度量值。[成果 4]

- 2 不符合项的处理，见 SUP.9。
- 3 测试策略中定义的能力测试环境需可用于对机械组件设计测试的执行。

## BP5

**Establish bidirectional traceability.**

1. Establish bidirectional traceability between the mechanical component design and the mechanical component test specification for test against mechanical component design.
2. Establish bidirectional traceability between the test results and tested mechanical component items.
3. Establish bidirectional traceability between test cases included in the mechanical component test specification and mechanic component test results.

**[OUTCOME 5]**

- 4 *Bidirectional traceability supports coverage, consistency and impact analysis.*

## BP6

**Ensure consistency.**

1. Ensure consistency between the mechanical component design and the test specification for test against mechanical component design.
2. Ensure consistency between the test results and tested mechanical component items.
3. Ensure consistency between test cases included in the mechanic component test specification and mechanical component test results.

**[OUTCOME 5]**

- 5 *Consistency is supported by bidirectional traceability and can be demonstrated by review records.*

## BP7

**Summarize and communicate results.**

Summarize the test results and communicate them to all affected stakeholders.

**[OUTCOME 6]**

- 6 *Providing all necessary information from the test case execution in a summary enables stakeholders to judge the consequences.*

**建立双向可追溯性。**

1. 建立机械组件设计和对机械组件设计测试的机械组件测试规范之间的双向可追溯性。
2. 建立测试结果和测试的机械组件项之间的双向可追溯性。
3. 建立机械组件测试规范中的测试用例与机械组件测试结果之间的双向可追溯性。

**[成果 5]**

- 4 双向可追溯性有助于覆盖率、一致性和影响分析。

**确保一致性。**

1. 确保机械组件设计和对机械组件设计测试的测试用例之间的一致性。
2. 确保测试结果和测试的机械组件项之间的一致性。
3. 确保机械组件测试规范中的测试用例与机械组件测试结果之间的一致性。

**[成果 5]**

- 5 一致性由双向可追溯性支持，并可通过评审记录来证明。

**总结和沟通结果。**

总结测试结果，并与所有受影响利益相关方沟通。[成果 6]

- 6 在总结中提供来自测试用例执行的所有必要信息，以便利利益相关方判断结果。



The purpose of the Test against Mechanical Component Requirements process is to test the mechanical component to provide evidence for compliance of the mechanical component with the mechanical component requirements.

对机械组件需求的测试过程的目的是：测试机械组件，以提供机械组件符合机械组件需求的证据。

Process outcomes – as a result of successful implementation of this process: 过程成果 - 成功实施这个过程的结果如下:

1. a strategy for the test against mechanical component requirements including regression test strategy consistent with the project plan and the release plan is developed;

2. a specification for the test against mechanical component requirements is developed according to the strategy for the test against mechanical component requirements that is suitable to provide evidence for compliance of the mechanical component with the mechanical component requirements;

3. test cases included in the test specification for the test against mechanical component requirements are selected according to the test strategy for the test against mechanical component requirements and the release plan

4. the mechanical component is tested according to the strategy for the test against mechanical component requirements and the test specification for the test against mechanical component requirements, and the results are recorded;

5. consistency and bidirectional traceability are established between the mechanical component requirements and the test specification for the test against mechanical component requirements as well as between the test specification for the test against mechanical component requirements and test results; and

6. results of the test against mechanical component requirements are summarized and communicated to all affected stakeholders.
1. 制定了与项目计划和发布计划相一致的对机械组件需求测试的策略（包括回归测试策略）；

2. 根据对机械组件需求的测试的策略，制定了对机械组件需求的测试的规范，以适用于提供机械组件符合机械组件需求的证据；

3. 根据对机械组件需求的测试策略和发布计划，选择了对机械组件需求测试的测试规范中的测试用例；

4. 根据对机械组件需求的测试的策略和测试规范测试机械组件，并记录结果；

5. 建立机械组件需求和对机械组件需求的测试的测试规范之间的一致性和双向可追溯性，并建立了对机械组件需求的测试的测试策略和测试结果之间的一致性和双向可追溯性；

6. 总结了机械组件需求测试结果，并与所有受影响利益相关方沟通。

Output work products 输出工作产品 [成果]

|                                 |             |                                |                |
|---------------------------------|-------------|--------------------------------|----------------|
| 08-50 Test specification 测试规范   | [OUTCOME 2] | 13-19 Review record 评审记录       | [OUTCOME 3,4]  |
| 08-52 Test plan 测试计划            | [OUTCOME 1] | 13-22 Traceability record 追溯记录 | [OUTCOME 4]    |
| 13-04 Communication record 沟通记录 | [OUTCOME 5] | 13-50 Test result 测试结果         | [OUTCOME 3, 5] |



## BP1

**Develop strategy for the test against mechanical component requirements including regression test strategy.**

Develop a strategy for the test against mechanical component requirements consistent with the project plan and the release plan. This includes a regression test strategy for retesting the mechanical component if it has been changed. [OUTCOME 1]

- 1 *The test strategy shall include a plan of which items need to be tested and the allocation of tests to be performed within different releases. The needed amount of items for dedicated tests shall consider that random and systematic faults have to be detected.*

## BP2

**Develop test specification for the test against mechanical component requirements.**

Develop test specification including test cases for the test against mechanical component requirements that are suitable to provide evidence for compliance of the mechanical component with the mechanical component requirements according to the test strategy. [OUTCOME 2]

## BP3

**Select test cases.**

Select test cases from the test specification for the test against mechanical component requirements. The selection of test cases shall have sufficient coverage according to the test strategy for the test against mechanical component requirements and the release plan. [OUTCOME 5]

## BP4

**Test the mechanical component.**

Test the mechanical component using the test specification for the test against mechanical component requirements according to the strategy for the test against mechanical component requirements. Record the test results and measured values. [OUTCOME 3]

- 2 *See SUP.9 for handling of non-conformances.*
- 3 *Capable test environment as defined in the test strategy needs to be available for performing test against mechanical component requirements.*

**制定包括回归测试策略在内的对机械组件设计设计的策略。**

制订与项目计划和发布计划相一致的对机械组件需求测试的策略。该策略包括当变更时，对机械组件在测试的回归测试策略。[成果 1]

- 1 测试策略应包含在不同发布中，哪些项需被测试以及待执行测试的分配的计划。特定测试的所需量应考虑必须能够发现随机故障及系统故障。

**开发对机械组件需求测试的测试规范。**

根据测试策略，开发包括对机械组件需求测试的测试用例和适用于提供机械组件符合机械组件需求测试用例的测试规范。[成果 2]

**选择测试用例。**

从对机械组件需求测试的测试规范中选择测试用例。对于对机械组件需求的测试策略和发布计划而言，所选择的测试用例应具备足够的覆盖率。[成果 5]

**测试机械组件。**

根据对机械组件需求测试的策略，使用对机械组件需求测试的测试规范测试机械组件。[成果 3]

- 2 不符合项的处理，见 SUP.9。
- 3 测试策略中定义的能力测试环境需可用于对机械组件设计测试的执行。

## BP5

**Establish bidirectional traceability.**

1. Establish bidirectional traceability between the mechanical component requirements and the test specification for test against mechanical component requirements.
2. Establish bidirectional traceability between the test specification for the test against mechanical component requirements and test results.
3. Establish bidirectional traceability between the mechanical component qualification test results and the tested mechanical component items.

**[OUTCOME 4]**

- 4 Bidirectional traceability supports coverage, consistency and impact analysis.

## BP6

**Ensure consistency.**

1. Ensure consistency between the mechanical component requirements and the test specification for the test against mechanical component requirements.
2. Ensure consistency between the test specification for the test against mechanical component requirements and test results.
3. Ensure consistency between the mechanic component qualification test results and the tested mechanical component items.

**[OUTCOME 4]**

- 5 Consistency is supported by bidirectional traceability and can be demonstrated by review records.

## BP7

**Summarize and communicate results.**

Summarize the test results and communicate them to all affected stakeholders.

**[OUTCOME 5]**

- 6 Providing all necessary information from the test case execution in a summary enables stakeholders to judge the consequences.

**建立双向可追溯性。**

1. 建立机械组件需求和对机械组件需求测试的测试规范之间的双向可追溯性。
2. 建立对机械组件需求的测试的测试规范和测试结果之间的双向可追溯性。
3. 建立机械组件合格性测试结果和测试的机械组件项之间的双向可追溯性。

**[成果 4]**

- 4 双向可追溯性有助于覆盖率、一致性和影响分析。

**确保一致性。**

1. 确保机械组件需求和对机械组件需求测试的测试规范之间的一致性。
2. 确保对机械组件需求测试的测试规范和测试结果之间的一致性。
3. 确保机械组件合格性测试结果和测试的机械组件项之间的一致性。

**[成果 4]**

- 5 一致性由双向可追溯性支持，并可通过评审记录来证明。

**总结和沟通结果。**

总结测试结果，并与所有受影响利益相关方沟通。[成果 5]

- 6 在总结中提供来自测试用例执行的所有必要信息，以便利益相关方判断结果。

## CAPABILITY LEVELS

### 能力等级

The implemented process achieves its process purpose. The following process attribute demonstrates the achievement of this level

已执行的过程实现其过程目的。以下过程属性证明这个等级的实现

PA 1.1 Process performance process attribute
 过程实施过程属性

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

过程实施过程属性是衡量过程目的的实现程度的一种度量，完全达成该过程属性的结果如下：

- a) the process achieves its defined outcomes

- a) 过程实现其定义的成果

Generic practices 1.1.1
 通用实践 1.1.1

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.

实现过程成果。[成就 a]  
 实现基本实践的意图。  
 生成证明过程成果的工作产品。

Generic resources
 通用资源

Resources are used to achieve the intent of process specific base practices [ACHIEVEMENT a]
 使用资源以实现过程特定基本实践的意图[成就 a]

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 process attributes, together with the previously defined process attribute, demonstrate the achievement of this level:

以管理的方式（计划，监控和调整）来实施前述的已执行的过程，并且适当的建立、控制和维护该过程工作产品。以下过程属性与先前已定义的过程属性一起来证明本级别的达成：

### PA 2.1 Performance management process attribute

### 实施管理过程属性

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 communicated;
- f) Personnel performing the process are prepared for executing their responsibilities;
- g) Resources and information necessary for performing the process are identified, made available, allocated and used;
- h) Interfaces between the involved parties are managed to ensure both effective communication and clear assignment of responsibility

实施管理过程属性是对过程实施进行管理的程度的度量。

完全达成该过程属性的结果如下：

- a) 识别了过程的实施目标；
- b) 计划了过程的实施；
- c) 监控了过程的实施；
- d) 调整了过程的实施以满足计划；
- e) 定义、分配和沟通了执行过程的职责和权限；
- f) 准备了执行过程的人员以履行其职责；
- g) 识别、提供、分配并使用了执行过程所需的资源 and 信息；
- h) 管理了参与方之间的接口以确保有效的沟通和明确的职责分配。

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.

- 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.*

- 2 *At minimum, process performance objectives for resources, effort and schedule should be stated.*

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

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.

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

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

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

**识别过程实施的目标。** [成就 a]

基于过程需求识别实施的目标。

定义过程实施的范围。

在识别实施目标时考虑假设和约束。

- 1 实施目标可包括：  
 (1) 满足已定义质量准则的工作产品的适时产出，  
 (2) 过程的周期时间或频率，  
 (3) 资源的使用；  
 (4) 过程的边界。

- 2 至少应说明资源、工作量及时间安排相关的过程实施目标。

**计划过程的实施以满足已识别的目标。** [成就 b]

制订过程实施的计划。

定义过程实施的周期。

建立过程实施的重要里程碑。

确定并维护过程实施属性的估算。

定义过程活动和任务。

定义进度表并与过程的执行方法相一致。

计划过程工作产品的评审。

**依照计划，监控过程的实施。** [成就 c]

根据计划执行过程。

监控过程实施以确保达成计划的结果并识别可能的偏差。

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

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  
2.1.5**Define responsibilities and authorities for performing the process.**

[ACHIEVEMENT e]

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.

GP  
2.1.6**Identify, prepare, and make available resources to perform the process according to plan.** [ACHIEVEMENT f, g]

The human and infrastructure resources, necessary for performing the process are identified made available, allocated and used.

The individuals performing and managing the process are prepared by training, mentoring, or coaching to execute their responsibilities.

The information necessary to perform the process is identified and made available.

GP  
2.1.7**Manage the interfaces between involved parties.** [ACHIEVEMENT h]

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.

**调整过程的实施。** [成就 d]

识别过程实施的问题。

在计划的结果和目标没有达成时，采取适当的行动。必要时，调整计划。

必要时，重新安排进度表。

**定义执行过程的职责和权限。** [成就 e]

定义、分配并沟通执行过程的职责、承诺和权限。

定义并分配验证过程工作产品的职责和权限。

定义过程实施需要的经验，知识和技能。

**识别、准备并提供资源以按计划执行过程。** [成就 f, g]

识别、提供、分配并使用过程执行所需的人力和基础设施资源。通过培训、指导或辅导，准备人员以履行其执行和管理过程的职责。

识别并提供执行过程所需的信息。

**管理参与方之间的接口。** [成就 h]

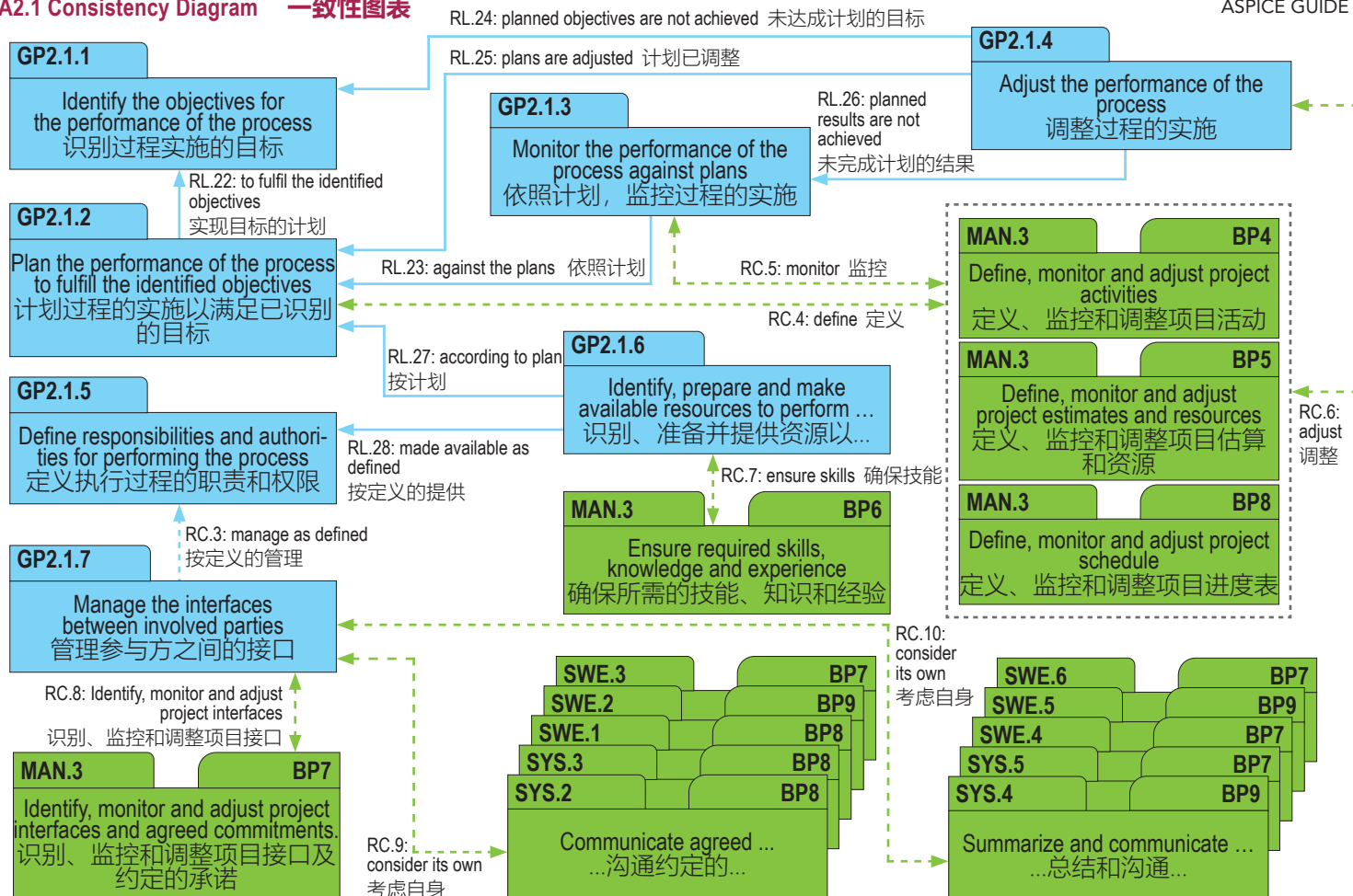
确定过程实施中涉及的人员和群体。

分配参与方的职责。

管理参与方之间的接口。

保证参与方之间的沟通。

保证参与方之间的有效沟通。







The work product management process 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 process 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.

- 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, distribution of work products, and for making relevant versions of applicable work products available at points of use.*
- 2 *The work products referred to in this clause are those that result from the achievement of the process purpose through the process outcomes.*

工作产品管理过程属性是对过程生成的工作产品进行适当管理的程度的度量。完全达成该过程属性的结果如下:

- a) 定义了过程工作产品的需求;
- b) 定义了工作产品的文档化和控制的需求;
- c) 适当地识别、文档化和控制了工作产品;
- d) 按照计划的安排评审了工作产品, 并根据需要调整了工作产品以符合需求。

- 1 实工作产品的文档化和控制的需求可包括: 变更和修订状态的识别, 工作产品的批准和复批, 工作产品的分发, 及在需要使用时提供适当的工作产品的相关版本。
- 2 本章节提及的工作产品是通过过程成果达成过程目的的结果。

## Generic practices 2.2.1

## 通用实践 2.2.1

GP  
2.2.1

### Define the requirements for the work products. [ACHIEVEMENT a]

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.

**定义工作产品的需求。** [成就 a]  
定义需要生成的工作产品的需求。  
需求可包括内容和结构的定义。  
识别工作产品的质量准则。  
定义工作产品的适当的评审和批准准则。

GP  
2.2.2**Define the requirements for documentation and control of the work products. [ACHIEVEMENT b]**

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 and
- (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. [ACHIEVEMENT c]**

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. [ACHIEVEMENT d]**

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

Issues arising from work product reviews are resolved.

**定义工作产品文档化和控制的需求。 [成就 b]**

定义工作产品文档化和控制的需求。该需求可包括以下需求：

- (1) 分发，
- (2) 工作产品及其组件的标识，
- (3) 追溯性。

识别和理解工作产品之间的依赖关系。

定义需要控制的工作产品的批准要求。

**识别、文档化和控制工作产品。 [成就 c]**

识别需要控制的工作产品。

建立工作产品的变更控制。

依据需求文档化和控制工作产品。

分配工作产品的版本到适用的产品配置中。

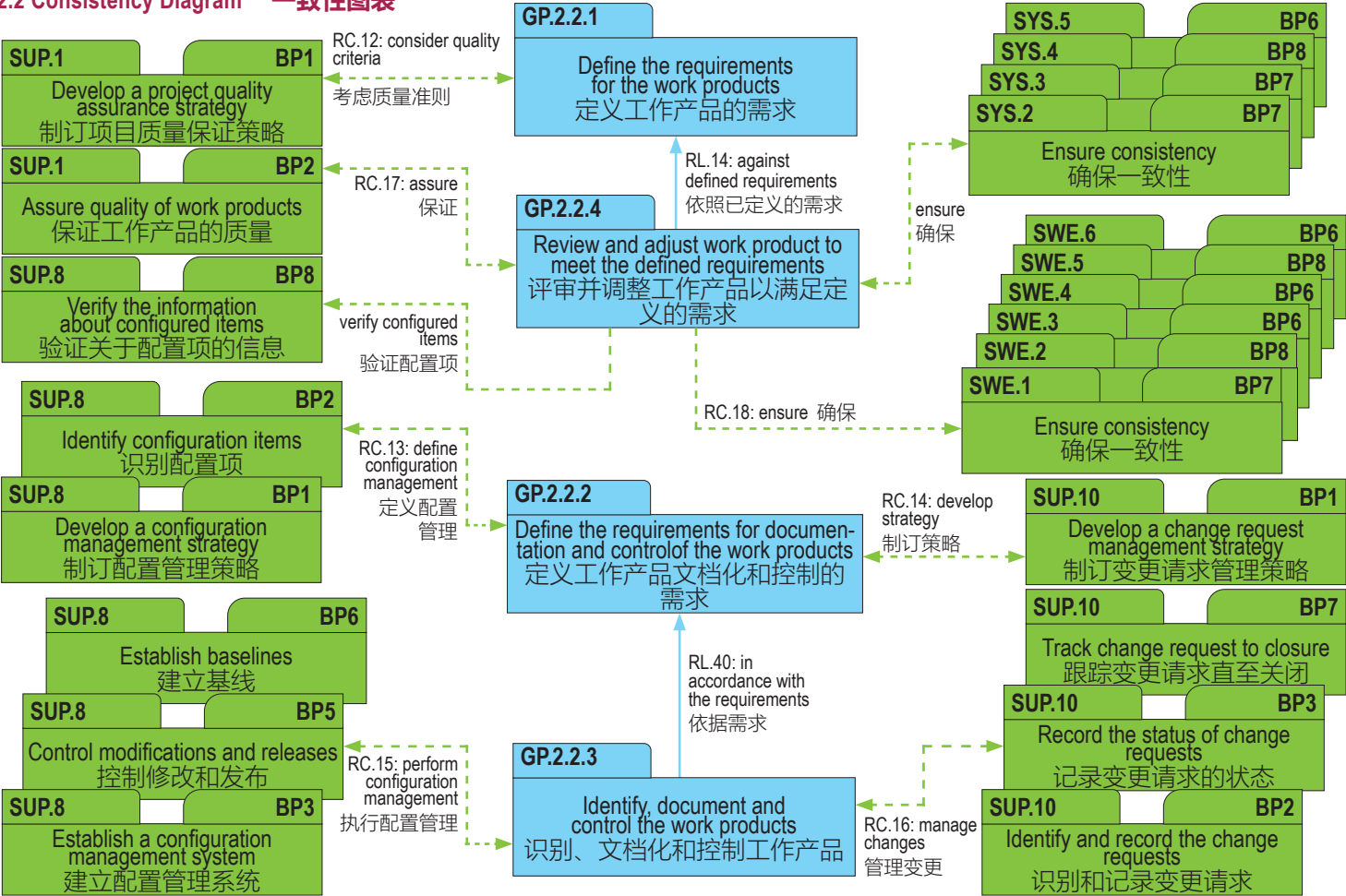
通过适当的访问机制，提供工作产品。

工作产品的修订状态可快捷地被查明。

**评审并调整工作产品以满足定义的需求。 [成就 d]**

依据计划的安排，按照定义的需求评审工作产品。

解决工作产品评审中发现的问题。





The previously described Managed process is now implemented using a defined process that is capable of achieving its process outcomes. The following process attributes, together with the previously defined process attributes, demonstrate the achievement of this level:

先述的已管理的过程，由能实现其过程成果的已定义的过程来实施。以下过程属性结合先前已定义的过程属性，证明达成该等级：

| PA 3.1 Process definition process attribute  | 过程定义过程属性   |
|--|--|
| <p>The process definition process 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 process attribute:</p> <ul style="list-style-type: none"> <li>a) A standard process, including appropriate tailoring guidelines, is defined and maintained that describes the fundamental elements that must be incorporated into a defined process;</li> <li>b) The sequence and interaction of the standard process with other processes is determined.</li> <li>c) Required competencies and roles for performing the process are identified as part of the standard process;</li> <li>d) Required infrastructure and work environment for performing the process are identified as part of the standard process;</li> <li>e) Suitable methods and measures for monitoring the effectiveness and suitability of the process are determined.</li> </ul> | <p>过程定义过程属性是维护标准过程以支持已定义过程的部署的程度的度量。完全达成该过程属性的结果如下：</p> <ul style="list-style-type: none"> <li>a) 定义并维护了标准过程，包括适当的裁剪指南。该标准过程描述了必须纳入已定义过程的基本元素；</li> <li>b) 确定了标准过程与其他过程的顺序和交互；</li> <li>c) 识别了执行过程所需的能力和角色，作为标准过程的一部分；</li> <li>d) 识别了执行过程所需的基础设施和工作环境，作为标准过程的一部分；</li> <li>e) 确定了监控过程的有效性和适用性的合适方法和度量。</li> </ul> |

| Generic practices 3.1.1   | 通用实践 3.1.1  |
|---|---|
| <div>GP 3.1.1</div> <p><b>Define and maintain the standard process that will support the deployment of the defined process. [ACHIEVEMENT a]</b></p> <p>A standard process is developed and maintained that includes the fundamental process elements.</p> <p>The standard process identifies the deployment needs and deployment context.</p> <p>Guidance and/or procedures are provided to support implementation of the process as needed.</p> <p>Appropriate tailoring guideline(s) are available as needed.</p> | <p><b>定义和维护标准过程，以支持已定义过程的部署。</b> [成就 a]</p> <p>开发和维护包括基本过程元素的标准过程。</p> <p>标准过程识别部署的需要和环境。</p> <p>根据需要提供指导和/或规程以支持过程的实施。</p> <p>根据需要提供适当的裁剪指南。</p> |

GP  
3.1.2

**Determine the sequence and interaction between processes so that they work as an integrated system of processes.** [ACHIEVEMENT b]

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, responsibilities, and authorities for performing the standard process.** [ACHIEVEMENT c]

Process performance roles are identified

Competencies for performing the process are identified.

Authorities necessary for executing responsibilities are identified.

GP  
3.1.4

**Identify the required infrastructure and work environment for performing the standard process.** [ACHIEVEMENT d]

Process infrastructure components are identified (facilities, tools, networks, methods, etc.).

Work environment requirements are identified.

GP  
3.1.5

**Determine suitable methods and measures to monitor the effectiveness and suitability of the standard process.** [ACHIEVEMENT e]

Methods and measures 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 conduct internal audit and management review is established.

Process changes are implemented to maintain the standard process.

**确定过程之间的顺序和交互，使它们作为一个集成的过程系统来运作。** [成就 b]

确定标准过程与其他过程的顺序和交互。

将标准过程部署为已定义的过程，维护过程的完整性。

**识别执行标准过程的角色和能力、职责和权力。** [成就 c]

识别执行过程的角色。

识别执行过程的能力。

识别执行职责必需的权限。

**识别执行标准过程所需的基础设施和工作环境。** [成就 d]

识别过程基础设施组件（设备、工具、网络、方法等）。

识别工作环境需求。

**确定合适的方法和度量来监控标准过程的有效性和适用性。** [成就 e]

确定监控过程的有效性和适用性的方法和度量。

定义监控过程的有效性和适用性所需的适当的准则和数据。

建立实施内部审核和管理评审的需要。

过程变更得到实施，以维护标准过程。

The process deployment process attribute is a measure of the extent to which the standard process is deployed as a defined process to achieve its process outcomes. As a result of full achievement of this process 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 the process, to demonstrate the suitability and effectiveness of the process, and to evaluate where continual improvement of the process can be made.

过程部署过程属性是，对标准过程作为已定义过程进行部署而实现其过程成果的程度的度量。完全达成该过程属性的结果如下：

- a) 基于适当地被选择的和/或裁剪的标准过程部署了已定义过程；
- b) 分配和沟通了已定义过程执行时所需的角色、职责和权限；
- c) 基于适当的教育、培训和经验，人员有能力执行已定义过程；
- d) 提供、分配和使用已定义过程执行时所需的资源和必需信息；
- e) 提供、管理和维护了已定义过程执行时所需的基础设施和工作环境；
- f) 收集并分析了适当的数据，作为理解过程行为的基础，以证明过程的适用性和有效性，并评估在哪里可以持续改进过程。

### Generic practices 3.2.1 - 3.2.2

### 通用实践 3.2.1 - 3.2.2

GP  
3.2.1

#### Deploy a defined process that satisfies the context specific requirements of the use of the standard process. [ACHIEVEMENT a]

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. [ACHIEVEMENT b]

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

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

#### 部署已定义过程，该已定义过程满足使用标准过程的特定背景要求。

[成就 a]

从标准过程中适当地选择 和/或 裁剪已定义过程。

验证已定义过程与标准过程要求的一致性。

#### 分配和沟通已定义过程执行时的角色、职责和权限。 [成就 b]

分配和沟通已定义过程执行时的角色。

分配和沟通已定义过程执行时的职责和权限。



GP  
3.2.3**Ensure necessary competencies for performing the defined process.** [ACHIEVEMENT c]

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.** [ACHIEVEMENT d]

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.** [ACHIEVEMENT e]

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 analyze data about performance of the process to demonstrate its suitability and effectiveness.** [ACHIEVEMENT f]

Data required to understand the behavior, suitability and effectiveness of the defined process are identified.  
Data is collected and analyzed to understand the behavior, 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.

1 Data about process performance may be qualitative or quantitative.

**确保已定义过程执行时必需的能力。** [成就 c]

识别所分配人员应具备的适当能力。  
为部署已定义过程提供合适的培训。

**提供资源和信息以支持已定义过程的执行。** [成就 d]

提供、分配和使用所需人力资源。  
提供、分配和使用过程执行时所需的信息。

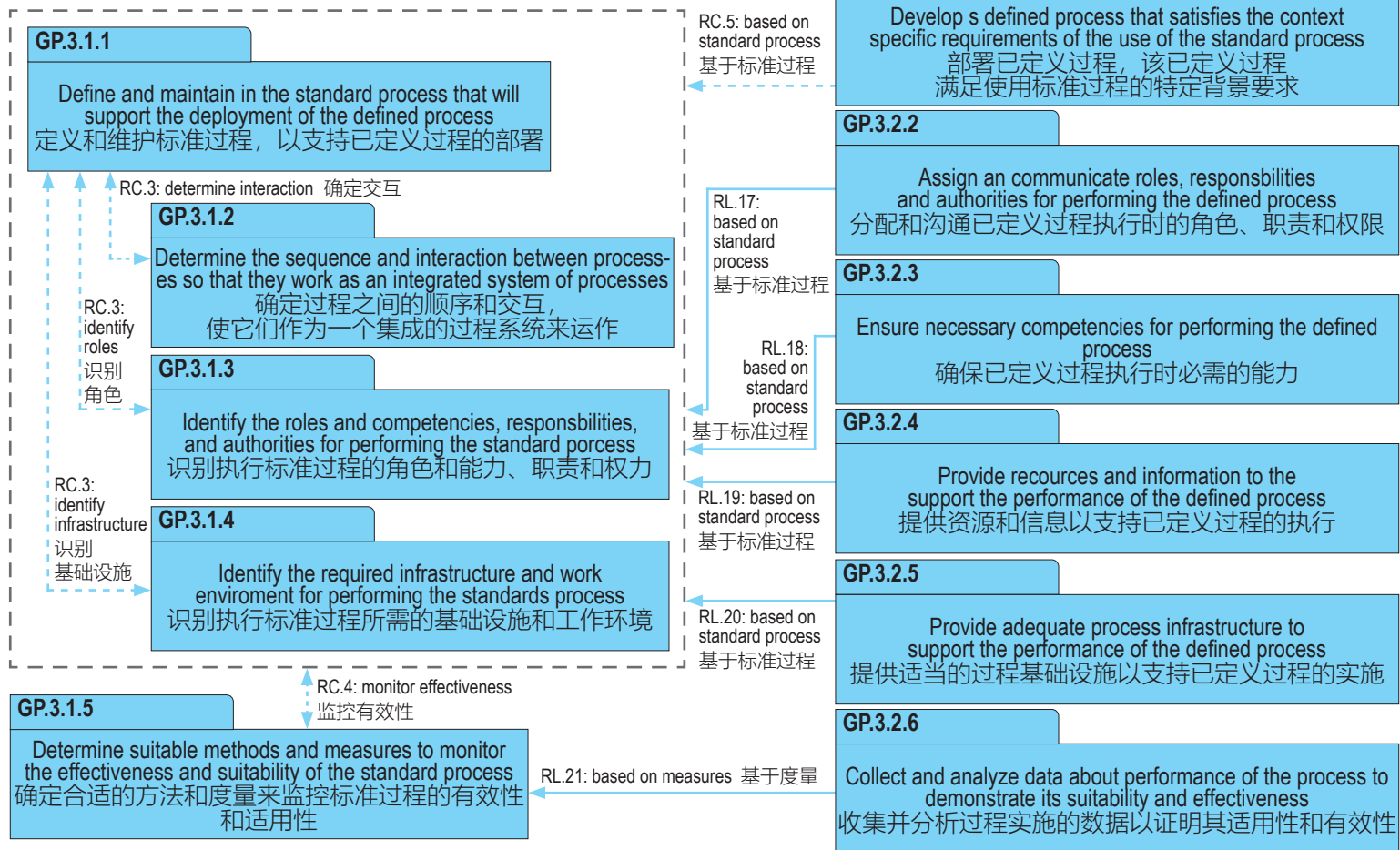
**提供适当的过程基础设施以支持已定义过程的实施。** [成就 e]

所需的基础设施和工作环境是可用的。  
用以有效管理并维护基础设施和工作环境的组织支持是可用的。  
使用和维护基础设施和工作环境。

**收集并分析过程实施的数据以证明其适用性和有效性。** [成就 f]

识别理解已定义过程的行为、适用性和有效性所需的数据。  
收集和分析数据以理解已定义过程的行为、适用性和有效性。  
使用分析的结果来识别在哪里可进行标准 和/或 已定义过程的持续改进。

1 关于过程实施的数据可以是定性的或定量的。



## Dependencies between processes and Process Attributes(ASPICE and ME SPICE) 过程与过程属性的依赖关系 (ASPICE 与 ME SPICE)

|        |   | PA<br>2.1 | PA<br>2.2 | PA<br>3.1 | PA<br>3.2 |
|--------|---|-----------|-----------|-----------|-----------|
| MAN.3  | Project Management<br>项目管理              | ++        |           |           |           |
| MAN.5  | Risk Management<br>风险管理                 | +         |           |           | +         |
| REU.2  | Reuse Program Management<br>重用程序管理      |           | +         | +         |           |
| ACQ.4  | Supplier Monitoring<br>供应商监控            | +         | +         |           |           |
| SUP.1  | Quality Assurance<br>质量保证               |           | ++        |           | +         |
| SUP.2  | Verification<br>验证                      |           | ++        |           | +         |
| SUP.4  | Joint Review<br>联合评审                    |           | +         |           |           |
| SUP.7  | Documentation<br>文档化                    |           | +         | +         |           |
| SUP.8  | Configuration Management<br>配置管理        |           | ++        | +         |           |
| SUP.9  | Problem Resolution Management<br>问题解决管理 | +         | +         |           | +         |
| SUP.10 | Change Request Management<br>变更请求管理     |           | +         |           | +         |
| SPL.2  | Product Release<br>产品发布                 |           | +         |           |           |

A +/++ entry in a cell indicates a dependency:

a weakness in the process most likely corresponds to a weakness in the related Process Attribute (PA)

单元格中的+ / ++表示依赖关系:

过程中的弱点最有可能对应相关过程属性 (PA) 中的弱点

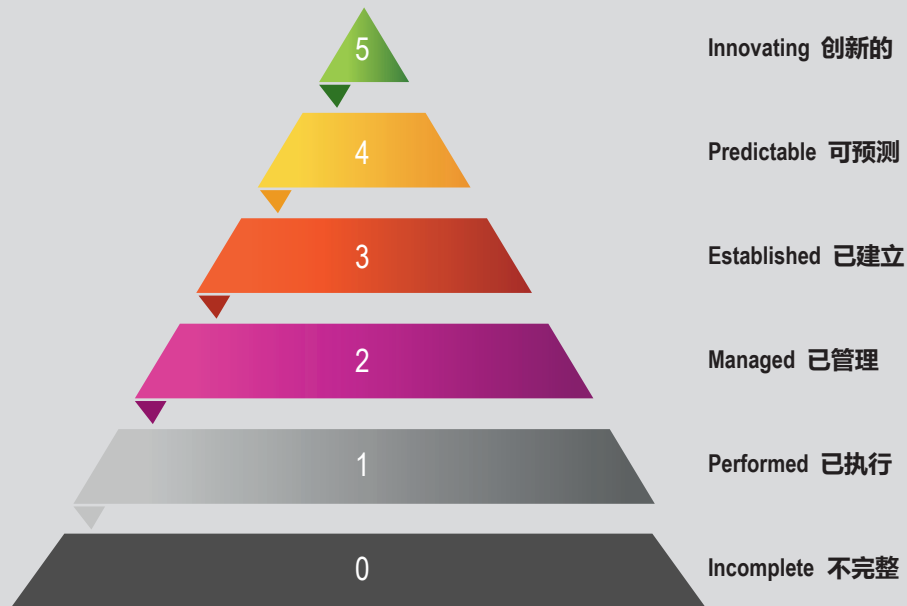
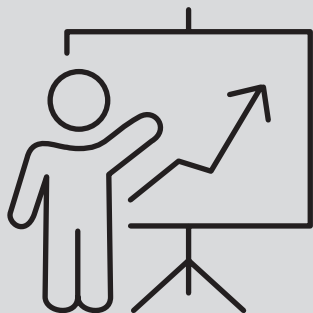
GP  
1.1.1

**The process purpose and outcomes are achieved**

- The intent of the base practices is achieved
- The work products are produced

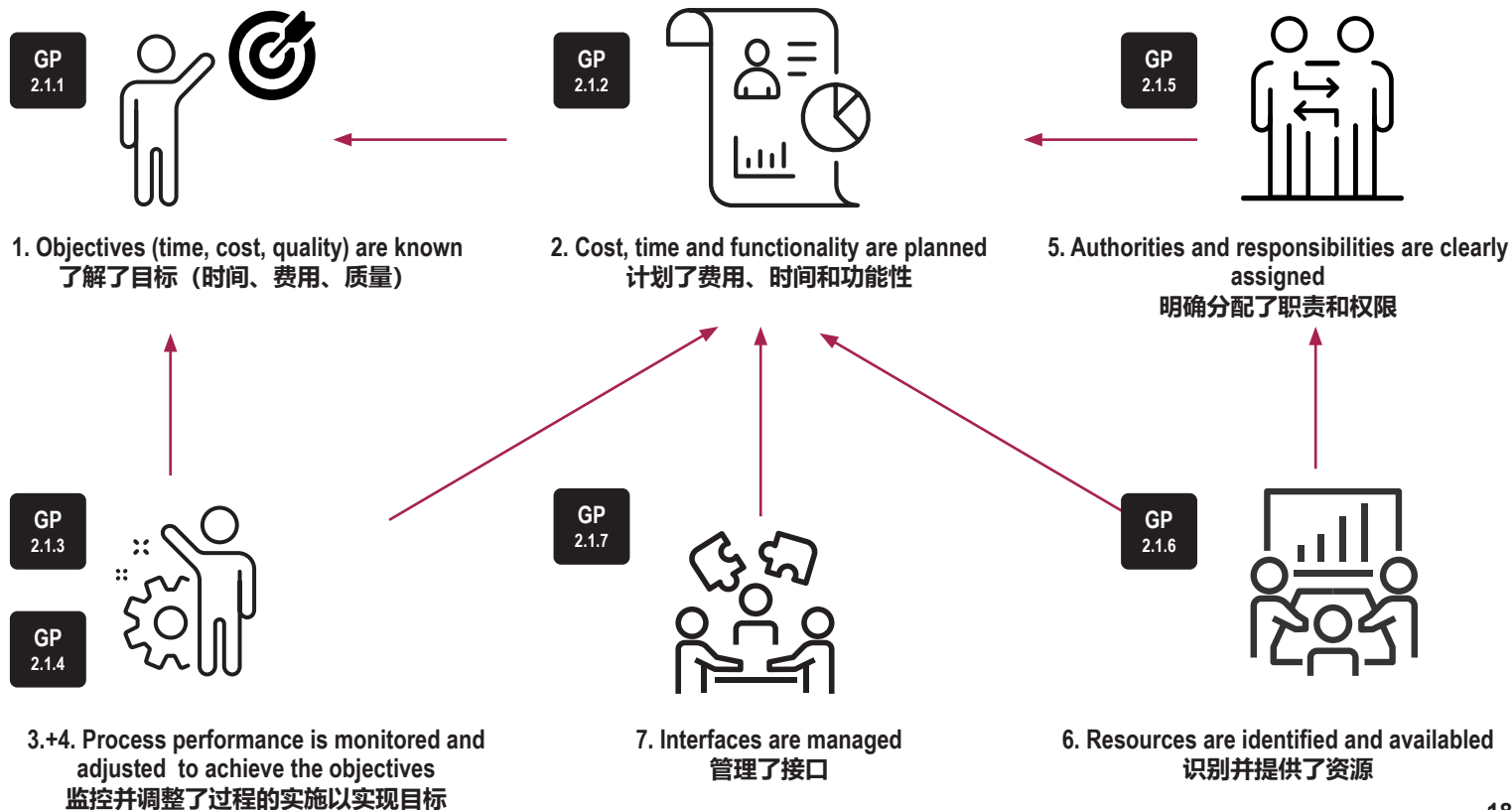
**过程目的与成果已实现**

- 基本实践的意图已实现
- 工作产品已生成



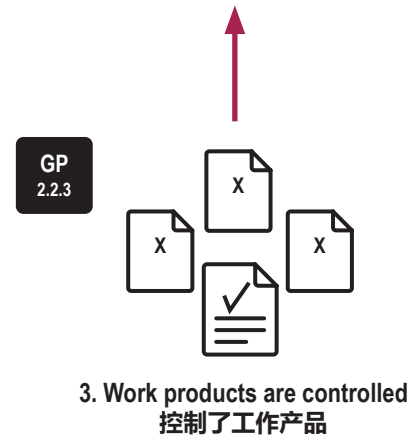
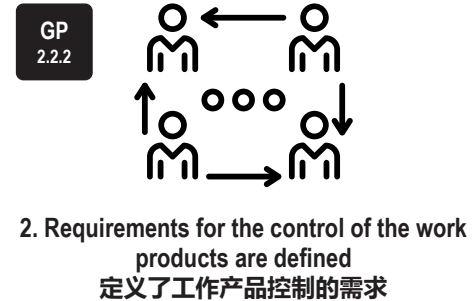
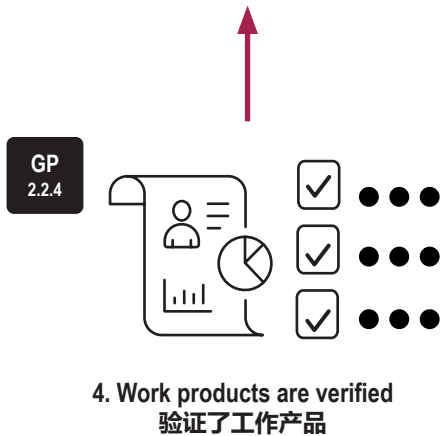
PA 2.1: Performance Management 实施管理

GP 2.1.1 – GP 2.1.7



PA 2.2: Work Product Management 工作产品管理

GP 2.2.1 – GP 2.2.4



### PA 3.1: Process definition 过程定义

GP 3.1.1 – GP 3.1.5

GP  
3.1.1

1. A standard process is defined  
定义了标准过程



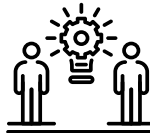
GP  
3.1.2



2. Sequence and interaction between  
processes are identified  
确定了过程之间的顺序和交互

GP  
3.1.3

3. Roles and competencies are  
identified  
识别了角色和能力



GP  
3.1.4



4. The infrastructure needed for the process  
performance is defined  
定义了过程实施所需的基础设施

GP  
3.1.5

5. Appropriate methods for monitoring  
the effectiveness and suitability of  
the standard process are determined  
确定了监控标准过程的有效性和适用  
性的适当方法



### PA 3.2: Process deployment 过程部署

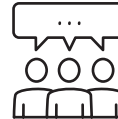
GP 3.2.1 – GP 3.2.6

GP  
3.2.1

1. The process is established  
建立了过程



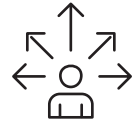
GP  
3.2.2



2. Tasks, competencies and responsibilities  
are assigned  
分配了任务、能力和职责

GP  
3.2.3

3. Necessary competencies are ensured  
确保了必须的能力



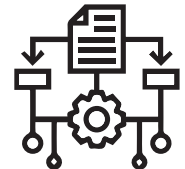
GP  
3.2.4



4. Resources / information are available  
提供资源和信息

GP  
3.2.5

5. Infrastructure is available  
提供基础设施



GP  
3.2.6



6. Process performance data is collected  
收集了过程实施的数据

The previously described Established process now operates predictively within defined limits to achieve its process outcomes. Quantitative management needs are identified, measurement data are collected and analysed to identify assignable causes of variation. Corrective action is taken to address assignable causes of variation.

The following process attributes, together with the previously defined process attributes, demonstrate the achievement of this level:

先述的已建立的过程，在定义的限值内可预测地运作以达成其过程成果。识别量化管理需要，收集和分析度量数据，以识别波动的可查明原因。采取纠正措施来解决波动的可查明原因。

以下过程属性结合先前已定义的过程属性，证明达成该等级：

#### PA 4.1 Quantitative analysis process attribute

The quantitative analysis process attribute is a measure of the extent to which information needs are defined, relationships between process elements are identified and data are collected. As a result of full achievement of this process attribute:

- a) The process is aligned with quantitative business goals;
- b) Process information needs in support of relevant defined quantitative business goals are established;
- c) Process measurement objectives are derived from process information needs;
- d) Measurable relationships between process elements that contribute to the process performance are identified;
- e) Quantitative objectives for process performance in support of relevant business goals are established;
- f) Appropriate measures and frequency of measurement are identified and defined in line with process measurement objectives and quantitative objectives for process performance;
- g) Results of measurement are collected, validated and reported in order to monitor the extent to which the quantitative objectives for process performance are met.

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

#### 定量分析过程属性

定量分析过程的属性是，定义信息需要、识别过程要素之间的关系以及收集数据的程度的度量。完全达成该过程属性的结果如下：

- a) 过程与量化的商业目标相一致；
- b) 建立了过程信息需要，以支持相关已定义的量化商业目标；
- c) 过程度量目标由过程信息需要导出；
- d) 识别了有助于过程实施的过程要素之间的度量关系；
- e) 建立了过程实施的定量目标，以支持相关的商业目标；
- f) 识别和定义了合适的度量项及其频率，并与过程度量目标及过程实施的定量目标相一致；
- g) 收集、确认和报告了度量结果，以监控过程实施达成定量目标的程度。

**1** 信息需要通常反映了管理、技术、项目、过程或产品的需要。



GP  
4.1.1**Identify business goals.** [ACHIEVEMENT a]

Business goals are identified that are supported by the quantitatively measured process.

GP  
4.1.2**Establish process information needs.** [ACHIEVEMENT a, b]

Stakeholders of the identified business goals and the quantitatively measured process, and their information needs are identified, defined and agreed.

GP  
4.1.3**Derive process measurement objectives from process information needs.** [ACHIEVEMENT a, c]

The process measurement objectives to satisfy the established process information needs are derived.

GP  
4.1.4**Identify measurable relationships between process elements.** [ACHIEVEMENT a, d]

Identify the relationships between process elements, which contribute to the derived measurement objectives.

GP  
4.1.5**Establish quantitative objectives.** [ACHIEVEMENT a, e]

Establish quantitative objectives for the identified measurable process elements and their relationships. Agreement with process stakeholders is established.

GP  
4.1.6**Identify process measures that support the achievement of the quantitative objectives.** [ACHIEVEMENT a, f]

Detailed measures are defined to support monitoring, analysis and verification needs of the quantitative objectives.

Frequency of data collection is defined.

Algorithms and methods to create derived measurement results from base measures are defined, as appropriate.

Verification mechanism for base and derived measures is defined.

1 Typically, the standard process definition is extended to include the collection of data for process measurement.

**识别商业目标。** [成就 a]

识别商业目标，其目标由定量度量过程所支持。

**建立过程信息需要。** [成就 a, b]

识别和定义已识别的商业目标和定量度量过程的利益相关方，及利益相关方信息需要，并达成一致。

**从过程信息需要中导出过程度量目标。** [成就 a, c]

导出过程度量目标以满足建立的过程信息需要。

**识别过程要素之间的度量关系。** [成就 a, d]

识别过程要素之间的关系，有助于导出度量目标。

**建立定量的目标。** [成就 a, e]

对于已识别的可度量过程要素及其之间的关系建立定量的目标。建立与过程利益相关方之间的约定。

**识别过程度量项以支持定量目标的实现。** [成就 a, f]

定义细化的度量项以支持对定量目标的跟踪、分析和验证需要。定义数据收集的频率。

定义适当的算法和方法以从基本度量导出度量结果。

定义基本度量和衍生度量的验证机制。

1 通常，对标准过程定义范围进行扩展，以包含过程度量的数据收集。

GP  
4.1.7**Collect product and process measurement results through performing the defined process. [ACHIEVEMENT a, g]**

Data collection mechanism is created for all identified measures.

Required data is collected within the defined frequency, and recorded.

Measurement results are analyzed, and reported to the identified stakeholders.

- 2 *A product measure can contribute to a process measure, e.g. the productivity of testing characterized by the number of defects found in a given timeframe in relation to the product defect rate in the field.*

**通过执行已定义的过程来收集产品和过程的度量结果。** [成就 a, g]

对所有已识别的度量项建立数据收集机制。

在定义的频率内收集并记录所需的数据。

分析度量结果并报告给已识别的利益相关方。

- 2 产品度量可助于过程度量，例如：以给定时间范围内发现的缺陷数量为特征的测试生产率与现场的产品缺陷率有关。

## PA 4.2 Quantitative control process attribute

## 定量控制过程属性

The quantitative control process attribute is a measure of the extent to which objective data are used to manage process performance that is predictable. As a result of full achievement of this process attribute:

- a) Techniques for analyzing the collected data are selected;
- b) Assignable causes of process variation are determined through analysis of the collected data;
- c) Distributions that characterize the performance of the process are established;
- d) Corrective actions are taken to address assignable causes of variation;
- e) Separate distributions are established (as necessary) for analyzing the process under the influence of assignable causes of variation.

定量控制过程属性是对客观数据被用于管理可预测的过程绩效的程度的度量。完全达成该过程属性的结果如下:

- a) 选择了分析收集数据的技术;
- b) 通过分析收集到的数据, 确定了过程波动的可查明原因;
- c) 建立了表征过程绩效的分布;
- d) 采取了纠正措施以解决波动的可查明原因;
- e) 建立了各自的分布 (必要时) 以分析受波动的可查明原因所影响的过程。

## Generic practices 4.2.1 - 4.2.3

## 通用实践 4.2.1 - 4.2.3

GP  
4.2.1

### Select analysis techniques. [ACHIEVEMENT a]

Analysis methods and techniques for control of the process measurements are defined.

### 选择分析技术。[成就 a]

定义控制过程度量的分析方法和技术。

GP  
4.2.2

### Establish distributions that characterize the process performance.

[ACHIEVEMENT c]

Expected distributions and corresponding control limits for measurement results are defined.

### 建立表征过程绩效的分布。[成就 c]

定义度量结果的预期分布和相应的控制限值。

GP  
4.2.3

### Determine assignable causes of process variation. [ACHIEVEMENT b]

Each deviation from the defined control limits is identified and recorded.

Determine assignable causes of these deviations by analyzing collected data using the defined analysis techniques.

All deviations and assigned causes are recorded.

### 确定过程波动的可查明原因。[成就 b]

识别并记录每个与已定义控制限值的偏差。

通过使用定义的分析技术来分析收集的数据, 以确定波动的可查明原因。

记录所有偏差和可查明原因。

GP  
4.2.4**Identify and implement corrective actions to address assignable causes.**

[ACHIEVEMENT d]

Corrective actions are determined, recorded, and implemented to address assignable causes of variation.

Corrective action results are monitored and evaluated to determine their effectiveness.

GP  
4.2.5**Establish separate distributions for analyzing the process** [ACHIEVEMENT e]

Separate distributions are used to quantitatively understand the variation of process performance under the influence of assignable causes.

**识别和实施纠正措施以解决可规避原因。** [成就 d]

确定、记录并实施纠正措施，以解决波动的可查明原因。

监控和评估纠正措施的结果，以确定其有效性。

**建立用于分析过程的各自的分布。** [成就 e]

使用各自的分布来定量地理解在可查明原因影响下过程绩效的波动。

## Process capability Level 5: Innovating process 过程能力等级5级：创新的过程

The previously described Predictable process is now continually improved to respond to change aligned with organizational goals.

The following process attributes, together with the previously defined process attributes, demonstrate the achievement of this level:

### PA 5.1 Process innovation process attribute

The process innovation process attribute is a measure of the extent to which changes to the process are identified from investigations of innovative approaches to the definition and deployment of the process. As a result of full achievement of this process attribute:

- a) Process innovation objectives are defined that support the relevant business goals;
- b) Appropriate data are analysed to identify opportunities for innovation;
- c) Innovation opportunities derived from new technologies and process concepts are identified;
- d) An implementation strategy is established to achieve the process innovation objectives.

### Generic practices 5.1.1 - 5.1.3

GP  
5.1.1

**Define the process innovation objectives for the process that support the relevant business goals. [ACHIEVEMENT a]**

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

GP  
5.1.2

**Analyze data of the process to identify opportunities for innovation. [ACHIEVEMENT b]**

Common causes of variation in process performance are identified and analyzed to get a quantitative understanding of their impact. Identify opportunities for innovation based on the quantitative understanding of the analyzed data.

GP  
5.1.3

**Analyze new technologies and process concepts to identify opportunities for innovation. [ACHIEVEMENT c]**

Industry best practices, new technologies and process concepts are identified and evaluated. Feedback on opportunities for innovation is actively sought. Emergent risks are considered in evaluating improvement opportunities.

先述的可预测的过程得到不断地改进，以响应与组织目标一致的变化。

以下过程属性结合先前已定义的过程属性，证明达成该等级：

### 过程创新属性

过程创新过程的属性是，从对过程的定义和部署的创新方法的调查中识别过程变化的程度的度量。

完全达成该过程属性的结果如下：

- a) 定义了支持相关商业目标的过程创新目标；
- b) 分析了适当的数据以识别创新的机会；
- c) 识别了来自新技术和过程概念的创新机会；
- d) 建立了实施战略以达成过程创新目标。

### 通用实践 5.1.1 - 5.1.3

**定义支持相关商业目标的过程创新目标。[成就 a]**

分析新的商业愿景和目标，以指导新的过程目标和过程创新的潜在领域。

**分析过程的数据以识别创新机会。[成就 b]**

识别和分析过程绩效波动的共通原因，以对它们的影响有量化的理解。

基于对分析数据的量化的理解，识别创新机会。

**分析新技术和过程概念以识别创新机会。[成就 c]**

识别和评估行业最佳实践、新技术和过程概念。

积极寻求创新机会的反馈。

在评估改进机会时考虑紧急风险。

GP  
5.1.4**Define and maintain an implementation strategy based on innovation vision and objectives.** [ACHIEVEMENT d]

Commitment to innovation is demonstrated by organizational management including the process owner(s) and other relevant stakeholders.

Define and maintain an implementation strategy to achieve identified opportunities for innovation and objectives.

Based on implementation strategy process changes are planned, prioritized based on their impact on defined innovations.

Measures that validate the results of process changes are defined to determine the expected effectiveness of the process changes and the expected impact on defined business objectives.

**定义和维护基于创新愿景和目标的实施战略。** [成就 d]

对创新的承诺由组织管理层（包括过程所有者和其他相关的利益相关方）体现。

定义并维护实施策略，以达成已识别的创新机会和目标。

基于实施策略，计划过程的变更，并基于其对定义的创新的影响进行优先级排序。

定义用来确认过程变更结果的度量项，以判定过程变更的预期有效性，和对已定义商业目标的预期影响。

## PA 5.2 Process innovation implementation process attribute

The process innovation process implementation attribute is a measure of the extent to which changes to the definition, management and performance of the process achieves the relevant process innovation objectives. As a result of full achievement of this process 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.

## 过程创新实施过程属性

过程创新实施过程属性是对过程的定义、管理和绩效的变化达成相关过程创新目标的程度的度量。完全达成该过程属性的结果如下:

- a) 依据已定义过程和标准过程的目标, 对所有提议的变更的影响进行评估;
- b) 对所有约定的变更的实施进行管理, 以确保对过程绩效的任何干扰得到理解并采取行动;
- c) 依据已定义的产品需求和过程目标, 基于实际绩效对过程变更的有效性进行评估。

## Generic practices 5.2.1 - 5.2.2

### GP 5.2.1

**Assess the impact of each proposed change against the objectives of the defined and standard process. [ACHIEVEMENT a]**

Objective priorities for process innovation are established.  
Specified changes are assessed against product quality and process performance requirements and goals.  
Impact of changes to other defined and standard processes is considered.

### GP 5.2.2

**Manage the implementation of agreed changes. [ACHIEVEMENT b]**

A mechanism is established for incorporating accepted changes into the defined and standard process(es) effectively and completely.  
The factors that impact the effectiveness and full deployment of the process change are identified and managed, such as:

- Economic factors (productivity, profit, growth, efficiency, quality, competition, resources, and capacity );
- Human factors (job satisfaction, motivation, morale, conflict/cohesion, goal consensus, participation, training, span of control);
- Management factors (skills, commitment, leadership, knowledge, ability, organizational culture and risks);

## 通用实践 5.2.1 - 5.2.2

**依据已定义过程和标准过程的目标, 对每个提议的变更的影响进行评估。[成就 a]**

建立过程创新的目标优先级  
依据产品质量、过程绩效需求和目标, 评估特定的变更。  
考虑变更对其它已定义过程和标准过程的影响。

**管理约定的变更的执行。[成就 b]**

建立机制, 以有效地和完全地将接受的变更纳入已定义过程和标准过程中。  
识别和管理影响过程变更的有效性和充分部署的因素, 例如:

- 经济因素 (生产力、利润、增长、效率、质量、竞争、资源和能力)
- 人的因素 (工作满意度、动机、士气、冲突/凝聚力、目标共识、参与、培训、控制范围)
- 管理因素 (技能、承诺、领导力、知识、能力、组织文化和风险)

GP  
5.2.2

- Technology factors (sophistication of system, technical expertise, development methodology, need of new technologies)
- Training is provided to users of the process.  
Process changes are effectively communicated to all affected parties.  
Records of the change implementation are maintained.

GP  
5.2.3**Evaluate the effectiveness of process change.** [ACHIEVEMENT c]

Performance and capability of the changed process are measured and evaluated against process objectives and historical data.

A mechanism is available for documenting and reporting analysis results to management and owners of standard and defined process.

Measures are analyzed to determine whether the process performance has improved with respect to common causes of variations.

Other feedback is recorded, such as opportunities for further innovation of the predictable process.

- 技术因素（系统复杂性、技术专长、开发方法、新技术需求）提供培训给过程用户。  
有效地与所有受影响方沟通过程变更。  
维护变更实施的记录。

**评估过程变更的有效性。** [成就 c]

依据过程目标和历史数据，度量和评估已变更的过程的绩效和能力。

提供一种机制，以记录和报告分析结果给标准过程和已定义过程的管理层和所有者。

分析度量项，以判定过程绩效是否相对于波动的共通原因有所改善。

记录其它反馈，例如：对可预测的过程进一步创新的机会。



## ASSESSMENT GUIDE 评估指南

| Certification Level<br>认证等级   | Additional Requirements & Capability (compared to the lower assessor grade)<br>附加要求及等级 (与低等级评估师相比)  |
|---|---|
| <p>"intacs™ certified <b>Instructor Competent Level</b>"<br/>(qualified for all PAMs; domain specific qualifications may apply)</p> <p>"intacs™认证<b>主任讲师等级</b>"<br/>(具备所有过程评估模型 (PAMs) 的知识; 可申请特定领域资格)</p>  | <ul style="list-style-type: none"> <li>Capable of performing competent assessor trainings<br/>能够进行主任评估师培训</li> <li>Approval by a certified instructor (observation process)<br/>认证讲师的批准(观察过程)</li> </ul>  |
| <p>"intacs™ certified <b>Instructor Provisional Level</b>"<br/>(qualified for all PAMs; domain specific qualifications may apply)</p> <p>"intacs™认证<b>助理讲师等级</b>"<br/>(具备所有过程评估模型 (PAMs) 的知识; 可申请特定领域资格)</p>  | <ul style="list-style-type: none"> <li>Capable of performing provisional assessor trainings<br/>能够进行助理评估师培训</li> <li>Proven teaching skills 教学技能得到认可</li> <li>Approval by a certified instructor (observation process)<br/>认证讲师的批准(观察过程)</li> </ul>                                 |
| <p>"intacs™ certified <b>Principal Assessor</b>"<br/>(qualified for all PAMs; domain specific qualifications may apply)</p> <p>"intacs™认证<b>首席评估师</b>"<br/>(具备所有过程评估模型 (PAMs) 的知识; 可申请特定领域资格)</p>   | <ul style="list-style-type: none"> <li>Continuously and actively contributes to the international ISO/IEC 1550/33000 community's knowledge &amp; best practices<br/>不断为国际ISO/IEC 1550/33000社团的知识和最佳实践做出积极贡献</li> <li>Min. 8 assessment experiences 最少8次评估经验</li> </ul>              |
| <p>"intacs™ certified <b>Competent Assessor</b>"<br/>(ISO/IEC 15504-5, ISO/IEC 330xx, Automotive SPICE®, TestSPICE, ISO 20000 PAM)</p> <p>"intacs™认证<b>主任评估师</b>"<br/>(ISO/IEC 15504-5, ISO/IEC 330xx, Automotive SPICE®, TestSPICE, ISO 20000 过程评估模型 (PAM) )</p>   | <ul style="list-style-type: none"> <li>Capable of leading assessments 能够主导评估</li> <li>Approval by a certified assessor (observation process)<br/>认证讲师的批准(观察过程)</li> <li>Min. 5 assessment experience 最少5次评估经验</li> <li>2 additional trainings &amp; one exam 2次额外培训和1次考试</li> </ul> |
| <p>"intacs™ certified <b>Provisional Assessor</b>"<br/>(ISO/IEC 15504-5, ISO/IEC 330xx, Automotive SPICE®, TestSPICE, ISO 20000 PAM)</p> <p>"intacs™认证<b>助理评估师</b>"<br/>(ISO/IEC 15504-5, ISO/IEC 330xx, Automotive SPICE®, TestSPICE, ISO 20000 过程评估模型 (PAM) )</p> | <ul style="list-style-type: none"> <li>Capable of acting as a co-assessor 能够担任助理评估师</li> <li>Little or no assessment experience 有部分或无评估经验</li> <li>Passed training course &amp; exam 通过培训课程与考试</li> </ul>   |



## intacs™ Experience Evidence (EE)

### intacs™经验证据(EE)

To be granted or have renewed an assessor grade you have to prove that you maintain technical skills & experience with using the standard by collecting Experience Evidence (EE):

要获得或更新评估师等级，必须通过收集经验证据（EE）证明您在标准使用方面的技术技能和经验。

| EE Type 类型 | EE Name 名称                    | EE Description 描述   |
|------------|-------------------------------|---|
| EE-AT      | Assessment Team member 评估小组成员 | 50h Co-Assessor in an ISO/IEC 15504/330xx compliant assessment<br>作为助理评估师执行50小时符合ISO/IEC 15504/330xx标准的评估       |
| EE-AL      | Assessment Leading 评估领导       | 50h Lead Assessor in an ISO/IEC 15504/330xx compliant assessment<br>作为主评估师执行50小时符合ISO/IEC 15504/330xx标准的评估      |
| EE-IP      | Internal Passive 内部参与         | 6h participation in an internal SPICE event hold by intacs certified assessors<br>参加6小时由intacs认证评估师举办的内部SPICE活动 |
| EE-EP      | External Passive 外部参与         | 6h participation in an external and intacs acknowledged SPICE event<br>参加6小时经intacs认可的SPICE外部活动                 |
| EE-AC      | Active Contribution 积极贡献      | Contributions to the SPICE community on how to comprehend and apply SPICE<br>通过对SPICE的理解与应用为SPICE社区做出贡献         |
| EE-CT      | Course training 课程培训          | Delivering an intacs assessor training course<br>执行intacs评估师培训课程  |

Intacs™ requirements for provisional assessor Automotive SPICE® (valid for 3 years)

Intacs™对Automotive SPICE®助理评估师的要求（有效期3年）

Provisional 助理

| Requirements for receiving assessor certification<br>获取评估师认证的必要条件   | Requirements for assessor grade renewal<br>更新评估师等级的必要条件  |
|---|--|
| <ul style="list-style-type: none"> <li>Passed provisional assessor training and examination<br/>通过助理评估师培训和考试</li> <li>Payment of fee (450 EUR in 2021) 费用（2021年为450欧元）</li> <li>No assessment experience and no EE required<br/>无评估经验和经验证据（EE）要求</li> </ul> | <ul style="list-style-type: none"> <li>Payment of fee (450 EUR in 2021)<br/>费用（2021年为450欧元）</li> </ul> |

| Requirements for receiving assessor certification<br>获取评估师认证的必要条件   | Requirements for assessor grade renewal<br>更新评估师等级的必要条件  |               |               |               |                            |                            |
|---|--|---------------|---------------|---------------|----------------------------|----------------------------|
| <ul style="list-style-type: none"><li>▪ intacs Provisional Assessor Certification intacs 认证助理评估师</li><li>▪ 4 years of professional experience in development of technical complex systems or quality assurance, confirmed by employer or customer<br/>4年在技术、复杂系统或质量保证方面的专业经验，且有雇主或客户的确认</li><li>▪ Attended the course „Introduction to the VDA Automotive SPICE Guidelines“<br/>参加“VDA Automotive SPICE导论”课程</li><li>▪ Passed competent assessor training and examination in last 12 months<br/>于最近12个月内通过了主任评估师的培训和考试</li><li>▪ 5 EE-AT in last 60 months (all led by an certified Automotive SPICE assessor; at least 4 out of 5 EE-AT in Automotive)<br/>于最近60个月取得5个EE-AT（均由认证Automotive SPICE评估师主导；5个EE-AT内至少4个是汽车行业）</li><li>▪ Positive assessment lead observation by an intacs certified Competent or Principal assessor<br/>经由intacs认证主任/首席评估师观察并给与正面评价的评估</li><li>▪ Payment of fee (450 EUR in 2021)<br/>费用（2021年为450欧元）</li></ul> | <ul style="list-style-type: none"><li>▪ Payment of fee (450 EUR in 2021)<br/>费用（2021年为450欧元）</li><li>▪ 6 EEs in last 36 months:<br/>于最近36个月内取得了6个经验证据(EE):</li></ul> |               |               |               |                            |                            |
|   | EE Type<br>类型  | EE Type<br>类型 | EE Type<br>类型 | EE Type<br>类型 | EE Type<br>类型              | EE Type<br>类型              |
|   | AT or AL   | AL            | AL            | EP or AC      | AT, AL,<br>IP, EP<br>or AC | AT, AL,<br>IP, EP<br>or AC |
|   |  |               |               |               |                            |                            |
| <ul style="list-style-type: none"><li>▪ intacs Competent Assessor Certification intacs 认证主任评估师</li><li>▪ 3 EE-AL gathered in at least 3 assessments plus 2 EE-AC plus one more EE (either EE-EP or EE-AC)<br/>在至少3次评估中获得3个EE-AL，2个EE-AC及1个EE(经验证据)(EE-EP或EE-AC)</li><li>▪ All EEs have to be granted within the last 36 months and only EE gathered after the certification as Competent Assessor are valid.<br/>所有EE必须是在过去36个月内取得的，且只有在取得主任评估师认证后所取得的EE是有效的</li><li>▪ Payment of fee (450 EUR in 2021)<br/>费用（2021年为450欧元）</li></ul>   | <ul style="list-style-type: none"><li>▪ Payment of fee (450 EUR in 2021)<br/>费用（2021年为450欧元）</li><li>▪ 6 EEs in last 36 months:<br/>于最近36个月内取得了6个经验证据(EE):</li></ul> |               |               |               |                            |                            |
|   | EE Type<br>类型  | EE Type<br>类型 | EE Type<br>类型 | EE Type<br>类型 | EE Type<br>类型              | EE Type<br>类型              |
|   | AT or AL   | AL            | AL            | EP or AC      | AC                         | AC                         |

| Requirements for receiving assessor certification<br>获取评估师认证的必要条件   | Requirements for assessor grade renewal<br>更新评估师等级的必要条件  |               |               |               |               |               |  |               |               |               |               |               |               |               |          |    |    |          |          |          |    |
|---|--|---------------|---------------|---------------|---------------|---------------|--|---------------|---------------|---------------|---------------|---------------|---------------|---------------|----------|----|----|----------|----------|----------|----|
| <ul style="list-style-type: none"><li>Intacs Principal Assessor Certification<br/>Intacs 认证首席评估师</li><li>Having demonstrated didactic skills, independent and objectively confirmed<br/>通过独立客观的方式得以确认证实的教学技能</li><li>Positive provisional assessor training course observation by an intacs acknowledged certified instructor<br/>由Intacs认证资质的讲师，进行观察并给与正面评价的助理评估师培训课程</li><li>Payment of fee (450 EUR in 2021)<br/>费用（2021年为450欧元）</li></ul> | <ul style="list-style-type: none"><li>Payment of fee (450 EUR in 2021)<br/>费用（2021年为450欧元）</li><li>7 EEs in last 36 months:<br/>于最近36个月内取得7个经验证据(EE):</li></ul> <table><tr><th>EE Type<br/>类型</th><th>EE Type<br/>类型</th><th>EE Type<br/>类型</th><th>EE Type<br/>类型</th><th>EE Type<br/>类型</th><th>EE Type<br/>类型</th><th>EE Type<br/>类型</th></tr><tr><td>AT or AL</td><td>AL</td><td>AL</td><td>EP or AC</td><td>AC or CT</td><td>AC or CT</td><td>CT</td></tr></table>  |               |               |               |               |               |  | EE Type<br>类型 | EE Type<br>类型 | EE Type<br>类型 | EE Type<br>类型 | EE Type<br>类型 | EE Type<br>类型 | EE Type<br>类型 | AT or AL | AL | AL | EP or AC | AC or CT | AC or CT | CT |
| EE Type<br>类型   | EE Type<br>类型  | EE Type<br>类型 | EE Type<br>类型 | EE Type<br>类型 | EE Type<br>类型 | EE Type<br>类型 |  |               |               |               |               |               |               |               |          |    |    |          |          |          |    |
| AT or AL  | AL   | AL            | EP or AC      | AC or CT      | AC or CT      | CT            |  |               |               |               |               |               |               |               |          |    |    |          |          |          |    |
| <ul style="list-style-type: none"><li>intacs Instructor Provisional Course<br/>intacs 助理讲师课程</li><li>Positive competent assessor training course observation by an intacs acknowledged certified instructor<br/>由intacs认证资质的讲师，进行观察并给与正面评价的主任评估师培训课程</li><li>Payment of fee (450 EUR in 2021)<br/>费用（2021年为450欧元）</li></ul>   | <ul style="list-style-type: none"><li>Payment of fee (450 EUR in 2021)<br/>费用（2021年为450欧元）</li><li>7 EEs in last 36 months:<br/>于最近36个月内取得了7个经验证据(EE):</li></ul> <table><tr><th>EE Type<br/>类型</th><th>EE Type<br/>类型</th><th>EE Type<br/>类型</th><th>EE Type<br/>类型</th><th>EE Type<br/>类型</th><th>EE Type<br/>类型</th><th>EE Type<br/>类型</th></tr><tr><td>AT or AL</td><td>AL</td><td>AL</td><td>EP or AC</td><td>AC or CT</td><td>AC or CT</td><td>CT</td></tr></table> |               |               |               |               |               |  | EE Type<br>类型 | EE Type<br>类型 | EE Type<br>类型 | EE Type<br>类型 | EE Type<br>类型 | EE Type<br>类型 | EE Type<br>类型 | AT or AL | AL | AL | EP or AC | AC or CT | AC or CT | CT |
| EE Type<br>类型   | EE Type<br>类型  | EE Type<br>类型 | EE Type<br>类型 | EE Type<br>类型 | EE Type<br>类型 | EE Type<br>类型 |  |               |               |               |               |               |               |               |          |    |    |          |          |          |    |
| AT or AL  | AL   | AL            | EP or AC      | AC or CT      | AC or CT      | CT            |  |               |               |               |               |               |               |               |          |    |    |          |          |          |    |

**OBJECTIVE:**

**Identification of process related product risks**

**目标:**

**识别与过程相关的产品风险**

- Classical objective  
传统目标
- Typically the customer aims to identify the product risks resulting from process weaknesses  
通常情况下，客户的目标是识别由过程弱点导致的产品风险
- Selected to measure completeness of process performance  
选择以度量过程性能的完整性
- Weaknesses in one process affect all following processes  
一个过程中的弱点会影响所有后续过程
- Insufficient inputs, which should be approved according to schedule, lead to downrating  
投入不足，应按计划批准，导致评定降级

**OBJECTIVE:**

**Evaluation of process improvement**

**目标:**

**对过程改进的评估**

- Improvement objective  
改进目标
  - Typically the organization aims to identify effectiveness of process changes  
通常，组织的目标是确定过程变更的有效性
  - Selected to measure the capability of recently modified processes  
选择以度量最近修改过程的能力
  - Weaknesses in one process do NOT affect following processes  
一个过程中的弱点不会影响后续过程
  - Insufficient inputs do NOT lead to downrating  
输入不足不会导致评定降级
  - Focus on small subsets e.g. golden samples  
关注小的子集，例如：标准样品
- This objective leads to better rating results  
此目标导向更好的评定结果

## Two different Automotive SPICE® assessment objectives and their impact on the rating 两种不同的 Automotive SPICE® 评估目标及其对评定的影响

### 1. The assessment objective "Identification of process related product risks" is selected to measure process performance completeness

选择“识别与过程相关的产品风险”为评估目标以度量过程实施的完整性



40% of spec is available  
40%的规范可用



The test process can only be executed for the given 40% of the system requirements.  
→ rating < L; Level 0

测试过程只能针对给定的40%的系统需求执行。  
→ 评定 < L; 等级 0

Idea of completeness 完整性观念

Good process performance with insufficient input from other processes leads to a lower rating. The argument is, that with insufficient input, the process cannot be executed without risks.

Typically the customer is interested to identify the process related product risks.

良好的流程绩效与其他流程的投入不足导致较低的评级。论点是，如果投入不足，过程就无法在没有风险的情况下执行。

客户通常对识别与过程相关的产品风险感兴趣。

### 2. The assessment objective "Evaluation of process improvement" is selected to measure the capability of recently implemented processes

选择“对过程改进的评估”为评估目标以度量最近实施的过程能力



40% of spec is available  
40%的规范可用



For the given 40% of the system requirements the test process is executed well.  
→ rating F

对于给定的40%的系统需求，测试过程执行良好。→ 评定 F

Idea of capability 能力观念

Good process performance with insufficient input from other processes leads to a good rating (see example above).

The argument is, that the process is executed in a good way based on the available input.

良好的过程性能和来自其他过程的不足输入导向良好的评定（参见上面的示例）。

论点是，过程是基于可用的输入，以良好的方式执行的。

| Roles and Assignments 角色和分配  |        |   |        |
|--|--------|---|--------|
| Sponsor, Position 赞助方，职位   |        |   |        |
| Lead Assessor, Certification ID 主评估师，认证ID  |        |   |        |
| Co Assessor(s), Certification ID(s) 助理评估师，认证ID   |        |   |        |
| Local Coordinator 本地协调员  |        |   |        |
| Standards and Classifications 标准与分类  |        |   |        |
| Product(s), ASIL Level(s) 产品，ASIL等级  |        | e.g. Braking Control Unit, ASIL D 例如：制动控制单元，ASIL D                |        |
| Assessment Standard 评估标准   |        | ISO/IEC 33002   |        |
| Assessment Process 评估过程  |        | KM-Assessment-Process v4.1 KM评估过程v4.1                             |        |
| Organization Unit Classification 组织单元分类  |        | Automotive Tier 1 汽车1级供应商   |        |
| Application of VDA Assessment Guideline chapter 2.2: Assessing specific application environments<br>VDA评估指南2.2章的应用：评估特定的应用环境 |        |   |        |
| 2.2.1 Model based development 基于模型的开发  | Yes/No | 2.2.4 Management of third party software 第三方软件管理                  | Yes/No |
| 2.2.2 Agile environments 敏捷环境  | Yes/No | 2.2.5 Management of platform and legacy software SW<br>平台和遗留软件的管理 | Yes/No |
| 2.2.3 Distributed development 分发开发   | Yes/No | 2.2.6 Application parameters 应用参数                                 | Yes/No |



## Assessment Input Part 2 of 3: Assessment Scope 评估输入第2部分（共3部分）：评估范围

| Assessment scope 评估范围   |   |                             |                       |
|---|---|-----------------------------|-----------------------|
| Process Assessment Model version 过程评估模型版本   | e.g. Automotive SPICE 3.1 例如：Automotive SPICE 3.1                                   |                             |                       |
| VDA Guideline version VDA指南版本   | e.g. 1st edition 2017 (or none) 例如：2017年第1版本（或无）                                    |                             |                       |
| Company and organizational Unit(s) 公司与组织单位  | <Name(s) of the assessed ...> <被评估方名称.....>   |                             |                       |
| Project(s) 项目   | <Name(s) of the assessed project(s)> <被评估项目名称>                                      |                             |                       |
| Location(s) 地点  | <Name of the cities with countries> <国家城市名称>  |                             |                       |
| Assessment purpose 评估目的   |   |                             |                       |
| e.g. "Identify potentials for (or evaluation of) process improvement" or "Identify process related product risk" 例如：“识别（或评估）过程改进潜力“或”识别与过程相关的产品风险“  |   |                             |                       |
| Assessed processes 评估过程   | e.g. VDA scope including MAN.5 and REU.2 例如：VDA范围包括 MAN.5 和 REU.2                   |                             |                       |
| Target capability level 目标能力等级  | e.g. CL 3 for all assessed processes 例如：所有评估过程的能力级别3级                               |                             |                       |
| Assessment class 评估等级   | 1,2 or 3 1,2或3级   | Independence category 独立性类别 | A, B, C or D A,B,C或D类 |
| Process context 过程背景  |   |                             |                       |
| Process context category 过程背景类别   | A (part of product/delivery) or B (Entire product/delivery) A(产品/交付的一部分)或B(整个产品/交付) |                             |                       |
| e.g. "A subset of stakeholder requirements valid for a specific release" OR "All changes between two defined project milestones" OR "All software requirements implemented by improved processes"<br>例如：“对特定发布有效的利益相关方需求子集”或“两个已定义项目里程碑的所有变更”或“通过改进的过程实现所有软件需求” |   |                             |                       |

**Assessment class 评估等级:**

1. 4 or more process instances per process*If there are fewer than the required number of process instances available in the organization, all process instances shall be selected.*  
每个过程有4个或以上过程实例，如果组织中的可用过程实例少于所需，则需要选择所有过程实例

2. 2 or more process instances per process *If there are fewer than ... (ditto)*  
每个过程有2个或以上过程实例，如果少于.....(同上)

3. else  
其他

**Example for a specific application environment:**  
**特定应用环境例子:**

**2.2.5 Management of platform and legacy SW**  
**2.2.5平台和遗留软件的管理**

**No** (i.e. the Management of platform and legacy software is not applied): *The assessment covers the current project and former projects in which platform and legacy software were developed. The platform and legacy software development is assessed and rated in separate instances.*

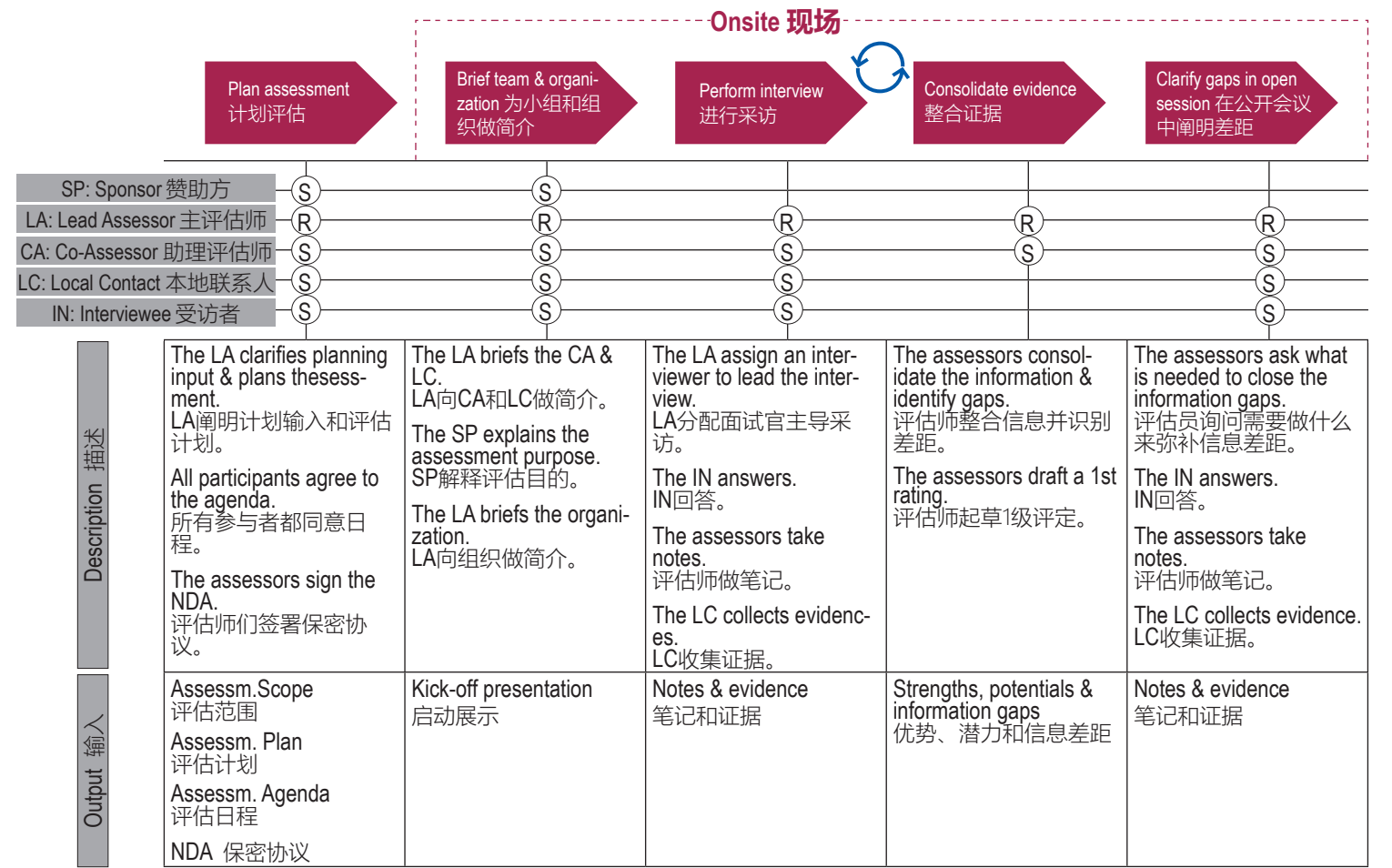
**否**（即对平台和遗留软件的管理不适用）：评估覆盖当前项目和以前开发平台和遗留软件的项目。对平台和遗留软件开发实例分别进行评估与评定。

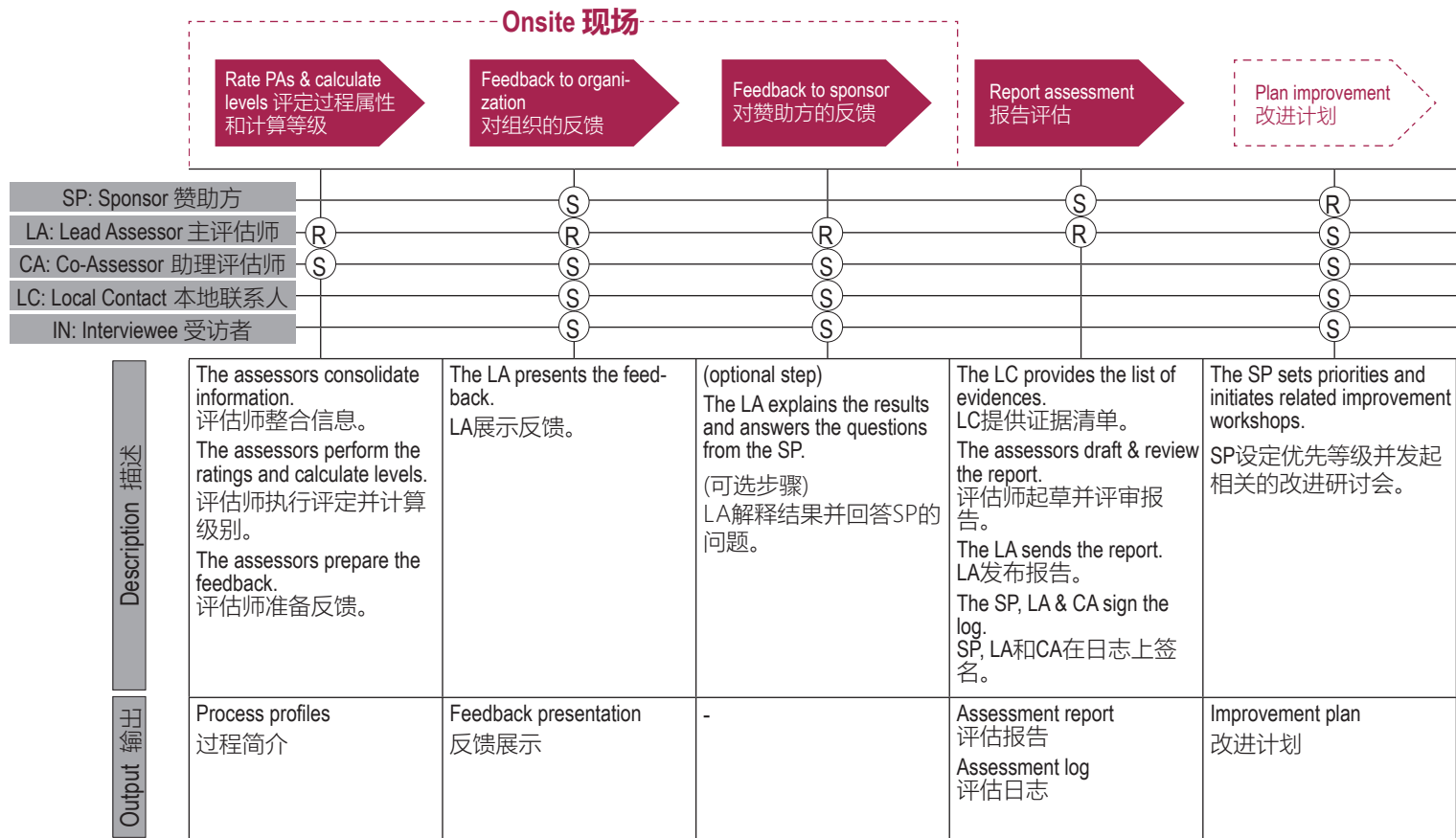
|  | Type A    A类   | Type B    B类   | Type C    C类   | Type D    D类  |
|--|--|--|--|---|
| Body performing the assessment<br>执行评估的机构                  | The body performing the assessment is independent of the organization being assessed<br>执行评估的机构独立于被评估的组织 |  | The body performing the assessment is part of the organization being assessed<br>执行评估的机构是被评估组织的一部分 | The body performing the assessment may or may NOT be independent being assessed<br>执行评估的机构可能是独立评估机构，也可能不是独立评估机构 |
| Competent assessor<br>主任评估师                                | Independent of the organization being assessed<br>独立于被评估组织   | Independent of the organization being assessed<br>独立于被评估组织   | Adequate separation of responsibility from personnel in other functions<br>与其他职能部门的人员充分分工负责        | Need NOT be independent of the organization being assessed<br>不需要独立于被评估的组织                                      |
| Assessors (other than competent assessor)<br>评估师（合格的评估师除外） |  | May be from the organization being assessed provided clear separation of the responsibilities of the assessors from personnel in other functions<br>可来自被评估组织，但需明确区分评估员与其他职能部门人员的责任 |  |   |

## Assessment Input Part 3 of 3: Assessment Agenda

### 评估输入第3部分（共3部分）：评估范围

| Day 1 第1天 |        |  |                                    |
|-----------|--------|--|------------------------------------|
| Start 开始  | End 结束 | Topic 主题   | Participants 参与者                   |
| 9:00      | 9:15   | Kick off 启动  | Sponsor, Assessment Team 赞助方, 评估小组 |
| 9:15      | 10:50  | MAN.3 - Project Management - Project Level MAN.3-项目管理-项目等级   |                                    |
| 10:50     | 11:00  | Break 休息   |                                    |
| 11:00     | 12:00  | MAN.3 - Project Mngt. - Sub-Project/Teams MAN.3-项目管理-子-项目/小组 |                                    |
| 12:00     | 12:30  | Break 休息   |                                    |
| 12:30     | 13:30  | Consolidation 整合   | Assessment Team only 只有评估小组        |
| 13:30     | 15:00  | SUP.1 - Quality Assurance SUP.1-质量保证                         |                                    |
| 15:00     | 15:30  | Consolidation 整合   | Assessment Team only 只有评估小组        |
| 15:30     | 17:00  | SUP.8 - Configuration Management SUP.8-配置管理                  |                                    |
| 17:00     | 17:30  | Consolidation 整合   | Assessment Team only 只有评估小组        |
| Day 2 第2天 |        |  |                                    |
| Start 开始  | End 结束 | Topic 主题   | Participants 参与者                   |
| 9:00      | 10:30  | SYS.2 - System Requirements SYS.2-系统需求                       |                                    |
| 10:30     | 11:00  | Consolidation 整合   | Assessment Team only 只有评估小组        |
| 11:00     | 12:15  | SYS.3 - System Architecture SYS.3-系统架构                       |                                    |
| 12:15     | 13:00  | Break 休息   |                                    |
| 13:00     | 13:30  | Consolidation 整合   | Assessment Team only 只有评估小组        |
| 13:30     | 15:00  | SWE.1 - SW Requirements SWE.1-软件需求                           |                                    |
| 15:00     | 15:30  | Consolidation 整合   | Assessment Team only 只有评估小组        |
| 15:30     | 17:00  | SWE.2 - SW Architecture SWE.2-软件架构                           |                                    |
| 17:00     | 17:30  | Consolidation 整合   | Assessment Team only 只有评估小组        |





### Prepare for the interview 为采访做准备

#### Understanding 理解

- Ensure correct understanding of the SPICE process, its purpose and practices  
确保正确理解SPICE过程、其目的和做法
- Ensure correct understanding of our strategy, process description, and needed artifacts  
确保正确理解我们的战略、过程描述和所需制品
- Reflect on the last "Process Audit" and weaknesses that were detected  
反思上一次“过程审核”中发现的弱点

#### Presentation 展示

- Prepare introduction slides  
准备介绍幻灯片
- Choose at least 5 examples to show that all actions are performed throughout the whole process  
至少选择5个示例，以表明所有措施在整个过程中均以执行
- Exercise presentation several times  
多次练习展示

#### Artifacts 制品

- Update, release and check-in artifacts as planned  
按计划更新、发布和检入制品
- Be prepared to show coverage  
为展示覆盖率做好准备
- Ensure you are able to guide the assessor through each artifact  
确保您能够指导评估师完成每个制品

### Convince in the interview 采访中的说服力

#### Strategy 策略

- Report your responsibility – very compactly; use the role description or ONE introduction slide for your work  
简洁紧凑的报告你的职责；使用角色描述或一张简介幻灯片进行工作。
- Show the defined process as the basis for your explanation  
展示已定义的过程作为解释说明的基础

#### Consistency 一致性

- Explain what you do using the defined process step by step. In parallel open the artifacts and show your work  
使用已定义的过程逐步解释所做的工作。同时，展开制品以展示工作。
- Use the prepared examples and show consistency  
使用准备好的示例并展示一致性。

#### Completeness 完整性

- Report progress and status  
报告过程和状态
- Show coverage  
展示覆盖率
- Show trends and derived actions  
展示趋势和衍生措施

### Start of interview

- Be friendly. Reduce stress. Ensure, that the interviewee does not feel he is being grilled. Start with a very easy question.

### How to raise questions

- Start with an 'open' question to get a lot of information. Use 'closed' questions to get precise or detailed answers.
- Be an active listener. Repeat what you have understood if you need additional confirmation.

### Do not ...

- Never assume any activities or work products
- Never phrase a question in a way that indicates a certain answer or expectation
- Never blame a person. Never provide feedback (i.e. rating or indicators for it) during interviews. Never be ironic.

### Find the gaps

- Follow the feature / change request / bug report from the source to the realization, to the qualification and to closure
- Repeat at least 3 times. Check consistency and completeness. Do not get distracted by sidetracks of 'storytellers'

### End of interview

- Be friendly. Reduce stress. Ensure, that the interviewee does not feel he is being grilled.
- Invite participants to the feedback presentation.

### 采访开始

- 保持亲切友好，为受访者减压。确保受访者没有受审问的感觉。以一个非常简单的问题开始。

### 如何提问题

- 以一个“开放式”问题开始来获取大量信息。使用“封闭式”问题来获得精确详细的答案。
- 做一个积极的聆听者。如您需要进一步确认，请复述您所理解的内容。

### 不要.....





- 不要对任何活动或工作产品做出假设。
- 不要以暗示某个回答或期待的方式来问问题。
- 不要责怪任何人。不要再采访过程中给与反馈（即评定或指标）。切勿讥讽。

### 找出差距

- 从来源到可实现性、合格性及关闭，全程遵循功能/变更请求/缺陷报告。
- 至少重复3次。确保一致性和完整性。不要跑题。

### 采访结束

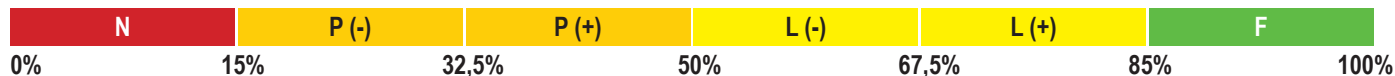
- 保持亲切友好，为受访者减压。确保受采访者没有受审问的感觉。
- 邀请参与者参加反馈展示。

|  |   |   |
|--|---|---|
|  | <p>Not achieved 没有达成<br/>0% to 15% 0%至15%</p>             | <p>There is little or no evidence of achievement of the defined attribute in the assessed process.<br/>在被评估的过程中, 有很少或没有证据表明定义的过程属性得以达成。</p> <p><b>Outcome:</b> Outcome/achievement not existent, or content judged unacceptable.<br/><b>成果:</b> 没有成果/达成, 或内容被判断为不可接受。</p>   |
|  | <p>Partially achieved 部分达成<br/>&gt;15% to 50% 15%至50%</p> | <p>There is some evidence of an approach to, and some achievement of, the defined attribute in the assessed process. Some aspects of achievement of the attribute may be unpredictable.<br/>在被评估的过程中, 有一些证据表明对定义的过程属性进行了执行, 并部分达成。过程属性的达成在某些方面可能是不可预测的。</p> <p><b>Outcome:</b> Some outcomes/achievements implemented, but projects/OUTs still incapable of reaching quality, time, or budget goals and targets<br/><b>成果:</b> 实施了一些成果/达成, 但是项目/运行单元依然无法达到质量、时间或预算目标和指标。</p>                                      |
|  | <p>Largely achieved 主要达成<br/>&gt; 50% to 85% 50%至85%</p>  | <p>There is evidence of a systematic approach to, and significant achievement of, the defined attribute in the assessed process. Some weakness related to this attribute may exist in the assessed process.<br/>在被评估的过程中, 有证据表明对定义的过程属性有系统地执行, 并得到显著的达成。过程属性相关的一些弱点可能存在于被评估的过程中。</p> <p><b>Outcome:</b> Outcome/achievement implies a significant likelihood, however no certainty, of reaching quality, time, and budget goals and targets.<br/><b>成果:</b> 成果/达成显示出很大的可能性, 但不确定是否能达到质量、时间或预算目标和指标。</p>           |
|  | <p>Fully achieved 全部达成<br/>&gt; 85% to 100% 85%至100%</p>  | <p>There is evidence of a complete and systematic approach to, and full achievement of, the defined attribute in the assessed process. No significant weaknesses related to this attribute exist in the assessed process.<br/>在被评估的过程中, 有证据表明对定义的过程属性有完整地 and 系统地执行, 并得到充分的达成。没有过程属性相关的显著弱点存在于被评估的过程中。</p> <p><b>Outcome:</b> No process risk with respect to quality, time, budget. Goals and targets identified, even in presence of imperfections.<br/><b>成果:</b> 在质量、时间、预算方面没有过程风险。虽然存在不完善的地方, 但识别了目标和指标。</p> |



- 1. Interview** the team members who perform the process and gather evidences like affirmations and work products for each practice (of both Base Practices and Generic Practices) within the assessment scope.
- 2. Clarify** how each practice is expected to be applied within the specific project, scope and schedule.
- 3. Rate** the achievement of each practice based on the evidence of application using **NPLF** (Not achieved / Partly achieved / Largely achieved / Fully achieved)

- 1. 采访**小组内执行过程的成员，并收集每个评估范围实践（包括基础实践和一般实践）中的主张和工作产品证据。
- 2. 阐明**在具体的项目、范围和进度中，如何应用每项实践。
- 3. 根据应用证据，使用NPLF来评定**每项实践的达成（**N**没有达成/**P**部分达成/**L**主要达成/**F**全部达成）



- 4. Rate** the degree to which the related Process Attributes (PAs) are achieved using NPLF.
  - 5. If applicable, aggregate** the PA ratings of several process instances (but never of different processes)
    - Assign values for each NPLF rating: N → 0; P- → 1; P+ → 2; L- → 3; L+ → 4; F → 5
    - Assign each value a pre-defined weighting, round the arithmetic mean and convert back
  - 6. Check** for rating consistency.
  - 7. Calculate** the capability level of the related process: a 'F' rating of the PAs is expected – start with capability level 1 and climb up level for level. Only at the highest level is a PA rating of 'L' accepted.
- 对使用NPLF实现相关过程属性（PAs）的程度进行**评定**。
  - 若适用，将多个过程实例（但绝非不同过程）的过程属性评定**聚合**起来
    - 为每个NPLF评定分配值：N → 0; P- → 1; P+ → 2; L- → 3; L+ → 4; F → 5
    - 为每个值分配一个预定义的权重，四舍五入平均数并转换回去
  - 6. 检查**评定一致性。
  - 7. 计算**相关过程的能力等级：从能力等级1级开始向上的每一级，过程属性评定必须取得“F”。只有在最高级可以接受“L”过程属性评级。

| Process xyz 某一过程          | PA1.1 | PA2.1 | PA2.2 | PA3.1 | PA3.2 | PA4.1 | PA4.2 | PA5.1 | PA5.2 |
|---------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Capability Level 1 能力等级1级 | L/F   |       |       |       |       |       |       |       |       |
| Capability Level 2 能力等级2级 | F     | L/F   | L/F   |       |       |       |       |       |       |
| Capability Level 3 能力等级3级 | F     | F     | F     | L/F   | L/F   |       |       |       |       |

The lead assessor reports the assessment team result to the sponsor.

The report includes as a minimum:

- The assessment input including constraints, if any
- The strengths and potentials per process
- The resulting capability and process attribute profiles
- The practice ratings and objective evidences
- The reasons for rule deviations, if applicable
- Unique title, version number, change history, distribution list

The report should also include:

- A Management Summary
- Basic recommendation for next improvement steps

In addition the lead assessor asks the sponsor to sign the assessment log.

主评估师向赞助方报告评估小组的评估结果。

报告至少需要包括：

- 评估输入包括约束条件（如有）
- 每个过程的优势和潜力
- 由此产生的能力和过程属性概览
- 实践评定和客观证据
- 规则偏差的原因（如适用）
- 唯一标题，版本号，变更历史和分发清单

报告还应包括：

- 管理总结
- 下一步改进的基本建议

此外，主评估师请赞助方在评估日志上签字。

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Automotive SPICE® 是 Verband der Automobilindustrie e.V. (VDA) 的注册商标。

有关 Automotive SPICE® 的更多信息，请访问 [www.automotivespice.com](http://www.automotivespice.com)

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Knüvener Mackert GmbH 楷迈德根据国际评估师认证计划 (intacs™) 提供认证的 Automotive SPICE® 培训。

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## IT ISN'T ONLY ASPICE WHICH WE **SIMPLIFY**

### Acceptance of processes is the key

Accepted processes are lived and make it possible to learn from each other.

Accepted processes can fulfill norms – and provide benefit.

The focus lies on the most important process results.

The responsibility for content and release are clear.

Participants agree on the most direct path to the goal.

Accepted processes are based on simple rules.

## TRAINING**WORKSHOPS**@KNÜVENERMACKERT

Easy and effective learning in training workshops

We offer trainings for

- SPICE and Process Management
- Engineering
- Safety and Security
- Management
- Leadership

Please find more information on  
[knuevenermackert.com/cn/training](http://knuevenermackert.com/cn/training).

## 我们不仅仅是**简化了** ASPICE

### 最关键的是对过程的接纳

受采纳的过程是活的，并使互相学习成为可能。

受采纳过程可以满足规范，并带来效益。

聚焦于最重要的过程结果。

内容和发布的职责明确。

参与者就实现目标的最直接途径达成一致。

受采纳的过程，基于简明的规则。

## 培训**研讨会**@KNÜVENERMACKERT

在培训研讨会中轻松有效地学习

我们提供以下培训

- SPICE 与过程管理
- 工程
- 安全(Safety)和安全(Security)
- 管理
- 领导力

更多信息，请查看  
[knuevenermackert.com/cn/training](http://knuevenermackert.com/cn/training).

WWW.KNUEVENERMACKERT.CN  
WWW.KAIMAIDE.CN



## SERVICES – WE DELIVER!

We deliver more than just process definition

We deliver by driving the change to your next level

- Trainings
- Assessments ASPICE, SPICE, CMMI, Safety
- Process management
- Process standardization
- Process roll out
- Coaching

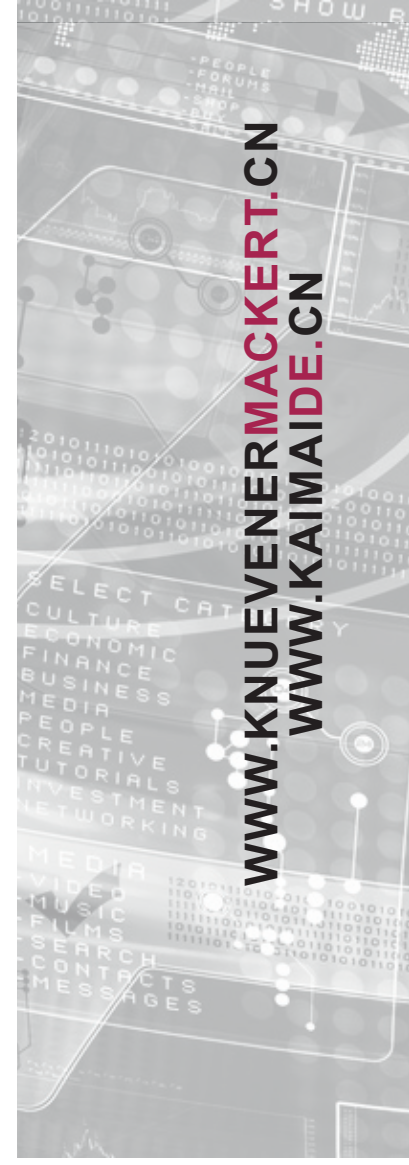
## 我们提供的 – 服务

我们不仅提供对过程的定义。

我们助您将变更提升到下一级别。

- 培训
- ASPICE评估, SPICE, CMMI, 安全
- 过程管理
- 过程标准化
- 过程推行
- 辅导

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# KNÜVENERMACKERT

ACCEPTED PROCESSES FOLLOW EASY RULES

## • INTRODUCTION TO AUTOMOTIVE SPICE®

AUTOMOTIVE SPICE® 简介

## • AUTOMOTIVE SPICE® V3.1 (extended VDA scope)

AUTOMOTIVE SPICE® V3.1 (VDA 扩展范围)

## • GUIDELINE RULES AND RECOMMENDATION IDS

指南规则及推荐ID

## • RATING CONSISTANCY DIAGRAMS

评定一致性图表

## • MECHANICAL ENGINEERING SPICE V1.7

机械工程 SPICE V1.7

## • ASSESSMENT GUIDE

评估指南

[www.knuevenermackert.cn](http://www.knuevenermackert.cn)

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